TRAINING OF RURAL EDUCATED YOUTH FOR SELF EMPLOYMENT IN FARM BASED ACTIVITIES
(TREYSEFA)

Back Ground :

Unemployment among the youth of the State is a matter of growing concern for the government. Job opportunities especially in the government sector are dwindling by the day. This has led to frustration and disillusionment among the educated youth especially those in rural areas. Rural youth, after having struggled to attain their education, are reluctant to return to the traditional practices of cultivation. It is in this context that the Department had formulated a programme entitled 'Training of Rural Educated Youth for Self Employment in Farm Based Activities' to open up opportunities for such youth to take up agriculture (including allied sectors) as an enterprise and a business. It is envisaged that this programme would motivate these youth to take up agriculture as an equally profitable venture.

Aims and Objectives :

The main aim of the programme is to impart training to the rural educated youth in areas like production technology, financing, project management and marketing thereby maximizing the profits by adoption of appropriate production technology and developing the entrepreneurial, management and behavioral skills in the youth. This will embed in him the responsibility of ensuring that business operations are efficient and effective converting land, labor and capital inputs into desired outputs and chalking out of a definite programme for managing the market situations and the ultimate execution of these plans to achieve the objectives.

Strategies:

- Resource persons will be drawn from the Line departments to assist the trained youth through their departmental schemes and programmes to help them established in their identified projects
- The trainees will also be assisted with some inputs required for starting the implementation of their individual/group projects along with limited financial assistance.
- The trainees will also be encouraged to avail credit facilities from financial institutions in the implementation of their respective projects.
- During the course of the training the trainees will also be attached to the various experimental stations run by the State Government Departments.
- After the initial two months the trainees will be assisted in the implementation of the respective projects in an integrated approach for the next one month and will be assigned to a Field Counselor from the Department.
- Towards the end of the training the trainees will have to prepare individual/group projects.
- After the programme the trainees will be able to start their own farm enterprise on an individual or group basis using the tools and techniques learned. The trainees will also be equipped with better skills for management of the farm and marketing and will adopt Group/Cooperative approach wherever possible so that these farms will serve as model farms for other farmers in the neighboring areas in particular and the State in general.

Target Beneficiaries : The target group will include 15 educated rural youths above 25 years of age possessing at least an educational qualification of Class X and preferably belonging to areas/zones having similar agro-climatic conditions. The selected youths should compulsorily own land or have family land/community land that will be made available to them for implementation of their individual projects after the training. Trainees will be drawn from each of the eleven Districts and four Sub-divisions of the State which would form clusters on the basis of the geographical locations, C & RD block jurisdiction, agro-climatic conditions, cropping pattern, agricultural & allied activities undertaken in the area/zone.

Management :

The Directorate of Agriculture as Nodal Department will co-ordinate the programmes with the other allied line departments viz. Directorate of Horticulture, Department of Veterinary & Animal Husbandry, Department of Fisheries, Department of Soil & Water Conservation and the Implementing agencies which will be implemented through the Basic Agriculture Training Centre through the process of net working.

Time Frame:

The training programme will run for a period of three months each which will include class lectures, informal discussion, group interaction, field visits, project preparation in a phase manner.

Outcome of the training :

At the end of the training the trainees will be able to :–

- Apply the new/improved production technologies on their farm for maximization of profits.
- Manage the farm business in a more effective and efficient way
- Form self-help groups/organizations needed for the progress of farm business
- Formulate projects for enhancing the farm business
- Judiciously use and manage resources to ensure the sustainability of the farm business and protection of the environment
- Take up marketing in an organized and effective way

Evaluation :

The success of the Programme can be evaluated by:

- Successful implementation of the identified projects undertaken by the trained youths.
- Higher production and profits of the farms of the trainees as compared to other farmers in the vicinity.
- Effective farm management to be measured by the trainees' skills to maintain up-to-date records, cashbooks and other accounting tools, quality of projects prepared by the trainees, effective marketing of produce, etc.
- Demand for the training by other farmers/youths

TIME TABLE WITH TOPICS FOR TREYSEFA			
DAY	**TIMING**	**SUBJECTS**	**TOPICS**
DAY - 1	10:00 am- 12:00 noon	AGRONOMY	Tillage and Tillage operations
	1:00 pm- 3:00 pm	HORT –I	Vegetable Cultivation in Meghalaya
	3:00 pm -5:00 pm	FARM MECHANISATION	Introduction to farm Mechanisation
DAY - 2	10:00 am- 12:00 noon	HORT –II	Introduction to Pomology
	1:00 pm- 3:00 pm	HORT – III	Introduction & Principles Of Gardening
	3:00 pm -5:00 pm	LIVING SOIL CONCEPT	Living soil concept
DAY - 3	10:00 am- 12:00 noon	COOPERATION	Introduction
	1:00 - 3:00 pm	PUBLIC Health	Air, water & soil pollution
	3:00 pm -5:00 pm	Practical	
DAY- 4	10:00 am- 12:00 noon	INM	Green Manuring
	1:00 pm- 3:00 pm		Practical
	3:00 pm -5:00 pm	AH & VETY	Integrated Farming
DAY- 5	10:00 am- 12:00 noon	HORT IV	Turmeric Cultivation
	1:00 pm- 3:00 pm	FARM MECHANISATION	Agriculture Engineering
	3:00 am – 5:00 pm	IPM	Rodent pest management
DAY -6	10:00 am -12:00 noon	HORT I	Polyhouse Vegetable Cultivation
	1: 00 pm -3:00 pm	HORT II	Cultivation of Peach and Pear
	3:00 pm-5: 00 pm	IPM	Agro EcoSystem Analysis(AESA)
DAY -7	10:00 am -12:00 noon	ORGANIC FARMING	Vasecular Arboscular Mycorhiza (VAM)
	1: 00 pm -3:00 pm	ORGANIC FARMING	Practical
	3:00 pm-5: 00 pm	PUBLIC Health	Zoonotic Disease
DAY -8	10:00 am -12:00 noon	AH & VETY	Piggery Farming
	1: 00 pm -3:00 pm	ORGANIC FARMING	Berkeley Compost
	3:00 pm-5: 00 pm	PRACTICAL	Berkeley

DAY	TIMING	SUBJECTS	TOPICS
DAY -9	10:00 am -12:00	HORT III	Classification of Flowers / Preservation of Flowers
	1: 00 pm -3:00 pm	PRACTICAL	
	3:00 pm-5: 00 pm	HORT II	Cultivation of Jackfruit
DAY 10	10:00 am -12:00 noon	FARM MECHANISATION	Important Functions /Instruction on the use of agriculture Machineries / Field Operations of agril . Machineries
	1: 00 pm -3:00 pm	ORGANIC FARMING	Berkley Compost
	3:00 pm-5: 00 pm	PRACTICAL	Berkley
DAY- 11	10:00 am -12:00	AGRONOMY	Integrated Farming System
	1: 00 pm -3:00 pm	AGRONOMY	Classification of Crops
	3:00 pm-5: 00 pm	HORT IV	Cultivation of Ginger
DAY 12	10:00 am -12:00	Hort-I	Potato cultivation
	1: 00 pm -3:00	Hort-III	Post-harvest management of cut flowers
	3:00 pm-5: 00 pm	TEA CULTIVATION	Tea cultivation in Ri- Bhoi
DAY- 13	10:00am-12	FARM BUDGETING	Farm Budgeting
	1:00 pm- 3:00 pm	SEED TESTING	Important of seed testing
	3:00 pm- 5:00 pm	PRACTICAL	
DAY -14	10:00am-12:00 noon	HORT III	Growing flowers in covered houses
	1:00 pm- 3:00 pm	IPM	On Farm Production of Bio Control Agents (Trichogramma spp)
	3:00 pm- 5:00 pm	PRACTICAL	
DAY -15	10:00 am- 12:00	MUSHROOM	Prospect of mushroom Cultivation in Meghalaya
	1:00 pm- 3:00 pm	HORT-I	Tomato Cultivation (Theory)
	3:00 pm- 5:00 pm	HORT-I	Tomato Cultivation (Practical)
DAY -16	10:00 am- 12:00	FARM MANAGEMENT	Introduction of Farm Management
	1:00 pm- 3:00 pm	AGRONOMY	Cropping system and Pattern
	3:00 pm- 5:00 pm	AGRONOMY	Intensive Cropping

DAY	TIMING	SUBJECTS	TOPICS
DAY -17	10:00 am- 12:00	SOIL TESTING	The Importance of Soil Testing
	1:00 pm- 3:00 pm	HORT-I	Cauliflower Cultivation.
	3:00 pm- 5:00 pm	FARM MANAGEMENT	Farm Resource and Farm Planning
DAY -18	10:00 am- 12:00	ORGANIC FARMING	Vermicompost
	1:00 pm- 3:00 pm	MARKETING	Meghalaya State Agricultural Marketing
	3:00 pm- 5:00 pm	PRACTICAL	
DAY -19	10:00 am- 12:00	PLANT HEALTHMANAGEMENT	Importance of Plant Health Management
	1:00 pm- 3:00 pm	PRACTICAL	
	3:00 pm- 5:00 pm	PUBLIC HEALTH	First Aid
DAY -20	10:00 am- 12:00	ORGANIC	Organic Certification (WRITE UP IS FOR ORGANIC SEED PRODUCTION)
	1:00 pm- 3:00 pm	MARKETING	Value addition of Banana, Jackfruit, Lichi
	3:00 pm- 5:00 pm	MARKETING	Value addition of Ginger & Peach
DAY-21		**FIELD VISIT**	
DAY -22	10:00 am- 12:00 noon	Fishery	Site selection and Construction of Fresh Water Fish Pond
	1:00 pm- 3:00 pm	MUSHROOM	Shiitake Mushroom Cultivation.
	3:00 pm- 5:00 pm	PRACTICAL	
DAY -23	10:00 am- 12:00 noon	HORT-II	Cultivation of Plum
	1:00 pm- 3:00 pm	PRACTICAL	
	3:00 pm- 5:00 pm	AH & VET.	Poultry Farming.
DAY -24	10:00 am- 12:00 noon	HORT-III	Cultivation of Gerbera.
	1:00 pm- 3:00 pm	FINANCING	Kisan Credit Card Scheme
	3:00 pm- 5:00 pm	HORT-I.	Broccoli Cultivation.

DAY	TIMING	SUBJECTS	TOPICS
DAY -25	10:00 am- 12:00 noon	ENTREPRENEURSHIP	Entreprenuership Development
	1:00 pm- 3:00 pm	ENTREPRENEURSHIP	Successful Entrepreneur(Poultry)
	3:00 pm- 5:00 pm	AGRONOMY .	SRI
DAY -26	10:00 am- 12:00 noon	POST HARVEST MANAGEMENT	(a) Extraction of Fruit Juice (b) Preparation of Squash Pulp
	1:00 pm- 3:00 pm	HRD	Leadership.
	3:00 pm- 5:00 pm	PRACTICAL	
DAY -27	10:00 am- 12:00 noon	FARM PLANING	Farm Planning
	1:00 pm- 3:00 pm	PRACTICAL	
	3:00 pm- 5:00 pm	HORT-III.	Cultivation of Alstroemeria.
DAY -28	10:00 am- 12:00 noon	ENTRENEURSHIP	Successful entrepreneur (Cattle)
	1:00 pm- 3:00 pm	HRD	Theories of Leadership
	3:00 pm- 5:00 pm	FISHERY.	Integrated Fish Farming .
DAY -29	10:00 am- 12:00 noon	MARKETING	Value addition of Pine apple, plum, mango, khasi mandarin, guava & cassava
	1:00 pm- 3:00 pm	MUSHROOM	Cultivation of Oyster Mushroom.
	3:00 pm- 5:00 pm	FINANCING.	Poultry venture capital fund subsidy scheme EDEG
DAY 30		FIELD VISIT	
DAY 31	10:00 am – 12:00 Noon	FARM MECHANIZATION	Safety Measures for operating Agricultural Machineries
	1:00 pm – 3:00 pm	AH & VET	Dairy Farming
	3:00 pm – 5:00 pm	PRACTICAL	
DAY 32	10:00 am – 12:00 Noon	HORT I	Pea Cultivation
	1:00 pm – 3:00 pm	AGRONOMY	Package & Practices of Soyabean
	3:00 pm – 5:00 pm	PUBLIC HEALTH	Nutrition

DAY	TIMING	SUBJECTS	TOPICS
DAY 33	10:00 am – 12:00 Noon	IPM	On Farm Production of *Pseudomonas fluorescence*
	1:00 pm – 3:00 pm	ENTREPRENEURSHIP	Successful Entrepreneur (Floriculture)
	3:00 pm – 5:00 pm	FINANCING	Banking and financial access
DAY 34	10:00 am – 12:00 Noon	FISHERY	Culture & Breeding of ornamental fishes
	1:00 pm – 3:00 pm	FINANCING	Banking and its facilities to farmers
	3:00 pm – 5:00 pm	TEA CULTIVATION	Cultivation of Organic Tea
DAY 35	10:00 am – 12:00 Noon	FARM MECHANIZATION	Routine Maintenance of AgriculturalMachineries
	1:00 pm – 3:00 pm	HRD	Objective & introduction of team building
	3:00 pm – 5:00 pm	PRACTICAL	
DAY 36	10:00 am – 12:00 Noon	ORGANIC FARMING	Panchagavya & Jeevamrit
	1:00 pm – 3:00 pm	PRACTICAL	
	3:00 pm – 5:00 pm	FRUIT PROCESSING	Preparation of Jam, Jelly,Marmalade
DAY 37	10:00 am – 12:00 Noon	PLANT HEALTH MANAGEMENT	IPM strategies for potato
	1:00 pm – 3:00 pm	AGRONOMY	IPM strategies in Rice
	3:00 pm – 5:00 pm	SOIL TESTING	Procedure of soil sample
DAY 38	10:00 am – 12:00 Noon	COOPERATION	Self help group
	1:00 pm – 3:00 pm	AH & VET	Zoonoses (Repeating FROM DAY 7)
	3:00 pm – 5:00 pm	HORT II	Strawberry & Kiwi cultivation
DAY 39	**FIELD VISIT**		
DAY 40	10:00 am – 12:00 Noon	HORT III	Cultivation of Lilium
	1:00 pm – 3:00 pm	MARKETING	1917 iTEAMS
	3:00 pm – 5:00 pm	PRACTICAL	

DAY	TIMING	SUBJECTS	TOPICS
DAY 41	10:00 am – 12:00 Noon	PLANT HEALTHMANAGEMENT	IPM Strategies for tomato
	1:00 pm – 3:00 pm	PRACTICAL	
	3:00 pm – 5:00 pm	FISHERY	Composite fish culture
DAY 42	10:00 am – 12:00 Noon	COOPERATION	Management in Co operative
	1:00 pm – 3:00 pm	ENTREPRENEURSHIP	Successful Entrepreneur(Food processing)
	3:00 pm – 5:00 pm	HORT II	Citrus cultivation
DAY 43	10:00 am – 12:00 Noon	HORT III	Cultivation of Gladiolus
	1:00 pm – 3:00 pm	APICULTURE	Introduction to Apiculture
	3:00 pm – 5:00 pm	APICULTURE	Rearing of honey Bees
DAY 44	10:00 am – 12:00 Noon	INTEGRATED NUTRIENT MANAGEMENT	Integrated Nutrient Management
	1:00 pm – 3:00 pm	HORT III	Rose cultivation
	3:00 pm – 5:00 pm	PRACTICAL	
DAY 45	10:00 am – 12:00 Noon	AGRONOMY	Cultivation of maize
	1:00 pm – 3:00 pm	PRACTICAI	
	3:00 pm – 5:00 pm	AH & VET	Farm Visit
DAY 46	10:00 am – 12:00 Noon	HRD	Supportive development building on ideas
	1:00 pm – 3:00 pm	FRUIT PROCESSING	Squash, Pulp extraction
	3:00 pm – 5:00 pm	FRUIT PROCESSING	Preparation of Pickles & Tomato Ketchup
DAY 47	10:00 am – 12:00 Noon	PLANT HEALTH MANAGEMENT	IPM strategies for cole crops
	1:00 pm – 3:00 pm	FARM MECHANIZATION	Improved tools and Machinery for Hill Agriculture (Repeat from day 10)
DAY 48		FIELD VISIT	
DAY 49	10:00 am – 12:00 Noon	MUSHROOM	Button mushroom Cultivation
	1:00 pm – 3:00 pm	MUSHROOM	Button Mushroom Cultivation
	3:00 pm – 5:00 pm	PRACTICAL	

DAY	TIMING	SUBJECTS	TOPICS
DAY 48		FIELD VISIT	
DAY 49	10:00 am – 12:00 Noon	MUSHROOM	Button mushroom Cultivation
	1:00 pm – 3:00 pm	MUSHROOM	Button Mushroom Cultivation
	3:00 pm – 5:00 pm	PRACTICAL	
DAY 50	10:00 am – 12:00 Noon	HORT II	Orchard Management
	1:00 pm – 3:00 pm	PRACTICAL	
	3:00 pm – 5:00 pm	AH & VET	Farm Visit
DAY 51	10:00 am – 12:00 Noon	COOPERATION	Maintenance of Books & Records
	1:00 pm – 3:00 pm	ZBNF (Zero Budget natural Farming)	Home remedies for management of pests & ZBNF
	3:00 pm – 5:00 pm	HORT I	Practical
DAY 52	10:00 am – 12:00 Noon	HORT III	Anthurium cultivation
	1:00 pm – 3:00 pm	HORT IV	Cultivation of Cardamom
	3:00 pm – 5:00 pm	PROJECT MANAGEMENT	Introduction to Project
DAY 53	10:00 am – 12:00 Noon	FARM MECHANIZATION	Maintenance of LOG Book
	1:00 pm – 3:00 pm	AGRONOMY	Organic seed production -
	3:00 pm – 5:00 pm	PRACTICAL	
DAY 54 – DAY 58		EXPOSURE TRIP OUTSIDE THE STATE	
DAY 59	10:00 am – 12:00 Noon	PROJECT MANAGEMENT	Project cycle, Project Cycle management
	1:00 pm – 3:00 pm	PROJECT MANAGEMENT	Key Activities in Project cycle management
	3:00 pm – 5:00 pm	PRACTICAL -	
DAY 60		FIELD VISIT INSIDE THE STATE	

DAY 1: 10:00 am- 12:00 noon: TILLAGE AND TILLAGE OPERATIONS

DEFINITION: AGRONOMY

The science of Agronomy has made it possible to generate suitable technology for varied agro climatic regions and integrate the results of other allied sciences, so as to deliver these appropriate innovative and tested practices to the farmers at large. Agronomy is a division of Agriculture is a branch of Agricultural science which deals with principles and practices of soil and crop management. The term is derived from Greek words 'agros' meaning '**field'** and 'nomos; meaning to **manage.**'

In recent times, Agronomy has assumed newer dimensions and can be defined as a branch of Agricultural science that deals with methods which provide favourable environment to the crop for higher productivity.

Agriculture is a very broad term encompassing all aspects of crop production, livestock farming, fisheries, forestry etc. The scenario in food production is changing fast in the country with the advances made in all branches of Agricultural sciences. However, the science of Agronomy, a specialized subject dealing with all aspects of field crop production, has accelerated the pace of food production, aided by the progress made in understanding the intricate relationships between crop growth and yield, and between crop and its environment like climate, soil, biotic factors and management practices.

TILLAGE AND TILLAGE OPERATIONS

Yield refers to mechanical manipulations of the soil thatare used to provide necessary soil conditions favorable for the growth of crops. Tillage includes all operations and practices that are used for the purpose of modifying physical character of the soil. Tilling the soil is the most difficult and time consuming operation in field crop production.

OBJECTIVE OF TILLAGE

1. To prepare the seed bed which promotes good germination and establishment of the seedling to a satisfactory level.
2. To control weeds and improve close plant –soil interaction in the rooting zone
3. To manage the plant residues by incorporating into the soil or to retain on the top layer to reduce erosion.
4. To improve the physical conditions of the soil so that rain water could be obsorbed easily and soil erosion can be minimized.
5. To establish specific surface configurations for sowing, irrigation, drainage etc.
6. To incorporate and mix applied fertilizers and manures into the soil.
7. To destroy the eggs and larvae of insects and their breeding places.
8. To permit root elongation and proliferation due to a low density soil.

TILTH: Tilth is the term used to express the physical condition of soil resulting from tillage**.** The physical condition is related to the soil- structural changes, which promote good seed germination and crop establishment. Tillage operations are aimed at producing and maintaining good tilth. A soil with good tilth will be mellow, friable and adequately aerated. Such soils will have high retentive capacity of rainwater and good aeration with adequate infiltration. Soil tilth is not static but varies with time.

Tillage and crop production: Tillage favours break up of clods, incorporate the organic matter into the soil and kills the weeds to create more favorable seed bed conditions. Physical condition of the soil significantly influences its moisture retention, root spread and penetration. It also influences the supply and uptake of nutrients by the crop plants. Soil aggregation depends on the clay and the humus contents in the soil. Soil porosity considerably influences root penetration.

TILLAGE OPERATIONS : Seed germination and seedling growth are greatly affected by the fineness of the soil clods. The degree of soil pulverization differs with the type of machine used, tilling method and operating condition of machine. Pulverization also differs with soil conditions such as water content or particle distribution and ground cover like straw or grass. Some soils are compact and do not allow the entry of plant roots into the soil. Ploughing improves the physical conditions of the soil and enables the farmers to grow a good crop. Soil furnishes anchorage for plant roots. Soil must be sufficiently open so that roots can penetrate easily. Ploughing means stirring the soil rather deeply. It involves complete or partial turning of the soil. The soil is being constantly and uniformly moved in a forward and upward direction as the plough advances and hence pulverization takes places.

Time of Ploughing

Early ploughing has a distinct advantage over late ploughing because it gives more opportunity to kill weeds. Early ploughing may help in getting the soil granulated at the time of sowing. In intensive cultivation, the field is to be prepared without any time lapse for raising the next crop.

Depth and intensity of ploughing

The purpose of cultivation is to control weeds and conservation of soil moisture. Deep ploughing gives better response in fields infested with weeds. This is also practiced to incorporate the residues, particularly in sandy soils. Incorporation of residues in the deep layer having fine texture may improve the chemical properties of the soil. Under dryland conditions, deep ploughing improves, soil moisture content. However, the yield advantage due to deep ploughing depends on rainfall and the type of crop. Normally yield advantage is reported during normal and above normal rainfall years. It is important to practice deep ploughing for long duration, deep- rooted crops. Root crops generally respond better to deep tillage than shallow rooted crops like cereals. Potato generally responds better to deep tillage, particularly in clayey and loamy soils. Sugarbeet also shows positive response to deep ploughing. In black cotton soil, deep ploughing gives higher yield in flue-cured cigarette tobacco. Deep tillage is normally practiced for crops like sugarcane. Small grain crops such as millets, sesame and flax do as well with shallow ploughing as with deep ploughing.

Seed bed preparation

A good seed bed preparation enables the seed to come in close contact with moist soil and to begin its growth under favourable conditions. Weeds are removed, which otherwise complete with the crop and limit its growth. Seedbed preparation needs adequate care so as to provide early seed germination and better crop stand. Seedbed preparation varies with the crops to be grown, soil type, prevailing climate and type of farming. The fineness of the seedbed is determined by the seed size. Small seeded crops need a finer seedbed than the large –seeded crops. It is also important to make the fine seed bed fairly firm.

Small seeded crops like finger millet, sesame and lucerne require a fine seedbed. However, crop like sorghum do well in moderately compact, coarse seedbed. Maize, chickpea and cotton require a coarsely prepared soil.

1:00 pm- 3:00 pm: VEGETABLE CULTIVATION IN MEGHALAYA

Meghalaya with its diverse agro-climatic conditions, favourable soil fertility status, including availability of vast land inventory, presents a great potential for the development of Horticulture in the state. This climatic advantage has encouraged the expansion of vegetable cultivation throughout the year and every corners of the state. Revenue retained from vegetables is much higher than from cereals and spices. Vegetable crops contributed about 60% in the horticulture production basket of the state.

Strengthening of vegetable cultivation is very essential especially with regards to protected cultivation where, off-season crops can be produced during lean period to meet the internal as well as external demand. The overall scenario of vegetable cultivation in the state is as follows:

1. The major vegetable crops grown in the state are cauliflower, cabbage, knol-khol. Pea, bean, tomato, carrot, radish, turnip, beetroot, lettuce, brinjal, lady's finger, cucumber, pumpkin, squash, bottle gourd, bitter gourd, potato and a wide range of other leafy vegetables. Other vegetables like broccoli, chinese cabbage and celery with good market potential are also being encouraged in the state.

2. Vegetable cultivation in the state is largely under rain-fed condition. This is possibly due to non-availability of irrigation facilities on the one hand, and also difficulty to irrigate the crops which is by and large cultivated on hill slopes and difficult to irrigate through indigenous methods and systems developed by farmers.

3. Application of farm inputs like bio fertilizers, bio fungicides/pesticides, FYM or cowdung, organic manure is widely used for the productivity of the crops. The adoption of organic farming taken up by the government has adversely affected the mindset of the farmers but at present the farmers realized the harmful effect of chemical fertilizers/pesticides and tried to adopt this technology.

4. Planting direction and layout are grossly erroneous. In almost all cases, planting has been made along the slopes of the hills which is ineffective in checking erosion of the top soil and as such also contributes to lower productivity of vegetable crops. However, in some regions, terracing and contour bunding are also adopted.

Seed production:

Even though the state is blessed with climatic features enabling seed production of different crops, the infrastructural set up for taking up production of breeder seed etc. At present the state is lacking, in term of Technology, specialized, technical man-power and certification agencies etc. Inspite of the potentials, the current scenario in seed production which is a vital input in the production system of crop is not so encouraging. Initially, in order to meet their own seed requirement, the growers produce their own vegetable seeds but the quantity is not sufficient nor the quality desirable. The only strategy would be to encourage and take up certified and quality seed production of those locally known varieties of vegetables like local cauliflower, cherrapunji pea , French bean, radish etc, as these are performing well and can compete in the open market in terms of quality and price. This strategy is further strengthened by the fact that there is an increasing influx and easy availability of improved/hybrid seeds in the open market which is performing better and has the preference of the vegetable growers. But with the introduction of organic farming, the improved/hybrid seeds have to be replaced with local/open pollinated seed, if possible. The per unit yield is however low as compared to the national standard due to the limited use of inputs such as organic manures, bio fertilizers, plant protection measures and other intercultural practices as our farmers are reluctant to purchase even though they are well versed with the techniques.

Existing Seed Production:-

As mentioned above, although there is no technical infrastructure to support the norms of vegetable seed production, the state Directorate of Horticulture is having two farms producing quality seeds, one is Government Fruit Garden, Shillong and another is Umwang Farm, Ri-Bhoi District. These two farms produce a number of identified vegetable seeds which are performing or have adapted well in this region. The demand of vegetable seeds/seedling is going up from year to year as the people even in the urban areas start realizing the value of kitchen garden/protected cultivation and this leads to the shortage of vegetable seeds/seedlings produced by the farms.

3:00 pm -5:00 pm: INTRODUCTION TO FARM MECHANISATION

AGRICULTURE ENGINEERING/ FARM MECHANISATION

Man is perpetually trying to find ways and means of producing abundant quantities of food, fibre and fuel, efficiently and economically. It is this endeavour which called for the use of engineering technologies in agricultural production enterprise. Agricultural engineering is the application of different fields of engineering to production, processing, preservation and handling of food and fibre. Technology on the other hand, is the content of science designed to improve an activity, operation or a practice. The agricultural Engineering technologies are relatively advanced processes, products and instrumentations which constitute an important component of the total system of agricultural technology.

The most important motives for the adoption of farm mechanization were labour scarcity, coverage of land area, better and timely tillage, intensive cropping, costly hiring and obtaining more yield.

OBJECTIVES:

Agriculture mechanization is to adopt mechanize cultivation and to do away with the traditional cultivation, which is very slow, primitive and time consuming when compared to the use of modern agricultural machineries and non availability of labourers.

Further the use of Agricultural machineries has also encouraged the farmers to adopt multiple cropping systems, that is after harvesting their first crop other crops can also raise during winter period.

With the introduction of new machineries it is envisaged to further lift the economic standard of the cultivators and as well raise the economy of the state.

TOPICS:

- Agriculture Mechanization
- What type of machines use in Agriculture
- Importance on the use of modern Agriculture Machineries
- Important parts and their functions
- Important instructions on the use of Agriculture Machineries
- Field operations of Agricultural Machineries
- Safety measures for operating Agricultural Machineries
- Routine maintenance of Agricultural Machineries
- Farm tools and Machineries for
- Improved tools and Machinery for hill Agriculture
- Maintain of LOG book.

1. Agriculture Mechanization: is to adapt Mechanization Cultivation and to do away the Traditional of Cultivation which is very slow, primitive and time consuming, when compared to the use of modern Agriculture Machineries in addition to non availability of labourer. Man is perpetually trying to find ways and mean of producing abundant quantities of food, fiber and fuel efficiently. Therefore the most important motive for the adoption of farm Mechanization, were labour scarcity, coverage of land areas for better and timely tillage, intensive cropping costly hiring and obtaining more yield.

2. What type of machines use in Agriculture: However as the time progress with motivation and awareness of the uses of modern Agriculture Machineries and tools such as Bulldozer, JCB, Tractors, Power tillers, Water Pumpset, Manual S.R.I, marker Cano Weeder,

3. Power weeder, Power paddy reaper, Manual paddy thresher and Brush Cutter. The Communities have realized the economic benefit, so as to make farming a sustainable and continuity business oriented enterprise. Due to the land lock and undulating terrain condition of the state, Agriculture Mechanization is on the gear, but requires redefining in a proper manner in all shape and form.

4. Importance on the use of modern Agriculture Machineries: Further, the use of Agriculture Mechanization has also encourage the farmer to adapt multiple cropping system of Agriculture, that is after harvesting their first crops, other crops like vegetable etc could also be raised during winter period. As to encourage the farmer of the state to adopt the advance methods of cultivation as used by the other progressive farmers of the country and also the advancement in the field of Agriculture by the advanced countries of the world, where such type of work is done by machine rather than manual labour. With the introduction of such machines in the state it is hope that it will be instrument to further lift the economic standard of the cultivators where it will be benefited not only the farmers but at the same time raise the economy of the state as well.
Current Mechanized agriculture includes the use of tractor, powertillers, combine harvesters, and other machines. Mechanisation was one of the large factors responsible for urbanization and industrialeconomies. Besides improving production efficiency, mechanization encourages large scale production and sometime can improve the quality of farm production.

Farm Mechanization is for increasing:

1. Production and productivity.
2. Comfort and safety.
3. Return and profitability to farmer.

By using of modern agriculture machineries

1. Timeliness of operation.
2. Saving in labour requirement.
3. Increase in land productivity/cropping intensity.

The saved labour due to Mechanization can be utilized for:

1. Processing of Agriculture productions.
2. Marketing of fresh and processed productions.
3. Manufacturing and sale of improved tools and implement other allied activities.

Thus mechanization also helps in improving utilizationefficiency of other inputs, safety and comfort if the agriculture, worker, improvements in the quality and value addition of theagricultural produce and also enabling the farmers to raise a second crop or multi crops making.

Benefits of farm mechanisation:

1. Mechanization of farms has led to increase, in the volume of Agricultural production.
2. Mechanization increases the labour productivity as the same output can be raised by the lesser number of labourers.

3. Application of farm Machines has relieved the Agricultural labourersmuch of the heavy work like land reclamation, ploughing, digging and carrying of soil.

4. Mechanization can solve the labour battleness faced by the farm during the peak periods.

5. Mechanization made the intensive cultivation successful and helped the farmers to follow multiple cropping system in suitable manner.

6. Mechanization increases the income of farmers and can transforms the traditional agriculture leading to the introduction of capitalist farming.

7. Mechanization of agriculture helps to derive an increase volume of economic surplus which not only induces the farmers to develop their agricultural farm but also helps towards industrial development and infrastructural development in a country.

DAY-2: 10:00 am- 12:00 noon: INTRODUCTION TO POMOLOGY :

The science of Pomology is an important branch of horticulture which deals with various aspects of fruits starting from raising of saplings growing them properly providing various intercultural operations, harvesting& marketing. The science also includes various improvement methods for quality & quantity & ultimate utilisation of fruits. In ancient times the Greeks used the term 'Poma' for fruits which subsequently got transformed to ' Pome ' in Latin. Thus Pomology is also a combination of two latin words Pome (i.e fruits)& logos (i.e culture).

Fruits are used for food, medicine, shelter & beautification. Date seems to be the oldest fruit known to mankind followed by Pomegranate as far as the written history on fruit culture is available from various countries.

However, in India, the Dravidians & Aryans knew the importance of banana, jack fruit, mango which were writtten in their great epics & religious books during 7000 – 3000 B.C.

SCOPE OF FRUIT PRODUCTION

Although the medicinal properties of fruits were admitted by the ancient people, yet the general use of fruits as consumable food was given much importance. The large scale plantations of fruits in many of the countries in south East and far East Asia are the glaring examples for choosing fruits as a source of higher food production from land.With the introduction of high yielding varieties of cereals and favourable weather condition, the production of certain staples has surpassed the demand and the people are lashing for quality food with higher nutritive values, vitamins, minerals and taste. Fruits possessing all these qualities have a tremendous scope for increasing the acreage and productivity for meeting the desire of not only the poor people but also of those living far away from the subsistence level throughout the universe.

IMPORTANCE OF FRUITS:

- Social
- Art and Culture
- Religious
- General utility
- Nutrition
- Economic Importance
- Trade and Industrial importance
- Ecological balance

CLASSIFICATION OF FRUIT CROPS:

Fruit plants are classified in different times for various purposes where each of the classifications have definite objective. The classifications were also made based on systematic botany, ecology, morphology, physiology , nutrient content, tolerance to soil physical and chemical properties, cultural requirements like pruning, training. The consumers and processing industries also classify fruits on the basis of size, shape and quality as well as commercial importance of the fruits produced by the trees.

The fruits plants are also classified on the basis of tolerance to temperature extremes or hardiness. This type of classification is very important from the horticultural stand point. The basic distinction on climatic tolerance helps the growers to select the fruit plants for a particular region .In this classification the fruit trees are categorized into temperate,tropical & sub – tropical and fruits of Arid and semi Arid groups.

(i) Temperate Fruits are those fruits which grow well in cool & temperate regions where temperature is generally below 25˚ C & have plenty of rainfall. They can tolerate severe cold, even frost and snow especially apple. Examples apple, apricot, kiwi, peach, pear, persimmon, plum, strawberry, cranberry, walnuts & almonds

(ii) Tropical and Sub Tropical Fruits are generally evergreen & are extremely sensitive to cold. These fruit grows in hot & humid climate where the temperature is generally 30˚ - 35˚ C & rainfall is plenty. These fruits cannot tolerate frost or arid conditions.
Mango, citrus, banana, grapes, pine apple guava, papaya, litchi, coconut, persimmon

(iii) Fruits of Arid and Semi Arid Areas: Fruits such as date palm, custard apple, jujube (ber) are found where rainfall is very less and temperature is high during the day (about 30-35^{o} C) but cool during the night (about 25 ^{o} C).

1:00 pm- 3:00 pm: INTRODUCTION & PRINCIPLES OF GARDENING

PRINCIPLES OF GARDENING

Practical experience and careful observations on the response to plant growth will give you the pleasure in growing plants successfully and the confidence in suggesting others to develop a good garden.

KNOWLEDGE OF PLANTS

If you want to develop, maintain and enjoy your garden according to your ideas, you should have interest and knowledge about plant and plant growth. With little interest and time spent in the garden one can very easily gain a fairly good knowledge about plants and their relation to soil and environment. You may then advise others what and where to grow.

KNOWLEDGE OF SOILS

Physical condition and chemical composition of the soil affect the fertility and plant growth. Porous soil, rich in organic matter and containing sufficient nutrients is ideal for most garden plants. Then the correct preparation, depth of it and after–care play a great part .Careless planting, keeping the soil wet or dry, exposure to extremes of heat or cold will also affect the plant growth. No soil should dry out too quickly. But if this condition exists, it must be corrected if plants are to thrive (grow well). There must be around 40 cm of soil for annuals, less than this would result in slow starvation and quick eroding of the soil. Change the top layer of the soil from time to time by digging deep and thus permit the nutrients which are lodged in the bottom to come to the top. When turning over soil always remove old roots and stones.

WATERING

Water is the medium which conveys the soluble nutrients in manure and fertilizer to the roots of the plants, at the same time providing the moisture. Over watering damages the delicate root system, and weakens the vitality of the plant. The plant should be allowed to dry before next watering.

Daily sprinkling encourages surface roots which are liable to be affected through extremes of heat and cold and are damaged when the soil is loosened. To test when a pot plant requires water, sound it with a wooden mallet, if it gives out a hollow sound it is dry; a dull sound ensures moist soil.

WHEN TO WATER

In the cold months, avoid giving water late in the evening when the nights are cold. Afternoon or early morning is better.

WHEN TO PLANT

Planting should be done when plants have the greatest chance of survival. Depending upon the types of flowers and plants you wanted to plant. Rainy season planting is perfectly safe provided the soil does not get water logged.

TRANSPLANTING

Transplanting is a simple operation and yet a number of plants collapse apparently for no reason. In the hot months do not risk transplanting during a spell of moist weather as the plants cannot stand it. Before Transplanting soak the pot or ground so that the ball of earth can be lifted easily. After repotting leave about 2-3cm space between the rim of the pot and the ball of earth for watering purposes.

WHEN TO TRANSPLANT

The wet weather is safest though during the winter months dormant plants can safely be shifted. It depends on the care with which the operation is performed as to when you transplant.

POTTING

It is a common practice in garden plant to transfer it from a smaller pot to a larger one by gradual stages. Before the plants get root bound, make the shift to a larger size. The plant thus obtains the maximum nourishment that roots can provide with each successive shift.

WHAT TO REPOT

Repotting of a plant will depend upon the rate of growth of both shoot and root. Chrysanthemums need repotting at intervals of 30-40days, while a palm may remain in a pot for 4-5 years .

Again when a plant grows rapidly it may need repotting every year but after few years change of pot is done less frequently. Specimen plants of ferns and foliage plants are not spotted every year but some rich soil is in corporate to maintain the growth.

Follow the instructions and you will find a difference in the condition of your garden:-

1. Get advice from reliable source
2. Always buy the best seeds; it pays in the long run.
3. Dig the ground deeply before planting.
4. Manure carefully with recognized fertilizers.
5. Aerate the soil while the plant is growing
6. Weed continually
7. Never over-water or over- manure a plant.
8. Remove flowers as they fade.
9. Destroy weeds when just noticed.

3:00 pm -5:00 pm: LIVING SOIL CONCEPT

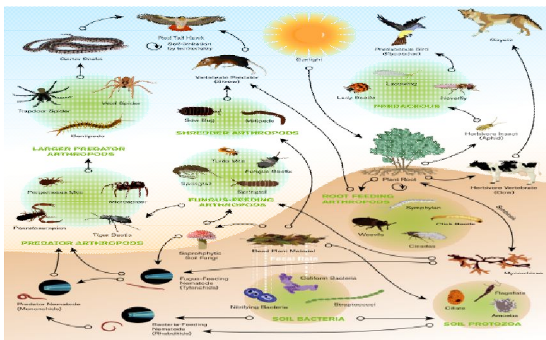
4. Living Soil Concept

Causes and Effects of Soil Degradation

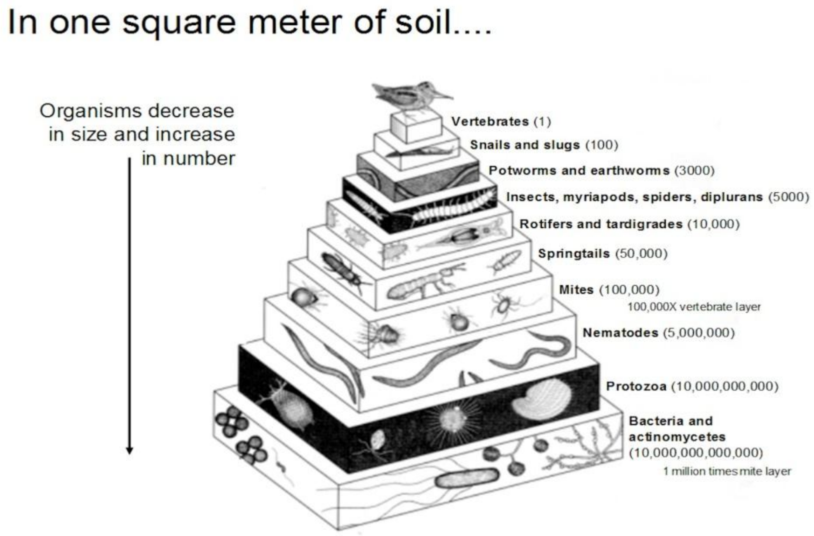
Over the last 50-60 years, for boosting crop production, indiscriminate use of chemical fertilizers, pesticides, monoculture, heavy tillage, etc. are promoted. Non judicious use of inputs led some adverse effect on our environment including soil ecosystem. Disturbance in natural soil system has made the soil unproductive on long term basis.

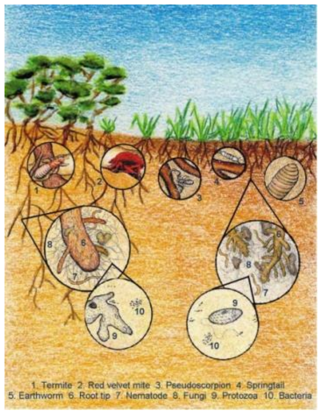
"All soils everywhere are comprised of the same basic critter groups. What's different about a desert, the tundra, a rainforest or a cornfield are numbers (relative densities of critters)." The concept that ties the different groups together is the soil food web.

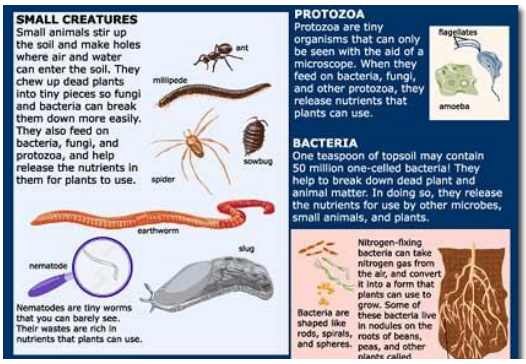
Soil Food Web: Eat and be Eaten



- *Life on earth is sustained by a complex underground ecological system - the soil food web.*
- *Through ignorance, food web is disrupted , in particular with ill-advised farming methods.*
- *We can return the food web to health by restoring the soil biology.*
- *The principle of 'living soil' is that*
- *Soil seems dead and inert material but is quite alive*
- *Instead of trying to feed the plant directly, the objective should be to nourish the soil.*

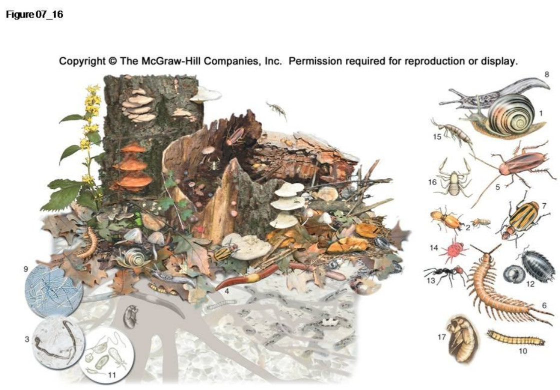






For this, the agriculture system has to be based on local resources, farmers' knowledge, management skills and labor.

SOIL BIOTA



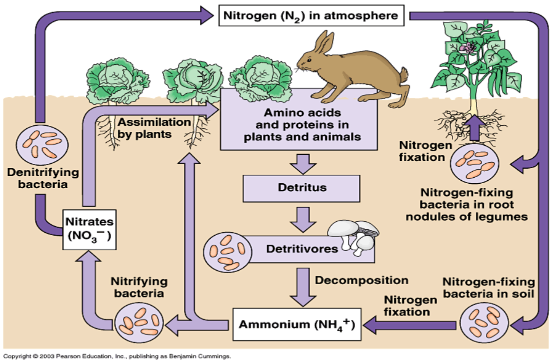
- *Bacteria chemical factories, convert wastes to nutrients*
- *Fungi convert woody substances to digestible compounds*
- *Amoebae prey on bacteria and fungi*
- *Nematodes hunt on amoebae, attack roots, eat fungi*
- *Arthropods (insects, collembolans, mites, etc) eat all of above*
- *Earthworms eat soil & leaf litter, drillospheres, bury litter*
- *Higher predators burrowing animals, reptiles*
- *Plants roots exude organic compounds- proteins, sugars and carbohydrates ("cakes and cookies") which attract beneficial micro-organisms.*

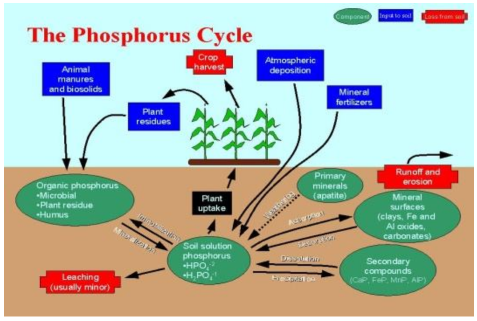
Functions of soil organisms

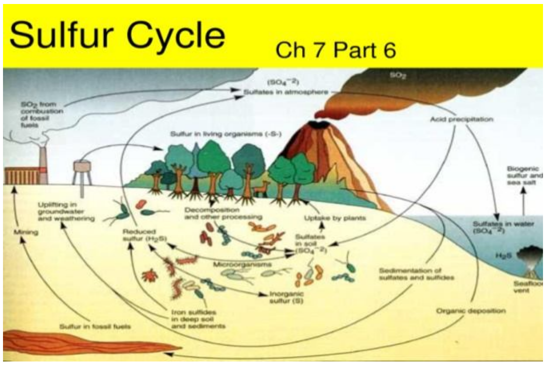
Soil organisms support plant health as they;

- ➢ Decompose organic matter,
- ➢ Cycle nutrients,
- ➢ Enhance soil structure,
- ➢ Control the populations of soil organisms including crop pests.
- ➢ Can tie up salts and harmful chemicals.
- ➢ Provides adaptation to changing conditions.

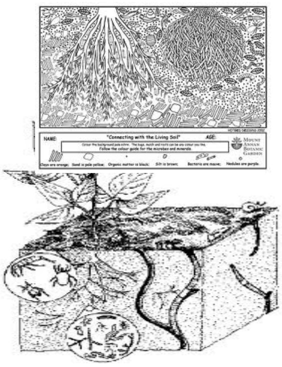
Soil life–involvement in plant nutrition

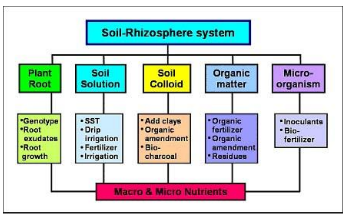


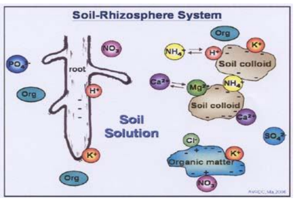




Soil Rhizosphere- habitat for soil life







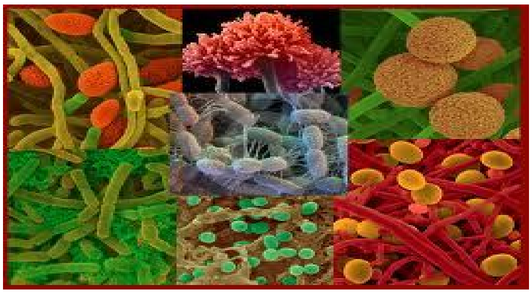
THE LIVING SOIL:

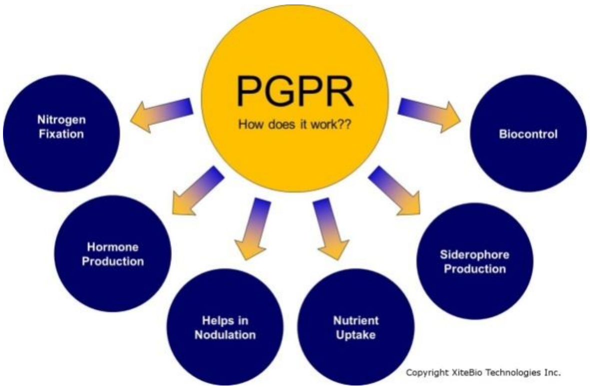
Bacteria

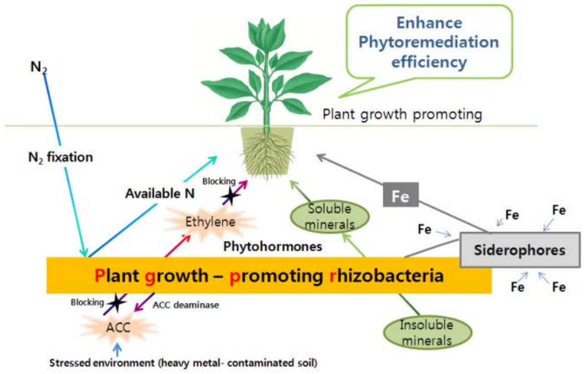
The bacteria and fungi attracted to the roots are "the white knights fighting off the bad guys."

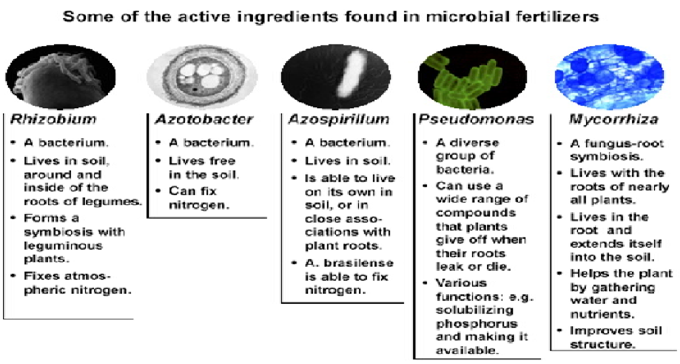
A ton of microscopic bacteria may be active in each acre of soil.

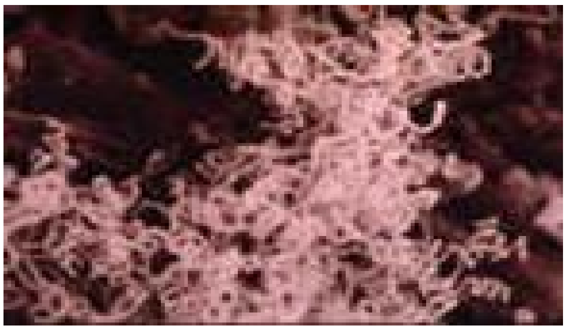
Bacteria dot the surface of strands of fungal hyphae

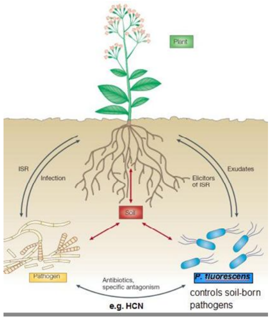


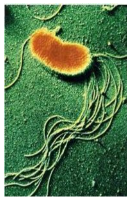












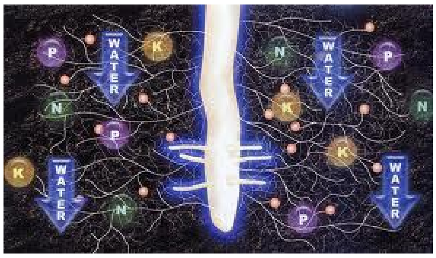
Soil beneficial *Pseudomonas fluorescens*.

Soil beneficial *Pseudomonas fluorescens*.

- Siderophores (meaning "iron carrier") are small, high-affinity iron chelating compounds secreted by microorganisms such as bacteria and fungi, and also grasses.
- Siderophores are amongst the strongest soluble Fe3+ binding agents known.
  - e.g. *P. fluorescens*, *Bacillus*.

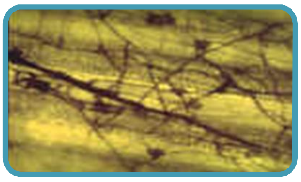
THE LIVING SOIL:

Fungi



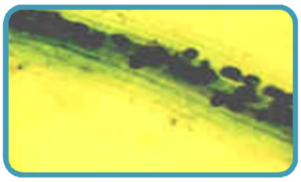
Fungi Play important functions in soil

Tree roots (brown) are connected to the symbiotic mycorhizal structure **(bright white)** and fungal hyphae (thin white strands) radiating into the soil.



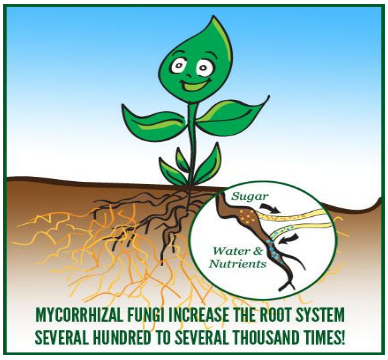
Fungus beginning to decompose leaf veins in grass clippings.

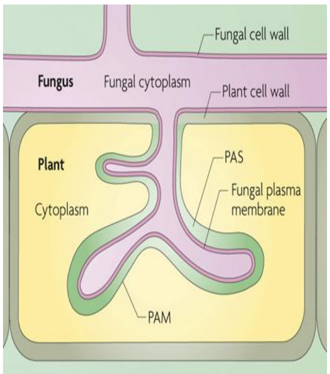
Ectomycorhizae are important for nutrient absorption by tree and grape roots.

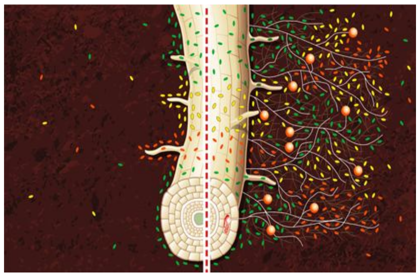


Endomycorhizae arbuscular mycorhizal fungus (AM).

Mycorrhizae: Give and Take Relationship



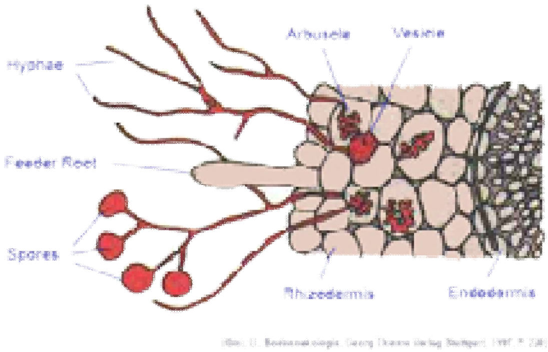


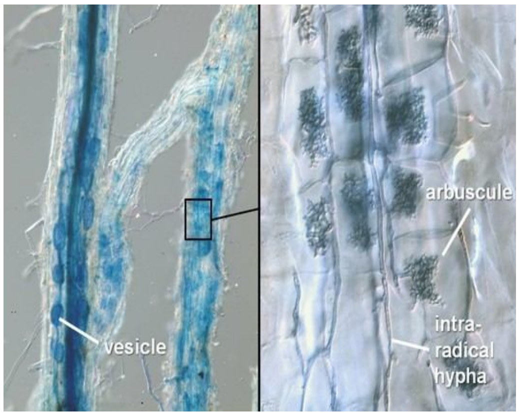


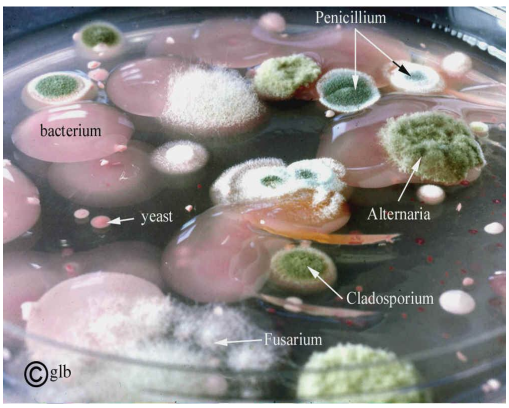
VAM Fungi

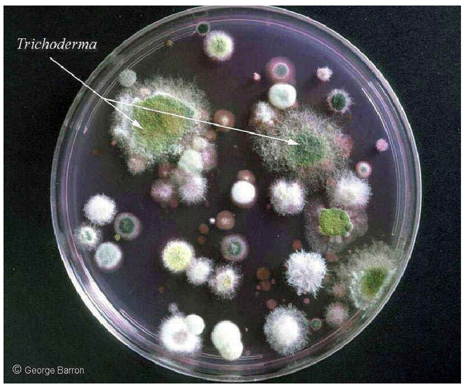
Symbiotic Fungus:

Wheels within wheels... life within life. Feeder root of a plant containing the nutrient-absorbing parts (dark blue) of a symbiotic fungus. Vesicular-arbuscular mycorrhizae ("VAM") fungi like this one colonize the root systems of most plants, providing nutrients and water to the plants, as well as protection against parasitic nematodes and root rot fungi.



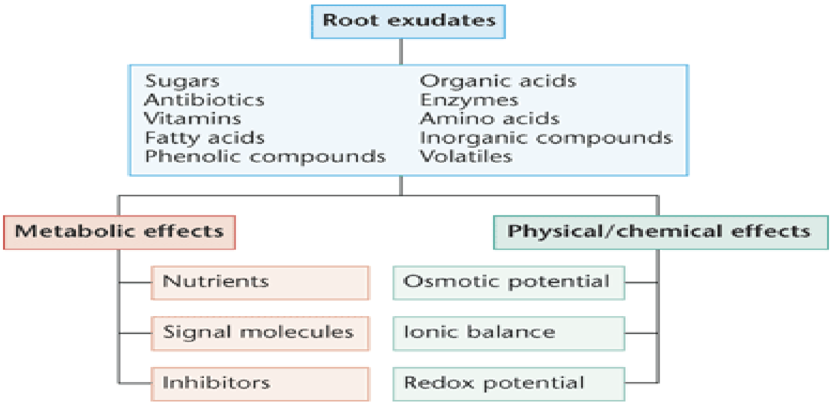






Soil contains large numbers of microorganisms - measured in hundreds of thousands per gram of soil. In this petri dish there is an equivalent of 1/1000 of a gram of soil.

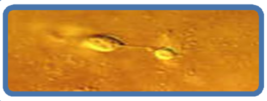
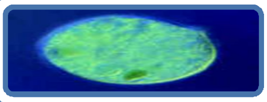
Diverse compounds exuded by different parts of the root system create a unique environment known as the rhizosphere. Interactions among microorganisms found within the rhizosphere and communication between these microorganisms and plant roots play an important role in maintaining plant health.



THE LIVING SOIL:

Protozoa

Role of protozoa in nutrient recycling

	Protozoa play an important role in **nutrient cycling** by feeding intensively on bacteria. Notice the size of the speck-like bacteria next to the oval protozoa and large, angular sand particle
	Bacteria ingested by an amoeba.
	Flagellates have one or two flagella which they use to propel or pull their way through soil. A flagellum can be seen extending from the protozoan on the left. The tiny specks are bacteria.
	Ciliates are the largest of the protozoa and the least numerous. They consume up to 10,000 bacteria per day, and release plant available nitrogen. Ciliates use the fine cilia along their bodies like oars to move rapidly through soil.

THE LIVING SOIL:

Nematodes

Most nematodes in the soil are not plant parasites.

Beneficial nematodes help control disease and cycle nutrients.

A predatory nematode consumes a smaller nematode

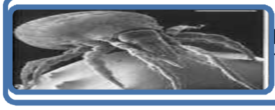
Broadly, there are four groups of nematodes

1. Predatory nematodes
2. Root feeders
3. Bacterial feeder
4. Fungal feeder

THE LIVING SOIL:

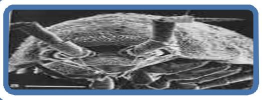
Arthropods

The 200 species of mites in this microscope view were extracted from one square foot of the top two inches of forest litter and soil.
Mites are poorly studied, but enormously significant for nutrient release in the soil.



Predatory mites prey on nematodes, springtails, other mites, and the larvae of insects. This mite is 1/25 of an inch (1mm) long. *Pergamasus sp.*

Millipedes are also called Diplopods because they possess two pairs of legs on each body segment. They are generally harmless to people, but most millipedes protect themselves from predators by spraying an offensive odor from their skunk glands.



Sow bugs are relatives of crabs and lobsters. Their powerful mouth-parts are used to fragment plant residue and leaf litter.

Giant Red Velvet Mite (*Trombidium grandissimum*)

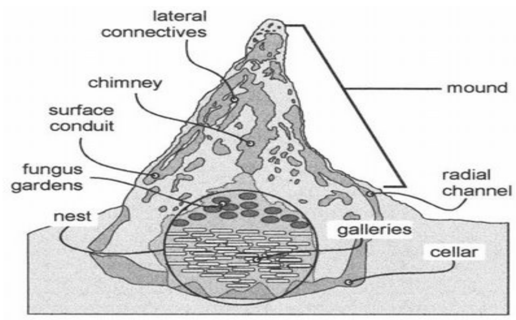
Since the Giant Red Velvet Mite spends the majority of its life in the soil, it lives in close proximity to bacteria, nematodes, and fungi-not to mention other insects and spiders.

As the diet of the Giant Red Velvet Mite consists of many pests, the mite could be used as a potential biological control tool.

Soil Arthropods : Termites

Termites are notorious for their voracious appetite for lignocelluloses i.e. timber, wood, cotton, jute and paper etc. causing damages more than earthquake and fire.

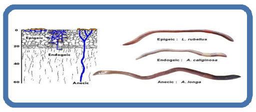
Termites are important in rehabilitations of degraded soil, survival of forest by recycling nutrients taken from soil by trees and plants



Termite mounds and plant growth

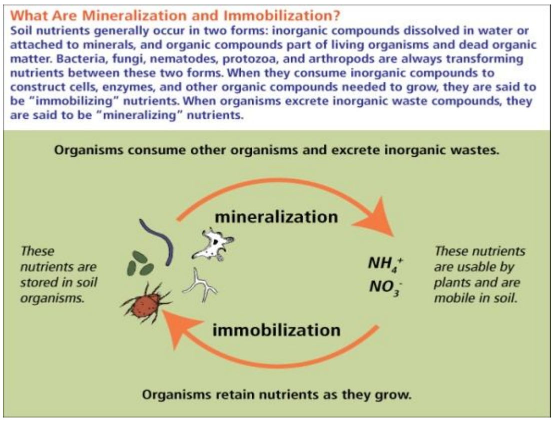
Earthworms

Earthworms generate tons of casts per acre each year, dramatically altering soil structure



Some worms live in permanent vertical burrows

Others move horizontally near the surface, filling their burrow with casts as they move.



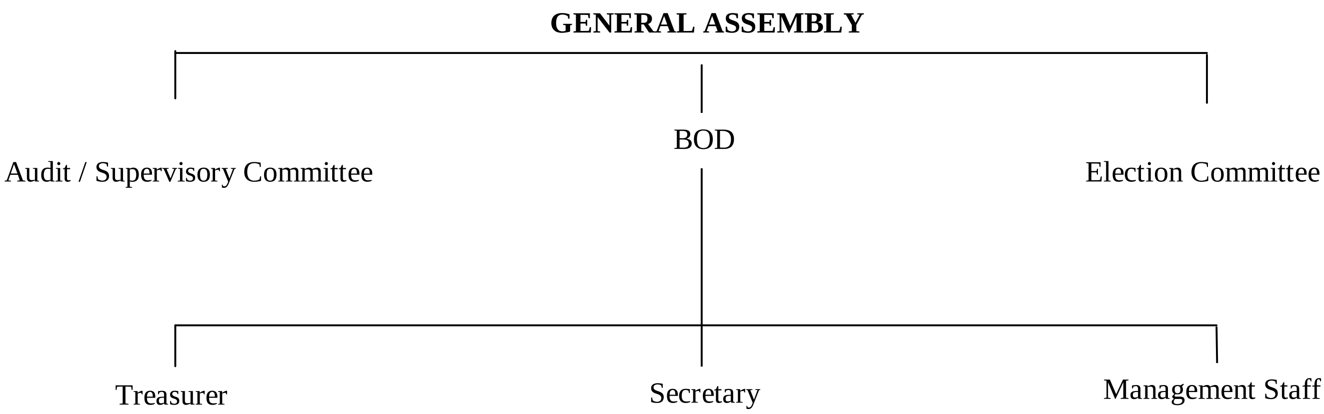
DAY-3: 10:00 am- 12:00 noon: Cooperation

COOPERATIVE

INTRODUCTION:

Cooperative originated in the west during the middle of the last century and from there these came to India. Formally cooperatives were introduce in India in 1904 when the India cooperatives Societies Act was promulgated. Initially, chit fund and cooperatives were from to provide credit to the farmers to eradicate the rural indebtedness. Gradually, these credit societies start working in other fields such as banking, processing and marketing. The meager fund of the farmer were pull in run cooperative and it was an attract way to solve their financial problems. After independence role of cooperatives societies grew of encompass Socio-Economic Development & Eradication of poverty in rural India, it become an integrated part of five year plan. With this cooperative Societies became a fundamental part of our economy.

STRUCTURE OF COOPERATIVE SOCIETY



Non-credit societies came in 1912. Importance of cooperative was also highlighted in the royal commission on agriculture in 1928. With the formation of the Reserve Bank of India (RBI) in 1935. Forming of more cooperative was given due importance.

The main aim of cooperative was to get the poor and indebted farmers out of poverty and to get out from the clutches of the money lenders. With in the span of time role of cooperative extended beyond agriculture credit. Cooperative are now playing a very significant role in the socio Economic Development of our country especially the rural India.

In 1951 there were 1,81,000 cooperatives of all types in India. During 2007-2008 there were 1,50,000 primary credit cooperatives and about 2,60, 000 non credit primary sectors of all types, In India there are four major types of cooperatives.

1. The primary agriculture credit or services societies (PACS)
2. Agriculture non- credit societies.
3. Agriculture cooperatives marketing societies
4. Cooperatives Farming societies.

In some cases, there was a downfall in the development of cooperatives. Due to lack of awareness and political interference despite of all the hardships, cooperative are really helping the poor in becoming self reliant cooperatives can improve more with the participation of women. Cooperatives provide credit to the farmers. Apart from this, cooperatives provide farmers with top quality, seeds, insecticides etc. at the reasonable price. Service Cooperatives provide tractors, threshers etc on rent to the farmers. Rural cooperatives are now entering into real estate, power, insurance, Health care & communication sector. If this spirit of working in maintained, then no doubt the quality of rural life would be for better than the urban life.

IMPORTANCE OF COOPERATIVE IN INDIAN ECONOMY

ECONOMY OF INDIA

The economy of India may be divided into two categories. Such as the rural economy and the urban economy. Rural economy is mainly based on agriculture while urban on industries.

"India lived in villages". This famous quote signifies the predominant feature of rural population in India. The rural population constituted nearly 75% of the country's population.

Agriculture is the backbone of the economic system and is the premier national key for the financial stability of the country. As a matter of fact, the whole population is directly or indirectly dependent on agriculture. Agriculture not only provides security to the population food but also provides raw materials to the industries & hence enhance the export & import business which in turn boost the economic of the country. Rural sector is the major contributor to the overall GDP of the nation & hence lack of development in the villages means lack of development in the country. Cooperative societies are playing significant role in this and share a major credit is the growth of rural sector. Which along with the Governmentt and private sectors contribute to the overall economy of India. Cooperatives cover more than 97%. Of Indian villages some run by its members and some by the government.

Government spends lakhs to crores of rupees annually on rural development but co-operatives working in rural areas are playing note-worthy role in this. Gujurat's diary cooperatives and Maharashtra's sugar cooperative proved their contribution.

Advantages & Disadvantages of Cooperatives.

Advantages: cooperatives can obtain discounts on supplies & services for their members by using their relatively large size as leverage. Cooperatives also can take advantage of govt.- grants. For instance, line department provide grants to cooperatives to promote rural & urban Development.

Disadvantage: The success of cooperative depends on the strength of its membership. If members don't participate the power of cooperative suffers. The one member, one vote structure also may discourage large investors, who don't get a bigger say in decision ever though they make the last investment.

CO-OPERATIVE MOVEMENT

CREDIT SOCIETIES

NON-CREDIT SOCIEITES

AGRICULTURAL CREDIT SOCIETIES
(i.e. Among Cultivators Cultivators)

Non-Agricultural Credit Societies
(i.e. among artisans, factory workers)

Agriculture (e.g. Marketing, Processing, Irrigation, etc.)

Non-Agriculture (e.g.) Coop. Consumers Stores, housing, transport, Industrial, etc.

CREDIT COOPERATIVES

The word credit is derived from the word ‘cretra’ a latin word which means to trust or to believe. The following are some of the definition:-

(1) It is a transfer of commodities involving the return of the equivalent at a future time.
(2) Proper utilization of the present for future payment.
(3) Exchange of service between one party and another at different times.
(4) Credit is the confidence felt in the future solvency of a person.

When giving loan to any person, there are three points to be taken into consideration such as (1) Responsibility (2) Resources (3) Reliability.

Why credit is needed for agriculture?

Agricultural sector accelerates the overall Economic Development According to Morman (1919) what promote agricultural benefits to mankind - the progress of agriculture & the progress of civilization go hand in hand. The industries depends on agriculture for its raw materials. Therefore, if agriculture stagnates, it acts as brake on industrial expansion and halt real growth. The agricultural sector would alone act as a catalyst in breaking the various circle of poverty. The Govt. has given more importance to agriculture in the process of economic development in the country.

Significance of credit for agriculture development:-

(i) To liquidate the old debt.
(ii) To safe guard the interest of the agriculturists
(iii) Financial help during Natural calamities
(iv) Uncertain income.
(v) Low income of the farmers
(vi) To adopt intensive agriculture.
(vii) Increase in expenditure.
(viii) To convert the small farmers into viable farmers.

NON-CREDIT COOPERATIVES:-

Non-credit cooperatives Societies came in 1912. Importance of cooperative was also highlighted in the royal commission on agriculture in 1928. With the formation of the Reserve Bank of India (RBI) in 1935 where forming of the more cooperatives was given due importance.

During the year 2007-08 there about 2,60,000 non credit primary credit societies of all types. The most important one was the agricultural non-credit societies.

Non-credit cooperatives may either be for agricultural purposes other than agriculture. Among the farmers, inclusion of agriculture, marketing, irrigation and distribution of agriculture input, such as fertilizers, seeds, pesticides and agricultural implements and diary are some of the common activities the example of non- agricultural Non credit cooperatives are cooperative stores, cooperatives sugar, milk cooperatives, cotton ginning, processing, spinning & weaving mill, cooperative housing, cooperatives cottage and small scale industries, Fishery cooperatives, Laborer contract etc.

In recent years non-agriculture non- credit cooperative has gone into new lines of business large scale fertilizers manufacturing (eg. Indian Farmer Fertilizers cooperative limited I.F.F.C.O.) which is a leading producer of fertilizers in the country and its membership cover about 27,000 cooperative institutions ranging from national level federation to the village level cooperatives the state of Maharashtra, Gujarat and Tamil Nadu lead in non- credit cooperatives sectors.

SELF HELP GROUP

PRINCIPLES:

1. Homogeneous membership: Small group for face to face inter action and relationship.
2. Secular in character.
3. Regular attendance in all meetings (participatory) Decision making Process.
4. Has a code of conduct-by laws
5. Small savings (thrift)
6. Mobilize savings for loans

COOPERATIVE AND SELF HELP GROUP

SIMILARITIES

1. A member should not be less than 18yrs of age
2. Transparency
3. Mutual trust
4. Equal distribution of surplus/ profit
5. Training
6. Audit

DIFFERENCES

Sl. No.	COOPERATIVE	S.H.G
1.	Voluntary association of a number of individual working together to secure their united endeavour	A group of people who provide mutual support for each other for overall development.
2.	Not less than 15 persons and may increase the nos. of thousands	Membership 8 - 10 person
3.	Registration is necessary	Not necessary to register with the Government
4.	Open Membership	Membership restricted only between same income earnests i.e. BPL same Gender
5.	F.A. from the Govt. depending on the working as society ranging from 1 (one) lakhs as S.C.; and Rs. 5,000/- as M.S.	Only Revolving Fund from the Govt. (Rs. 25,00/-) only.
6.	After regd. may seek assistance from the line Deptt.	May seek assistance from line Deptt. only if with SGSY now known as NRLM (National Rural Livelihood Mission)
7.	If N.F. the cooperative societies will still remain unless and until Section 61 of Act & Rules is conducted	If Non-functioning will automatically disappear.

PRINCIPLES OF COOPERATION

Introduction: Cooperation is known to be one of the "Economic Miracles of the last century", is a form of economic organisation based on certain high values such as equality (of control & opportunity) & equity (of distribution) & mutuality for the promotion of their common interests as producers or consumers. It is just organised, therefore, cooperative business is different from the other concerns which are owned and run for the personal benefit of their owners by rendering service to others.

The mutual economic and social cooperation and cooperative way of life is a part of tribal tradition and a way of life in Meghalaya. However, when the formal cooperative movement based in the "Principles of Cooperation", "Cooperative Values" and Cooperative Acts & Rules was promulgated in a structured manner, it did not percolate well to the people of the grassroots level hence, it took considerable time for them to understand and appreciate the system before final acceptance.

Cooperative Movement is a Peoples' Movement.

In other words, a cooperative is defined as an autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly-owned and democratically controlled enterprise.

PRINCIPLES: Cooperative Principles are set of basic guidelines by which cooperatives put their values into practice. These values are self-help, self-responsibility, democracy, equality, equity and solidarity. in the tradition of their founders, members of cooperatives believe in the ethical values of honesty, openness, social responsibility and concern for others.

The Principles of cooperative are as follow:

1. Voluntary and open membership.
2. Democratic control
3. Limited Interest on Capital
4. Equitable distribution of surplus.
5. Cooperation Education
6. Cooperation among cooperatives
7. Concern for community

1. Voluntary and Open Membership: Cooperatives are Voluntary organisation, open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political and religious discrimination and once a person joins he is admissible with equal voting rights.

But there are certain natural and legitimate limitations on openness, such as exclusion of bad characters, persons living in the area of operation of another society of the same type, limiting membership in a housing society to the member of sites available, etc.

2. Democratic Control: Co-operatives are democratic organisations controlled by their members, who actively participate in setting their policies and in making decisions. Men and women serving as elected representatives are accountable to the membership. In primary co-operatives members have equal voting rights (one member, one vote) and co-operatives at other levels are also organised in a democratic manner, irrespective of variations in the amount of capital subscribes by them or of business done with it. This system eliminates the opportunity for any one member or small group to obtain control of the society by virtue of his or their shareholdings.

3. Limited Interest on Capital: Capital is an important factor that an enterprise or association should have. In a cooperate, capital should be owned and controlled by the people it serves and share any surpluses on the basis of each member's contribution, and treats capital as a mere factor of 'wage-earner' and remunerates it by paying a fixed interest. The idea invoked by this principle is that, capital should not be a source of profit.

4. Equitable Distribution of Surplus (Patronage Dividend): Cooperative aims at promoting members interest. So it cannot earn profits from members who deal with it. Hence, it is expected to render service to members at the actual cost taking into account the cost price, overhead charges, etc. where member-patron is over-charged or inter-charged as the case may be, hence a surplus is allowed to accumulate. This surplus belongs to them, so, it returns to them as patronage dividend in the very same proportion which they have contributed to, viz in proportion to their transactions with the cooperative. This is equity or justice. Therefore, this method of distribution of surplus is also known as the **PRINCIPLE OF EQUITY OR DISTRIBUTIVE JUSTICE.**

5. Cooperative Education: Cooperative Education is an essential factor of a cooperative enterprise. Members of a cooperative institution, representatives, managers and employees were provided with proper education and training to enable them to execute their duties effectively for the overall development of their organisation.

6. Cooperation among cooperatives: Co-operation being the only form of organisation upholding the freedom and dignity of the individual, can restore true freedom for men, through broad ownership and democratic control of their own enterprises. Joint effort is required on the part of co-operators and co-operatives. They should co-ordinate their activities, work on economic and technical integrations and modify the democratic structures to observe and preserve democracy in them. Thus co-operation among co-operatives is a 'must' for the survival and growth of the Cooperative Movement. Therefore, the Commission of 1966 thought it important to add a new principle, viz. "principle of growth" by mutual Co-operation among co-operatives.

7. Concern for community: Cooperative is **Self Help** and act as a Mutual Aid - **One For All**. Self Help means the pride of applying one's own needs by one's own resource of being one's own merchant banker, money lender and employer. "One for All" means to seek liberation not only for oneself but through and for others which include the community as a whole. In other words, co-operatives work for the sustainable development of their communities through policies approved by their members.

1:00 - 3:00 pm: PUBLIC Health: Air, water & soil pollution

SURVEILLANCE OF DRINKING WATER QUALITY

The activities that ideally should be included in the surveillance function are:

a) Approval of new sources
b) Watershed protection
c) Approval of the construction and operating procedures of waterworks
d) Sanitary surveys
e) Monitoring programmes
f) Development of codes of practise for well construction, pump installation and plumbing
g) Inspection quality control in bottled water and ice manufacturing operations.

Sanitary Survey

Sanitary Survey is all on the spot inspection and evaluation by a qualified person of the entire water supply system. A sanitary survey is essential for adequate interpretation of laboratory results.

Sampling

It should be carried out by competent and trained personnel in strict accordance with the methods and frequency of sampling prescribed in the WHO guidelines for drinking water quality or the ICMR manual of standards of quality for drinking water supplies.

Bacteriological Surveillance

The tests usually employed in water bacteriology are presumptive coliform test, tests for detecton of faecal streptococci and clostridium perfringens and colony counts.

1. Presumptive coliform test

Multiple tube method- This test is based on estimating the most porbable number (MPN) of coliform organisms in 100 ml of water.

2. The detection of faecal streptococci and clostridium perfringens

It provides useful confirmatory evidence of faecal pollution of water in doubtful cases.

3. Colony counts

Colony counts on nutrients agar at 37° C and 22° C are frequently used in the bacteriological examination of water.

Colony counts provide an estimate of the general bacterial purity of water. A single counts from the same sources at frequent intervals may be of considerable value. A sudden increase in the colony count may give an early indication of contamination the recommended plate counts.

Water at point of consumption	Plate count after 2 days at 37° C	Plate count after 3 days at 22° C
a) Disinfected	0	20
b) Not Disinfected	10	100

Recent studies indicate that, the bacterial plate count on yeast extract agar after incubation at 22° C for 7 days, night serve us the best purpose indicator of microbiological quantity.

4. Biological Examination

Water may contain microscopic organisms such as algae, fungi, yeasts, protozoa, rotifers, _______, minute worms, etc. These organisms are collectively called plankton. The plankton organisms produce objectionable taste and odours in water. They are an index of pollution. The degree of pollution is assessed qualitatively and quantitatively by noting the type, and number of organisms prevailing in water.

5. Chemical surveillance of water

Chemical Surveillance of drinking water is assuming greater importance in view of industrial and agricultural pollutants finding their way into raw water sources. Tests for ph, colour, turbidity, chlorides, ammonia chlorine demand and residual chlorine are the basic tests. Regular measurement part replace bacteriological surveillance tests for iron and manganese are required complete chemical analysis would also include analysis for toxic metals, pesticides, persistent organic chemicals and radioactivity.

Purification of water

Purification of water is essential to prevent water borne diseases. This can be done in three ways:

a) Purification of water on large scale (for the supply of towns and cities)
b) Purification of water on medium scale (for villages)
c) Purification of water on small scale (domestic level)

Purification of water on small scale

1) Chlorination by using chlorine tablets, bleaching powder, perchloron or high test hypochlorite (HTH).
2) Boiling of Water
3) Filtration of water by using water filters.

Bleaching powder

Bleaching powder is also called chlorinated lime, chemical formula $caocl_{2.}$ It is smelling white chlorine, chlorination, superchlorination, free chlorine, residual chlorine, are terms commonly used during discussion of chlorination of water.

Adding chlorine to water in any form is called chlorination of water. When chlorine is added to water hypochlorous acid and hydrochloric acid ions is formed. The disinfection action of chlorine i.e. mainly due to hypochlorous ions.

Principles of Chlorination

During chlorination of water, first we should determine or calculate the chlorine demand. Chlorine demand is defined as the amount of chlorine that needs to kill the bacteria and oxidize the organic matter present in soil i.e. the difference between the amounts of chlorine added to water and the amount of residual chlorine remaining at the end of contact period.

Contact period is 1 hour:

The presence of free residual chlorine in water should be maintained for atleast 1 hour to kill bacteria and viruses. It has no effect on spores, cysts, ova, except in higher concentrations.

Superchlorination

Superchlorination is needed to destroy cysts, ova and spores and to chlorinate turbid water that is commonly encountered in Epidemic. Superchlorination means adding chlorine to water at higher concentration, which are otherwise not recommended. It is advised during Epidemics where facilities are not available to measure chlorine demand of water.

Boiling of water

It is cheap and satisfactory method during Epidemics of gastrochlorites, cholera, typhoid etc. Role boiling is advised for 5-10 mins.

Filtration of water by using water filters

Various types of water filters are available in the market. Berkafeld filter is the most commonly used in India. Other filters are chamberland filter and katadyn filter. It removes the bacteria and protozoa in water but not the viruses. Only clean water is advised for use, ____________ should be cleaned weekly by using running water or boiled water.

3:00 pm -5:00 pm: Practical

DAY-4: 10:00 am- 12:00 noon: INM

Green Manuring

It is a practice of ploughing in the green plant tissues grown in the field or adding green plants with tender twigs or leaves from outside and incorporating them into the soil for improving the physical structure as well as fertility of the soil. It can be defined as a practice of ploughing or turning into the soil, undecomposed green plant tissues for the purpose of improving the soil fertility.

The object of green manuring is to add an organic matter into the soil and thus, enrich it with 'N' which is most important and deficient nutrient.

Types of green manuring: There are two types of green manuring:

1. **Green manuring *in-situ*:** When green manure crops are grown in the field itself either as a pure crop or as intercrop with the main crop and buried in the same field, it is known as Green manuring *In-situ.* E.g.: Sannhemp, Dhaicha, Pillipesara, Shervi, Urd, Mung, Cowpea, Berseem, Senji, etc.

These crops are sown as:

- **i)** Main crop,
- **ii)** Inter row sown crop,
- **iii)** On bare fallow, depending upon the soil and climatic conditions of the region.

2. **Green leaf manuring:** It refers to turning into the soil green leaves and tender green twigs collected from shrubs and trees grown on bunds, waste lands and nearby forest area. E.g.: Glyricidia, wild Dhaicha, Karanj.

Characteristics/desirable qualities of a good manuring:

- **i)** Yield a large quantity of green material within a short period.
- **ii)** Be quick growing especially in the beginning, so as to suppress weeds.
- **iii)** Be succulent and have more leafy growth than woody growth, so that its decomposition will be rapid.
- **iv)** Preferably is a legume, so that atm. 'N' will be fixed.
- **v)** Have deep and fibrous root system so that it will absorb nutrients from lower zone and add them to the surface soil and also improve soil structure.

vi) Be able to grow even on poor soils.

Sesbania (*Sesbania sp*) **Cowpea *(Vigna unguiculata*)** **Sunhemp *(crotolaria sp)***

Stage of green manuring: A green manuring crop may be turned in at the flowering stage or just before the flowering. The majority of the G.M. crops require 6 to 8 weeks after sowing at which there is maximum green matter production and most succulent.

Advantages of green manuring:

i) It adds organic matter to the soil and simulates activity of soil micro-organisms.

ii) It improves the structure of the soil thereby improving the WHC, decreasing run-off and erosion caused by rain.

iii) The G.M. takes nutrients from lower layers of the soil and adds to the upper layer in which it is incorporated.

iv) It is a leguminous crop, it fixes 'N' from the atmosphere and adds to the soil for being used by succeeding crop. Generally, about 2/3 of the N is derived from the atmosphere and the rest from the soil.

v) It increases the availability of certain plant nutrients like P2O5, Ca, Mg and Fe.

Disadvantages of green manuring:

i) Under rain fed conditions, the germination and growth of succeeding crop may be affected due to depletion of moisture for the growth and decomposition of G.M.

ii) G.M. crop inclusive of decomposition period occupies the field least 75-80 days which means a loss of one crop.

iii) Incidence of pests and diseases may increases if the G.M. is not kept free from them.

Application of phosphatic fertilizers to G.M. crops (leguminous) helps to increase the yield, for rapid growth of *Rhizobia* and increase the 'P' availability to succeeding crop.

AZOLLA AND ITS USES

Family Name of Azolla: - Salviniaceae.

Botanical/Scientific Name of Azolla: - A. filiculoides.

Common names of Azolla: - Azolla, mosquito fern, duckweed fern, fairy moss, water fern

Azolla is a small aquatic fern with a branched stem and bilobed leaves. The roots that emerge from the stem help the plants to float on water. It is generally found floating on stagnant water. There is a small cavity on the upper most part of the leaf which houses as many as 80,000 blue green algae have the capacity to fix atmospheric nitrogen and make it available to azolla. In return the blue green algae gets shelter and food from azolla fern and blue green algae. When the plant dies and decays in the soil nitrogen becomes available to plants.

Why the Azolla cultivation is increasing and becoming popular?

Because, Azolla has many nutrient benefits when compared to other fodders. Apart from this, it has nature of fixing Nitrogen in rice crop field. This is the reason Azolla is being used as common bio-fertilizer and green manure in rice fields. The blue-green algae grow in symbiotic association with this fern and are responsible for nitrogen fixation in the rice crop.

Where can it be grown?

It can be cultivated in ponds, ditches and rice fields of warm-temperate and tropical regions throughout the world. Azolla fodder is an excellent alternate feed supplement for livestock, poultry and fish. This is a boon for dairy farmers because; it drastically reduces the feed cost and results in increased milk yield. Though there are many species of Azolla, "A. pinnata" is popular among those. When it comes to nutrient value, Azolla possess high protein content, amino acids, vitamins, minerals (like magnesium, calcium, phosphorous, and potassium). Azolla is a highly productive plant and it doubles its biomass in 4–10 days period, depending on conditions, and yield can reach up to 8–12 tonnes/ha in rice fields.

Uses and Advantages of Azolla

1. Azolla easily grows in wild environment and even can be grown under controlled environment like polyhouse and greenhouse.
2. Azolla can be grown in large quantities, if requires and used as green manure in both Kharif and Rabi seasons.
3. Azolla can fix atmospheric CO2 and nitrogen to form carbohydrates and ammonia respectively. After decomposition it adds available nitrogen to the soil.
4. Azolla solubilises Zn, Fe and Mn and make them available to the rice in the field.
5. Azolla helps in weed control and suppresses tender weeds such as Chara and Nitella in rice field.
6. In natural way, Azolla releases plant growth regulators and vitamins which are very much required to enhance the growth of paddy crop.
7. Azolla helps increase the crop yield and quality.
8. Azolla reduces water evaporation rate from the irrigated rice field.
9. When used as supplemental feed in dairy, it helped to increase the milk yield.

Growing Conditions for Azolla Cultivation:-

Azolla can be grown or found in ditches, ponds and wetlands of warm temperate and tropical regions. Azolla prefers shade and requires light (30 to 50 % light required for its growth) for photosynthesis. As we all know this (Azolla) is water based crop, one should ensure sufficient water for its cultivation. It is always recommended to have at least 5 inches of water in pond for proper growth of Azolla. Azolla grows well where the optimum/ideal temperature range is 20°C to 35°C. Higher temperatures above 36°C will seriously affect the multiplication of Azolla. For better yield and quality of Azolla, it requires the water pH value of 5.0 to 7.0 and relative humidity of 80 to 90%. Too much of acidic conditions or alkalinity has a negative impact on the growth of Azolla (fern). When it comes to requirement of nutrients, Azolla absorbs the nutrients from water and phosphorus is most important element. Usually, 20 to 25 ppm of phosphorus in the water is optimum. It is also essential to apply micro- nutrients which can improve the multiplication and growth of Azolla.

Azolla Cultivation: -

For Azolla production, it requires a shallow pond.

Location of Pond in Azolla Cultivation:

The pond location plays major role in Azolla cultivation. Make sure to have location where you can monitor on regular basis. As this requires good water supply, choose a location near to good water source. Basically, Azolla prefers partial shade; hence one should select the location where partial shade is expected or create the partial shade to cover the location. This partial shade helps in better growth of Azolla and preventing water evaporation. Make sure to have pond bottom free from any pointed stones, thorns that can damage or puncture the sheet place at the bottom of pond.

Construction of Pond in Azolla Cultivation:

Size of the pond varies from farmer to farmer and mainly depends on how much quantity of Azolla is expected to feed the livestock. In case of small holders, you can go for 6 feet x 4 feet for growing Azolla. This can produce 1 kg of supplemental feed/day. The pond should be cleaned thoroughly and levelled. Use bricks to construct side walls of pond (Even you can use raised embankment with the excavated soil). Place durable plastic sheet at the bottom of the pond and secure all the sides of sheet by placing bricks over the side walls. The pond should also be secured with a net to prevent the fall of leaves and other debris into the pond. This net also provides partial shade which is very essential in Azolla cultivation. In order to secure this net, place wooden poles or bamboo sticks over the pond walls. Place stones or bricks on the edges for securing the plastic sheet and net.

Growing (Production) of Azolla:

Mix clean fertile soil with cow dung and water and spread across (uniformly) the pond. To cover the 6 feet X 4 feet pond, 1 kg of fresh Azolla culture is required. Apply this culture uniformly in the pond. Make sure to have the water depth at least 5 to 6 inches in the pond. For fast growth of Azolla, you can tap the rain water during monsoon season. Another important factor to consider in Azolla cultivation is not to have high content of salt in pond water which can adversely affect the growth of Azolla. If you are growing the Azolla, it is better to test the water for Alkalinity and acidic properties.

Pond Maintenance in Azolla Cultivation:

For ensuring better growth of Azolla, apply 1 kg of cow dung and 100 to 120 grams of super phosphate once in 2 weeks. Make sure to remove any weeds formed in the pond regularly. The pond should be emptied once in 6 to 8 months and cultivation of Azolla has to be restarted with fresh culture and soil.

Harvesting and Feeding Azolla Cultivation:

Usually, Azolla will be ready for harvesting in 2 to 3 weeks after stalling the culture in the pond. Azolla can be harvested daily after its full growth. Plastic sieves should be used to harvest the biomass from the pond's surface. One can obtain on an average, 1 kg of fresh Azolla per day from the size of 4 feet x 6 feet pond. Harvested Azolla can be fed directly or mixed with nutrients and fed to livestock like cattle (dairy), sheep, goat, pigs, poultry and rabbits. Azolla in dried form can also be fed to livestock. Before feeding Azolla to livestock, clean the Azolla with fresh water.

Dairy farmers are getting excellent profits by avoiding feed cost and also it has been proven, increased milk yield. To get used to the taste of Azolla, better to feed it along with the concentrates in the initial stages.

Limitations in Azolla Cultivation

High summer temperatures, extreme lower temperatures, water scarcity, and low humidity, poor quality of water makes it difficult to adopt Azolla cultivation.

Conclusion

Azolla cultivation is an excellent option for farmers who want to fix the Nitrogen in paddy fields and to save supplemental feed cost in livestock.

1:00 pm- 3:00 pm: **Practical**

3:00 pm -5:00 pm: AH & VETY: INTEGRATED FARMING SYSTEM

It is an integration of two or moreappropriate combination of enterprises of crops,dairy, piggery, goatery, fishery,poultry, bee keeping, etc., for each farm according to the availability of resources to sustain and satisfy the necessities of the farmer.

ROLE OF LIVESTOCK IN INTEGRATED FARMING SYSTEM

Keeping livestock is traditional and closely linked to rural culture. It contributes to the livelihood of the poor in many ways. Smaller livestock farming such as pig, goat, sheep, poultry and rabbit have many common factors as relatively undemanding in feeding requirement, easy to house and manage. They are less risky and easier to replace as they are not so costly and reproduce faster.

Agriculture and livestock system are highly integrated. While livestock become a source of organic manure to the crops. The crop and crop residues act as a source of feed to the animals. Thus production system which integrated both crop and livestock are highly sustainable. Animal manure and waste as manure of cattle pig, goat, sheep, poultry and other animals including bedding and litter, waste feed etc are environment friendly and economically sound source of crop production. Besides, reducing the need for commercial fertile such waste can also add organic matters which improve soil health.

CROP LIVESTOCK INTEGRATION.

In crop livestock integration optimum diversity may be obtained by integrating both crops and livestock in the same farming operation. Mixed crop and livestock operation have several advantages.

1) First growing row crops only on more level land on steeper slopes will reduce soil erosion.
2) Pasture forage crop on rotation enhance soil quality and reduce erosion.
3) Livestock manure improve the physical, Chemical, and biological properties of soil as well as release of nutrients after decomposition, affecting plant growth. Crop livestock integration not only help to increase net farm income but also utilize all available resources efficiently.

CROP – LIVESTOCK – FISH INTEGRATION

Fresh pig manure is regarded as highly efficient for pond fertilization. Moreover, fish can utilize directly the feed spilled by pigs which would otherwise go as a waste, thereby reducing the feed cost of livestock production.

ADVANTAGE OF INTEGRATED FARMING

- Agriculture and livestock system are highly integrated.
- Provide alternative source of income.
- Crops and crop residue act as a source of feed to the animals.
- Sustainable growth in agriculture.
- Waste product of one component serve as a resource for the other.
- Pollution free environment.
- Recycling of farm residue.
- Increase in employment.

- High standard of living.
- Practicing agriculture with livestock farming is more profitable than doing agriculture alone.
- Cowdung, poultry waste, dried leaves can be used as fertilizer (organic).
- Provide healthy and weathly life.
- Remove poverty of the farmers.
- Increase the economic status of the farmers.
- Small and marginal farmers cannot rely on agriculture alone throughout the year.
- It is very important to establish integrated system of agriculture.
- Generate self-employment and income throughout the year.
- Agriculture practice with animal husbandry not only gives additional income and employment to the farmers around the year but also livestock excreta can be used as fertilizer and lowered the cost of fertilizer.

ANIMAL MANURE

Animal manure is the excreta of plant eating animals (Hervivores) and poultry mixed with bedding materials.To improve the organic status of the soil,farmer are now turning towards the age old practice of organic farming i,e, managing crop without the use of fertilizer and pesticides. Animal excreta differ according to species, diet environment and productivity of the animals. Most of the time undigested protein and nitrogen are excreted in the form of urea or uric acid via faeces and urine respectively.Magnesium, Iron,Calcium and Phrosphate are excreted in the feaces.Goat manure is known to supply more Nitrogen to the plants. Animal waste are the valuable sources of organic matter and plant nutrient such as Nitrogen.Compost manure of animals origin improves mineral nutrition of the soil and enhance the growth and flowering of the plants. Animal waste can provide an economical source of N.P.K. as well as other nutrients needed for plant growth.

CONCLUSION

Integrated farming system is based on the concept of recycling of animal excreta, litter material and other waste like feed, etc., to serve as fertilizer in crop field and sometimes as food for fishes cultivated in ponds while the crop and crop residue can be utilized as animal feed, thereby reducing the feed cost of livestock production.

"There is no waste" and waste of one component is a resource for another component.

DAY- 5: 10:00 am- 12:00 noon: HORT IV: TURMERIC CULTIVATION

Turmeric is a sub-tropical plant and can be grown on different types of soils under rain and irrigated conditions. It is a shallow rooted crop and suitable for intercropping. Turmeric plant is propagated through rhizomes. It is used as spices in Indian foods. It has several medicinal properties like stomachic, carminative, tonic, blood purifier, vermicide and antiseptic. The active ingredients of turmeric are cur cumin, which has a wide range of therapeutic effects. It is cultivated in Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, West Bengal, Gujarat, Meghalaya, Maharashtra and Assam. India is the largest producer and exporter of turmeric in the world. It can be grown in the temperature range of 20-35°C with annual rainfall of 1500 mm.

Soil – Turmeric requires rich loamy soil having good drainage. Sandy or clay loam soil with a pH range of 4.5 – 7.5 with good organic matter status. It cannot withstand water stagnation or alkaline soil.

Sowing time – April –May.

Spacing Time – 25 – 30 plant to plant & 45 – 60 cm between rows.

Seed rate – 2500 kg/ha. Each planting unit consists of bits of 20 - 25 gram each.

Varieties – Lakadong variety from Jaintia Hills is mostly grown in the state. The plant height is 140-180 cm and the leaves are shiny green. Finger rhizomes are stout and reddish and matures within 255 days. It is also highly resistant to leaf diseases. It is popular for its high curcumin content. Other varieties are Meghalaya Turmeric – 1, Surome, Roma, Alleppey, Sudharshana.

Propagation – Both whole and splits mother rhizomes are used for planting. Select well developed, healthy and disease free rhizomes for planting. Mother rhizomes are split into two, each having at least one bud. The fingers are cut into 4-5 cm long pieces.

Land Preparation – Land should be prepared to fine tilth with four deep ploughing. Beds of 15 cm height and 1 m width should be prepared at a spacing of 45 cm apart.

Seed treatment – Before panting the rhizomes are soaked in a mixture of *Trichoderma harzianum* @ 2.5 g + *Pseudomonas florescence* @ 5 g / 1 liter of water for 30 minutes. Rhizomes are stirred 3-4 times to ensure uniform soaking. Then the rhizomes are air-dried under shade. Seed treatment induces early germination and protects from seed borne pathogen, pests and diseases especially rhizome rot.

Sowing – Small pits are made with a hand hoe on the prepared beds with a spacing of 20-25 cm along the rows. Place the finger rhizomes flat with bud facing upwards in the shallow pits. Then cover the rhizomes with soil or dry powdered farm yard manure.

Organic nutrient management – Application of well decomposed FYM or compost @ 25-30 tones/ha to the land is done through broadcasting and ploughing at the time of land preparation. Apply Neem cake @ 2 tones/ha along with vermi-compost @ 10 tones/ ha at the time of planting to increase yield and control rot disease and nematodes. Soil application of Trichoderma bio-control agent (2.5 kg mix with 100 kg FYM and keep in shade for 7 days) for 10-15 days before sowing also helps in improving the soil biological activity. Also soil application of bio fertilizer like Azosperillium @ 30 kg/ha or seedling application @ 20 g/ liter of water improves yield as it supply better nutrition to the crop.

Mulching – Paddy straw or green leaves are usually used for mulching in turmeric beds after sowing. This will help to enhance germination of rhizomes and it prevents soil erosion during heavy rains. It also helps to add organic matter to the soil and conserve moisture during the later part of the cropping season. The first mulching with green leaves @ 10-12 tones/ha is to be done immediately after sowing. Then it is repeated @ 5 tones/ha at 40 and 90 days after planting. Cow-dung slurry or liquid manure may be poured over the beds after each mulching to enhance microbial activity and nutrient availability. Mulching helps to reduce weed growth in the beds.

Weeding & earthing up – Weeding should be done thrice at 60, 90 and 120 days after sowing depending upon the weed intensity. Earthing up is essential for the enlargement of rhizomes and it is also provide adequate aeration to the roots and protects the rhizome from scale insects. The first earthing up is done at 45 days after planting and the second at 120 – 135 days after planting. Earthing up also helps to manage the weeds growth.

Cropping system – Turmeric can be grown as intercrop with leguminous crops like soya-bean, French-beans, pigeon pea etc. Intercropping with soya-bean and finger millet and maize is advantageous as it improve the soil fertility.

Harvesting & curing – Turmeric takes 7-9 months for harvesting. Drying up of the aerial portion indicates maturity. An average yields of 25-30 tones/ha of fresh rhizomes may be obtained. After harvesting the fingers are separated from the rhizomes. Then they are cleaned and dried for one day.

Processing – The rhizomes should be boiled in water till they become soft and then dried in the sun fir 10-15 days until they produce metallic sound. The dried rhizomes are the put into the gunny bags and crushed against the floor in order to remove the scales and roots.

Storage – The fresh harvested rhizomes should be dried in shade for 4-5 days after removing the dirt and leaves. Then they are kept in an underground pit. The upper layer of the rhizome should be covered with dry grass and the month of the pit may be covered by plastering it to prevent water from entering into the pit. The pits should be opened during January – February to inspect diseases infestation of rhizomes.

DISEASES

1. **SOFT ROT** (*Pythium aphanidermatum*)

Symptoms: It is a serious seed as well as soil borne disease and the symptoms can be seen from July. Yellowing of leaves appear first on the lower leaves and proceeds to upper leaves. Roots arising from the affected rhizome become rotten and show brown discoloration of the rhizome tissue. Sometimes the pseudostem comes off easily with a gentle pull. The rotten parts attract other fungi, bacteria and insects particularly the rhizome fly. During the rainy season this disease spreads very fast from the infected field to healthy field.

Management : Avoid water logging and mother rhizome removal. At the time of sowing treat the rhizomes with *Trichoderma harzianum* or *T. viride* @ 8-10 gm/litre water or Bordeaux mixture (1%). Remove the badly affected plants and drench around the infected plants, after slightly removing of soil with Trichoderma @ 8-10 gm/litre water or Bordeaux mixture (1%).

2. **Bacterial Wilt** (*Ralstonia solanacearum*)

Symptoms: It is the most serious disease and the symptoms can be noticed from July-August. The leaf margins of the affected plant turn bronze and curl backward. The whole plants wilt and die. The base of the infected pseudostem and the rhizome emit foul smell. When the suspected pseudostem is cut and immersed in a glass of clean water milky exudates will ooze out from the cut end. Typical symptom is the wilting observed during afternoon in young seedlings.

Management: Seed contamination is the major sources of infection hence procure only healthy rhizome from disease free area. 3-4 years crop rotation should be followed to avoid disease incidence. Avoid crop rotation with solanaceous crops like tomato, chilli, brinjal, etc rather go for leguminous or cruciferous crops soybean, mustard, radish, etc to overcome pathogen. Seeds should be treated with *Trichoderma harzianum* or *Trichoderma viride* + *Pseudomonas florescens* @ 5-10 gm per kg seeds before sowing. Remove the affected clumps and drench the soil with *Pseudomonas florescens* @ 10 gm/literwater or Bordeaux mixture (1%).

INSECT/PESTS

1. Shoot Borer – (*Conogethes puntiferalis*) **–** The larvae bore the tender pseudostem and reach the central portion by feeding on the internal tissues resulting in yellowing and drying of shoots. Infestation may occur during June – October.

Management – Mechanical collection and destruction of the adult larvae periodically should be done. Light traps should be installed during mid May to June and July to trap adults. Spray Nimbicidine (2-5 ml/water) or *Beauveria bassiana* @ 2-5 ml / 1 liter of water.

2. White Grub (*Holotrichia spp.*) - It is a sporadic pest, sometimes causes serious damage. The grub feeds on the roots and newly formed rhizomes. The infestation is generally more during August-September.

Management : The entomophagus fungus *Metarrhizium anisophilae* can be mixed with fine cowdung and then applied in the field to control the grubs. In endemic areas opt for soil application of neem cake @ 40kg/ha before sowing or apply Nimbicidine @ 2-5 ml/l or *Beauveria bassiana* @ 2-5 ml/l. FYM or cowdung should be well decomposed to avoid infestation.

3. Rhizome Scale (*Aspidiella hartii*) - The economic part of the plant namely the underground rhizome is often attacked both in field and in storage condition. The minute crawling nymphs infest near the growing buds and suck the sap. It results in shrivelling and drying of the rhizomes. The plants are devitalized and get withered before drying completely. The rhizomes fail to germinate.

Management: Severely infested rhizomes are to be discarded before storage of rhizomes. Storage of rhizomes in dried leaves of *Strychnos nux-vomica* + sawdust in 1: 1 proportion helps in keeping the seed rhizomes free of scale infestation. Spraying of Neem oil @ 3ml/lit of water at 15 days interval is found to be effective.

1:00 pm- 3:00 pm: FARM MECHANISATION: AGRICULTURE ENGINEERING/ FARM MECHANISATION

AGRICULTURE ENGINEERING(MECHANICAL) PLAN SCHEME

A. Objective of the Scheme:

The main objective of the Scheme is to bring farm machinery within the reach of small and marginal farmers of the State by popularizing the use of Agricultural Machineries such as Power Tillers, Tractors, Bulldozers, Power Reapers, Excavators, etc, which is necessary in view of the scarcity of farm labour as well as to promote farm mechanization in the state, thereby facilitating efficient use of resources and timeliness of agricultural operations.

B. Impact of the Scheme.

Though this Scheme, Agricultural Machineries were purchased by the Department for giving out to the farmers on hire at 60 % subsidized rates, to reduce the input cost of production and also to ensure that the farmers get maximum returns from the land. The implementation of the scheme has greatly benefitted the small and marginal farmers of the state who by virtue of their economic condition are unable to purchase Agricultural Machineries of their own. As the present mechanization status in the state is among the least in the country, such mechanized activities have to be expanded, especially in places with low farm power availability.

SOCIAL BENEFIT AND EFFECTIVENESS OF THE AGRICULTURE ENGINEERING

(MECHANICAL) PLAN SCHEME.

The main objective of the scheme is to bring farm machinery within the reach of small and marginal farmers of the state by popularizing the use of Agricultural Machineries such as Power Tillers, Tractors, Bulldozers, Power Reapers, Power Pumps etc. which is necessary in view of the scarcity of farm labour as well as to promote Farm Mechanization in the State, thereby facilitating efficient use of resources and timeliness of Agricultural operations.

Through the Scheme, Agricultural Machineries were purchased by the Department for giving out to the farmers on hire at 60 % subsidized rates, to reduce the input cost of production and also to ensure that the farmers get maximum returns from their land. The implementation of the Scheme has greatly benefitted the small and marginal farmers of the state specially those in very remoted areas who by virtue of their economic condition are unable to purchase farm machineries on their own. Moreover in such areas, the presence of private individual/ groups hiring out Agricultural machineries to the farmers is negligible or non- existent. Therefore the hiring out of Agricultural Machineries by the Department has been of great assistance and value to the farmers of these area and the state as a whole.

Currently the Department has the following Agricultural Machineries at its disposal which are being hired to the farmers of the state:-

Name of District	**East Khasi Hills**	**West Khasi Hills**	**Ri-Bhoi District**	**Jaintia Hills District**	**West Garo Hills**	**East Garo Hills**	**South Garo Hills**	**North Garo Hills**	**Grand Total**
Name of Machines	Nos.of machines	Nos.of machines	Nos.of machines	Nos.of machines	Nos.of machines	Nos.of machines	Nos.of machines	Nos.of machines	Nos.of Machines
JCB	1			1	1				3
Bull Dozer	1	1	1						3
Tractor	2	2	1	1	1	1	1		9
Power Tillers	13	15	15	16	13	12	10	7	101
Power Reaper	5	2	6	5	5	6	2	2	33
Truck	1				1				2

- As the mentioned Departmental Machineries are hired out to the farmers of the state at subsidized rate for the various agricultural operations and as there is a huge demand from the farming community for such machineries.

- Since these Agricultural Machineries are very much in demand from the small and marginal farmers of the state, the necessity for repairing of such machineries is also necessary to maintain them so as to ensure their operational worthiness and longevity.

- Also due to such high demand, there arises the need to engage additional workforce to operate these machineries especially during the peak tillage season for cultivation of important cereal crops like paddy, maize as well as vegetables.

- The present mechanization status in the state is among the least in the country, therefore, such mechanized activities has to be expanded especially in places with low farm availability.

- The implementation of this Scheme would also help in the promotion of Agricultural Mechanization to a great extent as well as ensuring an increasing in the farm power penetration in the state, which is only 0.7 Kw/ Ha as compared to the national average of 2.0 Kw/Ha.

- In view of the factors mentioned above and in the interest of serving, every section of the farming community, it is prayed that this scheme be considered at the earliest.

3:00 am – 5:00 pm: IPM

RODENT PEST MANAGEMENT

Rodent pest management is normally aimed at application of poison baits in order to kill the rodents which is often a failure. In order to manage the rodents successfully, study of their behavioural traits is important.

Major behaviours of rodents:

1. Fossoriality
2. Nocturnality
3. Exploration
4. Thigmotaxis
5. Neophobia
6. Bait shyness
7. Rodenticide resistance
8. Reproductive bouncing
9. Migrality

Fossoriality: Except most of the squirrels and house rats, rodents are fossorial.

- They live in burrows/ crevices.
- Constant environmental conditions are maintained inside the burrows, facilitated by the soil.
- The depth normally depends on the atmospheric temperature.

Nature of rodent burrows:

- Porcupines – make crevices between rocky areas; the crevices are normally tapering; complex of crevices due to gregarious living.
- Bandicoots – scooped soil exists before the burrows with soil pebbles.
- Soft furred field rat – vertical burrow, which extends laterally
- Gerbils – burrow complexes

Nocturnality:

- Most of the rodents are nocturnal in habits.
- The spontaneous activity starts at evening hours after sunset and have exploration, feeding and feeding rhythms; the activity will be minimize by 9.30 pm.
- Again they become active in early morning having exploratory and feeding activities.
- Crepuscular (Dawn & Dusk).

Exploration:

- Rodents have a habit of checking the environment during the spontaneous activity period.
- This is to guard the area where they live to check any incursions or change in the environment
- This is an inborn instinct of all rodents

Thigmotaxis:

- Rodents normally move aligning vertical surfaces.

- In crop fields they move at the base of the bunds and hardly move on the bund.
- Hence, the baits placed on the bund are not accepted
- In storage and domestic situations, they move aligning the walls**.**

Neophobia:

- During the exploration, if they observe any change in the environment, they develop new object reaction
- If it is a trap , they will not enter in side.
- If it is food material, they will not eat readily the food; they mark the food and taste the food.
- Hence, if poisoned baits are given, the behavior affords protection to avoid the bait consumption.
- Neophobic periods:

  R. *rattus* – 3 days
  B. *bengalensis* – 1 day
  M. meltada – 5 days
  T. Indica – 3 days

Bait shyness:

- Sub lethal doses of acute rodeticide will not kill the rodents, but the minute quantities of Phophine generated in stomach will give stomach disturbance.
- Rodents will associate this discomfiture with bait material ate.
- Consequently they avoid eating the food item-   BAIT SHYNESS.
- It is temporary phenomenon
- Persistent periods:

  R. *rattus* – 75 days

  B. *bengalensis* – 21 days

  M. meltada – 135 days

  T. Indica – 75 days

Rodenticide resistance:

- Chronic rodenticides are reported to result in development of resistance over a period of time.

Reproductive bouncing :

Normal Breeding	Abnormal breeding
▸ Sex ration (M:F)- 1:1 ▸ Avg. Litter size – 6 ▸ Post partum oestrous- 90 days. ▸ Maturity period- 90 d ▸ This is seen in normal un-disturbed agrarian ecosystems.	▸ Sex ration (M:F)- 1:2 ▸ Avg. Litter size -20 ▸ Post partum oestrous- 2 days. ▸ Maturity period- 75 d ▸ This is seen during unexpected favourable climatic situations.

BREEDING PROFILES

Normal

Abnormal

Migrality:

- Rodents inherently have migrality - movement in search of food sources
- Emigration – outward movement after the harvest in search of food available areas
- Immigration – inward movement of rodents to the crops under establishment

INTEGRATED RODENT PEST MANAGEMENT:

1. Cultural practices - Deep Ploughing and Trimming of field bunds
2. Mechanical practices – Employing local traps
3. Smoking the rat Burrows
4. Flooding of the burrows
5. Biological management: Keeping bird perches in the field. Barn owl, spotted owl, snakes and cats are good predators of rodents. So in order to manage the rodent population we need to preserve and increase the population of owls instead of hunting them.

DAY -6: 10:00 am -12:00 noon HORT I: Polyhouse Vegetable Cultivation

POLYHOUSE VEGETABLE CULTIVATION

Polyhouse cultivation of vegetables involve protection of production stages of vegetables mainly from adverse environmental conditions – temperatures, hail, scorching sun, heavy rains and snow. Polyhouse conditions can be conventional devices to computerize environment controlled polyhouses. Such conditions for vegetable productions are created locally by using different types of structures. These structures are designed as per climate modification requirement of the area. Besides, temperature, humidity, wind velocity, soil conditions play a major role in the design of protection structures for growing vegetables crops.

Polyhouse, low tunnels ,shading net houses, anti –hail nets, bird protection net, trench (pit type polyhouse), mulch, wind- break and floating crop covers are some of the common plant- protection structures used for raising vegetables crops or their nurseries.

A polyhouse is a framed structure covered with UV stabilized low- density polythene or other transparent plastic films in which crops could be grown under controlled or partially controlled polyhouse environment and which is generally large enough to permit a person to work within it to carry out cultural operation easily.

A polyhouse is covered with a transparent polythene, depending upon the transparency of plastic films, major fractions of sunlight is absorbed by vegetables crops and other object. These objects in the polyhouse in turn emit long wave thermal radiation for which plastic film has lower transparency. With the result, solar energy is trapped and resists the temperature drop inside the polyhouse. This is popularly known as green house effect. This rise in temperature in polyhouse is responsible for vegetable forcing in cold climates. During summer months, air temperature in polyhouse is to be brought down by providing cooling device or air circulation. In commercial poly house besides temperature controlled humidity, carbon dioxide. Photo period, soil temperature, plant nutrients etc, facilitate round the year production of desired vegetable crops controlled climatic and soil conditions provide an opportunity to vegetable crops to express their yield potential.

BENEFITS

The major benefits of polyhouse are:-

- Vegetable crops can be grown under adverse climatic conditions when it is not possible to grow them in open fields.
- Certain vegetable crops can be grown round the year in a particular place.
- Polyhouses provide an excellent opportunity to produce uniform vegetable crops for export.
- Production is manifold in polyhouses compared with open field.
- Polyhouses are ideally suited for raising nurseries of vegetables both sexually and asexually.
- Management of insects, pests and weeds is easier to control in poly house
- Polyhouses are ideally suited for farmers having very small holdings
- Organic farming of vegetables is easier in polyhouses.
- Polyhouses are ideally suited for producing genetically engineered and micro propagated vegetables varieties and hybrids.

Indian Polyhouses

Many types of Poly houses are used in the country. They are

1. IPCL designs are aluminum frames preferably 9m x 3m x 2.7 m, mud- brick green house 25m x 4m. Leh design is Jorhat design of bamboo framed polyhouse of localized types. Besides, other plant –protection structure are also used in vegetable farming. These structures protect vegetables from adverse temperature, humidity, hail, rain and wind.

Some of the structures are:-

Plastic low tunnels: Tunnels are made of either low density polythene or plastic sheets. They are considered ideal for raising vegetable nurseries and certain vegetable crops. These are called miniature polyhouse.

Soil Trench: This structure is underground solar polyhouse. Solar trench of 5'width and 3'depth with different length depending on the availability of land is made for raising vegetables in extreme cold conditions. It is the cheapest poly- house for cold desert areas of temperature region. Maintenance of higher temperature in soil trench is better than above poly houses. Higher temperature helps in better growth of vegetables leading to higher yield. The Palak(beet leaf) yield in soil trench 1m2 areas is almost double than in the glass/polyhouse. Soil trenches in heavy snowfall areas with detatchable dome/tunnel type aluminium/wood/iron/bamboo frame cladded tight plastic film are suitable for vegetable cultivation.

Site Selection: In temperate region, polyhouses are mainly depending on solar energy. During winter, maintenance of higher temperature is dependent on the quantum of sunlight, received over larger period, therefore, site for poly- houses should be sunny. Tubular type of poly house (IPCL design) should be put in open space where tree shade can be avoided. Installation of polyhouse should ensure that cladding material (polythene film) should face southern side. East–West, orientation, of polyhouse ensures maximum hours of sunlight. Shadow of trees, hillocks and other objects should not fall on the side of the polyhouse during or part of the day. In places where avoidance of shadow of tree is not possible southern and western sides should be clear.

Besides shade, another important consideration is selection of soil. Fertile soil with normal pH (5.5-7.5) is desirable. Soil in and around polyhouse should be well-drained. Polyhouse site should be outside the range of strong wind localities. Wind-breaks can be put up where windy locations cannot be avoided. Polyhouses should have easy and convenient approach.

Poly house Structure:

Different light weight materials are preferred for making a polyhouse. Aluminium and its alloy, which are strong, light weight and corrosion resistant are preferred. Farmers who are unable to afford aluminium structures can make polyhouses frame of locally available wood, bamboo etc. Iron frames being prone to rust should be avoided. However, structure having such frames should use paints. Stones and unbaked bricks are used for polyhouse construction. Northern side of polyhouse should preferably be made of stone or mud to check heat losses.

1: 00 pm -3:00 pm: HORT II: Cultivation of Peach

PEACH

Peach (*Prunus persica*) is an important fruit crop of Meghalaya. Besides, Meghalaya it is also grown in almost all states of the NEH region because of introduction of the low chilling varieties. Fruits are rich in protein, sugar, minerals and vitamins. It has various uses as fresh fruit as well as processed product.

SOIL AND CLIMATE

It is cultivated on varied type of soils but deep sandy loam soil rich in organic matter is best. It is highly susceptible to water logging and prefer perfect drainage. It can be fitted in any type of farming system and can thrive well in high hills, foothills as well as mid-hills situations.

CULTIVARS:

Clingstone or white fleshed varieties- Eureka,Altons etc.

Free stone or yellow fleshed varieties- Kiora and Flordasun

PROPAGATION

Peach is propagated through seeds and vegetative means. However, vegetative propagation is commercially followed.

Raising of rootstock: For raising rootstock for grafting, wild peach is propagated through seeds. For producing rootstocks, seeds are kept in moist sand for 10-12 weeks for stratification. The germination and vigour of the seedling can be improved by pre- sowing treatment of seeds with Gibberellic acid (200mg/litre water). The sowing of seeds in nursery is done during the month of October-November. The seeds are sown in well-prepared beds about 5 cm deep and 15 cm apart in a row spacing of 20 cm. Seedbeds are mulched with dry grass and light irrigation is given after sowing to avoid desiccation of seeds.

Grafting: Tongue and cleft/wedge grafting in the month of November-December is very good method for commercial multiplication.

TIME OF PLANTING

Late Autumn or early winter as growth starts early i.e. October to November.

PLANTING DISTANCE

4-5 m x 4-5 m depending upon the variety grown and topography of land.

TRAINING AND PRUNING

Peaches are usually trained to an open-centre system. Cut back newly planted trees to about 30 inches high, just above a lateral branch; select 3-4 laterals with wide-angle crotches spaced evenly.

Peach require heavy and regular pruning because fruiting occurs laterally only on previous season’s growth. During early bearing, 20-30% linear growth of the shoots should be removed. The best time of pruning is last week of October. Water sprouts that come below the graft union is removed periodically.

FRUITING

Peach bear fruits on one year old shoots and on older spurs. It comes to full bearing from 5 – 6 years onwards

MANURES:

Incorporation of organic manure in the soil and bio-fertilizers is very important in orchard nutrition. Depending upon the age (year) of tree, FYM manure schedule is given below:

Age (Year)	**FYM (Kg)**
1	5
2	10
3	20
4	20
5 and above	25

Combination of organic manures, bio-fertilizers ensures balanced orchard nutrition package for better plant performances. There are many organic manures however farm yard manure, vermicompost are commonly used. Organic manures improves soil texture, increases beneficial microorganisms strength in the root zone and facilitate availability of nutrient elements. Vermicompost, NADEP compost, neem based manures etc are some new organic preparations which can be applied in combination with FYM. Bio-fertilizers like *Rhizobium, Azotobacter*, Phosphorous Solubilising Bacteria and Fungi and Vesicular Arbuscular Mycorrhiza (VAM) can be applied directly into the soil except *Rhizobium* can be fixed with dried FYM, compost or vermicompost in the ratio of 1:25. Seed treatment with 500g culture and root dip of seedlings in slurry of bio-fertilizers for 15-20 minutes is followed. Other organic manures which can be used are Jeevamrit and Panchagavya where the soil microbial diversity as well as the soil health can be improved and enhanced.

INSECT/PESTS

Peach aphid: This insect suck the sap from growing buds. Leaf buds become weak and result in poor setting and fruits fall-off prematurely.

Management:

- One of the methods is by spraying soap solution or neem oil on the plants. Oils kill aphids by smothering them so it's important to cover the plant parts well. Further, soaps and oils are effective for short periods of time so they have to be sprayed frequently. In fact, neem compounds break down fairly fast (5–7 days) when exposed to sunlight and soil. Make a neem oil insecticide in a spray bottle by mixing 1 tablespoon of pure liquid soap or olive oil based soap with 2 tablespoons of neem oil. Add water as and shake well. Spray wherever needed.

- Fermented plant extracts of neem leaf and garlic were found to be quite effective against aphids.
- Vapors of essential oils like cumin and eucalyptus have proven to be effective even at mild concentrations against aphids. To make an effective mix of essential oils against aphids,
- take about 4–5 drops of the essential oils available. Pour this mix into a small spray bottle filled with water. Shake well and spray on infested plants. This concoction works well as a general purpose insect repellant too.
- Garlic has a pungent odor and extracts of garlic have been found to be quite effective against some aphids. To make a garlic oil spray, take 3–4 cloves of garlic and chop them finely. Add 2 teaspoons of mineral oil. Let this mix sit for 24 hours. Strain and add the liquid to one pint of water. Now add 1 teaspoon of liquid dishwashing soap. Store this insecticide and use when needed. To use, add 2 tablespoons of the mixture to one pint of water in a spray bottle.

Diseases

Diseases least affect peach. However, powdery mildew and shot hole cause damage to the crop.

Powdery mildew: It causes white powdery substances on the leaves, buds and flowers.

Management:

1. Prune or stake plants to improve air circulation. Pruning tools should be disinfected (one part bleach to 4 parts water) after each cut.
2. Remove diseased foliage from the plant and clean up fallen debris on the ground.
3. Use a thick layer of mulch or organic compost to cover the soil after it has been raked and cleaned it well. Mulch will prevent the disease spores from splashing back up onto the leaves.
4. Neem oil can be used on a 7 day schedule.
5. Destroy all plant debris after harvest. They should not be used for making compost.

Shot hole: It is caused by fungus; in which dark brown scattered lesion on leaves appear.

Management:

All infested buds, blossoms, fruits and twigs need to be promptly removed and destroyed. Contaminated leaves around and beneath the tree should be removed as well. Always avoid overhead irrigation to reduce transmission of the disease between branches or trees.

Harvesting and yield

For distant market, fruits are harvested when they attain good colour with hard skin, whereas, for local consumption, ripe peaches are harvested by twisting with hand. The peak harvesting period of peach is last week of April to May.

On an average, 20-30 kg fruit/tree can be harvested from 3 years old tree.

PEAR

The European pear, *Pyrus communis*, is a perennial deciduous tree in the family Rosaceae, grown for its fruit. The tree is a short deciduous tree with a tall and narrow crown and alternately arranged, simple leaves. The leaves are elliptical with finely serrated margins and defined tips and can reach 2–12 cm (0.7–4.7 in) in length. The tree produces white flowers which are 2.5 cm (1 in) in diameter and a fleshy green pyriform fruit. Pear trees can reach 9 m (30ft) and will produce fruit for about 20 years .

USES

The pear fruit is eaten fresh or can be cooked in a range of sweet dishes. The fruit may also be pressed for juice. The leaves of the tree can be used to produce dyes and the wood can be used in carpentry and is very durable.

CLIMATE AND SOIL

Pears grow very well in areas that have a late frost and a cool, dry summer and will grow at temperatures between -26 and 45°C (-14.8–133°F). Pear trees have a chilling requirement of between 1000 and 1500 hours between 0 and 7°C (32–44.6°F) to break dormancy depending on the particular variety being grown. Generally, trees must cross pollinate with a different variety in order to successfully set fruit. Pear trees require a deep, well draining soil with a pH of 6–7 and will grow in sandy, medium or heavy soil.

CULTIVARS:

William Barlett
Winter Nelis
Nashpati
Gola

PROPAGATION

Pear trees are propagated by whip and tongue grafting on Pyrus khasiana during winter or cuttings from autumn to early spring in case of Nashpati with the help of rooting hormones. They are planted by digging a hole which is large enough to accommodate the outstretched roots of the tree without bending. The graft union should be at least 10–15 cm (4–6 in) above the soil line.

PLANTING TIME:

October to December

Planting in pit of 1mx1mx1m size and filled with mixture of soil and well rotten FYM or compost.

SPACING

5m row to row

5m plant to plant

TRAINING AND PRUNING

Pear trees are usually trained and often they follow a central leader system. The central leader system encourages earlier fruiting and is recommended for European pear varieties. The system consists of one main trunk which gives rise to 12 to 16 primary scaffold branches. The tree becomes conical in shape, being wider at the bottom and narrower at the top. The shape is achieved through selective pruning of the branches in the years after planting. Pruning is done during mid winter and midsummer i.e mid December and June to July.

FRUITING:

Pear bears fruit from 2 years old and comes to full bearing from the 6th year onwards.

MANURES

The quantity of Bio-fertilizer / organic manure that should be supplied to pear trees depends on the soil type and composition and should be checked with the aid of a soil test. Less nitrogen is supplied to pear trees than to apple as it promotes vigorous growth, increasing susceptibility to fire blight. In the first year of growth, phosphorous and potassium may be required but in subsequent years, only nitrogen is generally added to the soil. The area around the base of the pear tree should be kept free from weeds which compete for water and nutrients.

COMMON DISEASES AND PESTS

Diseases

- *Armillaria root rot (Oak root fungus)*Armillaria mellea

Symptoms

Small, discolored leaves which drop early; death of branches; death of plant; clusters of honey-colored mushrooms may sprout at base of plant

Management

Armillaria root rot cannot be effectively controlled once it has become established in an orchard; diseased or dead plants should be uprooted and removed; planting resistant rootstocks is the most effective method of preventing the disease

- ***Blast*** Pseudomonas syringae

Symptoms

Water-soaked or black lesions on leaf petioles;which rapidly expand along the leaf midrib; cankers on twigs and branches; twigs may be girdles and die; leaves turning black and dying; black lesions may be present on fruit

Management

In areas where disease is severe spray Trichoderma 5gms/l of water and pseudomonas 5ml/lit of water.

- ***Fire blight*** Erwinia amylovora

Symptoms

Shoots and blossoms turning black and shriveling; plant appears as if it has been scorched by fire; watery exudate may be present on infected areas

Management

Cut out diseased wood.

Pear decline phytoplasma

Symptoms

Poor shoot growth; dieback of shoots; reddening and rolling of upper leaves in canopy; premature leaf drop; reduced leaf and fruit size

Management

Plant trees which have been grafted on tolerant rootstocks; control pear psylla on trees

Pests

- ***Codling moth*** Cydia pomonella

Symptoms

Holes and burrows in fruit; holes may be blocked with crumbly brown frass (insect excrement); wounds may be shallow or may be deep burrows extending to the fruit's core; adult insect is a dark brown moth; larvae are pink with a brown head and may be up to 1.3 cm (0.5 in) long

Management

Proper pruning methods help to open out tree canopy to ensure treatments penetrate interior of the tree and reach larvae; removal of any wild hosts or trees in abandoned orchards helps remove reservoirs of insect ; small scale growers and home gardeners can remove infested fruit by hand before larvae leaves fruit to reduce insect population; successful reduction of insect population in large scale orchards is usually achieved by mating disruption by releasing pheromones over successive years

- ***Leafrollers (Omnivorous leafroller, Redbanded leafroller, etc)*** Platynota stultana Argyrotaenia velutinana

Symptoms

8 Leaves of plant rolled and tied together with silk webbing; feeding damage to rolled leaves; defoliation of plant; silk webbing may also be present on fruits and fruits may have substantial scarring from feeding damage; larvae wriggle vigorously when disturbed and may drop from plant on a silken thread

Management

Monitor plants regularly for signs of infestation; remove weeds from plant bases as they can act as hosts for leafrollers; *Bacillus thuringiensis* may be applied to control insects ; apply sprays carefully to ensure that treatment reaches inside the rolled leaves

- ***Pear psylla*** Psylla pyricola

Symptoms

Reduced tree vigor and death of trees caused by pear decline; insect is a dark red-brown insect resembling a tiny cicada

Management

Control of pear psylla populations is best conducted when trees are dormant; organically acceptable control methods include the use of neem oil , spraying of *Verticillium lecani* @5gms/ lit can also be done to control the populations of overwintering insects

HARVESTING

Pear fruits are usually harvested when mature, but are are ripened off of the tree. Pear allowed to ripen on the tree tend to ripen from the core outwards, resulting in fruit with mushy centers. It can be difficult to determine the correct time to harvest pears and so a variety of factors should be taken into consideration prior to picking. One of the most common indicators of maturity is the firmness of the fruit.

3:00 pm-5: 00 pm: IPM: AESA

AGRO ECOSYSTEM ANALYSIS (AESA)

The IPM has been evolving over the decades to address the deleterious impacts of synthetic chemical pesticides on environment ultimately affecting the interests of the farmers. The economic threshold level (ETL) was the basis for several decades but in modern IPM (FAO 2002) emphasis is given to AESA where farmers take decisions based on larger range of field observations. The health of a plant is determined by its environment which includes physical factors (i.e. soil, rain, sunshine hours, wind etc.) and biological factors (i.e. pests, diseases and weeds). All these factors can play a role in the balance which exists between herbivore insects and their natural enemies. Understanding the intricate interactions in an ecosystem can play a critical role in pest management.

Decision making in pest management requires a thorough analysis of the agro-ecosystem. Farmer has to learn how to observe the crop, how to analyze the field situation and how to make proper decisions for their crop management. This process is called the AESA. Participants of AESA will have to make a drawing on a large piece of paper (60 x 80 cm), to include all their observations. The advantage of using a drawing is that it requires the participants/farmers to observe closely and intensively. It is a focal point for the analysis and for the discussions that follow, and the drawing can be kept as a record.

AESA is an approach, which can be gainfully employed by extension functionaries and farmers to analyse field situations with regard to pests, defenders, soil conditions, plant health, the influence of climatic factors and their inter-relationship for growing healthy crop. Such a critical analysis of the field situations will help in taking appropriate decision on management practices. The basic components of AESA are:

- Plant health at different stages
- Built –in-compensation abilities of the plants
- Pest and defender population dynamics
- Soil conditions
- Climatic factors
- Farmer past experience

Principles of AESA based IPM

- Grow a healthy crop
- Select a variety resistant/tolerant to major pests
- Treat the seeds/seedlings/planting material with recommended pesticides especially bio-pesticides
- Select healthy seeds/seedlings/planting material
- Follow proper spacingSoil health improvement (mulching and green manuring wherever applicable)

- Nutrient management especially organic manures and biofertilizers based on the soil test results. If the dosage of nitrogenous fertilizers is too high the crop becomes too succulent and therefore susceptible to insects and diseases. If the dosage is too low, the crop growth is
- retarded. So, the farmers should apply an adequate amount for best results. The phosphatic fertilizers should not be applied each and every season as the residual phosphate of the previous season will be available for the current season also.
- Proper irrigation
- Crop rotation

Observe the field regularly (climatic factors, soil and biotic factors)

Farmers should:

- Monitor the field situation of the field at least once a week (soil, water, plants, pests, natural enemies, weather factors etc.)
- Make decisions based on the field situation and P: D ratio
- Take direct action when needed (e.g. remove infested plants)

Plant compensation ability

Compensation is defined as the replacement of plant biomass lost to herbivores and has been associated with increased photosynthetic rates and mobilization of stored resources from source organs to sinks (e.g., from roots and remaining leaves to new leaves) during active vegetative growth period. Plant tolerance to herbivory can arise from the interaction of a variety of plant traits and external environmental factors. Several studies have documented such compensation through increased growth and photosynthetic rate.

Understand and conserve defenders

- Know defenders/natural enemies to understand their role through regular observations of the agro ecosystem
- Avoid the use of chemical pesticides especially with broad-spectrum activity

Insect zoo

In field various types of insects are present. Some are beneficial and some may be harmful. Generally farmers are not aware about it. Predators (friends of the farmers) which feed on pests are not easy to observe in field. Insect zoo concept can be helpful to enhance farmers' skill to identify beneficial and harmful insects. In this method, unfamiliar/unknown predators are collected in plastic containers with brush from the field and brought to a place for study. Each predator is placed inside a plastic bottle together with parts of the plant and some known insect pests. Insects in the bottle are observed for certain time and determined whether the test insect is a pest (feeds on plant) or a predator (feeds on other insects).

Pest: Defender ratio (P: D ratio)

Identifying the number of pests and beneficial insects helps the farmers to make appropriate pest management decisions. Sweep net, visual counts etc. can be adopted to arrive at the numbers of pests and defenders. The P: D ratio can vary depending on the feeding potential of natural enemy as well as the type of pest. The natural enemies of apple pests can be divided into 3 categories

- Parasitoids
- Predators and
- Pathogens

The general rule to be adopted for management decisions relying on the P: D ratio is 2: 1. However, some of the parasitoids and predators will be able to control more than 2 pests. Wherever specific P: D ratios are not found, it is safer to adopt the 2: 1, as P: D ratio. Whenever the P: D ratio is found to be favourable, there is no need for adoption of other management strategies. In cases where the P: D ratio is found to be unfavorable, the farmers can be advised to resort to inundative release of parasitoids/predators depending upon the type of pest. In addition to inundative release of parasitoids and predators, the usage of microbial bio pesticides and biochemical bio pesticides such as insect growth regulators, botanicals etc. can be relied upon before resorting to synthetic chemical pesticides.

Decision Making

Farmers become experts in crop management

Farmers have to make timely decisions about the management of their crops. AESA farmers have learned to make these decisions based on observations and analysis viz. abiotic and biotic factors of the crop ecosystem. The past experience of the farmers should also be considered for decision making. However, as field conditions continue to change and new technologies become available, farmers need to continue improving their skills and knowledge.

- Farmers are capable of improving farming practices by experimentation

- Farmers can share their knowledge with other farmers

AESA methodology:

✓ Go to the field in groups (about 5 farmers per group). Walk across the field and choose 20 plants/acre randomly. Observe keenly each of these samples and record your observations:

- **Plant**: Observe plant height, number of branches, crop stage, deficiency symptoms etc.

- **Pests:** Observe and count pests at different places on the plant.

- **Defenders (natural enemies):** Observe and count parasitoids and predators.

- **Diseases:** Observe leaves and stems and identify any visible disease symptoms and severity.

- **Rats:** Count number of plants affected by rats.

- **Weeds:** Observe weeds in the field and their intensity.

- **Water:** Observe the water situation of the field.

- **Weather:** Observe the weather condition.

- ✓ While walking in the field, manually collect insects in plastic bags. Use a sweep net to collect additional insects. Collect plant parts with disease symptoms.
- ✓ Find a shady place to sit as a group in a small circle for drawing and discussion.
- ✓ If needed, kill the insects with some chloroform (if available) on a piece of cotton.
- ✓ Each group will first identify the pests, defenders and diseases collected.
- ✓ Each group will then analyze the field situation in detail and present their observations and analysis in a drawing (the AESA drawing).
- ✓ Each drawing will show a tree representing the field situation. The weather condition, water level, disease symptoms, etc. will be shown in the drawing. Pest insects will be drawn on one side. Defenders (beneficial insects) will be drawn on another side. Write the number next to each insect. Indicate the plant part where the pests and defenders were found. Try to show the interaction between pests and defenders.
- ✓ Each group will discuss the situation and make an field management recommendation.
- ✓ The small groups then join each other and a member of each group will now present their analysis in front of all participants.
- ✓ The facilitator will facilitate the discussion by asking guiding questions and makes sure that all participants (also shy or illiterate persons) are actively involved in this process.
- ✓ Formulate a common conclusion. The whole group should support the decision on what field management is required in the AESA plot.
- ✓ Make sure that the required activities (based on the decision) will be carried out.
- ✓ Keep the drawing for comparison purpose in the following weeks.

A. Data recording

Farmers should record data in a notebook and drawing on a chart. Keeping records of what has happened help us making an analysis and draw conclusions

Data to be recorded

- **Plant growth (weekly):** Height of plant; Number of leaves
- **Crop situation (e.g. for AESA) :** Plant health ; Pests, diseases, weeds ; Natural enemies ; Soil condition ; Irrigation ; Weather conditions
- **Input costs:** Seeds; Fertilizer; Pesticides; Labour
- **Harvest:** Yield (Kg/acre); Price of produce (Rs. /Kg)

Some questions that can be used during the discussion

- Summarize the present situation of the field?
- What crop management aspect is most important at this moment?
- Is there a big change in field situation compared to last visit? What kind of change?
- Is there any serious pest or disease outbreak?
- What is the situation of the beneficial insects?
- Is there a balance in the field between pests and defenders?
- Were you able to identify all pests and diseases?

- Do you think the field is healthy?
- What management practices are needed at this moment?
- When will it be done? Who will do it? Make sure that responsibilities for all activities are being discussed.
- Are you expecting any problems to emerge during the coming week such as congenial weather conditions for pest buildup?
- What problems? How can we avoid it? How can we be prepared?
- Summarize the actions to be taken.

Advantages of AESA over ETL

One of the problems of the ETL is that it is based on parameters that are changing all the time, and that are often not known. The damage or losses caused by a certain density of insects cannot be predicted at all. In ETL the due recognition of the role of natural enemies in decreasing pest population is ignored. Farmers cannot base their decisions on just a simple count of pests. They have to consider many other aspects of the crop (crop ecology, growth stage, natural enemies, weather condition, etc.) and their own economic and social situation before they can make the right crop management decisions. In ETL based IPM, natural enemies, plant compensation ability and abiotic factors are not considered. In AESA based IPM emphasis is given to natural enemies, plant compensation ability, abiotic factors and P: D ratio.

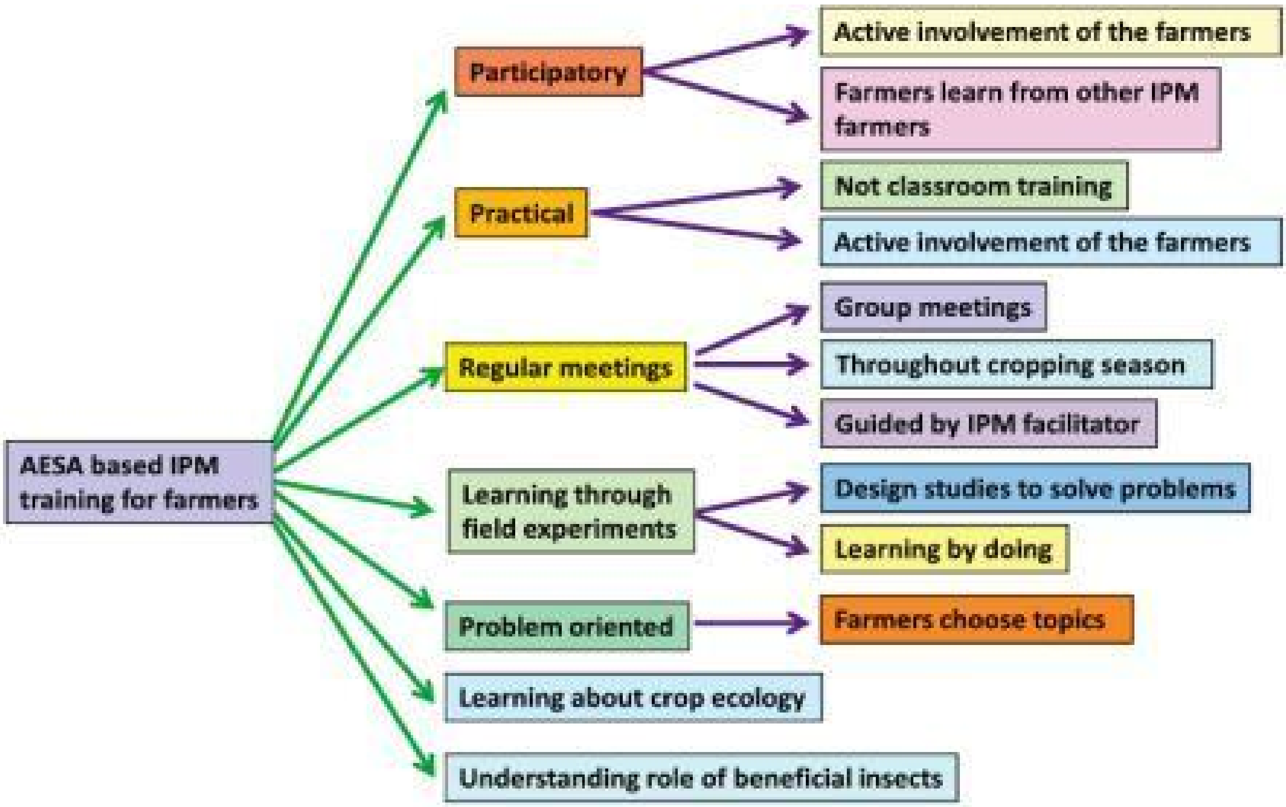
AESA and farmer field school (FFS)

AESA is a season-long training activity that takes place in the farmer field. It is season-long so that it covers all the different developmental stages of the crop and their related management practices. The process is always learner-centered, participatory and relying on an experiential learning approach and therefore it has become an integral part of FFS.

Farmers can learn from AESA

- Identification of pests and their nature of damage
- Identification of natural enemies
- Management of pests
- Water and nutrient management
- Influence of weather factors on pest buildup
- Role of natural enemies in pest management

FFS to teach AESA based IPM skills



B. Field Scouting

AESA requires skill. So only the trained farmers can undertake this exercise. However, other farmers also can do field scouting in their own fields at regular intervals to monitor the major pest situation. Surveillance on pest occurrence in the field should commence soon after crop establishment and at weekly intervals thereafter. In each field, select five spots randomly. Select five random plants at each spot for recording counts of insects as per procedure finalized for individual insects.

Sampling in fruit crops

In field, select five trees such that four are from four corners and one from the centre of the field. Two rows of trees alongside of boundary of field in all directions should not be selected for observations. The tree selection for pest observations during each weekly visit should be random. In each of the selected trees, the observations are to be made from four directions viz., East, South, West and North (make it a habit to start at East direction of a tree and follow anticlockwise direction). Use either beat or tap method for taking observations on pest's samples.

For insect pests

- **Aphids, whiteflies and mites:** Count and record the number of both nymphs and adults on five randomly selected leaves per plant.

- **For borers:** Count the number of young and grown up larvae on each plant and record.

For diseases

Whenever scouting, be aware that symptoms of plant disease problems may be caused by any biotic factors such as fungal, bacterial, viral pathogens or abiotic factors such as weather, fertilizers, nutrient deficiencies, pesticides and abiotic soil problems. In many cases, the cause of the symptom is not obvious. Close examination, and laboratory culture and analysis are required for proper diagnosis of the causal agent of disease. Generally fungal diseases cause the obvious symptoms with irregular growth, pattern & colour (except viruses), however abiotic problems cause regular, uniform symptoms. Pathogen presence (signs) on the symptoms can also be observed like fungal growth, bacterial ooze etc. Specific and characteristic symptoms of the important plant diseases are given in description of diseases section.

- **Root sampling:** Always check plants that appear unhealthy. If there are no obvious symptoms on plants, examine plants randomly and look for lesions or rots on roots and stems. Observe the signs of the causal organism (fungal growth or ooze). It is often necessary to wash the roots with water to examine them properly. If the roots are well developed, cut them to examine the roots for internal infections (discoloration & signs). Count the total number of roots damaged/infested/infected due to rot should be counted and incidence should be recorded.

- **Leaf sampling:** Examine all leaves and/or sheaths of each plant for lesions. Leaf diseases cause most damage during the seedling and flowering stages of plant growth. Observe for the symptoms and signs on the infected plant parts. Determine the percent area of leaf/sheath infection by counting the number of leaves (leaf area diameter)/plant infected due to disease and incidence should be recorded.

- **Stem, flower and fruit sampling:** Carefully examine the stem, flower and fruit of plants for symptoms and signs of fungal or bacterial diseases. The stem, flower and fruit should be split or taken apart and examined for discoloration caused by fungi and bacteria. Count the number of stems, flowers and fruits infected due to disease and percent disease incidence should be recorded.

For weeds

The goal of weed scouting is to assess the infestation level of known weeds as pests and detect new weeds that may be at very low levels so that action can be taken to control or prevent them from becoming an economic concern. In some cases, early detection of a weed can make eradication possible.

Begin scouting as soon as weeds appear in the field and continue until freeze-up. Record stages of growth of all the weeds and the number of each weed species/square metre.

Frequently, all scouting patterns must be used since weed habitat can be very species specific. Each field usually requires a pattern for a uniform sample and samples in low areas and field margins or ditches to assess immediate or future risk from problem weeds left uncontrolled. Detailed counts of the number of weeds per square metre provide the ideal record of a weed problem.

C. Surveillance through pheromone trap catches:

Pheromone traps @ 4-5/acre have to be installed, if available, for fruit flies. Install the traps for each species separated by a distance of >75 feet in the vicinity of the selected fixed field. Fix the traps to the supporting pole at the height of one foot above the plant canopy. Change of lures should be made once a month. During each week of surveillance, the number of moths/trap/week should be counted and recorded year round. The trapped moths should be removed and destroyed after each recording.

D. Yellow/ blue water pan and sticky traps

Set up yellow water pan/sticky traps for monitoring aphids and blue water pan/sticky traps for thrips at the height of mid canopy @ 4-5 traps/acre. Locally available empty tins can be painted yellow/blue and coated with grease/Vaseline/castor oil on outer surface may also be used. Count the number of aphids and whiteflies on the traps daily and take up intervention when the population exceeds 100/trap.

E. Light traps

Set up light traps @ 1 trap/acre at the height of mid canopy for monitoring and mass trapping insects. Light traps with exit option for natural enemies of smaller size should be installed and operate around the dusk time (6 pm to 10 pm).

F. Nematode extraction

Collect 100 to 300 cm3 (200-300 g) representative soil sample. Mix soil sample and pass through a coarse sieve to remove rocks, roots, etc. Take a 600 cc subsample of soil, pack lightly into a beaker uniformly. Place soil in one of the buckets or pans half filled with water. Mix soil and water by stirring with paddle; allow to stand until water almost stops swirling. Pour all but heavy sediment through 20-mesh sieve into second bucket; discard residue in first bucket; discard material caught on sieve. Stir material in second bucket; allow to stand until water almost stops swirling. Pour all but heavy sediment through 200-mesh sieve into first bucket; discard residue in second bucket. Backwash material caught on 200-mesh sieve (which includes large nematodes) into 250-ml beaker. Stir material in first bucket; allow to stand until water almost stops swirling. Pour all but heavy sediment through 325-mesh sieve into second bucket; discard residue in first bucket. Backwash material caught on 325-mesh sieve (which includes small to mid-sized nematodes and silty material) into 250-ml beaker. More than 90% of the live nematodes are recovered in the first 5-8 mm of water drawn from the rubber tubing and the sample is placed in a shallow dish for examination.

DAY -7: 10:00 am -12:00 noon: ORGANIC FARMING: VAM

VESICULAR-ARBUSCULAR MYCORRHIZA

Mycorrhizae are the root-symbionts which obtain their nutrients from the plant and provide mineral elements like N, P, K, Ca, S and Zn to the host plant. The word mycorrhiza is derived from classical Greek word for "mushroom" and "root". In a mycorrhizal association, the underground myceliums are in contact with plant roots, but without causing any harm to the plant.

Mycorrhizal fungi are responsible in improving growth of host plant species due to increased nutrient uptake, production of growth promoting substances, tolerance to drought, salinity and synergistic interactions with other beneficial microorganisms.

The natural role of mycorrhizosphere organisms may have been marginalized in intensive agriculture, since microbial communities in conventional farming systems have been modified due to tillage (Sturz et al., 1997; Mcgonigle and Miller, 1996) and high inputs of inorganic fertilizers, herbicides and pesticides (Gianinazzi et al., 2002). Microbial diversity in these systems has been reduced (Maeder et al., 2002) and the functional consequences of this loss of diversity are still uninvestigated. Indiscriminate use of inorganic fertilizers contributes enormously in stepping up agricultural production regionally and globally but at the same time its impact on soil fertility, environmental persistence, soil biodiversity, run off concentration and aquaculture pollution cannot be viewed superficially. Increased environmental awareness has progressively led to shift from conventional intensive management to low input crop production.

It has been suggested that VAM fungi increase host tolerance of pathogen attack by compensating for the loss of root biomass or function caused by pathogens (Linderman, 1994), including nematodes (Pinochet et al., 1996) and fungi (Cordier et al., 1996).

VAM gives the following benefits to the crops:

- Increase N.P.K. uptake, mobilizes Phosphate in the soil.
- Micronutrients, Zinc, Cobalt, Magnesium, Iron, Copper, and Molybdenum are made available to the plant.
- Enhances tolerance to soil stress like heavy metal toxicity, high salt levels, drought, high temperatures etc.

Mode of Application:

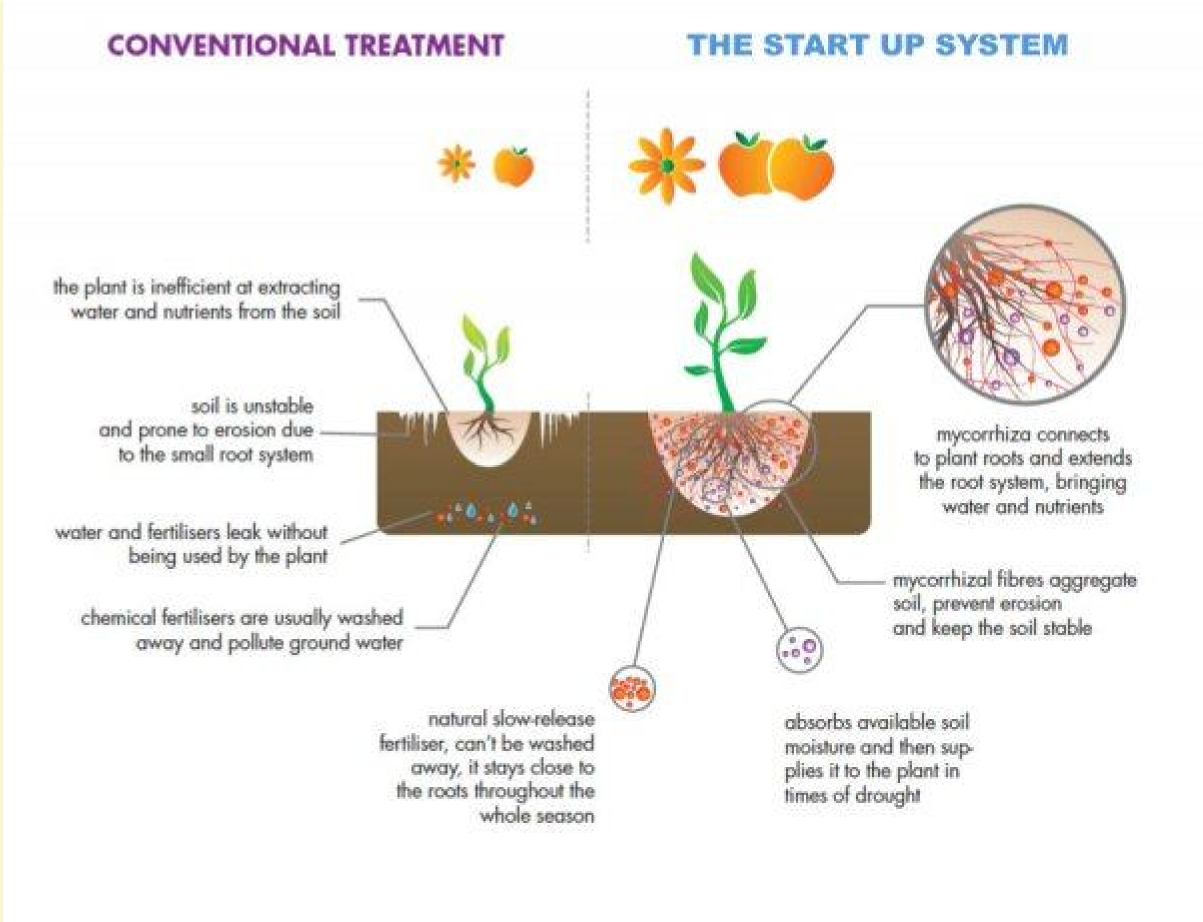
Nursery application : 2-3 kg/acre during seed bed preparation.

Main field application: 3-4 kg/acre by spreading and turning at land preparation time.

Pot application: i) 5g/pot of small size i.e., 1 ft diameter.

ii) 10g/pot of big size i.e., > 1ft diameter.

Storage:
The VAM can be stored for eight months to one year at room temperature.



Pictorial representation of Conventional vrs Mycorrhizal treatment

ON FARM PRODUCTION OF VESICULAR ARBUSCULAR MYCORRHIZA (VAM)

Mycorrhiza can be produced at farm level by farmersafter undergoing a few days training and hands on practice.

For this purpose, following steps have to be followed sequentially:

1. Sterilize soil by heating for 2-4 hours using a big metal pan or by drying under intense heat of the sun for 2-3 days
2. Place the sterilized soil in thoroughly cleaned and dry clay pots.
3. After cooling the soil, place a pinch of root starter inoculants then cover with a thin layer of soil.
4. Sow 3-5 seeds in each pot.

5. Grow the plants for three months under normal conditions.
6. Protect the plants from pest and diseases. Stop watering the plants after 3 months.
7. Do not use chemical fertilizer/fungicide in pots/seedbed before sowing if VAM is to be applied.
8. Cut the plants or sta1ks when they are completely dried. Allow the soil in the pot to dry further.
9. Remove the plant from pot and remove soil adhering to the roots. x) Cut the roots finely and save some root inoculants for future use. Mix the finely cut roots with the soil from the pot to produce VAM soil inoculants or *5%* of cut roots mix with vermicompost for products.
10. Store the root and soil inoculants in sealed plastic bags in a dry and cold place.

Infrastructure required including equipments, raw materials: For mycorrhiza production at farm level, specific equipments, machines are not required.

The multiplication can be done at farmer's field with the following materials:

i. Plastic Pots or Poly bags
ii. Soil
iii. Vermicompost
iv. Starter Inoculum
v. Seed Material (Sorghum/Maize/Rice, etc).

1: 00 pm -3:00 pm ORGANIC FARMING Practical

3:00 pm-5: 00 pm: PUBLIC HEALTH: Zoonotic Disease

What are zoonotic diseases?

Zoonotic diseases were known since antiquity. Zoonoses have been defined as those diseases and infections, which are naturally transmitted between vertebrate animals and man. More than 150 zoonoses have been recognised apart from the morbidity and mortality they cause, zoonoses are responsible for great economic losses particularly in animal's meat, milk and other foods, and products of animal origin.

Zoonoses and human health are matters of particular concern in India, because nearly 68.86% of India's population is rural and live in close contact with domestic animals, and not far from wild ones.

The four categories of zoonoses are.

1) Direct zoonoses: They are transmitted from an infected vertebrate host to a susceptible vertebrate host by direct contact or contact with fomites, or by a mechanical vector.
Example are, Rabies, Trichinosis, brucellosis.

2) Cyclozoonoses, requires more than one vertebrate host species, but no invertebrate host to complete the development cycle of the agent. Example, Taeniasis, Echinococcosos.

3) Metazoonoses, are transmitted biologically by invertebrate vectors. Example, arbovirus infections, plague and schistosomiasis.

4) Saprozoonoses has both vertebrate host and a non-animal reservoir.
Organic matter including food, soil and plants are considered non-animals. Example, mycoses, larvae migrans.

LEPTOSPIROSIS

It is considered to be the most widespread of disease transmissible from animal to man with high prevalence in warm humid tropical countries. Mostly occur during heavy rainfall and flooding.

Etiologic agent is, Leptospira a thin and light motile spirochaete 0.1-0.2 µm wide and 5-15 µm long with hooked ends. Leptospira are excreted in the urine of infected animals for a long time and often for the entire time in case of rodent.

Animals reservoirs – wild and domestic animals especially rodent such as rats, mice, cattle, sheep, goats, water buffalos, pigs, horses.

Mode of transmission

It can enter the body through skin abrasions, mucous membrane, by direct contact with urine or tissue of infected animals.

Indirect contact– of broken skin with soil water or vegetation contaminated by urine of infected animals or ingestion of food contaminated with Leptospira or by inhalation of air, contaminated with Leptospira. The disease can vary from mild febrile illness, to sometimes fatal diseases with liver and kidney involvement.

Vaccination: of farmers and pets.

Control: anti-biotics, penicillin drug of choice, or by tetracycline or doxycycline.

RABIES

It is also known as hydrophobia, is an acute highly fatal disease of the central nervous system caused by lyssavirus type 1. It is a zoonatic disease of warm blooded animals such as dogs, cats, jackals, wolves. It is transmitted to humans through the bite and licks (on broken skin) of rabid animals. Rabies occurs in more than 150 countries. Rabies in dogs is a source of 99% of human infections. In India alone 20,000 deaths are estimated to occur annually. In Africa it is 24,000.

The virus is excreted in saliva of the affected animals, this is called a street virus, serial brain to brain passage of street virus serial brain to brain passage of street virus in rabits, modifies the virus, and is known as fixed virus. It no longer multiplies in extrarenal tissues. The fixed virus is used in the preparation of anti-rabies vaccine. In dogs and cats the virus may be present n saliva for 3-4 days before the onset of clinical symptoms, and during the course of illness till death.

Mode of transmission

People are infected following a deep bite or scratch by an infected animal. Transmission can also occur when infections material – saliva comes into direct contact with the human mucosa or fresh skin wounds. Rarely rabies may be contracted by inhalation of virus containing aerosols, or via transplantation or an infected organ. Human to human transmission by bite is theoretically possible but has never been confirmed. Incubation period in man is highly variable, commonly 1-3 mts following exposure, but may vary from 7 days to many years.

Rabies in man is called hydrophobia. It begins with prodromal symptoms of headache, malaise, sore throat and slight fever for few days, in some pain and tingling sensation at the site of the bite. The prodromal phase is followed by widespread excitation and stimulation of nervous system, sensory, motor, sympathetic. Pt is intolerant to verse, bright light, or cold drought of air, violent spasm of the muscles swallowing causing the symptoms of fear of water, other symptoms are increased perspiration salivation, lacrimation (tears). Mental changes include, fear of death, anger, irritability and depression. At later stage mere sight of water many provoke spasm of swallowing. Duration of illness is 2-3 days, but sometimes may be 5-6 days.

Convulsions occurs and patient passes into the stage of paralysis and coma. To date only 10 people who have been stricken with rabies have survived.

Treatment is supportive

Prevention – by exposure and post exposure prophylaxis with vaccination.

Local treatment of wound

I. Prompt was duly of bite wounds and scratches, with plenty of soap and water under a running tap.

II. Chemical treatment - virucidal agents aqueous solution of iodine or alcohol.

III. Suturing can only be done after 24 – 48 hours, anti-tetanus and anti-biotics.

Immunization

Pre and Post Exposure – by in actuated purified cell cellular vaccine (PCCV), and embryonated egg-based vaccine (EEV).

Schedule 0 day - 3 -7, - 14 – 28th day (5 close regimen)

Rabies immunoglobulin is administered only once, as soon as possible after initiation of post exposure vaccination.

Pre-Exposure Prophylaxis

It may be performed with any of the modern cell derived vaccines, given to those at risk of frequent exposure to rabies, animals handlers, laboratory workers dealing with rabies virus, given on day 0-7 and 21 or 28th. Serum should be monitored every 2 years. Booster dose is given only if rabies virus neutralizing antibody titres falls to less than 0.5 Iμ/ml.

SCRUB TYPHUS

It is caused by rickettsia in man. It exists as zoonoses between trombiculid mites, rats and their small mammals (field mice, rats and shrews). More than one million cases occur annually. Most occur during visits to rural area in endemic countries for activities such as camping, hiking or rafting.

The causative agent is rickettsia tsugamushi. Reservoir of infection is trombiculid mite. The nymphic and adult stages of the mite are free living in the soil. It is the larva that feed on vertebrate hosts.

Mode of transmission

By the bite of infected larval mites.

Mite -> Rats and Mice -> Mite, Rats and Mice -> Man.

Incubation period of about 10-12 days.

Crucial features

I. Chills and fever (104 - 105° F).
II. Headache, malaise, prostration.
III. Macular rasp on 5th day
IV. Punched out ulcer covered with black scab known as Eschar.

The fever falls by 3rd week in untreated cases

Prophylaxis - soak clothes and blankets with miticial chemicals (benzyl benzoate) and apply mite repellents on exposed skin.

No vaccine exists.

Treatment – Tetracycline DOC.

Vector control – clearing the vegetation where rats and mice live, apply insecticides such as lindane to ground vegetation.

JAPANESE ENCEPHALITIS

It is a mosquito borne encephalitis, caused by group B arbovirus (Flavivirus) and transmitted by culicine mosquitoes. It infects mainly animals, and incidentally man.

JE is the leading cause of viral encephalitis in Asia and occurs in almost 24 Asian and western pacific. Transmission occurs principally in rural agriculture locations where flooding irrigation is practiced. Transmission is seasonal and manly related to the rainy season in south east Asia region.

Recognition of JE was first made in 1995 in Tamil Nadu. The disease is endemic in 21 states, Assam, Bihar, west Bengal, Haryana, Karnataka. The disease is transmitted to man by the bite of infected mosquitoes, however man to man transmission has not been recorded.

Pigs, cattle and buffaloes may also be infected with JE virus.

The culicine mosquitoes mainly breeds in irrigated rice fields, shallow ditches, and pools. Rice fields are the most important breeding places.

Clinical features – Incubation period of 5 - 15 days.

Stages of JE

Prodrome – fever, headache, lethargy malaise.

Encephalitic stage – high fever, neck rigidity convulsions, difficulty in speech, paralysis, tremors eventually coma.

Late Stage – Neurological signs become stationary and tend to improve.

Control of Japanese Encephalitis

Vaccination of population at risk. Three types of JE vaccines in large scale use are.

I. Mouse brain derived inactivated vaccine.
II. Cell culture derived inactivated vaccine.
III. Cell culture derived live attenuated vaccine.

Cell culture based live attenuated vaccine is available in India and is an integral part of universal immunization programme in 83 endemic districts of UP, Assam, West Bengal, Karnataka targeting children in age group 1-15 years. It is given as a single dose, followed by a booster, after 1 year.

VECTOR CONTROL

I. Aerial or ground fogging ultra-low volume insecticides (e.g., malathion, fenitrothion). All villages reporting cases should be brought under indoor residual sprays, spraying should cover the vegetation around the house, breeding sites, and animal shelter. Use of mosquito net should be advocated.

TAENIASIS

Taeniasis is an intestinal infection caused by tow species of tapeworm, taenia Solium (pork), and taenia saginata.

Infections also occurs in human, when they eat raw or uncooked pork. Taenia Solium tapeworm infection is of significant importance as it can cause cysticercosis.

Cysticercosis is the infection with the tapeworm at the larval stage (cystic Erie). It develops in a number of tissues such as muscles, subcutaneous tissue, eyes and brain. In the brain it is called neurocysticercosis, the most severe form of the disease. It is the most frequent preventable cause of epilepsy in the developing world.

SWINE FLU

It is a respiratory disease of pigs caused by Type A viral influenza, hat regularly causes outbreak on influenza in pigs. Influenza virus that commonly circulate in swine are called swine influenza viruses. There are different strains of severe influenza viruses. The main swine influenza viruses circulating in US pigs in recent years, have been triple reassert ant (tv)

H1N1 (influenza virus) tv H3N2 and tv H1N2 virus.

Swine flu virus can cause high level of illness in swine herds, but usually cause few deaths. Common signs in sick pigs include fever, barking cough, discharge from nose, eyes, sneezing, eye redness and going off feeds. However, some may not appear ill or appear just mildly ill.

Variant influenza virus

When an influenza virus that normally circulates in swine, is detected in a person. It is called a variant influenza virus.

For example, if a swine origin influenza Type A H3N2 virus is detected in a person that virus will be called H3N2 variant virus, or H3N2 virus.

Swine flu virus do not normally infect humans, however sporadic human infections have occurred. When this happens, these viruses are called "Variant viruses". Most commonly, human infections with variant viruses, have occurred in people exposed to infected pigs (children near pigs, at a fair or workers in the swine industry). Also, cases of limited person to person spread of variant viruses have occurred.

In the past, CDC received reports of approximately one human infected with influenza. Viruses that are usually found in swine every one or 2 years, but in 2012, there was jump in the number of cases. The pandemic is more than 40 years.

Symptoms

Fever, lethargy, lack of appetite, coughing, running nose, sore throat, eye irritation, nausea, vomiting and diarrhoea. But in a small percentage, there may be shortness of breath and development of pneumonia which requires ICU admission. Swine influenza does not transmit through eating properly cooked pork.

Modes of transmission.

Infected pigs cough or sneeze, and droplets of influenza virus, land in a person nose or mouth, became inhaled and gets infected, or the person can touch a surface with virus on it and then touches his nose or mouth. Human to human transmission of variant flu virus also occurred through this, method of spread has influenza virus that infect pigs may be different from human influenza viruses. Thus, influenza made against human influenza viruses are generally not expected to protect people from influenza viruses, that normally circulate in pigs. In addition, because pigs are susceptible to avian, human, and swine influenza viruses, they potentially may be infected with influenza viruses from different species (e.g., ducks and humans) at same time. If this happens, it is possible for the genes of these viruses to mix and create a new virus. This type of major change in influenza A viruses is known as antigenic shift. If this new virus causes illness in people and can be transmitted from person to person, an influenza pandemic can occur. This is what happened in 2009, when an influenza A H1N1 virus with swine, and human genes emerged in the spring of 2009 and caused been limited.

Diagnosis of infection with variant influenza virus

1) Respiratory specimen needs to be collected within 4 – 5 days nasal swab, nasopharyngeal secretions tested by RT – PCR.

Treatment

1) Oseltamivir- within 48 hours
   Zanamivir
2) Supportive care.

Prevention

1) Personal protective equipment like apron, gloves, mask.
2) Avoid touching eyes and nose before washing hands.
3) Wash hands and apply alcohol-based hand sanitizers.
4) Inform veterinary Department of any sick pigs

Vaccination

a) Killed vaccines

b) Live attenuated vaccines.

Killed Vaccines

Most influenza vaccination programs make use of inactivated vaccines.

The strains from vaccine productions are grown in chick embryo, purified and killed by formation or BPL (beta propio lactose).

The protective value of the vaccines varies between 70% - 90%, inaccurately lasts for only 6-12 months.

Live Attenuated Vaccines

A trivalent live attenuated influenza vaccine administered as a single intra nasal spray.

Age group for use – 2- 49 years of age.

It is contra indicted in household members of immunosuppressed individual’s contra indicted in those with allergy to eggs

DAY -8: 10:00 am -12:00 noon : AH & VETY: Piggery Farming

PIGGERY FARMING

Pig farming is very important component in our State and North East as a whole. Pig is considered as one of the most important source of meat for the consumers of entire North East region. Pigs are efficient converters of feed into pork and pork products. Feed conversion ratio is more efficient in pigs compared to other livestock. Pigs are prolific breeder, grow rapidly, mature quickly and capable of producing 2 litters in a year with 8 -12 piglets in a litter under good management practice. Pig farming requires small investment on building and equipments. Pig farming can be combined with other Agricultural activity. Pig can utilize the waste products very efficiently kitchen waste unmarketable fruits and vegetables can be fed to pigs. Pig manure can be used for vegetable cultivation and also make the soil fertile. About 80 % of the total population in Meghalaya consumes meat. Meat production is not self – sufficient in the State. So, with increasing demand of pork in the State, piggery farming has become very profitable enterprise.

OBJECTIVE

- Provide employment opportunity.
- To increase the meat production.
- To Increase the livelihood status of the farmer .

BREED

- Hampshire
- Large black
- Large white Yorkshire.

Classification

- Meat purpose – Fattening Pigs
- Breeding Purpose

Selection of site

1.Location of the farm.

2. Road facilities.

3. Water supply

4. Electricity

5. Drainage System.

6. Market.

HOUSING OF PIGS

Good housing with adequate accommodation, incorporating all essential requirements of pigs must be provided so that the animals can grow quickly and efficiently. This is only possible through scientific housing which includes provision for fresh air, exercise, sunlight protection from inclement weather conditions. Pigs are kept under two system – Open air system and indoor system which is followed in most places of our country.

FLOOR SPACE REQUIREMENT

Fattening pig – 25 – 30 sqft/pig

Farrowing pig – 50 – 60sqft

Boar - 40 – 50 sqft.

CARE AND MANAGEMENT

- Good management ensures proper growth and production.
- Good ventilation
- Clean water supply.
- Feeding balanced ration.
- Cleaning of the shed regularly.
- Regular Deworming
- Timely vaccination.

Preparation before farrowing

1. Farrowing pen should be cleaned properly

2. Bedding materials like saw dust should be used especially during winter or use gunny bags

3. Show sign and symptoms before farrowing

4. Three days before farrowing shift to the farrowing pen

Care & Management after farrowing

1. Care should be taken to the newborn piglets till weaning

2. Profit depends on the nos. of piglets

3. Keep the newborn in a warm place

Care & Management of newborn Piglets

Clean the piglets with warm moist cloths

Keep in a warm place

Cut the umbilical cord 3 hours after farrowing about 3 cm (1inch) apply Tr. Iodine

Cut the needle teeth after 3 days as they will injure the nipples

Colostrum feeding should be given within 2 hours.

Weaning- 56 days or 8 weeks

Iron should be given to the piglets

Castration – 2-3 months of age

Deworming- Every 3 months

ADVANTAGES OF PIGGERY FARMING

- Provide employment opportunity and improve their standard of living.
- Pig farming requires small investment on building and equipment.
- Provide quick returns, market weight can be achieved within a period of 7 – 8 months.
- Low cost investment.
- Pigs are highly prolific in nature and farrow twice a year.
- Increase the livelihood status of pig farmer as well as provide financial security during the

urgent need of the hour.

- Produce 8-10 piglets in each farrowing.
- 80% of the total human population in Meghalaya consumes meat.
- Meat production is not self -sufficient in the State thus demand of meat is very high
- Proper feeding is very important item of management since feed represent a very high percentage of the total cost of production of pigs.Pig has got the highest feed conversion efficiency i.e., produce more live weight gain from a given weight of feed.

SWINE DISEASES

Main threat of piggery farming is diseases which causes economic loss to the piggery farmer

1.Hog cholera or swine fever

2.Swine pox

3.Foot and mouth diseases

4. Piglet influenza

5. Ascariasis

6. Taeniasis

7. Piglet Pneumonia.

PREVENTION AND CONTROL

1. Regular Deworming.
2. Vaccination programme.
3. Consult the nearest Dispensary in case of any outbreak or death of animals
4. Record keeping/Maintain Health card

Vaccination Schedule

Pigs should be vaccinated against Swine Fever.

Primary vaccination -2months of age.

Revaccination – Annually.

Feeding Schedule for pigs

Age	Type of feed	QUANTITY
2-3mths	Grower feed	500gms-1kg/day
3-4 mths	Do	lkg - 1.250kg/day
4-5mths	Do	1.250 - 1.500kg/day
5-6mths	Do	2kg-2.250kg/day
6-7mths	Finishers feed	2kg-2.250kg/day
7-8mths	Do	2 .5kg-3.0 kg/day
8months & above	Do	3kg/day

ESSENTIAL FACTORS INFLUENCING WELFARE OF PIGS

GENERAL

- Always buy your stock from a pedigree and disease free herd.
- Feed adequate balanced ration to the growing pigs, finishers and breeding stock.
- Deworm the herd every quarter.
- Vaccinate,the pigs every year against diseases for which vaccine are available.
- Provideadequate shade and shelter and ample water especially during the summer season.

HOUSING

- The building must be well lit to ensure good management, hygiene and disease control.
- There must be space for essential behavioural needs of the pigs, freedom to stand up, lie down, stretch their limbs and groom themselves.

- The main requirements for satisfactory housing are that the quarters be dry, sanitary and well ventilated and that they provide good protection from heat,cold and wings. Remember that all body functions depend on fresh air and oxygen.
- Separation of various age groups is a great advantage in feeding and management which all help in growth rate and in reduction of diseases.

CARE OF SOWS

- Deworm sows three weeks before farrowing.
- Transfer the pregnant gilt to farrowing pen one week before farrowing.
- Give laxative feed to pregnant gilts three days prior to farrowing.
- Avoid over feeding three days prior to farrowing and 12 hours after farrowing. Provide guard rails and bedding to the farrowing house.
- Keep close watch on sows during farrowing without disturbing them.
- Feed adequate balanced ration to the sucking mothers along with sufficient clean drinking water.
- Breed sows at first heat after weaning with outstanding boars.
- Wash the sow's udder with soapy disinfectant before she enters the farrowing pen so that piglets do not get infected while nursing. The farrowing pen should be clean and disinfected.
- Proper lighting in a farrowing pen is important.

CARE OF PIGLETS

- Clean the mouths and nostril of the piglets immediately after their birth and induce them to suck milk from the dams. Prevent the piglets from being overlayed by dam.
- Protect newborn piglets from cold by providing comfortable and warm housing (70 – 75^o F).
- To protect piglets from pernicious anaemia, give them iron injections during the first week of age or paint the teats of mother with a mixture of ferrous sulphate and molasses.
- Provide palatable feed to the piglets when 15days old. Ensure equal quantity of ration to each piglets.
- Feeders should be placed always under shelter.
- Wean the piglets at eight weeks of age and castrate all the males not required for breeding.

1: 00 pm -3:00 pm: ORGANIC FARMING: Berkeley Compost

IMPORTANCE OF COMPOST

For five hundred million small holder farmers worldwide, agriculture is the main source of income. They produce 70% of world food. In India, Agriculture plays a vital role in its economy. Over 58% of rural families depend on Agriculture as their principal source of livelihood. Role of the small farmers and women in the field of food security is increasingly acknowledged. As experienced, compost suppress plant disease and pest, it reduces the need of chemical fertilizer. Its regular use promotes improves crop yield due to improvement in soil fertility. Application of adequate compost remediates soil contamination occurred by hazardous fertilizers and pests and also improves soil structure. It improves crop's nutritious value. With an ability to improve water holding capacity of soil, compost is an important tool in helping fight climate change: It proven helpful in conversion of waste soil into fertile.

BERKELEY METHOD OF COMPOSTING

There were many methods which were followed earlier for composting like Indore method, Bangalore method and Coimbatore method which too more than 2 months in decomposition. In this method some nutrients get eroded due to rains and disease producing organism. Many hardy weeds like wild spinach/ Bathua (Chenopodium Album] cannot be controlled. They again germinate in the field after application of compost.

Berkeley Method was innovated by Professor Robert D. Raabe in University of California in

1970. It is the fastest way to decompose organic material. This method, saves lengthy process ofdecomposition.

Material needed:

1. Dry twigs ,
2. Dry material- leaves, grasses, wheat, paddy straw etc. without spines. The material should be chopped or cut to the size of 1 - 1.5 inches. Soft, succulent material neednot be chopped in to small pieces.
3. Green material- grasses, tree twigs with green leaves and green vegetation without spines
4. Water
5. Jaggery/sugarcane-pieces-1.5 Kgs dissolved in 2-3 liters of water
6. Algae
7. Wire mesh/iron cage- 1.5 mt diameter base and 1.2 mt height. Cage can also be prepared from bamboo sticks.
8. Polythene sheet

PROCESS

1. Spread dry twigs sized 1-2 inches. This ensures smooth aeration and drainage of excess water.

2. Layer dry material up to 10-12 cm thickness.
3. Spray water
4. Apply a fine layer of fertile soil
5. Layer 6-8 cm of green material and spray water and apply fine layer of soil again
6. Apply 2-3 cm of dung, spray water
7. Spray jaggery slurry followed by handful of algae. Sugarcane pieces can also be used instead of jaggery. 24 hours prior to compost making, 2-3 sugarcane should be cut in pieces sized of 1-2 inches pieces and keep them in 2-3 liters of water. These pieces with water could be used in place of jaggery slurry.

This is the first layer. The same steps need to be followed 5-7 times each of equal diameter. So as to maintain equal diameter, compost is prepared inside the iron cage/ wire mesh. At the end, cover the heap with polythene, so as to retain moisture and generate needed heat.

If all the steps are followed properly, pile will generate high temperature within 24 to 48 hour.

Turning:

First turning- 4th day after composting. From then, every alternate day. All together 8 turnings are necessary.

In this way, compost will be ready within 14 to 20 days.

Dry material, green material and cow dung should be in the ratio 3:2:1. The height of heap will be 1.2 mt with diameter 1.5 mt. A good compost should have C/N ratio 30:1. Needed C (carbon) content is maintained by use of dry material, for N (Nitrogen), green material, dung and fresh garbage is used.

Jaggery solution should be applied after every layer. It helps in creating more micro-organisms boosting decomposition process. Algae is used for enhancing nitrogen content. We need to ensure 50% moisture in the pile. To assess moisture sufficiency, the heap should be like kneaded flour.

In Berkeley's process, temperature inside the heap should be maintained at 65-70 ^C. If temperature is higher than this, the essential micro-organisms will be destroyed. Temperature can be judged by entering hand inside the heap periodically. If we are able to enter half the arm before pulling it out because of heat, it indicates normal or needed temperature (65-71 degree Celsius). In case we are able to enter only the palm and have to pull it back with jerk, it indicates that temperature is more than required. If we can enter full arm inside the pile, it means that the temperature of compost is cooler than needed.

Very high and low temperature conditions inside the compost, both are not good. This is why turning of compost is important as it maintains the temperature. It also helps in proper aeration.

If the pile is over-heated, add dry material like wood-dust, wheat-straw, etc. This will reduce the temperature. If it is cool, add green material like green leaves, green weeds or tree branches with cow dung to increase heat. In this way, appropriate temperature can be maintained for effective functioning of microorganism and bacteria. It is required for proper decomposition of material.

Estimated cost for 1 (one) unit (for seven layers) of Berkeley Compost:-

SI.No	Material	**Qty**	Cost (Rs)
1	Jiggery/sugarcane	1.50 kg	Rs. 25.00
2	Dung	100kg	Rs.90.00
3	Fertile soil	14 kg	Rs.45.00
4	Plastic	3 meter	Rs.150.00
5	Wire mesh	15x4 ft	Rs.1150.00
6	Labour for collection of vegeation (i.e dry and green material)	Rs.169 x 5 mandays	Rs.845.00
	Total		Rs.2305.00

(Rupees Two Thousand Three Hundred and Five only)

NON NEGOTIABLEs

1. 5.0% moisture is to be maintained.
2. 65-71 degree Celsius temperature should be maintained.
3. 5-7 layers are recommended for quality functioning of microorganism and bacteria.
4. Dry, green, dung ratio should be 3:2:1 respectively.
5. Diverse material should be used in BMC making.
6. In rainy reason, polythene should be used for covering pile. It prevents pile from rain water.
7. Heap should be turned at least 8 times during entire process of decomposition.
8. Urine soaked waste material which used for animal bedding is very good for BMC.
9. Direct use of urine in pile should be avoided.
10. All kind of leaves except green leaves of Neem and eucalyptus are useful for BMC.
11. But dry leaves of Neem and eucalyptus can also be used.
12. Compost should be prepared in raised area to avoid stagnancy of water.

VERMI-COMPOSTING

Vermi-composting uses earthworms to turn organic wastes into very high quality compost. In ideal conditions worms can produce at least their own weight of organic matter in a day. The micro-organisms in the worm casts promote healthy plant growth. Usually, a twin pit model is used for vermi-composting, with the pit size of 3.6m* 1.5m* 0.76 mand with a dividing wall in the middle. Vermi-composts are best suited for intensive application in kitchen Gardens and small vegetable plots. One vermi-compost pit produces.0.15 tonne of compost, which is sufficient for enhancing productivity of 0.25 hectare (2500 sq.m.).

The unit cost of one vermi-compost pit comes to around Rs. 9000, with an unskilled labour: material ratio of 25:75.

Selection of households to be taken up for this activity under MGNREGA will be made only from those households eligible under MGNREGA for work on private land. Before taking up a second vermi-compostpit for any household under MGNREGA, it must be first ensured that all eligible MGNREGA households willing to take up this work have been covered with one vermi-compost pit.

How is Berkeley Compost better than Farm Yard Manure (FYM) and other compost?

1. Time: It takes 18 days in preparation while FYM takes a minimum 2-3 months

2. Infestation free: In case of FYM, usually the compost is not properly decomposed. Hence it may cause infestation of diseases, pests and weed when applied in the field

3. Nutrient value: Berkeley compost has high nutrient value owing to use of diverse varieties of organic material.

4. In Berkeley Method of Compost (BMC), we always use material (dry, green and dung) in standard ratio 3:2:1, but in other method, there is no standard ratio evolved so far.

5. There are 8 turnings recommended in BMC, but other methods are not like that.

6. Cross ventilation (ample oxygen) and 30% green vegetation are main causes of fast decomposition of material.

7. Jaggery and Algae used here enhance functioning of microorganism and bacteria especially in BMC.

8. As the time taken is less, we can easily prepare and apply compost at every .stage preferably basal dressing and top dressing.

9. It can be stored for 3-4 months.

Detail estimate for construction of 18 days composting (EMC) (Modified Berkeley method

As per prevailing market rate and locally supply rate

Dimension in Inch		**Dimension in meter**		**Dimension in feet**		
Unit		**1 Unit**		**1 Unit**		**1**
size of pile						
Dimeter	=	1.5 m	=	4.95 ft	=	59.4 in

Height	=	1.2 m =	3.96 ft =	47.52 in
Circumference	=	4.71 m =	15.54 ft =	186.48 in
Volume	=	8.48 m^3=	305.28 ft^3 =	
Nos of zone required	=	7 nos		
Thickness of zones	=	0.36 m	0.53 ft	6.36 in

Materials required for each zones

Ratio Dry materials : Green Material : Dung = 3:2:1

Quantity of materials in each zone=

Layer of	Dry Materials	=	0.08m	0.26ft	3.12 in	= ft^3
	Green Materials	=	0.05 m	0.17 ft	2.04 in	= ft^3
	Cow dungs	=	0.03 m	0.1 ft	1.2 in	= ft^3

Cane water/jiggery/ um mithai
Water 3 lit

No of unit required = 1nos

1. Collection and supply of wire mesh , 1.2 m height of required length and specification
   Length= 1 x 4.81 = 4.81 m

   @ Rs. 220.00 /m Rs. 1058.00

2. Collection preparation and supply of dry materials (max of semi length)

   Quantity = 1x(3.14x2x2x 1.5 = 3.96 /m^3

   @ Rs. 25.00 /m^3 Rs. 297.00

3. Collection and preparation supply of green materials to size (not more than 5cm length) except

   Thorni leaves,neem and ecaliptus.

   Quantity = 1x(3.14x0.05x7x2x1.5 = 2.47 m^3

   @ Rs.50.00 / m Rs. 124.00

4. Collection preparation and supply of Dung (Cow, pig etc) local and easily available

   Quantity= 1 x(3.14 x0.03 x7 x2x1.5 =3.48 m^3

   @ Rs. 200.00 / m^3 Rs. 296.00

5. Collection preparation supply of cane water/ jiggery/ um mithai water in required preparation (1.5 kg To

3 lit of water) as adviced

Quantity= 1 x 1.5 kg = 1.5 kg

@ Rs. 80.00 /m^3 Rs. 120.00

6. Collection preparation and supply of green algee / soh pailen materials as adviced kg

Quantity= 1 x 4 kg = 4kg

@ Rs. 80.00 /m^3 Rs. 120.00

7. Collection, preparation and supply of Fertile soil…as adviced.
Quantity= 1 x 5 Kg = 5 Kg

@Rs 5.00 /m^3 =Rs 25.00

8. Collection, preparation and supply of Polythene/ plastic sheet of required thickness.
Top cover 1x(3.14 x 1.5 1.5)= 7.07 m^2

circum cover 1x(3.14 x 1.5 x 1.2)= 5.65 m^2

Total = 12.72 m^2 @Rs 35.00 /m^2 =Rs 445.00

9. Collection and supply of water as adviced.
Quantity= 1 x 3 x 7 lit = 21 lit
@Rs 5.00 /lit = 105.00
10. collection and supply of dry twig materials
Quantity= 1x(3.14 x 0.1 x 1.5 X 1.5 **)**=0.71 m3
@Rs 100.00 /m^3 =Rs 71.00

Turning of composting (inside portion to outside and Vice versa) once on the 4th day and as adviced.

11. 1st turning lx 1 no =1no
@Rs 89.00 /no =Rs 89.00

12. Deduct public contribution =Rs 2750.00

=Rs	2750.00
=Rs	0.00

Net total			=Rs	2750.00

(Rupees Two thousands seven hundreds fifty) only

3:00 pm-5: 00 pm: PRACTICAL: Berkeley

DAY -9: 10:00 am -12:00: HORT III: Classification of Flowers / Preservation of Flowers

CLASSIFICATION OF FLOWERS

As we all know that flowers fall under Ornamental plants they are classified based on:-

1. Growth habits 2. Life cycle 3. Growing seasons 4. Uses

Based on:

1. Growth Habits

A. HERBS

-Soft succulent stem, will have fibres.

Eg. Marigold, Petunia, Dahlia, Chrysanthemum, Corn flower, Zinnia, Hollyhock, Tuberose, Cosmos, Periwinkle,etc

B. VINE

-Weak Stem, Climbing or creeping stem & cannot stand erectly without support.

Eg. Bougainvillea, Money plant, Honey suckle,(Lonicera), Ivy, etc.

C. SEMI SHRUB

-Softly woody & bushy in nature.

Eg. Bamboo, Royal Palm, Areca Palm, etc.

D. SHRUB

-Medium sized bushy plants with several hard and woody stem and bear a lot of branches from the base, bushy appearance.

Eg. Rose, China Rose, Night jasmine, Azaleas, Camellias, Rhododendrons, Hydrangea, etc.

E. TREE

-Well defined woody branches with clear trunk.

Eg. Acacia, Ashoke, Camel's foot, ironwood Tree, etc.

Based on:

2. Life cycle

A. ANNUAL

Complete life cycle within a year.

Eg: Marigold, poppy, Cosmos , Dianthus, Helichrysum, Godetia, Salvia etc

B. BIENNIAL

Complete life cycle with more than 1 year and less than 2 years.

Eg. Gladiolus, Sweet William, Hollyhock, Day lily, Tuberose, Foxgloves, Forget me not, etc.

C. PERENIAL

-Do not die after completing their life cycle every year.

Eg. Primula, Polyanthus, Chrysanthemum, Alstroemeria, Phlox, Aster, Jasmine, Geveniums, Iris, Peacock flower, Ixora, Gardenia, Rudbeckia, Campanula (Bell flower) etc.

Growing flowers in covered houses

A. <u>POLY-HOUSES</u>

Growing flowers in Poly-houses is better than growing them in open fields, because flowers are protected from harmful weather conditions like heavy rainfall, hailstorms, frost, cyclones, etc. Besides, the flowers grow better in these poly-houses because inside them they are getting good and controlled conditions for their growth and development like sufficient sunlight, heat and water required by them. For example, if the condition inside the poly-houses is too hot or too humid especially in the summer, temperature can be regulated by opening the sides of the poly-house for ventilation. However, if the condition is cold and dry especially in winter, the sides of the poly-house are closed and water is sprayed in the air inside the poly-house, so that the place becomes warm and humid even during cold winter season and becomes suitable for flowers. The reason for good growth of flowers inside the poly-house is that these houses are fully covered with plastic sheet usually a 200 micron thick ultra violet (UV) film. This particular plastic film is unique in its characteristic i.e., it permits the "one-way entry" of heat from the sun. This heat is trapped inside the poly-house. Moreover the carbon dioxide which is produced by the plants during respiration is also trapped inside giving the "Green House Effect" which is very good for the growth and development of the plants. Hence, poly-house is also called "low-cost greenhouse" because they are made of bamboo or wooden materials which are cheap and available locally and also because here, plastic sheet is used instead of glass. Generally, green houses are made of glass and iron and steel structures which are costly.

This 200 micron U-V plastic sheet is available in the market and sold in kilograms. It can be purchased as per requirement depending on the space available according to the farmer's need and convenience.

<u>Advantages of poly-houses</u>

2. It may be used for growing flowers in all season.
3. It is also used for raising seedlings in large number in very short time as the seeds will germinate quickly due to warm and moist conditions inside the poly-house. Hence this is very suitable for commercial purposes.
4. The seedlings planted in pots or poly-bags grow better and quicker inside the Poly-house.
5. Since poly-house is protected from flying insects and bad weather conditions, the flowers and seedlings growing there are healthier and also have better quality than those growing in the open field.
6. In warm and rainy weather, these poly-houses serve as rain shelter with all the sides open and only the roof is covered.
7. In cold areas, the poly-houses are used to produce good quality seeds of flowers because they are protected from frost.
8. In case some flowers need shade, a net providing 50% or 70% shade is given just below the plastic cover to protect the flowers from hot sun rays passing through the transparent plastic sheet.

9. Since they can be made with locally available materials like bamboo and wood, they are not costly and so even poor farmers can afford to have such poly-houses.

B. <u>NET HOUSE</u>

Many shade loving flowers like Orchids, Lilium, Gladiolus, etc are better grown in net houses rather in poly-houses because in transparent poly-houses, the heat of the sunrays may scorch the plants especially the petals, thereby decreasing their market value. In net house, however the partial shade protects them from the hot sun and the flowers look fresh and therefore will have a good price.

These net houses can be constructed with locally available materials such as wood or bamboo poles and can be fully covered with nylon cloth made up of nylon fibres. When the structure is covered with this net, it gives 50% to 70% shade as per requirement of flowers such as light shade or heavy shade. Lilium and Gladiolus require light shade while Orchids need heavy shading. The added advantage of net houses is that the roof, being a net, allows the raindrops to fall on the plants, thereby supplying water and therefore the cost of irrigation is greatly reduced. Being a net house, it also protects the plants from color of the net is green, but they are available in other colors also. The net house costs cheaper than the poly-house and can be afforded even by poor farmers in the villages.

<u>Preserving Flowers</u>

As well as the flowers that bear the name ‘everlasting’ – Helichrysum, Statice, Acrolinium, Limonium- there are many others that can be used for drying for winter decoration and in dried flower arrangements.

The flowers should be picked just as the blooms are opening and before they reach maturity. Tie them in small branches and hang them upside down in a dry dark cupboard, shed or attic where there is a good circulation of air; darkness prevents the color from fading. Leave them alone if you can until they are needed for decoration. Grasses are particularly useful when dried in this way, and they provide graceful backgrounds for arrangements of other dried material.

Many people use the pressing method to preserve ferns, ivy, bracken, large leaves of tree and shrubs. The leaves should be laid flat between sheets of newspaper, making sure they are not overlapping. Weigh them down with equal pressure all over, and leave until completely dry. Leaves of trees and shrubs and herbaceous plants can be placed between sheets of newspaper and then ironed. You will find that because drying with an iron is quicker, the leaf color will be well preserved. The leaves can then be mounted on florists’ wire and used in arrangements.

1: 00 pm -3:00 pm: PRACTICAL

3:00 pm-5: 00 pm: HORT II: Cultivation of Jackfruit

Jack fruit *(Artocarpus heterophyllus)*

Jack fruit grows best in humid regions with tropical climate. In Meghalaya it grows well in the Southern Hills slopes bordering Bangladesh. Ripe jack fruit is eaten as fruits but unripe fruit is prepared as vegetable. Jack fruit flesh is very sweet and aromatic. Jack fruit has many health benefits as it contains calcium, carbohydrate, vitamin A, fibre, protein etc.

Jack fruit varieties are classified according to the texture of the flesh. Hard jack fruits are bigger in size with firm flesh. On the other hand, soft jack fruit are smaller but sweeter and softer in consistency.

Planting Materials- Jack fruit is usually propagated through grafting. Grafted seedlings free from pests and disease infestations are used as planting materials. One-year old grafted seedlings should be planted at the onset of monsoon.

Planting – Pit size of 60cm x 60cm x 60cm should be prepared at a spacing of 12-15 m. The pits should be filled with a mixture of top soils and 10 kg well decomposed FYM. Deep planting should be avoided as it results in poor growth of the graft. It should be ensured that the graft joint is above the soil level. The seedlings should not be exposed to draught and frost. Adequate drainage and watering results in better performance of the seedlings.

Harvesting – The plant generally bear fruits after 8 years and grafted plants bears after three years of planting. Harvesting is done during May-June.

Plant Protection – The pest of Jack fruit are shoot borers, caterpillar, mealy bug and jack scale. Two sprays of Neembicidine or Neem Oil spray @ 10 ml / 1 lit water or *Bacillus thuringiensis* @ 5 g / 1 lit of water for control of the above. The common diseases are pink disease, stem rot and fruit rot plants. Pruning of the affected plants and protecting the cut ends with Bordeaux paste can manage the above diseases. Also spraying of *Trichoderma* and *Pseudomonas* @ 5g/1 lit of water can control the above diseases.

Important Facts of Jackfruit

1. Jackfruit is recognized as the largest tree fruit, growing as big as 36 inches long and 18 inches wide, and weighing as much as 22.67 kg.

2. In single year, the jackfruit tree can produce as many as two hundred fifty fruits.

3. Jackfruit varieties are classified according to the texture of the flesh. “Hard” jackfruits are those that are bigger sized and have firm flesh. “Soft” jackfruits on the other hand, are smaller but sweeter and softer in consistency.

4. The number of seed that can be found in a jackfruit range from 100 to 500.

5. The jackfruit‟s flesh is very sweet and aromatic, having been described as having the flavour combination of mango, banana, melon and papaya.

6. Ripe jackfruit is eaten as fruit but unripe fruit is eaten as vegetable.

7. Other processed products can also be made from jackfruit.

Health Benefits of Jackfruit

1. Maintains healthy thyroid.

2. Strengthens bone.

3. Lowers blood pressure.

4. Jackfruit seeds contain Vitamin A that is an essential vitamin for healthy hair and to prevent dryness and brittleness of hair.

5. Jackfruit seeds can aid in healthy blood circulation that is vital for good hair growth

6. Jackfruit is loaded with carbohydrate and calorie. It gives instant energy.

7. Maintains healthy eyes and skin.

8. Jackfruit is a rich source of dietary fiber that makes it a bulk laxative. This helps toimprove digestion and prevents constipation.

9. Prevents cancer.

10. Jackfruit also contains calcium which strengthen and promotes healthy bones. Aids in preventing osteoporosis.

11. Contains a good amount of vitamin-A and can prevent night blindness.

12. An extract from leaves and latex cures asthma, prevents ringworm infestation andheals cracking of feet.

Nutrition

One cup of raw, sliced jackfruit contains about:

1. 155 calories

2. 2.6 g Fibre

3. 2.4 g Protein

4. 39.6 g Carbohydrates

5. 0.5 g Fat

It is high in calories, very high in water (roughly 80%) and is extremely low in fat.

Value Added Products of Jackfruit

Jackfruit often considered as a „wonder‟ fruit, is eaten as a vegetable when tender. For vegetarians, it serves as a meat substitute. Ripe jackfruit bulbs (flakes) are consumed worldwide as a dessert fruit. The pulp is also used to flavour ice cream and beverages and preparing drinks. The mature fruit can be used to prepare chips and papad. When ripen, it can be used to prepare squash, jam and jelly. The seeds can be eaten boiled, roasted or dried and served as table nuts, or they can be grinded to make flour and blended with wheat flour.

List of Food Products Made From Jackfruit:

1. Jams

2. Juices, squash, Ready To Serve (RTS), syrup

3. Canned segments

4. Drum-dried powder

5. Flour

6. Jackfruit chips

7. Dehydrated jackfruit seeds

8. Jackfruit cake

Other Uses of Jackfruit

1. Jackfruit paste in applied to the skin for poisonous bites

2. The wood derived from the jackfruit tree is highly prized because of its termite and fungus-resistant properties. It is used in making furnitures, houses, musical instruments, bee hives, oars etc.

3. A yellow dye also can be extracted from the wood particles and used as dye.

4. The rind of the fruit and leaves can be used as fodder.

DAY 10: 10:00 am -12:00 noon : FARM MECHANISATION:

Important Functions /Instruction on the use of agriculture Machineries / Field Operations of agril . Machineries

IMPROVED TOOLS AND MACHINERY FOR HILL AGRICULTURE

PLOUGING/PUDDLING

Animal Drawn Mould Board Plough

Mould board Plough is used for primary tilling operator and help to dig the soil and invert it for quick decaying of surface trash and stubble. It has less specific draft requirement as compared to the country plough. Draft requirement depends upon its width as well as depth of ploughing and accordingly can be pulled either by a pair of bullock or a single bullock. The 25 cm size plough has been designed for hilly region as an improvement over indigenous plough. The depth of operation varies from 10 to 15 cm depending on soil condition. The ploughing efficiency and soil inversion is 65.O% and 62.2% by MB Plough as compared to 65.6% and 38.7% in case of indigenous plough respectively. The held capacity is 0.25 ha/day and costs Rs. 1200/-

Animal Drawn Light Ridger Plough

It is a light duty, double mould board with reversible share type plough suitable for ploughing and making ridges in light soils and hilly terrains. The implement can be effectively used for upland cultivation. Compared to conventional method of using spade for making ridges, this animal drawn implement has high capacity. It is superior over local plough and can be adopted in light soils and hilly terrains.

Dimension (Ixwxh), m	: 1.95x0.20x0.77
Weight, kg	: 5.6 (without beam)
Power source	: A pair of bullock
Width of cut,, mm	:150
Depth of cut, mm	:140
Field capacity, ha/h	: 0.03
Labour requirement, man-h/hr	:33

Animal Drawn Puddler: It is a rectangular blade typepuddler suitable for puddling operation under wetland condition. It consists of 3 rows of plades, each row having blades welded on the shaft. Average depth of operation is about 10 cmhaving field capacity and field efficiency about 0.90ha/h and 65% respectively. It saves 66% labour and 88% operating time as compare with conventional method of puddling using animal drawn country plough.

Dimension (Ixwxh), m	:0.90x0.65x0.58
Weight,kg	:40
Power	: A pair of bullock
Width of cut, mm,	:A pair of bullock
Cost ,Rs.	:1500/-

SOWING/PLANTING

Metallic Tip Dibbler

Metallic tip dibbler is used for dibbling maize and other bold seeds on hill slopes. It helps in getting better output per unit time as compared to localdibbling stick. Seeds can be sown up to 7 cm depth as compared to 3 -4 cm by the wooden/non metallic tip dibbler. Its field capacity is about 0.10 ha/day at 40 cm row-to-row spacing and it costs Rs. 120/- .

Adjustable Row Marker

It is suitable for marking rows at different spacing as per the requirement of the crop to be sown. Sowing in rows facilitates intercultural operationslike weeding, earthing etc. in easy way. Row spacing can be adjusted between 20 to 60 cm by sliding the tynes on a cross bar. The cost of the equipment is Rs. 480/-.

Bardoli Seed Drill

Bardoli seed drill is manually operated equipment suitable for sowing seeds in line and fertilizer application in terraced land condition. Normal width of furrow is 7.5 cm and hand pressure is used to get the desired depth. The field capacity is 0.4 ha/day at 40 cm spacing and it costs Rs. 400/-.

WHEEL HOE SEED DRILL It is, manually operator seeddrill suitable for sowing mustard, rape seed and Linseed in rows at desired seed rates. By changing fluted roller, other crop like wheat and green gram can also be sown.It saves 50% on cost of operation.

Dimension (lxwxh), m	: 1.00 x 0.40 xl.05
Weight, kg	: 8
Labour requirement, man-h/ha	: 32
No of row	: One

4- Row Pre germinated Paddy Seeder

It is useful for sowing pre-germinated paddy seeds in puddled fields. It is capable of sowing 4 rows at 20 cm spacing. A lugged wheel is provided for giving drive and agitation in drums to facilitate dropping of seeds.

Overall dimension, mm	: 1700 x 940 x 600
Weight, kg	:15
No. of Seed drums	: 2
Drum size (dia x length)	: 200x 265

Metering orifice size, mm	: 8
Row-to-row spacing, mm	: 200
Effective field capacity, ha/h	: 0.04 — 0.06
Power source	: One person

Manually Operated Paddy Transplanter

It is suitable for transplanting mat type paddy seedlings in rows. The row-to-row spacing is 20 cm and depth of planting varies between 2-3 cm. The average field capacity of 6- row transplanter is 0.04ha/h and field efficiency is 57%. It saves about 65% labour requirement and 45% on cost of operation as compared to manual transplanting method.

WEEDING/INTERCULURE

Long hand1e weeders aIIow performing weeding operation without bending thus reductiondrudgery to the operator andincrease the capacity. These weeders are namely Circuiar (U) bIade weeder (1) Garden rake, (2), V blade Weeder (3), Grass slasher (4),and hand fork (5) costing Rs. I 50/-, Rs. 160/-, Rs. '190/-, Rs.1 20/-, and Rs. 140/- respectively. These weeders are suitable for weeding in paddy and vegetable fields. The uprooted weeds can be collected using garden rake. can be used in standing water and later collection of weeds can be done using garden rake. With these hand tools labour saving to the extent of 60-65 % can be achieved over traditional method.

Wheel Hoe

It is manually operated implement suitable for weeding and interculture in upland row crops. This is suitable for removing weeds among the rows of vegetable crops. It can also be used to bury the weeds around trunk of fruit trees. It saves 70-75 percent on labour and operating time and 80 per cent on cost of operation and it also results in 5-8 per cent increase in yield compared to conventional method of using khurpa. The cost of the equipment is Rs. 900/-.

Rotary Paddy Weeder

Rotary paddy weeder is manually operated equipment with long handle and blades fitted on cones to perform weeding operation in between the paddy rows without bending the posture of the operator thus reducing drudgery of work.

Dimension (lxwxh), mm	: 1740 200 940
Weight, kg	: 6.7
Cost of equipment, Rs:	: 800/-
Number of persons required:	: 1
Width of coverage, mm:	: 140
Field capacity:	: 036 ha/h

HARVESTING

Improved Sickle

It is a serrated blade sickle suitable for cutting of grasses and harvesting of different crops like paddy wheat, maize etc. the wooden handle has a bend for better grip and to avoid hand injury during use. The blade is of self – sharpening type. The average field capacity is 0.018ha/h and saves 26% of labour and operating time compared to harvesting with local sickle.

Self Propelled Vertical Conveyor Reaper

It is an engine operated, walking type harvester suitable for harvesting and windrowing cereal and oilseed crops like paddy, wheat, soybean etc. it can harvest two to six rows at a time according to size of the cutter bar and row-to-transmitted to cutter bar and conveyor belt through belt-pulleys. The cutter bar length is 1.0 m and its pitch is 75 mm. the machine saves 52% labour requirement, 90% operation time and 52% cost of operation compared to the conventional method of harvesting with sickle.

THRESHING AND WINNOWING

Maize Sheller

It is a manually operated sheller suitable for shelling of maize cobs. It consists of a 198x72 mm size G.l. sheet folded to a round shape. It is provided with four tapered fins, folded at 110 and welded inside the tube. A ring of 3 mm thick wire wrapped around is provided at the inlet edge of the tube as a protection from hand injury. Shelling is done by holding the sheller in one hand and gradually inserting the cob into the sheller by the other hand with backward and forward twist. It is available in tubular and octagonal shape. A person can shell 30kg of grain per hour as compare to 10-12 kg per hour by the tradition method of shelling by hand. It saves 66% labour and operating time and 70% on cost of operation. The cost of maize sheller is Rs. 50/-.

Groundnut Decorticator

The Groundnut decorticator separator kernels from the groundnut pod by rubbing action. It consists of oscillating sectors with rubber shoes and perforated screen. Decorticated pods fall through screen and kernels are separated manually. Clearance to size of pod, moisture content of crop, etc. the breakage of kernels is 1 to 3 % and decortications efficiency is 96-98%.

Decortication Efficiency	: 93 %
Breakage of kernel	: 4 %
Working Efficiency	: 81 %
Feed Rate	: 10.2 kg/h

Pedal Paddy Thresher

It is a manually operated paddy thresher consisting of threshing cylinder, pedal and grain shield. Threshing cylinder is fitted with wire loops perform threshing operation by combing action.

Dimension, (lxwxh)	: 1.25x0.65x063
Output capacity, kg/hr	: 40-50
Threshing efficiency, %	: 98

Motorized Paddy thresher:

It is an improvement over pedal type paddy thresher. It consists of threshing, cylinder, blower, prime mover and grain shield. Its capacity is four times higher than that of pedal type. Blower fitted with the machine helps to throw the broken chaff at some distance away from grain. The machine can be operated either with 1.5 hp electric motor of 2-3 hp engine. Threshing cylinder and prime mover can easily be transportation of thresher in hilly area. There is saving of about 80% labour requirement and 74% on cost of operation against pedal type paddy thresher.

Dimension, m	: 085X0•75X0.75
Weight ,kg	: 50
capacity, kg/h	: 150-200
threshing efficiency, %	: 98
Cleaning efficiency, %	: 90

Hand Winnower

It is a manually operated hand winnower used for cleaning threshed paddy grains and separation of straw, husk, dust and other light weight foreign material from paddy crops. It has a pair of gears for increasing the speed of the fan blades. One person is required for the operation of this equipment while another person release grains from height so as to separate the husk or other unwanted light material from the grain by air flow of the winnower. Its weight is about 29 kg. . .

Dimension, m	: 1.16X1.1 6x1 .77
Power	: One person
Weight, kg	: 29
No. of vanes	: 4

DAY 10: 01:00 pm -03:00 pm - ORGANIC FARMING

Berkeley Compost

Compost which is being used by farmers since ages is a micro and macro nutrients adding to the soil for its improvement. It positively affects the physical and biological properties of soil. It improves soil structure by lowering the bulk density and increasing the permeability and porosity of the soil. It provides the plant roots more space to breathe and grow. It increases the organic content in soil, humic acid and organic carbon content and, it also reduce pH in sodic soils. Organic content in soil is positively correlated with microbial and crop growth is a balance diet, nutritional food of the soil.

REGULAR/COLD COMPOSTING

1. Placing a variety of organic materials in a compost bin, enclosure or compost pit
2. Leaving it there until it breaks down several months later
3. Slow process
4. Takes about 6-12 months

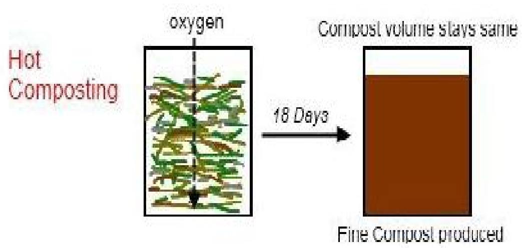
Hot Composting

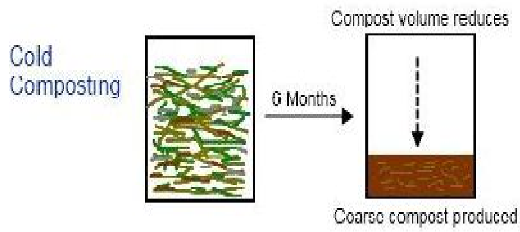
1. Produces compost in a much shorter time
2. Benefits of killing weed seeds and pathogens (disease)
3. Breaking down the material into very fine compost
4. Benefits of hot composting over cold composting

Benefits of hot composting over cold composting

	Hot (40-65°C)	Cold (0-40°C)
1.	Will work all year round – which is relevant when composting food waste.	Cold heaps 'stop' in winter (-5 to +5°c). Anything added piles up until spring when the sunshine warms up the heap. Piling up food waste is not an option – it is just a free rat take away.
2.	Hot Composting can take a wider variety of food waste types without causing issues. Also the higher temperature results in water removal – and hence removes a prime cause of mushy/anaerobic food waste).	70% all household food waste is not added to 'cold' compost bins as it is likely to cause issues with odour, rats and flies. Cold compost bins tend to be constructed with open vents and hatches – so any odour not only attracts but also allows access to the food – creating the infamous 'swarm' of flies when the lid is taken off, or even worse finding a nest of rats when the heap is broken open.
3.	Hot composting kills weed seeds faster. The higher the temperature the more seeds are destroyed.	Many seeds will survive in 'cold' composting heaps. The problem is made worse as the seeds are planted in nature's best growing medium - humus/compost. It's not just weed seeds but seeds from melons and tomatoes plus weeds like couch grass and dandelion will also survive and grow.

4.	Hot composting kills pathogens and unwelcome bacteria.	You need to leave cold compost a long time (12-18 months) to achieve the same level of sanitization and bacteria to die off.
5	Herbicides and pesticides are broken down in composting. They are broken down 32 times faster at 60°c than at 10°c.	The risks of pesticide infection via use of domestic compost is low because the concentration and volumes used are low. However the extra security of fast destruction in hot composting is an extra level of security.
6.	A hot heap rarely produces putrid odours. Hot heaps transfer water away from the heap as steam (as long as the waste has free air space which is normally provided by bulking agent).	In a cold heap, water is not evaporated; it has to drain to the ground. This happens slowly and poorly in compost, so it gets water logged and turns anaerobic and putrid. The main solution is not to add 'wet' food waste to cold heaps - most of our diet is foods with 80% water. Cold composting releases VOC more slowly and they do not vaporize as much.
7.	A hot bin will kill fly eggs & larvae - so no swarms of flies or maggots in a hot compost bin. It's too hot at the top for ants, rats, and most things you don't like to see in a heap.	Flies will lay eggs and larvae (e.g. maggots) will be present in a cold heap, and often swarms of flies can come out when lid open.





18 days Compost

It follows the Berkeley Method of Compost preparation. (Berkeley Method was innovated by Professor Robert D. Raabe in University of California in 1970). It is the fastest way to decompose organic material. It is a quick and cost effective method, based on locally available resources. The decomposition happens aerobically, breaking down all the material in only 18 days, providing proper C: N ratio. In colder region it may take 20-22 days.

Requirements for hot composting using the Berkeley method

1. Compost temperature is maintained between 55-65°C.
2. The C:N (carbon:nitrogen) balance in the composting materials is approximately 25-30:1.
3. The compost heap needs to be roughly 1.5m high.

4. Compost is turned from outside to inside and vice versa to mix it thoroughly.

Composting Materials and the Carbon-Nitrogen Balance

1. In the hot composting method, the ratio of carbon to nitrogen in the compost materials needs to be between 25 to 30 parts carbon to one-part nitrogen by weight.
2. This is because the bacteria responsible for the composting process require these two elements, in these proportions, as nutrients to construct their bodies as they reproduce and multiply.
3. Materials that are high in carbon are typically dry, “brown” materials, such as sawdust, cardboard, dried leaves, straw, branches and other woody or fibrous materials that rot down very slowly.

4. Materials that are high in nitrogen are typically moist, “green” materials, such as lawn/grass clippings, fruit and vegetable scraps, animal manure and green leafy materials that rot down very quickly.

5. If ratio of C:N is right in this technique of fast, aerobic (uses oxygen), hot composting, the compost will break down to the same volume.
6. This is in contrast to slow, anaerobic (without oxygen) composting that happens in a compost bin, which drastically reduces in volume as it rots down.

Method of preparation

- Materials needed
  - ✓ Brown matter
  - ✓ Green matter
  - ✓ Cow dung
  - ✓ Water
- Ratio:
  - ✓ Brown : Green: Cow dung (3:2:1)

Steps for preparation

1. Location must be protected from too much sun/ heavy rain.
2. Brown or green matter must be chopped to one inch.
3. Make the heap at 1.5m x 1.5m.
4. Pile up according to the ratio and add water at every level.
5. Cover with plastic.
6. On day 5, turn the compost heap over, outside turn to inside, inside turn to outside.
7. Ensure that moisture stays constant.
8. Need optimum temperature of 55-65°C.
9. At 65°C, a white mould spreads through the compost – anearobic thermophilic bacteria.
10. It disappears when the temperature drops and aerobic composting bacteria takes over.
11. Turn the compost heap every alternate day.
12. On day 18, compost gives a fine black humus.

3: 00 pm -5:00 pm: PRACTICAL

DAY- 11: 10:00 am -12:00: AGRONOMY: Integrated Farming

INTEGRATED FARMING SYSTEM

Integration of various enterprises in a farm ensures growth and stability in overall productivity and profitability. It also ensures recycling of residues,optimization of resources, minimization of risk and generation of employment. Various enterprises that could be included in farming system are crops, vegetables, fruits, flowers cultivation, dairy, poultry, fish, goat, pig, sericulture, mushroom cultivation, agroforestry, bee keeping, silvisulture, agro-based industries and food processing. A judicious mix of enterprises complementary to cropping and suited to the given farm situation and farmer's preference would bring overall prosperity.

DEFINITION OF FARMING SYSTEM

Farming system is a complex inter-related matric of soil,plants, animals, implements, power, labour, capital and other inputs controlled in part by farm families and influenced by varying degrees of political, economic, institutional and social forces that operate at many levels. Under farming system,the farm is viewed in a holistic manner. Farmers are subjected to many socio-economic, bio- physical, institutional, administrative and technological constraints. Farming system conceptually is a set of elements or components that are inter-related which interact among themselves. At the centre of the interaction is the farmer exercising control and choice regarding the type and results of interaction.

Farming system is a resource management strategy to achieve economic and sustained production to meet diverse requirement of farm household while preserving resource base and maintaining a high level environment quality.

FARMING SYSTEM CONCEPT

In farming system, all the activities, decision, management, input/output, purchase/ sale and resource(s) utilized make the matrix which interacts with socio- economic and bio-physical environment. Farm activities interact with market forces(socio- economic) and ecosystem (bio- physical) for purchasing inputs and disposing outputs by utilizing and degrading natural resources(land, water, air, sunshine, etc.). Sustainability is the objective of the farming system where production process is optimized through efficient utilization of inputs with out infringing on the quality of environment with which it interacts.

The overall objective is to evolve technically feasible and economically viable farming system models by integrating cropping with allied enterprises for irrigated, rainfed, hilly and coastal areas with a view to generate income and employment from the farm. The specific objectives are:

1. To identify existing farming systems in specific areas and assess their relative viability.
2. To formulate farming systems models involving main and allied enterprises for different farming situations.
3. To ensure optimal utilization and conservation of available resources and effective recycling of farm residues within a system and
4. To maintain sustainable production system without damaging resources/environment.

SCOPE OF FARMING SYSTEM

Farming enterprises include crop, livestock, poultry, fish, tree crops, plantation crops, sericulture,etc. A combination of one or more enterprises with cropping, when carefully chosen, planned and executed, gives greater dividends than a single enterprises, especially for small and marginal farmers. Farm as a unit is to be considered and planned for effective integration of the enterprises to be combined with crop production activity. Integration of farm enterprises depends on many factors such as,

1. Soil and climatic features of the selected area.
2. Availability of the resources, land labour and capital.
3. Present level of utilization of resources.
4. Economics of proposed integrated farming system.
5. Managerial skill of the farmer.

1: 00 pm -3:00 pm: AGRONOMY: Classification of Crops

CLASSIFICATION OF CROPS

In general, crop is an organism grown or harvested for obtaining yield. Agronomically crop is plants cultivated for economic purpose.

CLASSIFICATION OF CROP

Classification of crop is done to generalize similar crop plants as a class for better understanding of them. Field crop are classified in the following ways:-

1. According to the range of cultivation.
2. According to the place of origin.
3. Botanical classification.
4. Commercial classification.
5. Economic / Agricultural / Agrarian classification.
6. Seasonal classification.
7. Classification based on ontogeny.
8. According to cultural requirement.
9. According to important uses.

1.RANGE OF CULTIVATION

(a) Garden crop: Grown on a small scale in gardens. Example – Onion, Brinjal etc.

(b) Plantation crop : grown on a large scale in estate and perennial in nature. Example Tea, coffee, Rubber, cocao etc.

(c) Field crop : Grown on a vast scale under field condition. They are mostly seasonal such as rice, wheat, cotton etc. agronomy deals with field crops only.

2. PLACE OF ORIGIN

(a) Native : Crops grown within the geographical limits of their origin, for example – rice, barley, blackgram, greengram, mustard, castor, sugarcane and cotton, grown in India, are native to India.

(b) EXOTIC OR INTRODUCED : Crops introduced from other countries, such as Tobacco, potato, Jute, maize, apple, groundnut etc.

3. BOTANICAL/ TAXONOMICAL CLASSIFICATION

According to systematic botany plants are classified as order, family etc, Similarly crop plants are grouped into families as,

(a) **Poaceae(Grammae;** Cereals, millets and grasses.
(b) **Cruciferae**: Mustard, Indian rape seed,raddish, cabbage, cauliflower.
(c) **Cucurbitaceae** : All gourds, cucumber, pumkin etc.
(d) **Solanaceae** : Potato, tomato, tobacco, Chilies, brinjal.
(e) **Zingiberaceae**: Ginger turmeric.

4. COMMERCIAL CLASSIFICATION

Based on the plant products which come in to the commercial field are grouped as

(a) **Food crops**: Rice, wheat, green gram, Soyabean, groundnut etc.
(b) **Feed crops/Forage crops**: All napier grass,Stylo, Lucerne etc.
(c) **Industrial / Commercial crops**: Cotton, sugarcane, sugarbeet, tobacco, Jute etc
(d) **Food adjuncts**: Turmeric, garlic, cumin etc.

5. ECONOMIC/ AGRARIAN/ AGRICULTURAL CLASSIFICATION.

This classification is based on use of crop plants, and their products. This is an important classification as far as agronomy is concerned (Agronomic classification).

(a) Cereals: They are cultivated grasses grown for their edible starchy grains(one seeded fruit- caryopsis) Larger grain used as staple food are cereal – rice, wheat, maize, barley, oats etc.

(b) Millets: Small grained cereals which form the staple food in regions of the developing countries are called millets. Example sorghum, bajra, ragi and minor millets.

(c) Oilseeds : Crops that yield seeds that are rich in fatty acids are used to extract vegetable oils, Example – mustard, rape seed, seasame, sunflower, castor, linseed, groundnut, soyabean etc.

(d) Pulses: Seeds of leguminous plants used as food. They produce dal rich in protein. Example- Plants/ products used for stimulating, drowsing or relishing effects. Example- tobacco, greengram,blackgram, red gram, Bengal gram.

(e) Feed/ Forage: It refers to vegetative matter, fresh or preserved utilized as feed for animals. It includes hay, silage, pasturage and fodder. Example – bajra, napier grass, guinea grass, fodder sorghum, fodder maize, lucerne, desmanthus etc.

(f) Fibre crops: Plants grown for their fibreyield. There are different kinds of fibre. They are seed fibre – cotton, ii) stem/ bastfibre- jute, mesta. iii) leaffibre- agave, pineapple.

(g) Sugar and starch crops: Crops grown for production of sugar and starch. Example sugarcane, sugar beet, potato, tapioca and asparagus.

(h) Spices and condiments : Crop plants or their products used to increase flavor, taste, and add colour to the fresh or preserved food of mild, agreeable. Example – tea, coffee, cocoa.

(i) Drug crops/ Medicinal plants: Crops used for preparation or medicines. Example- tobacco, mint, etc.

(j) Narcotics,Fumitories and masticatories: Plants/ products used for stimulating, drowsing or relishing effects. Example – tobacco.

(k) **Beverages**: Products of crops used for preparation of mild, agreeable. Example- tea, coffee, cocoa.

6. SEASONAL CLASSIFICATION.

Crops are grouped under seasons in which their major field duration falls.

(a) **Kharif or South West Monsoon Season Crops:** Crops grown during June – July, September – October which requires a warm wet weather during their major period of growth and shorter day length for flowering. Example – rice, maize, castor, groundnut.

(b) **Rabi Crops**: Crops grown during October- November to January – February which require cold dry weather for their growth period and longer day length for flowering. Example- Wheat, mustard, barley, Oats potato, bengalgram, berseem, cabbage and cauliflower.

(c) **Zaid or summer crops**: Crops grown during February – March to May- June which require warm dry weather for growth and longer day – length for flowering. Example- blackgram, Greengram, sesame, cowpea etc. This classification is not a universal one. It only indicates the period when a particular crop is raised. Example- Kharif rice, kharif maize, summer pulses etc.

7. ACCORDING TO ONTOGENY.

a) **Annual crops:** Crop plants that complete life cycle within a season. They produced seed and die within the season. Example:- wheat, rice, maize, mustard.

b) **Biennial crops:** Crop plants that have life span of the two consecutive years. First year- these plants have purely vegetative growth usually confined to rosette of leaves. The tap root is often fleshy and serves as a food storage organ.

c) **Perennial crops:-** They live for three.or more years. They may be seed bearing or non seed bearing. Example- sugarcane and napier grass. In general perennial crops occupy land for more than 30 (Thirty) months.

3:00 pm-5: 00 pm: HORT IV: Cultivation of Ginger

Commercially grown in almost all the states of northeastern region. It is an important cash crop supporting the livelihood and improving the economic level of many ginger growers of the region. It is sold in the fresh condition as well as processed products like dried ginger, ginger powder, ginger oil, ginger oleoresin, ginger candy, ginger pickles, ginger wine, ginger squash, medicinal herbs etc.

Climate

- Warm & humid climate, optimum temperature 25 - 30°C.

Soil

- Well drained with atleast 30 cm depth and aeration
- Grows well in sandy or clayey loam, pH 5.0-6.5

Growing season

- Early planting is beneficial and ensures the crop grows sufficiently to withstand heavy rains and grows rapidly with the received of heavy rain.
- Mid April - May, with the onset of the monsoon.

Varieties

- Nadia and IISR Varada (High yielding & Low fibre), Wynad
- Local varieties

Selection of Planting Material:

Select healthy rhizomes free from diseases (rhizome rot and leaf spot) and pests (rhizomefly).Sprouted rhizomes are broken into pieces keeping 2-3 sprouted eye buds on each rhizome. Each piece should be 2.5-5 cm long and 20-25 g in weight.Ginger rhizomes are used for planting. For selection and preservation of seeds, adopt the following methods: Mark healthy and disease free plants in the field when the crop is 6-8 months old and still green. Select best rhizomes free from pest and disease from the marked plants. Handle seed rhizomes carefully to avoid damage to buds. Soak the seed rhizomes in a solution containing Pseudomonas @ 20g/litre for 30 minutes and dry under shade by spreading on the floor. Store the treated rhizomes in pits dug under shade, the floor of which is lined with sand or saw dust

Seed Size

- Weight of the seed rhizomes is 25–30 gm, 4–5 cm length in size and 2-3 sound buds (approx.)
- Higher yield and profit were obtained from larger seed pieces.

Seed Rate

- 1200- 1500 kg per hectare
- Varies with variety and soil fertility.

Seed Treatment

- Trichodermaharzianum @ 2.5 gmor Pseudomonas fluorscens 2.5 gm per litre water for 30 minutes and dry under shade
- Sun drying for 1 or 3 days
- Cover rhizomes with polythene sheets and exposed to sunlight for 2 hrs at 48℃ for 30 mins

Land Preparation

- **Beds** - 15 cm height,1 m width and of convenient length may be prepared.
- **Interspace** of 50 cm in between beds.
- In level lands, deep drains are to be provided at sufficient spacing to drain out excess water during rainy season.
- **Spacing** : 20-25 cm within & between rows.
- **Depth** of planting : 4-10 cm
- **Buffer zone** of 25 ft should be left all around to separate the plot from conventional farms.
- **Germination** : Under ideal condition ginger appears above ground 10-15 DAP, but it may prolonged upto 2 months.

Manuring

- Nutrient exhausting crop
- Well decomposed cowdung/compost @ 25 tonnes as basal and 5t/ha each at 60DAP and 120DAP.
- *Vermi*compost (reduced dose).
- Use of natural organic fertilizer – Jeevamrutham (tonic for micro-organism formation)
- Soil application of *Trichoderma* bio-control agent (2.5 kg mixed with 50 kg FYM) 10-15 days before sowing.
- BIO NPK
  - Soil application of @30kg/ha
  - Seedling application @ 20gm/litre
- Micronutrient - $ZnSO_4$
  - Soil application @5kg/ acre,
  - Foliar spray @ 500 gm/ 100-250 litres water, twice at 45 and 90 DAP resulted in higher yield

Apply manures and biofertilizers at the following rates.

FYM / compost @ 25 tonnes as basal and 3t/ha each at 60DAP and 120DAP. Apply FYM, Trichoderma, neem cake mixture @ 100 g / planting pit at the time of planting. Vermi compost or coir pith compost may also be used at a reduced dose instead of FYM according to availability.

Apply Azospirillum @ 2.5 kg /ha / PGPR mix I as basal. Repeat the same dose at 120 DAP. Inoculate with AMF at the time of planting.

Intercultural operation

- ❖ **Mulching**

- ➢ The first mulching with green leaves @ 10–12 t/ha is at the time of planting.
- ➢ It is repeated @ 7.5 t/ha at 40 and 90 days after planting.
- ➢ Cow dung slurry or cow urine may be poured on the bed after each mulching to enhance microbial activity and nutrient availability.
- ➢ Green manuring crops like Daincha and Sunnhemp can be grown in the interspaces of beds, along with ginger and harvest the green manure crop during second mulching of ginger beds.

- ❖ **Weeding**

- ➢ The plot is kept clean by hand weeding during first 4 - 6 weeks.
- ➢ Depending upon intensity of weeds, 5-6 weeding are given to have better yield.

- ❖ **Earthing up**

  - enlargement of daughter rhizomes,
  - provides adequate aeration for roots
  - and protects the rhizome from scale insect
  - helping in weed management.

- ➢ 1st Earthing up – 45th DAP
- ➢ 2nd Earthing up - 120-135 DAP

Crop rotation

- ➢ Leguminous crops, Maize, Paddy is beneficial.
- ➢ Tomato, Potato, Chilli, Eggplant should be avoided.

Intercropping with Soybean, Lady's finger, French bean and Maize are advantageous.

Harvesting

The crop is ready to harvest in about eight to ten months depending upon the maturity of the variety. When fully mature leaves turn yellow and start drying up gradually. Clumps are lifted carefully with a spade or digging fork and rhizomes are separated from dried leaves, roots and adhering soil. The average yield of fresh ginger per hectare varies with varieties ranging from 15 to 25 tonnes.

Preservation of seed rhizomes

The rhizomes to be used as seed material should be preserved carefully. The indigenous practices like spreading layers of leaves of *Glycosmispentaphylla* called in Malayalam 'panal' being followed by farmers can very well be adopted for this purpose. In order to get good germination, the seed rhizomes are to be stored properly in pits under shade. For seed materials, big and healthy rhizomes from disease-free plants are selected immediately after harvest. For this purpose, healthy and disease-free clumps are marked in the field when the crop is 6-8 months old and still green. Seed rhizomes are stored in pits of convenient size made inside the shed to protect from the sun and rain. Walls of the pits may be coated with cow dung paste. Seed rhizomes are stored in these pits in layers along with well dried sand or saw dust (i.e. put one layer of seed rhizomes, then put 2 cm thick layer of sand or saw dust). Sufficient gap is to be left at the top of the pits for adequate aeration. The pits can be covered with wooden plank with one or two small holes for aeration. Seed rhizomes in pits need inspection once in twenty days to remove shriveled and disease affected rhizomes. Seed rhizomes can also be stored in pits dug in the ground under the shade of a tree provided there is no chance for water to enter the pits. In some areas, the rhizomes are loosely heaped over a layer of sand or paddy husk and covered with dry leaves in a thatched shed.

Management of Pests

1. Shoot Borer

❖ Regular field surveillance and adaptation of phyto-sanitary measures are necessary.
❖ Install Light traps during mid May to June, July month for adult mass trapping.
❖ Cut open the affected shoot and pick out the caterpillar and destroy.
❖ Conserve the natural bioagents such as ladybird beetle & spiders
❖ Release *Trichogrammachilonis @ 40000/ acre.*
❖ Applicationof*Metarhiziumanisopliae*or *Beauveriabassiana*@ 10 g/ltr is effective.

2. White Grub

❖ Leaving the land fallow for 2 consecutive years reduce the pest population.
❖ Growing of resistant crops such as sunflower also checks the build up of grub population.
❖ Sowing of trap crops such as sorghum, maize, onion etc to reduce white grub infestation.
❖ Application of *Beauveriabassiana* or *Metarhiziumanisopliae* mixed with vermicompost @ 5g/kg or drenching the soil with these entomopathogenic fungi @ 5g/l.
❖ Two sprays of Neem oil @ 3ml/l at 15 days interval is found to be effective.
❖

Management of Diseases

Soft Rot

➢ **Cultural management:**
❖ Use of healthy planting material

❖ Water-logging in the field must be avoided.

❖ Provide proper drainage and keep land free from weeds at all times.

❖ 2-3 years crop rotation with cruciferous crop (mustard, radish), leguminous crops rather than solanaceous crops (tomato, chillies, brinjal,etc)

❖ Collect the diseased material as and when the disease is noticed and burn them.

❖ Early planting during April month.

➢ **Biological management:**

❖ Rhizomes treated with Trichodermaharzianum @ 5 gmor Pseudomonas fluorscens 5gm per litre water for 30 minutes and dry under shade

❖ Soil application of *Trichoderma* bio-control agent (2.5 kg mixed with 50 kg FYM) 10-15 days before sowing.

❖ Soil drenching withTrichodermaharzianum @ 5 gm or Cow urine extract

Plant Protection

Pests

Nematodes

Apply neem cake @ 1t/ha at planting.Repeat the same dose at 45 DAP.

Diseases

Rhizome rot and bacterial wilt

Select sites having proper drainage.

Dip the seed rhizome with 5% talc formulated (50g/L) suspension of Pseudomonas fluorescens P1 for 15 minutes before planting. Treat the seed rhizome with AMF

Apply organic manure enriched with Trichoderma at the time of planting. Spray and drench the plant with Pseudomonas fluorescens P1 / PGPR mix II at 45 days after planting (onset of monsoon).Repeat spraying and drenching at monthly intervals based on disease incidence and intensity

Post-harvest management of ginger

❖ After harvest, the fibrous roots attached to the rhizome should be trimmed off and the soil is to be removed by washing. Scraping of the skin can be practiced but refrain from using metallic knives as it causes discoloration.

❖ Scraping off the skin helps in reducing drying time thus minimizing mold growth and fermentation.

❖ The scraped rhizomes can be immersed in lime solution for 6 hours and allowed to dry in the sun for 10 days.

❖ For long term storage, the gingers in the pits arecovered with thorny plants to prevent from stray animals and rodent attacks.

DAY-12: 10:00 am -12:00: Hort-I: Potato cultivation

Potato *(Solanum tuberosum)*

Family – Solanaceae

Potato is one of the most important food crops in the world. David Scott is reported to be the first to bring the plant to Khasi Hills in the year 1830. However the variety which he brought did not suit the hills here and thus did not survive. From the year 1904 onwardsmany varieties were imported from England and Scotland and trials were conducted at the Upper Shillong farm. Most varieties failed to perform and were discarded but varieties like up – to – date, Great Scot, Royal Kidney and Karr's pink has not only survived but still play an important role in the rural economy of the Khasi Hills. It has been our traditional crop for a little over a century. This intimate and long association of the Potato among the Khasi has actually convinced them that this is a life giving crop in these Hills.

Potato is conventionally grown by use of fertilizers like urea, phosphorous and potash. It is also highly susceptible to blight which is effectively controlled by used of fungicides. Therefore, for potato to be economically viable in an organic system of cultivation, utmost attention is to be given to the crop throughout the growing period. Also, prophylactic measures should be taken at the earliest for any anticipated attack by pests and diseases. After harvest, tubers are to be stored in a dry area free from excess moisture and heat.

Land Preparation

Potato is sensitive to water logging and requires sufficient aeration during its growth period. For this reason the plots should be at a higher level to facilitate drainage. In unavoidable circumstances, land should be prepared in such a way that water logging is avoided. This may be done by digging of micro canals in and around the plots. The land is ploughed to a depth of 30 cm and left for sundrying. The soil should:

- Be friable
- In case of high clay content, sand maybe mixed to increase porosity
- Brought to a fine tilth
- Manures should be applied and mixed with the soil during last ploughing.Bio-fertilizers and other soil nutrient sources should also be applied to enhance overall crop growth (See manuring)

Season of planting

Potatoes can be grown only under such conditions where the temperatures during the growing season are moderately cool. Potato cultivation is taken up in four seasons at various altitudes in the state. The autumn crop is cultivated mainly for commercial purpose whereas winter crop caters to local needs. The four crops are: -

Spring Potato: Cultivated in the rice fields by the farmers of Umsning and Bhoirymbong area under Ri-Bhoi District as a proceeding crop to rice.Planting of potato crop commence from 2ndweek of January to 2ndweek of February and the crop is harvested within the month of May. No fungicides is required for this crop.

Summer Crop: This is the most common growing season in the East, West Khasi Hills and parts of Jaintia Hills District. This crop is planted from end of February to March. This crop generally escapes the late blight disease. Harvesting of the crop starts from July onwards to last part of October.

The Autumn Crop: Growing of autumn crop is more challenging because of the late blight and the availability of quality seed. But at the same time it is the most rewarding crop as it commands the highest prices. It is planted between August and September and harvested in November and December when there are no availability of fresh potato in the market.

Winter Crop: This crop covers the smallest area. It is cultivated in the lower altitudes areas of the state in the East and West Garo Hills District. Planting is done by the end of October to November.

Varieties: In recent years, a number of potato varieties have been developed by the Central Potato Research Institute, Shimla, to suit different climate and soil conditions. The following are some of the main varieties.

Kufri Anand: The plants are tall, strong and stand straight. The leaves are brown-green and the flowers are light purple in colour. The tubers are white, long and elliptical. It takes 100-110 days for the crop to be ready for harvesting and the average yield is 35-40 tonnes/ha.

Kufri Swarna: The plants are straight, erect, strong and tall with abundance of dark green leaves. The flowers are white and the tubers are of medium size, white in colour, and turn yellowish after drying. The crop duration in summer is 130-135 days in winter, 100-110 days. Its yield is approximately 48 tonnes/ha. This variety is resistant to early blight and late blight diseases and nematodes.

Kufri Sinduri: The plant are tall, straight and erect with abundance of branches. The leaves are light green in colour and the flowers are red with white spots on the petals. The medium sized tubers are red coloured and round/elliptical in shape. The crop duration is 110-120 days. Yield is around 40 tonnes/ha. This variety is resistant to late or early blight and leaf rot diseases and can be grown even in high temperature regions, with minimal irrigation.

Kufri Jyoti: The plants are tall erect, compact and vigorous with few but thick stems. Tubers are medium to large size, oval with white skin and fleet eyes. The crop duration is medium to early maturing (110-130 days).

Kufri Megha: The plants are medium tall, semi-erect, medium compact with green straight stems. The flowers are white. Tubers have white smooth surface and round in shape with shallow eyes. The crop is long duration (140-145 days) with a dormancy period of 10-12 weeks.

Kufri Giriraj: The plant is medium tall, semi erect, medium compact, vigorous with medium thick stems that are coloured at the base. Tubers are white with smooth skin, medium to large in size, oval to oblong with fleet eyes. The crop duration is 105-135 days with a dormancy period of 8-9 weeks.

Kufri Himalini: The plant is medium tall, semi erect, semi compact, vigorous, green with purple colour at the base. Tubers are medium in size, oval to oblong, with shallow eyes and a pale yellow flesh. The crop is medium duration (110-120 days).

Planting

1. **Seed Size** - The best seed weight for raising summer and autumn crop is 40 - 50g having about 3 - 4 eyes. But, generally medium size of 25 – 75 g can be used. Seed requirement is 2 - 2.5 ton/ha depending on seed size.
2. **Seed Preparation** - Seed from previous year's harvest should be kept in seed trays or basket or spread out on the floor or on racks in a Store/Godown and exposed to natural diffused light to ensure proper sprouting. Unsprouted and rotten tubers should be sorted out periodically. The sprouted seed tuber should be taken to the fields in trays for planting to minimize sprout damage. Before sowing, the seed may be dried in the sun for a day.

   For obtaining higher yield and preventing infestation of diseases it is recommended to treat the seed by soaking it overnight in Jeevamrit.

3. **Planting time –** The main crop is planted in the first fortnight of March and autumn crop is planted in the last week of August to 1st week of September.
4. **Method of Planting** - Tubers should be planted in furrows made at adistance of 60 cm apart against the slope. However, in narrow terraces it can be reduce to 50 cm. It is important to make furrows and ridges upto to a height of 15 cm against the slope to avoid soil erosion. Plant the tuber seeds at a distance of 20-25cm depending on seed size. Seed tubers should be properly and immediately covered with soil after planting to prevent drying up of the planting materials.
5. **Weed Control -** The potato crop develops canopy in about 4 weeks after planting and weeds must be controlled by this time to gain competitive advantage for the crop. If the weeds are large, they should be removed before the ridging operations begin. Before earthing up the weeds between the growing plants and at the top of the ridge should be removed by mechanical means. Weeding is done manually.
6. **Earthing up -** The main object of earthing up is to keep the soil loose and destroy weeds. Two or three earthing ups should be done at an interval of 15-20 days. The first earthing-up should be done when the plants are about 15-25 cm height. The second earthing up is often done to cover up the tubers properly.

Manuring

Nutrient requirement of potato crop is high and the application of organic manures and bio-fertilizers is considered essential to obtain economic yields. In light soils and places where organic manures are not easily available, green manuring is beneficial. The optimum dose of bio-fertilizer application varies greatly depending upon the type of product, soil type, soil fertility, climate, crop rotation, variety, length of growing season and moisture supply.

NPK granules are applied @ 20kg/ha. Other bio/organic inputs used are

1. FYM or compost @ 30-35 tons/ha.
2. Bio fertilizers – *Azotobacter* or *Azosrillum* for Nitrogen.
3. Bone meal/Rock Phosphate for phosphorous.
4. Wood ash for potash.
5. Phosphorous Solubilising Bacteria (PSB) for solubilising phosphorous.
6. Bio NPK.
7. Further enrichment of the soil maybe ensured through application of Jeevamrit or vermi wash or panchagavya as per convenience.

Plant protection

Potato crop is infested by a variety of fungal, bacterial and viral diseases. As regards pests, some pests attack the foliage while some attacks the tubers. Many of the diseases in potato are soil/seed borne and so once infected is very difficult to control them. Thus, proper diagnosis and control of pests and diseases is of utmost importance. Some of the pest and their methods of control are:-

1) **Aphids**
   a. Install yellow Sticky Trap.
   b. Spray Helicon -L/Bio Power (*BeauveriaBassiana)* @ 15-16 tsp in 16 litres of water.
2) **Potato tuber moth –**
   a. Plant the tubers at a depth of 10 cm.
   b. Cover all the exposed tuber during earthing up.
   c. Used light traps.
   d. Install Pheromone traps 15 nos./ha.
   e. Remove the infected plants from the field and destroy it.
   f. Do not leave freshly harvested Potato tubers in the open field.
   g. Store the potatoes in shelves spread with saw dust, sand and then cover with 2-3 cm thick layers of chopped leaves of *Lantana Sp.*
   h. Cover the opening of the ventilators of the store room or go-down with wire or nylon net.
3) **White grubs and cut worms**
   a. Timely planting and harvesting of Potato crops.
   b. Spray the crop and drench the soil with Helicon – L or Bio Power (*Beauveria bassiana*) 1tsp in 1 litre water.
   c. Spray Multineem or Nimbicidine 8 tsp in 16 litre water.
   d. Soldier @ 8 tsp in 16 litre water and drench the soil.
   e. Soil drenching with bio pesticide-Metarrhizium @ 5g/l of water.

Diseases

1) **Late blight –** It is a fungal disease affecting the leaves stems and roots. Its symptoms appear in the form of green spots on the leaves, which gradually change into black and brown spots. Some cotton-like growth appears on the underside of the infected leaves. A 2-3 cm long, purple streak appears on the stem of the infected plant and the plant looks thin and weak. The infested potato has brown spots on it and is pink inside.

Management

a. The yearly crop cycle should be adhered to.
b. Disease resistance varieties should be selected (viz. K. Giriraj, K. Girdhani, K.Megha, K. Kanchan, K. Himalini)
c. The field should be subjected to 3-4 deep tillings before sowing so that the soil gets treated by the heat of the sun.
d. Soil should be heaped uniformly along the rows to ensure that the potatoes are not left uncovered to prevent greening of tubers due to Glycoalkaloid.
e. The infected plants are to be taken out and burnt somewhere else and not in the field.

Recommendations

a. Disease resistance varieties should be selected.
b. Tuber treatment with *Trichoderma sp* @ 5g/kg of seeds.
c. Foliar application with *Trichoderma sp* + *Pseudomonas florescence* @ 5g/l of water.
d. FYM treated with *Trichoderma sp* @ 2.5 kg/100 kg of FYM.

2. **Early blight (*Alternaria solani*)**

Locally known as ïapiong. This disease infects the leaves and it is more prevalent during summer. The fungus is formed due to excessive wetness in the soil and favourable temperatures. Big dark-brown spots appear on the infected leaves. If preventive measures are not taken up the infection spreads to other parts of the plants which weakened the crop till it gradually dies.

Management

a. Before cultivating, the field should be subjected to 3-4 deep tilling so that the soil is exposed to the heat of the sun.
b. The weeds in the field are converted into green manure which enhances the fertility and immunity of the soil and reduces the chances of infection.
c. Strict adherence to the crop cycle decreases the possibilities of this disease.

Recommendation

a. Spraying of vermiwash or jeevamrit mixed with water in a ratio of 1:13.5 litres protects the crop from fungal infestation.
b. *Trichoderma*@ 10 grams/lit water may be sprayed on the crop.

3. **Black scurf** (*Rhizctonia solani*)

This disease is caused by a soil borne fungus. It infects different organs of the plant including the eyes of the germinated seed, the stem and the flowers. The leaves of the infected plants become red and brown. Tubers of the infected plants have brown spots on them.

Management

a. Crop cycle should be adhered to.
b. Sesbania or corn is cultivated in the field before potato.

Recommendations

a. Spraying of jeevamrit and *Trichoderma* on the standing crop.

4. **Brown rot** (*Pseudomonas solancearum*)

Brown rot is an organically caused disease and generally occurs in the central Himalayan region. The stem of the infested plant turns brown. The plant bends and falls. The leaves also gradually turn brown and eventually the plant dies. This disease generally spreads through infected seeds. It enters the plant through the roots and destroys the tissues of the plant; consequently the flow of water from the roots to the upper parts of the plant is blocked and the plant withers away. This disease generally occurs in summer and increases with a rise in heat and humidity.

Management

a. Infected potatoes should not be used for seed.
b. The seed should not be cut in order to prevent pathogens from entering and affecting other seeds as well.

c. Sowing should be completed by February and the crop harvested before the beginning of the rains.

Recommendations

a. Before sowing, seeds should be treated with Jeevamrit.

5. **Bacterial wilt**
   a. Crop rotation with rice, wheat and maize should be followed.
   b. Application of *Trichoderma sp* + *Pseudomonas florescence* @ 5g/l of water.

Harvesting-

The time of harvest is very important in potato. The development of tuber continues till the vines dies. The main crop is ready for harvest within 75-120 days of planting depending upon the area, soil type and variety sown. The main crop is ready for harvest when majority of the leaves turn yellowish brown. The crop is harvested 10-15 days after haulms cutting for allowing hardening of skin of potato tubers to prevent disease infection through skin. Harvesting should be carried out on bright sunny days. The tubers may be kept in heap for 15 days in the shade for further hardening of the skin. All the cutted, cracked, bruised, damaged and infected tubers should be removed and rejected.

Process of dehaulming

If the produce of the crop is to be used for seed purposes the process of dehaulming is very important. Towards the beginning of June (for summer crop) depending upon the date of planting crop should get crop duration of 80-90 days before dehaulming. Cut the haulms at the ground level. At this time, the crop also starts maturing. The cut haulms should not be left as such in the field. Ensure that there is no re growth of stems after dehaulming as tender succulent leaves are more attractive to the aphids.

Exposed tubers should be covered with soil immediately after dehaulming. The crop should be harvested 10-15 days after dehaulming. This will allow hardening of the tuber skin and increase shelflife of the potato tuber. The practice of haulm cutting is very important for the seed crop as it prevent disease infection through skin. Dehaulming may be skipped if the produce is to be sold for table purpose.

Storage

Harvested tubers should be kept in a well-ventilated room that is relatively dry and dark. Tubers are best stored in racks made out of bamboo or wood which are above ground level and which allow for air movement in between the tubers. Leaves of *Lantana camera* are chopped in to pieces and spread out on the tubers. This is a prophylactic measures against small mites and insects. Light traps can be used to trap flying insects. Fine nets can be used to cover the tubers.

1: 00 pm -3:00: Hort-III POST-HARVEST MANAGEMENT OF CUT FLOWERS

INTRODUCTION:

In Agriculture, Post- harvest management is one of the operations carried out after harvesting, which includes cooling, cleaning, sorting and packaging.

The goals of post- harvest handling are to keep the product cool and fresh, to avoid moisture loss, to slow down undesirable chemical change and avoid physical damage such as bruising.

Each crop requires different range of temperature and humidity and hence the initial stage of post-harvest handling is critical to maintain. Also, certain crops cannot be stored together, as unwanted chemical interactions can take place.

Post- harvest factors:

Temperature: Opening of flower buds and rate of senescence accelerate at higher temperatures. At lower temperatures, the respiration rate decreases and the flowers produce less ethylene. Temperature plays an important role in the expansion of buds for flowers harvested at the immature stage; therefore flower buds are kept at low temperature.

Light: Light is essential for long distance transport or prolonged storage of cut flowers. Similarly, high light intensity is essential for opening of tight bud cut flowers. Flowers like carnations can be stored in darkness for a longer period without affecting quality. Florists should maintain a light intensity of 2000-3000 lux for 12-24 hours in their shops for illuminations.

Humidity: Cut flowers should be kept at 90-95% relative humidity for maintaining turgidity; flowers begin to show wilting symptoms when they have lost 10-15% of their fresh weight. The rate of transpiration from leaves is reduced with the increase of high relative humidity.

Water Quality: Water quality is defined by pH and EC value, hardness contents of phytotoxic elements and the presence of microorganisms causing vascular occlusions that affect the longevity of cut flowers. Saline water decreases the vase life of cut flowers. In case of cut gladiolus, the longevity of flowers decreases when the concentration of salts in the water reaches 700 ppm, whereas for cut roses, chrysanthemum and carnations, 200 ppm is harmful. At salt levels over 200 ppm, each 100 g per litre increase in salinity shortens vase life by half a day. . The presence of basic ions like Ca^{++}, Mg^{++} in hard water is less harmful to flowers than soft water that contains sodium ions. Fluorine is very toxic to most of the cut flowers and causes injury to freesias, gladiolus and gerberas at 1 ppm, and chrysanthemums, roses, poinsettias and snapdragons at 5 ppm. Flowers like lilacs, cymbidiums and daffodils, however, are resistant to fluorine ions. Vase life increases in tap or well water that has been passed through a de-ionizer. The importance of low pH of the holding solutions is well known for improving vase life. A holding solution of pH 3.0-5.0 is optimum for increasing vase life of cut flowers.

Ethylene: Ethylene plays an important role in the regulation and co-ordination of senescence in climacteric flowers. Less of this hormone is produced but is more stable in floral buds and young flowers. A sharp increase in ethylene evolution is found during flower maturation, opening and senescence. Afterwards, ethylene production decreases and remains static. Basically, ethylene is first produced in the pistil and the evolved ethylene acts on the petals and induces expression of genes for ACC synthase, ACC oxidase and cysteine proteinases, resulting in the auto-catalytic ethylene production from the petals, in-rolling of petals and wilting of flowers. The gynoecium has been shown to produce a significant amount of ethylene before its production in the petals, possibly induced by factors such as ABA or IAA. This suggests its importance in controlling ethylene production in the flower during natural and pollination induced senescence, with emasculation hastening the release of ethylene. A wide range of flowers is affected by ethylene. Some typical symptoms are: sleepiness of carnation and kalanchoe petals, fading and in-rolling of the corolla of Ipomoea, fading and wilting of sepal tips in orchids, and induction of anthocyanin formation in female reproductive parts and abscission of flowers and petals. Orchid flowers are highly sensitive to ethylene. High levels of ethylene production are due to herbivore damage, mechanical injuries and pollination. Decapped and emasculated flowers produce more ethylene than untreated ones. Sometimes, forced unfolding of flower buds in orchids reduces vase life.

Diseases and Insect- pests: Fungi, bacteria and insects affect the quality of cut flowers by causing the production of higher amounts of ethylene. Microbes accelerate flower senescence by the plugging of xylem vessels with pectin degraded products, and by producing ethylene and toxic compounds. Among bacteria genera, Alcaligenes, Pseudomonas, Enterobacter, Erwinia, Bacillus, Corynaebacteria, Aeromonas, Acetinobacter and Flavobacterium are commonly found in vase water. Some fungal species Botryris cinerea, Fusarium oxysporum, Mucor, Penicillium spp, Rhizopus, Aspergillus spp, Alternaria alternata and Acremonium strictum are responsible for early senescence of flowers and wilting and decaying of potted plants.

Post-harvest operations in cut flowers:

Harvesting: Flowers should be harvested in mild temperatures because high temperature causes rapid respiration rates and excessive water loss. Flowers should be harvested in the early morning or in the evening. In the early morning, flowers remain turgid due to transpiration at night and higher sugar levels. Similarly, flowering stems retain a higher amount of stored carbohydrates if cut in the afternoon and retain more vase life. Sharp tools or secateurs should always be used to detach the stems of flowers from the mother plant. The angle of the cut should be slanting and the stem should not be crushed during harvesting, especially hard wood stems. The spikes should be dipped in a bucket containing water immediately after harvest.

Grading: Grading is done based on parameters like appearance, stage of maturity, blemishes or injuries due to diseases, infestations caused by insect pests, colour and size of the bud, and straightness, strength and length of stem. Flowers are generally grouped into bunches of 5, 10, 12 or 20 stems and loosely tied with rubber bands. Before placing in the package, individual flower bunches are wrapped with suitable packing materials such as cellophane paper, kraft paper, newspaper, tissue paper or corrugated cardboard sheets. For local markets, bunches are held in buckets containing water or preservative solution. It is advisable that for long distance transport and storage, flower bunches are held in dry cardboard boxes. The minimum length of boxes should be about twice the width, and the width should be about twice the height.

Packaging: Cut flowers are inserted in a tube containing water with or without preservatives or simply wrapped in wet cotton swabs covered with a piece of plastic and tied with rubber band to keep in its place. Flower spikes are grouped into bunches of 5 or 10 or so. Bunches or individual spikes are placed inside the box in in alternate fashion. Ethylene scrubbers with $KMnO_4$ or Purafil may also be kept in the box. For export purpose, packing of flowers in two piece boxes is the best option. In Cymbidium, single flowers backed by a fern leaf are inserted in small flasks containing preservative solution. The flasks are then packed in a 3-sided box with a display window. In the Dendrobium hybrid ‘Sonia-17’ a low gauge polyfilm of 100 gauge thickness along with the cotton dipped in 8-HQS (25ppm) covering the base of the spike had maximum vase life and flower quality. A glass flute containing a flowering mini Cymbidium and stylish setting is called a Cilindra, and is commonly used as festive packaging for special occasions like Birthdays.

Storage: Low temperature treatment during the storage or shipment period reduces the entire metabolism in the tissues, slows down the respiration, transpiration and ethylene action and retards the multiplication of bacteria and fungi. In general, temperate orchids are stored at temperatures as low as 5°C in cold chambers whereas tropical orchids are stored at 7-10°C. A 90-95% relative humidity is necessary during storage to minimize moisture loss and to prevent wilting. There are two types of cold storage methods, namely ‘wet storage’ and ‘dry storage’. In wet storage, flowers are stored with their bases dipped in water or preservative solution for a short time, whereas dry storage methods are used for long term storage. In this method, fresh flowers are harvested in the morning, graded and sealed in plastic bags or boxes to prevent the loss of moisture. In Controlled Atmosphere (CA) storage, cut flowers are kept in gas tight cool chambers equipped with cooling systems at a higher level of CO2 and lower level of O2 to reduce the respiration rate and the production and action of ethylene. Generally, the concentration of CO2 should be maintained at levels higher than 4% and not below 0.4% in CA storage.

Transport: Flowers are short lived and perishable in nature and should be delivered to their destination as early as possible immediately after harvest. For long distance markets, cut flowers are transported by cargo planes, merchant ships and trucks. Other modes of transportation are head loads, bicycles, two-three wheelers, cars, vans etc. Hence, for long distance transportation, advanced methods of post-harvest handling like cooling, conditioning, impregnation, pulsing, bud opening and packaging are followed. Short time pulsing of flowers with optimal concentration of sucrose, $AgNO_3$, STS and growth regulators is important for long term truck and sea shipments. Flowers such as standard and spray carnations, chrysanthemum with non-hardy stems of full flowers, gerbera, coloured bud lily, miniature and floribunda roses are suited for dry transport over a period of several days; while chrysanthemum with hardy stems and single flowered freesias, iris, narcissus and H.T. roses are unsuited for dry transportation over a long period. Other than tropical flowers, the best method of transport of most cut flowers is under refrigeration from the grower to final consumers.

Vase life of Cut flowers: A fresh flower is still a living specimen even though it is cut from the main plant. The vase life of flowers declined due to the following reasons:

1. Inability of stems to absorb water due to blockage.
2. Excessive water loss from the cut flower.
3. A short supply of carbohydrate to support respiration.
4. Diseases.
5. Ethylene gas.
6. Room temperature and humidity.

There are certain preservatives used to extend the vase life of cut flowers. These preservatives maintain the quality and longevity.

Under polythene plastic with shade cloth

Floral preservatives perform three functions:

1. Provide sugars.

2. Supply a bactericide to prevent microbial growth and blockage of the water conductive cells in the stem.

3. Acidify the solutions.

Preservatives are used in holding solutions in the form of tablets containing a mixture of chemicals such as sugars, germicides, salts, growth regulators etc. In addition, the chemicals are employed during conditioning, pulsing and for making bud opening solutions to improve flower shape, size, colour and opening. Sugar, biocide, anti-ethylene compounds and hydrated compounds are used for conditioning. The sugar and biocide solutions are effective for opening of bud cut flowers. The vase solution should contain sugars, acidifying agent and a biocide. Citric acids are mainly used as acidifying agents and hydroxy quinoline as biocide. Metallic salts like silver nitrate, cobalt chloride, aluminium sulphate, zinc sulphate, calcium nitrate and nickel chloride have been found to prolong post-harvest life of various cut flowers. Among several growth regulators used to increase vase life of cut flowers, BA, IAA, NAA, 2,4,5-T, GA3, B9, CCC are common.

Treatments:

I. Bud opening solutions:

1. It is a procedure for harvesting flowers at storage earlier than normally coincided by cutting stage.

2. Bud opening method is identical to pulsing, longer duration and low concentration of sugar.

3. 8-HQC, STS, KCL, Al_2SO_4, 4% sucrose are used for bud opening.

II. Vase Solutions:

1. Holding solutions used in the vases to keep flowers for extending their vase life.

2. Solutions: Sugar + Germicide + Growth regulator + Organic acid + Ethylene inhibitor.

3. Commonly used: Sucrose + Citric acid @ 500ppm pH: 4.5 – 5.0

III. Holding Solution:

1. Use of preservatives in the form of tablets.

2. Prepared by mixture of chemicals Sugar, germicides, salt, growth regulator)

IV. Conditioning/ Hardening:

1. Flowers are kept standing loosely in a big container, so that air can circulate around the stems.

2. Purpose: Restore the turgidity of cut flowers from water stress during storage and transportation.

3. Water + Germicides + Citric acid@ 500ppm.

V. Impregnation:

1. Ends of the cut flower stems are impregnated for short times with chemicals.

2. Prevent blockage of Xylem vessel in the stem by microbial growth and stem decay.

3. Commonly used chemicals for impregnation: $AgNo_3$, $NiCl_2$, $CoCl_2$ @ 10-15min.

Post-Harvest Management of Some Important Cut Flowers:

1. ANTHURIUM (*Anthurium andraenum)* :

Family: Aeraceae

Tropical Red **Acropolis**

Harvesting Method:

Harvest commences after 3 – 6 months of planting. Each leaf unfold will give out one flower. Flowers are harvested when the spathe completely unfurls and the spadix is well developed with one third of bisexual flowers got opened. Harvesting has to be done during cooler parts of the day i.e.) early morning or late evening. In general, the blooms are placed in water held in plastic buckets immediately after cutting from the plant. Delay in keeping in water allows air entry into the stem and causes blockage of the vascular vessels. Cut flowers after harvest should be shifted to pre cooling chambers in refrigerated vehicles having 2-4°C temperature as they deteriorate most rapidly at high temperature.

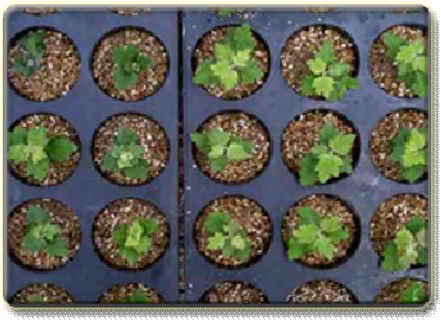
Yield:
An average 8 flowers/plant/year can be obtained.

Post-harvest technology:
1. Pulsing of flower stalks with BA 25 ppm for 24 hours improves shelf life up to 24.5 days as against 13.5 days in control
2. Packing the spathe with spadix in poly film (100 gauge) and covering the basal ends of the

stalks with cotton dipped in BA improves shelf life up to 27.5 days
3. Holding solution: 8 HQC 200 ppm + sucrose 5 % increases vase life up to 30.5 days

2. CUT CHRYSANTHEMUM (*Dendranthema grandiflora* Tzeuleu):

Family: Asteraceae



Chrysanthemum ready to harvest

Harvesting Index:

Standard types - Flowers are harvested when 2 - 3 rows of rays florets are perpendicular to the flower stalk. Spray types - When 50% flowers have shown colour for distant markets; when two flowers have opened and others have shown colour for local markets.

Yield:

Standard types: 67 flower stems/m2
Spray types: 260 flower stems/m2

Post-harvest technology:

Pulsing	:	Sucrose 4 % for 24 hrs (Vase life : 18 days; Control : 8.5 days)
Holding solution	:	BA 10 ppm + Bavistin 0.1 % + Sucrose 2 % (Vase life : 17 days; Control : 8.5 days)
Wrapping material	:	Polysleeves with holes (50 gauge thickness) (Shelf life: 9.25 days; Control : 6.5 days)

After harvest, the stem has to be cut at equal length (90 cm is the standard), bunched in five, putting a rubber band at the base and sliding them into a plastic sleeve and putting the bunches in plastic buckets filled with water. Early morning on the day of shipment (or night before), the bunches can be packed in boxes.

3. HYBRID ROSE (*Rosa hybrida)* :

Family: ***Rosaceae***

Harvesting:

Harvesting is done with sharp secateur at the tight bud stage when the colour is fully develop and the petals have not yet started unfolding. There should be 1-2 mature leaves (those with five leaflets) left on the plant after the flower has been cut. The reason for leaving these matures leaves is to encourage production of new strong shoots. Harvesting is done preferably during early morning hours.

Secateur for harvest

Harvesting technique

Postharvest handling

Roses must be placed in a bucket of water inside the polyhouse immediately after harvesting and transported to cold storage (2-4°C). The length of time depends upon the variety and quality of the roses.The flowers are graded according to the length. It varies from 40-70 cm depending on the variety and packed in 10/12 per bunch

Pre cooling

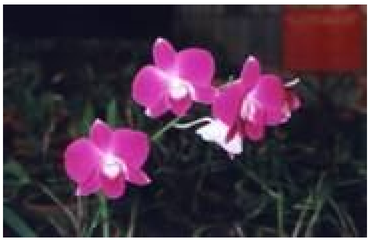
Grading

Packing

4. DENDROBIUM ORCHID (*Dendrobium sp.)* :

Family: Orchidaceae

Sonia-17



Sonia- 28

Pravit white

Harvesting Method:
Dendrobium flower fully matures only 3 or 4 days after it opens. Flowers are harvested when they are fully open as the flowers cut prior to their maturity will wilt before reaching the wholesaler. Immediately after harvest, the lower 0.75cm of the peduncle is cut off, and the flower is inserted into a fresh tube of water containing preservative. Harvesting the spike when 75 per cent of the flowers are open and remaining buds are unopen.

Post-harvest handling:

Pulsing	:	8-HQC 500 ppm + Sucrose 5% for 12 hrs
Holding solution	:	$AgNO_3$ 25 ppm + 8-HQC 400 ppm + Sucrose 5%
Wrapping material	:	50 gauge polythene with base of spikes dipped in 8-HQC 25 ppm

Yield:
8 - 10 spikes/plant/year

5. GLADIOLUS (*Gladiolus* spp) :

Family: Iridaceae

Harvesting of spikes:
Gladiolus takes 110-120 days to produce spikes. While harvesting, at least four basal leaves should be retained on the plant to ensure proper development of corms and cormels.

Post-harvest treatment and Grading
Soak the stem in water to avoid wilting and lodging of stem and flower. Based on stem length and number of florets, the spikes are grouped into A, B, C, D grades.

Yield
2.0 - 2.5 lakh flower stalks/ha/crop.

6. Lilium :

Family: Liliaceae

Royal Sunset Lily hybrid **Harvesting stage with one bud**

Harvest: Harvesting is done when lower most bud shows colour (colour breaking stage) but is not open.
Crop duration:
Asiatic hybrids : 8 - 10 weeks
Oriental hybrids : 14 - 16 weeks

Yield: The average yield is 30 - 40 flower stems/m^2

7. GERBERA (*Gerbera jamesonii*) :
Compositae

YCD-1 **YCD-2**

Season of flowering and Harvesting:

When flowers completely open, harvesting is done. Flower stalk is soaked in Sodium hypochloride solution (5-7 ml/lit of water) for 4-5 hours to improve vase life.

Post_harvest handling:

Harvesting is done when outer 2-3 rows of disc florets are perpendicular to the stalk. The heel for the stalk should be cut about 2-3 cm above the base and kept in fresh chlorinated water. Flowers should be graded and sorted out in uniform batches. Flowers packed individually in poly puches and then put in to carton boxes in two layers.

Stem break

It is a common post harvest disorder in cut gerberas. This is mainly caused by water imbalances. It could be ethylene controlled and associated with early senescence caused by water stress.

Grading

Based on stem length and diameter, flowers are graded in A, B, C and D.

Yield

The crop yields 2 stems / plant / month. Harvest starts from 3rd month of planting and continued up to two years. Under open condition, 130 -160 flowers / m^2 / year and under greenhouse condition, 175 - 200 flowers /m^2/ year can be obtained.

3:00 pm-5: 00 pm TEA CULTIVATION Tea cultivation in Ri- Bhoi

A GLANCE OF ORGANIC TEA CULTIVATION IN RI-BHOI

WHAT IS ORGANIC FARMING

Organic Farming is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biologicalcycles and soil biological activity. Itemphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems.

WHY ORGANIC FARMING

• Focus on clean and quality production

• Focus on improvement of the health and livelihoodof the farmers

• Focus on efficient management of natural resourcesto maintain agricultural productivity

• Focus on Healthy and tasty food

• Focus on the health of the consumer

ORGANIC CERTIFICATION STATUS IN RI-BHOI

• MEG ICS ORGANIC TEA PROJECT is the firstOrganic Project in the state.

• AWARDED SCOPE CERTICATE FROM 2013-14.

• 37 NUMBER OF FARMERS COVERING ABOUT80.5 HECTARES

• 2 ORGANIC CERTIFIED MINI TEA PROCESSINGUNITS

HISTORY OF TEA CULTIVATION IN INDIA

- 750 BC- Historical records of tea consume in India
- 1823- Robert Bruce(Scottish Explorer) Discovered that tea was planted and brewed by the
- Singhpho Tribes of upper Assam
- ManiramDewan- First Indian to undertake tea Cultivation in Assam

1838- the first consignment of 12 chests of Assam tea reached London

1850- commercial tea cultivation started in Darjeeling

1853- India's tea export had reached 183.40 tonnes

1977-78- tea nurseries started in government farms at Ri –Bhoi District, Garo Hills and West Khasi Hills

WHY IS ORGANIC TEA CULTIVATION THE ONLY OPTION IN RI-BHOI AND MEGHALAYA

1. We are 150 years behind in tea cultivation compared to Assam and Darjeeling
2. Our tea area is only 0.4% from the total area undertea plantation in India during 2016

Our production is only 0.6% from the total made teaproduction in India during 2016

PES OF ORGANIC TEA CULTIVATION IN MEGHALAYA

- Diverse Agro Climatic Conditions
- Abundant Flora and Fauna
- Virgin/Fertile Soil
- No Serious Pests and Diseases
- Tea plantations are Nascent. First recorded Tea Cultivation in Meghalaya was in the year 1978
- Organic by the system. Less/Negligible use of Chemicals and Fertilizers

POTENTIALITY OF ORGANIC TEA CULTIVATION IN MEGHALAYA

- Tea is a beverage which is much loved by all categories of people
- Purchasing power of the people has increased over the years
- The current trend of health conscious people
- Ancillary effects to the community, society, environment, ecosystem, employment avenues, tea tourism etc.
- Reputation in India and abroad as superior in quality, rich and fragrant in aroma and powerful liquor.
- Discourage the traditional shifting cultivation

CHALLENGES OF ORGANIC TEA CULTIVATION IN MEGHALAYA

- Unorganized tea sector
- Lack in Professionalism
- Sub-Standard workmanship
- Low productivity of labour
- Low yield
- Difficulty in weed control
- No minimum support price to small tea growers
- Scope of mechanization is negligible due to terrain
- Non- Uniformity of wages
- Fear of closing down of tea factories due to low production
- Absenteeism of labourers

FUTURE TARGETS…..

- To produce consistent quality tea and compete with the best in India
- To concentrate more on green and white tea
- To develop its own brand and logo
- To concentrate the sale of branded teas in niche market for maximum price realization
- To bring 50% more under organic certified teaq Aggressive advertisement/marketing by setting up of teacafes, tea boutiques, tea lounge, tea clinics,tea festivals, etc.
- To develop trust with the consumers
- Tea Tourism

DAY- 13: 10:00am-12 noon: FARM BUDGETING: Farm Budgeting

FARM BUDGETTING- AN APPROACH FOR ENHANCING FARM INCOME

It may be defined as a detailed physical and financial statement of a farm plan or of a change in farm plan over a certain period of time. Farm budgeting is a method of analyzing plans for the use of agricultural resources at the command of the decision-maker. In other words, the expression of farm plan in monetary terms through the estimation of receipts, expenses and profit is called farm budgeting. It may also be termed as a process of estimating costs, returns and net profit of a farm or a particular enterprise.

A farm budget can be divided into three major points for application such as follows Ia ka Budget can be lah ban pynwandur ha ki lai bynta kata

1. Application prior to the crop season
2. Application during the farm year
3. Application at the end of the season

Farm planning budgets are created and analyzed by farm managers and owners to test out ideas on paper before making decisions to commit time and resources. Using the economic principle of opportunity costs, managers can use planning budgets to assess the potential benefits resulting from the chosen enterprise relative to the benefits represented by the next-best alternative enterprise. The purpose of farm planning budgets is to estimate the profitability of a plan and the impact of any proposed change to the plan.

Types of Farm Budgeting

a. Cash Flow Budget: A cash flow budget is a summary of projected inflows and outflows over a given period of time. Its purpose is to estimate the amount and timing of future borrowing needs and demonstrate the farm's ability to repay debts in a timely fashion. A key task of managing farm financial risk exposure is to plan cash flows for future accounting periods that are divided into quarterly or monthly time frames. A cash flow budget represents a projection of the future deposits and withdrawals to the farm business checking and savings accounts. Completion of the cash flow budget allows farmers to plan the dollar pathway by documenting both where and when funds need to go out to cover expenses and, funds are expected from farm sales.

b. Partial Budget: A partial budget is a formal and consistent method for making management decisions based on relatively small changes to an existing farm plan. Farm managers are faced with numerous decisions that have the potential to impact the profitability of the operation, such as whether to participate in government farm programs, purchase equipment or custom hire, or plant more of one crop and less of another. The purpose of the partial budget is to outline the available options by comparing the profitability of one alternative (usually the current situation) to the profitability of a proposed alternative. Construction of the partial budget allows the farm manager to assess only those factors that will be affected by the proposed change; all other unaffected factors are held constant.

c. **Whole Farm Budget**: A whole farm budget is a summary of available resources and the planned type and volume of farm production that are under the management of the farm owner. The whole farm budget is constructed to include the expected costs, revenues, and profitability of each enterprise that compose the overall farm business. The purpose of this budget is to analyze a major change that has the potential to affect several enterprises. A simple whole farm budget may include minimal information (e.g., list enterprises and production level) or include detailed data for each enterprise (e.g., seed and fertilizer prices and volumes, custom harvest costs, pre- and postproduction labor hours, application rates, etc.). The time period analyzed in a whole farm budget can vary depending on the needs of the farm owner or manager. Armed with a completed whole farm budget, farmers can make informed decisions such as taking over a new farm business, adding more land to the existing farm, or taking on a partner for the existing farm business.

d. **Enterprise Budget**: A farm enterprise budget is the organization of revenues, expenses, and profit for a specific farm enterprise that is constructed on a per-unit-of production basis (e.g., crop yield per acre, number of head of livestock, or number of trees per acre). The purpose of an enterprise budget is to demonstrate the potential profitability of each enterprise to the farm business. A completed enterprise budget provides farm managers with a tool that includes opportunity costs that demonstrate the economic returns to the enterprise in addition to the accounting costs.

1:00 pm- 3:00 pm: SEED TESTING: Important of seed testing

IMPORTANCE OF SEED TESTING

The main objective of the Seed Testing is to obtain accurate and reproducible results regarding the purity, composition, moisture content and the percentage of seed that can be expected to produce normal seedlings under favourable condition. Seed testing and quality control has assumed great importance in seed, programmed to make available to the farmers.

Thus by testing the seed the farmer will be able to get accurate information about quality and reproducibility of the seed before sowing and there-by help in enhancing the yield and minimizes the risk of sowing decayed, damaged and diseased seed which are the factors contributing to low yield/unit area.

How To Collect Seed Sample

Seed sampling is selecting a small portion of seed from a larger amount. This sample can be taken in the field, from bulk storage, or from grain stored in sacks. The purpose of seed sampling is to obtain a portion that is representative of the entire seed lot. This means that the characteristics (e.g. moisture content) of the sample are similar to those in the lot from which the sample was taken. When such a sample is analysed, the results are as good as measuring the whole lot.

When selecting samples, equal amounts should be drawn from different parts of the seed lot - from the top, middle and bottom of the lot. In general, seed lots are either in bags, in bulk or in stream. The amount or size of a seed lot determines how much sampling is required. This is called the sampling intensity.

Sampling Intensity

A. FIELD SAMPLE: Obtaining a representative sample from a field. A field is usually not uniform - the edge or border rows are different from what is obtained from the middle of the field. In order to get a representative sample:

i. Walk through the whole field in a pattern.

ii. Hand-pick and shell grain from several plants.

iii. Mix the grains you have picked.

iv. Take at least three readings for an average value.

B. BAG SAMPLE: to decide how many bags to sample from, take samples from a number of bags that represents the square root of the lot size. Examples: if the lot contains nine bags, then sample at least three bags (9=3).

If the lot contains 100 bags, then sample at least 10 bags (100=10).

C. BIN SAMPLE: when sampling from a bin, to get a representative samples, collect seeds from various depths and avoid the centre and the corners. Select samples from as many parts as possible within the bulk storage. Do not mix the sample: test them separately. Knowing the properties of the samples at different locations will help in making management decisions.

D. SEED IN BULK OR IN STREAM

WEIGHT OF THE LOT	NUMBER OF PRIMARY SAMPLES
Up-to 500	At least 5
501-3000	1 for each 300 kg (but not less than 5)
3001-20,000	1 for each 500 kg (but not less than 10)
More than 20,0001	1 for each 700 kg (but not less than 40)

E. SEED IN SMALL CONTAINERS: If a container holds 15 kg or less it may be sampled as for seed bags. Containers of 15kg or less may be combined into units of 100 kg and each unit regarded as one container and then sampled as for bags. If the seed is in small packets, up to 100g, each packet should be considered as a sample. Samples should be taken to give enough seed for the required test.

Handling of samples

Avoid delays in processing the samples because changes in moisture content and quality occur over time.

i. Put samples either in sealed containers or plastic bags immediately after sampling to maintain the current moisture content.

ii. If temporary storage is necessary, store the samples in a refrigerator or a cold room.

iii. Always label the sample containers properly with a permanent pen.

3:00 pm- 5:00 pm: PRACTICAL

DAY -14: 10:00am-12:00 noon HORT III: Growing flowers in covered houses

Growing flowers in covered houses

A. POLY-HOUSES

Growing flowers in Poly-houses is better than growing them in open fields, because flowers are protected from harmful weather conditions like heavy rainfall, hailstorms, frost, cyclones, etc. Besides, the flowers grow better in these poly-houses because inside them they are getting good and controlled conditions for their growth and development like sufficient sunlight, heat and water required by them. For example, if the condition inside the poly-houses is too hot or too humid especially in the summer, temperature can be regulated by opening the sides of the poly-house for ventilation. However, if the condition is cold and dry especially in winter, the sides of the poly-house are closed and water is sprayed in the air inside the poly-house, so that the place becomes warm and humid even during cold winter season and becomes suitable for flowers. The reason for good growth of flowers inside the poly-house is that these houses are fully covered with plastic sheet usually a 200 micron thick ultra violet (UV) film. This particular plastic film is unique in its characteristic i.e., it permits the "one-way entry" of heat from the sun. This heat is trapped inside the poly-house. Moreover the carbon dioxide which is produced by the plants during respiration is also trapped inside giving the "Green House Effect" which is very good for the growth and development of the plants. Hence, poly-house is also called "low-cost greenhouse" because they are made of bamboo or wooden materials which are cheap and available locally and also because here, plastic sheet is used instead of glass. Generally, green houses are made of glass and iron and steel structures which are costly.

This 200 micron U-V plastic sheet is available in the market and sold in kilograms. It can be purchased as per requirement depending on the space available according to the farmer's need and convenience.

Advantages of poly-houses

10. It may be used for growing flowers in all season.

11. It is also used for raising seedlings in large number in very short time as the seeds will germinate quickly due to warm and moist conditions inside the poly-house. Hence this is very suitable for commercial purposes.

12. The seedlings planted in pots or poly-bags grow better and quicker inside the Poly-house.

13. Since poly-house is protected from flying insects and bad weather conditions, the flowers and seedlings growing there are healthier and also have better quality than those growing in the open field.

14. In warm and rainy weather, these poly-houses serve as rain shelter with all the sides open and only the roof is covered.

15. In cold areas, the poly-houses are used to produce good quality seeds of flowers because they are protected from frost.

16. In case some flowers need shade, a net providing 50% or 70% shade is given just below the plastic cover to protect the flowers from hot sun rays passing through the transparent plastic sheet.

17. Since they can be made with locally available materials like bamboo and wood, they are not costly and so even poor farmers can afford to have such poly-houses.

B. NET HOUSE

Many shade loving flowers like Orchids, Lilium, Gladiolus, etc are better grown in net houses rather in poly-houses because in transparent poly-houses, the heat of the sunrays may scorch the plants especially the petals, thereby decreasing their market value. In net house, however the partial shade protects them from the hot sun and the flowers look fresh and therefore will have a good price.

These net houses can be constructed with locally available materials such as wood or bamboo poles and can be fully covered with nylon cloth made up of nylon fibres. When the structure is covered with this net, it gives 50% to 70% shade as per requirement of flowers such as light shade or heavy shade. Lilium and Gladiolus require light shade while Orchids need heavy shading. The added advantage of net houses is that the roof, being a net, allows the raindrops to fall on the plants, thereby supplying water and therefore the cost of irrigation is greatly reduced. Being a net house, it also protects the plants from color of the net is green, but they are available in other colors also. The net house costs cheaper than the poly-house and can be afforded even by poor farmers in the villages.

1:00 pm- 3:00 pm: IPM: On Farm Production of Bio Control Agents (Trichogramma spp)

ON FARM PRODUCTION OF BIO-CONTROL AGENTS (Trichogramma spp.):

Bio-control agents reared in the State Bio-Control & Pesticide Testing Laboratory, Upper Shillong:

Trichogramma japonicum, Trichogramma chilonis, Trichogramma brassicae and Trichogramma brasiliensis

Host insect used: *Corcyra cephalonica*

I) Method for mass production of host insect:

The rice meal moth, *Corcyra cephalonica* Stainton (Lepidoptera: Pyralidae) ranks first in the mass culturing of entomophagous insects due to its amenability to mass production, adaptability to varied rearing conditions and its positive influence on the progeny of the natural enemies.

Corcyra cephalonica (Stainton) a stored grain pest has been proved to be one of the most efficient surrogate host for rearing a wide range of biological control agents. The important amongst them are egg parasitoids - *Trichogramma* spp., egg larval parasitoids - *Chelonus blackburni*, larval parasitoids - *Bracon* spp., *Goniozus nephantidis*, *Apaneteles angaleti*, insect predators - *Chrysoperla carnea*, *Mallanda boniensis*, *Cyrtorhynus feltiae (Neoaplectana carpocapsea)* is reared on the larvae of *C. cephalonica*. Besides, some entomopathogenic nematodes such as *Steinernema feltiae* is also reared on the larvae of *Corcyra cephalonica* . Only an efficient and healthy insect mass rearing medium can result in mass production of effective biological control agents. *Corcyra* can be mass multiplied throughout the year in all the ecological zones of India at 28± 2°C and 65± 5% Relative Humidity considering the economics as well as quality of eggs produced.

The following materials are required to mass produce *Corcyra cephalonica* in the farm:

Absorbent cotton	Mosquito net	Rubber band
Broken maize grain	Oviposition cages	Measuring cylinder
Brush	Plastic basin	Sieves
Enamel Tray	Face masks	Streptomycin sulphate
Honey	Soap	
Muslin cloth	Groundnut kernel	
Formaldehyde 40%	Yeast	
Storage drums	Storage racks	

II) *Mass multiplication method and usage:*

a) *Trichogramma spp.:*

The genus *Trichogramma* is cosmopolitan in distribution and present in all terrestrial habitats and is one of 80 genera in the family Trichogrammatidae. *Trichogramma* are primary parasitoids eggs of Lepidoptera, but parasitism also occurs in eggs of other orders such as Coleoptera, Diptera, Hemiptera, Hymenoptera and Neuroptera. It is important for plant protection because of its wide spread natural occurrence and its success as biological control agent by mass releasing. Since this parasitoid kills the pest in the egg stage itself before the pest could cause any damage to the crop and also that it is quite amenable to mass production in the farms, it has the distinction of being the highest produced and most utilized biological control agent in the world. Trichogrammatidae includes the smallest of insects, ranging in size from 0.2 - 1.5 mm.

b) *Biology of Trichogramma :*

The development of all Trichogramma spp. is very similar. Being an egg parasite, the female drills a hole through the chorion and deposits its eggs within the egg of the host. The internal pressure of the egg forces a small drop of yolk out of the oviposition hole. Females feed on this yolk, which increases their longevity and under laboratory conditions a female parasitizes from 1-10 eggs day^{-1} or from 10-190 during her life. Large females parasitize more eggs than smaller females. The number of eggs laid per host egg may vary from 1-20 or more depending upon the size of the host egg.

A female parasitoid can distinguish already parasitised eggs, thereby avoiding superparasitism or multiple-parasitism under natural conditions. Fecundity varies from 20 - 200 eggs female^{-1} according to the species, the host, and the longevity of the adult. Eggs in the early stages of development are more suitable for parasite development. Older eggs, especially those in which the head capsule of the larva is visible, are not usually parasitized and if they are, parasite survival is much lower. Venom injected by the female at the time of oviposition is believed to cause this pre-digestion of the eggs contents.

During the 3rd instar (3 - 4 days after the host egg was parasitized) dark melanin granules are deposited on the inner surface of the egg chorion, causing the host egg to turn black. This is an invaluable diagnostic character for distinguishing them from unparasitised eggs. Larvae then transform to the inactive pupal stage.

The adult wasps emerge from the pupae and escape the host egg by chewing a circular hole in the egg shell. The black layer inside the chorion and the exit hole are evidence of parasitism by *Trichogramma*. The egg, larval and pupal stages of *Trichogramma* at 28± 20°C are completed in about 1 day, 3 - 4 days, and 4 - 5 days respectively. Thus, the life cycle is completed in 8 - 10 days, but it may be prolonged at lower temperatures or hampered at very high temperatures. The adults are short lived (6-8 days). Mating and oviposition take place immediately after emergence. The sex ratio is generally 1:1.

c) Tricho cards :

*The parasitisation of *Trichogramma* spp., on one cc eggs of Corcyra cephalonica, which are uniformly spread and pasted on a card measuring 14 cm x 10 cm is called as Tricho card. The card has 24 demarcations (stamps).

*About 16,000-18,000 *Trichogramma* adults emerge out from this card in 7-8 days after parasitisation.

*To delay the emergence of *Trichogramma*, these cards can be stored in refrigerator at 5-10°C for 10-15 days.

*On removing the cards to room temperature, the parasitoids emerge normally. Tricho cards have a shelf life of 2-3 days. However, these can be stored in a refrigerator for a period of 1 month without any spoilage.

d) How to prepare Trichocards:

i) A card (chart paper) of 14 cm x 10 cm is made.

ii) A coat of acacia gum is applied on the grids and the eggs are sprinkled uniformly in a single layer with the aid of a tea strainer/sieve.

iii) Label information on the manufacturer, species of the parasitoid, date of parasitization and expected date of emergence are given in the left over spaces.

iv) The cards are then exposed to UV rays for half an hour.

v) The egg cards are placed into polythene bags of suitable size and the nucleus card of *Trichogramma* are introduced in it.

vi) The easiest way to accomplish this is to place a piece of Tricho egg card containing parasitized eggs (i.e. pharate adults) that are ready to yield the adults and to hold them in subdued light for 2 - 3 days.

vii) The inside of the polythene bags is smeared with dilute solution of honey in two to three spots.

viii) The emerging parasites readily parasitize the fresh eggs.

e) Methods of application in the field:

i) *Trichogrammas* are supplied as Trichocards. Cut along the lines into 24 bits per card.

ii) Clip in the underside of leaves of any vegetables etc and spread them at a distance of 5-8m from each bit.

iii) In case of paddy, clip the bit inside the disposable cups to prevent from heavy rain.

iv) At least three releases are needed @ 2 cards each in the first and second releases and 1 card in the third release at 15 days interval each release.

f) Dosage:

Sl No.	***Bio-agents***	***For the control of***	***Dose per ha***
i)	***Trichogramma japonicum***	Paddy stem borer	5 cards
ii)	***Trichogramma chilonis***	Paddy leaf roller, Maize stem borer, Citrus butterfly	5 cards
iii)	***Trichogramma brasiliensis***	Tomato fruit borer	5 cards
iv)	***Trichogramma brassicae***	Cabbage butterfly in Cole crops	5 cards

3:00 pm- 5:00 pm: PRACTICAL

DAY -15: 10:00 am- 12:00 noon: MUSHROOM:

Prospect of mushroom Cultivation in Meghalaya

BRIEF HISTORY

- 1981 --- Modest beginnjng at DLRSL Shillong.
- 1982 --- NEC " Regional Centre for training of and Production of Mushrooms"
- 1989 --- Shifted to Upper Shillong.
- 1995 --- Bulk Pasteurization Unit (NEC)
- Research Station Jowai.
- Mushroom Centre at Jowai.

Activities:-

- o At MDC, Upper Shillong
- o Culture maintainance and spawn production.
- o Trainings – Farmers and Entrepreneurs.
- o Small scale cultivation in villages(Oyster and Button Mushroom)
- o Development of prototype bomboo and mud house for mushroom cultivation.

At Upper Shillong Center:-

- ➢ Started larger scale production of Spawn.
- ➢ Supply in the state and other North Eastern states on demand.
- ➢ Started composting (long method)
- ➢ Started cultvation of both Oyster and Button mushroom at the centre for demonstrations and trainings.
- ➢ Developed the "Rangad Dehydrator".

Bulk pasteurization:-

- Shifted from long method to short method.
- Production of bulk compost at centre.
- Training of growers on short method.
- Supply of pastuerized compost to growers.

Consideration for expansion:-

- Availability of **quality** spawns.
- **Qualified** manpower for spawn production.
- **Strategizing species** to be grown based on :
  a. Climatic zones.
  b. Ability of growers.
  c. Market demand.
- Availability of raw materials.
- Quality Compost.

Constraints:-

I. Capital intensive –credit linkages.
II. Specialized activity –need for stringent selection of growers.

III. Lack of specialized manpower (govt).
IV. Raw materials year round?
V. Assured supply of quality spawn.
VI. High incidence of contamination and pest.

Prospects:-

- Congenial climate – Temperature/ Humidity.

I. No need of artificial climate control.
II. Lower capital costs.
III. Can be competitive in markets.

- Markets in North East comparatively open.
- Oppertunities for "fresh" markets without additional cost on processing.
- Entrepreneurship
- opportunities/incentives for the North East.

Few suggestions:-

- Clear roles of : Government / private sector /Growers.
- Cluster based storage of raw materials.
- Set up cluster based mushroom farms /villages.
- More spawn laboratories – Government / Private.
- Bulk composters - Government / Private.
- Cluster / community based multi product processing units.
- Btand development .
- Quality control.
- Publicity.
- Network with other mushroom producing North East states.
- Research : Cultivation of local edible species.
- Establish economically viable techniques.

Steps:-

i. Spawn selection.
ii. Tree selection and log cutting.
iii. Hole drilling.
iv. Inserting spawn in holes.
v. Plugging and waxing hole Stacking the logs.
vi. Fruiting and harvesting.

Spawn Selection :-

To grow shiitake mushrooms , you need to make a one- time invesment in spawn.

Different forms –wooden dowels (plugs)- This is easier

1:00 pm- 3:00 pm HORT-I Tomato Cultivation

Tomato (*Solanum lycopersicum*)

Tomato is one of the most important crop in Meghalaya supporting the livelihood and improving the economic life of many tomato growers in the state, it is used as a vegetable, soup, salad, pickle, ketchup, puree, sauce and many others. It is a good source of vitamin A,B and C.

1. Soil and Climate: Sandy loam soil rich in organic matter is ideal for tomato cultivation.The optimum temperature is 15- 27 ^{o} C. Excessive and continuous rain during flowering and fruiting adversely affect fruit setting and yield.

2. Seed (varieties): The seeds grow mainly in our state are as follows: -

(i) Hybrid : Avinash – 2, Rocky, 017, Suraksha, Vaishali, Arka Meghali, Arka Vishal.

(ii) Lower altitude varieties: Pusa Ruby, Punjab Chhuhora and Manithoibi

(iii) Bacterial Wilt Tolerant Varieties : Arka Alok, Arka Abha, Megha Tomato – 1, Megha tomato – 3, Suraksha (hybrid)

3. Seed Rate :

(i) For open pollinated variety, seed requirement is 400 gms / ha

(ii) For hybrid seed requirement is 200 gms / ha

4. Sowing Time: It is grown in high hills from February to June (spring – summer), while in mid and low hills two crops can be raised, one from February to June and another from September to December. The summer crop fetches good price in the market.

5. Nursery Raising : Seedlings are grown on raised nursery bed. The width of nursery bed should not be kept more than 1 metre and length as per the need/ availability of space. The beds are dug and mixed with FYM @ 4 kg/ m^2 and levelled properly. Before sowing, the beds are drenched with *Trichoderma viridae* @ 5 gm/ lit of water to reduce incidence of damping off. Make the rows at 5 cm distance along the width of bed with the help of bamboo stick. Apply sieved FYM on prepared beds and seeds are sown in line and covered with sieved FYM or sand. Nursery bed is covered with dry grass/ paddy straw or polythene sheet for 3 – 5 days to induce early germination of seeds. Soon after sowing, the bed should be irrigated every morning and evening. The cover is removed immediately as soon as the sprouts come out, then after, the shade is placed as a roof to cover the seedlings from any natural calamities such as rain, sun, hail storm etc.

6. Transplanting and Spacing: The nursery is ready for planting after 25 – 30 days of sowing. The seedlings are planted at a spacing of 60 x 45 cms for open pollinated variety and 75 x 45 cms for hybrid. To protect the seedlings from caterpillars, cutworms *Metarhizium* *anisopliae* @ 5ml/ lit of water per hill is applied at the time of transplanting. Planting is done preferably in the evening or rainy day or during cloudy weather. Irrigation is done immediately after transplanting if there is no rain.

7. Manures and Fertilizers : FYM or compost @ 25 tonnes/ ha is incorporated in the soil during land preparation. Bio fertilizers such as Azotobacter, Azospirillium. PSB etc can also be incorporated. Biofertilizer e.g. Azotobacter of 200 gms / pkt requires 14 (fourteen) packets for 1 Hectare or 2.8 Kg per hectare. Azotobacter in the liquid form can be sprayed in the soil @ 2- 3 ml/ seedling.

Dip the tomato seedlings in the bio fertilizers in the mixture of 1 kg of Azotobacter + 200 gms Phosphorous solubilising bacteria (PSB) before transplanting.

8. Weeding and Hoeing : Four weeding and hoeing are sufficient for optimum growth and yield. One hand weeding about 45 days after transplanting can also be practiced for weed control.

9. Staking : Staking is very essential operation for open pollinated variety and hybrid for getting high yield and good quality fruits. Staking is done either by using bamboo, rope or wire.

10. Plant Protection Measures:

I. **Fruit Borer**: The borers penetrate the fruit and eat the inner layer of the fruit.

- Collect the larvae and kill them.
- Plant with marigold as intercropping
- Plant with other vegetables like mustard, cauliflower and cabbage
- Use Trichocards (*Trichogramma brasillienses*) or pheromone traps using Helicoverpa armigera.
- Spray with *Beauveria bassiana* (Bio power – L) @ 80 ml/ 16 lits of water

II. **Red Spider mites** : The insect rolls the leaves, stem and damage the plant

- Plant with marigold as intercropping
- Spray the leaves with water to drop down the insects
- Spray with Derisom (Karanjin) @ 2ml/ lit of water

III. **Cut worms** : The insects come out at night they cut the leaves and eat the fruits.

- Spray with Neem based bio pesticides nimbeccidine @ 5ml / lit of water.
- Spray with *Bacillus thuringiensis* (Bt) or Dipel @ 60 ml/ 16 lits of water
- Spray with *Beauveria bassiana* (Bio power/ Helicon –L) @ 80ml /16 lits of water.
- Picking and destructing of the larvae at the early stage of the crops.

IV. **White Flies** : The flies dwell in the lower side of the leaves, they suck the sap from the leaves and later secrete the watery gum like honey. The leaves roll up and become yellowish in colour.

- Spray with *Neem oil @ 5ml/lit of water*
- Place with yellow sticky traps about 10 nos in 1 Hectare area. The trap can be made from a yellow paper put in a plastic bag and paste it with a glue stick or grease.
- Uses of 100 mesh nylon net in nursery to avoid entry of white flies for transmission of leaf curl disease.

V. **Late Blight and Early Blight** : The leaves turn yellowish or black in colour, they become dry and a powdery like dust is seen below.

- The diseased branch or twig should be removed immediately.
- Plant with resistant varieties like TRB- 1, TRB – 2.
- Spray with bio fungide MATW – 2 (a mixture of 5 gms turmeric + 5 gms asafoetida in 10 lits of water) or spray with Tri cure @ 5ml/lit of water.
- Spray with *Trichoderma viridae* (Vericon-L) or *Pseudomonas fluorescens* @5ml /lit
- Crop rotation should be followed.
- Follow field sanitation. Proper drainage during rainy season. Grow under polyhouse.

VI. **Bacterial Wilt**: Yellowing of the leaves which wilt and die. The branches are affected and the plants remain stunted

- Tomato should not be grown in the same land every year. Plant other crops like paddy, maize etc
- Plant other vegetables like French bean, pea, cabbage, cauliflower in the infected area.
- Mix 1.5 gms Asafoetida + 5 gms turmeric in 10 lits of water. Spray this mixture before planting.
- Sppray with Pseudomonas fluorescens (Biofor pf/Biocure B) @ 5ml/ lit of water

VII. **Grey Mould** : Dust like powdery grey coloured seen in the fruits which leads to rot

- Tomato grows in wet lands are most affected
- Remove all the affected leaves and fruits immediately
- Spray with Bordeaux mixture by mixing 100 gms slaked lime + 100 gms Copper sulphate in 10 lits of water.

VIII. **Harvesting and Pickings**: Fruits are picked up at proper stage of maturity depending upon the purpose for which they are used and distance over they are to be transported. There are six following stages of maturity for harvesting of tomato

- Immature : Before the seeds are fully developed and before the jelly like substance surrounding the seeds have formed,
- Mature green: The fully grown fruit shows a brownish ring at stem scar, light green colour at blossom end has changed to yellowish green. Seeds are surrounded by jelly like substances filling the seed cavity.
- Turning: ¼ of the surface at the blossom end shows pink. This is the right stage for transportation outside state.
- Pink: About ¾ of the fruit surface shows pink
- Hard Ripe: Nearly all red or pink but the flesh is still firm and good for table purpose.
- Ripe: Fully coloured and soft.

IX. **Yield** : A normal crop of tomato yields about 250 qtls/ ha in open pollinated variety and 500 qtls/ ha in hybrid.

3:00 pm- 5:00 pm: HORT-I: Tomato Cultivation (Practical)

10:00 am- 12:00 FARM MANAGEMENT Introduction of Farm Management

INTRODUCTION OF FARM MANAGEMENT

What is a farm?

Farm is a socio economic unit. It is composed of farm family, farm enterprises and structures. Farmer is a grower cum manager. The farmer has to decide how much land, labour, capital and type of technology to use to produce in a given season. Ultimately, the farmer has to earn a profit to support his livelihood.

Farm Management: Farm management comprises of two words: 'farm' and 'management'.

Literally 'farm' means a piece of land where crops and livestock enterprises are taken up under a common management and has specific boundaries. 'Management' means the act or artmanaging.

Definitions

- Farm management is defined as the science that deals with organization and operation of the farm in the context of efficiency and continuous profits (J.N. Efferson).

- Farm management is defined as the science of organization and management of the farmenterprises for the purpose of securing greatest continuous profits (G.F. Warren).

- Farm management is defined as the art of managing a farm successfully as measured by the test of profitableness (Gray).

- Farm management is defined as the art of applying business and scientific principles to the organization and operation of the farm (Andrew Boss).

- Farm management is the decision-making process whereby limited resources are allocated to a number of production alternatives to organize and operate the business in such a way to attain some objectives (Ronald D. Kay).

- Farm management is a branch of agricultural economics, which deals with wealth earning andwealth spending activities of farmer in relation to the organization and operation of the individual farm unit for securing the maximum possible net income (Bradford and Johnson).

- Farm management, as the sub-division of economics, which considers the allocation of limited resources within the individual farm, is a science of choice and decision-making and thus a field requiring studied judgment (Heady and Jensen).

Thus in simple words, farm management can be defined as a science which deals with judicious decisions on the use of scarce farm resources, having alternative uses to obtain the maximum profit and family satisfaction on a continuous basis from the farm as a whole and under sound farming programmes. In other words, farm management seeks to help the farmer in deciding problems like what to produce, how much to produce, how to produce and when to buy and sell and in organization and managerial problems relating to these decisions.

What will the farmer do in farm management?

The farmer would efficiently use the available resources to increase profits through deciding among the best alternatives available.

Some basic functions of farm management

The farmer performs following basic functions to effectively manage the farm:

Diagnosis: Analysis of past performance of farm, its weakness/strengths.

Planning: Planning for the future crops/animals considering the opportunities and threats.

Implementation: Efficient implementation with least cost.

Monitoring: Reduce the losses and increase the profits by reducing the costs and choosing better technologies based on the observed opportunities.

Evaluation: Evaluating the actions for repeating the successes in future.

Typical Farm Management Decisions

As farm management is the science which concerns with making decisions and choices about combining different enterprises and optimal utilization of resources available, it is necessary to understand the typical farming decisions. Decisions can be classified into organizational management decisions, administrative management decisions and marketing management decisions which are discussed as below:

1. Organizational management decisions:

These are further sub-divided into operational management decisions and strategic management decisions.

i) Operational management decisions: Those decisions, which involve less investment and are made more frequently, are called operational management decisions. The effect of thesedecisions is short lived. These decisions can be reversed without incurring a cost or with less cost. These decisions are what, how and how much to produce.

a) What to produce?

Every farmer has to decide at the beginning of the every crop season about the type of farm commodities to produce with the resources available on the farm. It means whether to produce crops alone or livestock enterprises alone or a combination of crops and livestock enterprises. While selecting the enterprises and their combinations, the farmer always aims at profit maximization.

b) How to produce?

Once the decision about the enterprises and their combinations to produce is made, the next immediate operational management decision to be made is with regard to the manner in which resources are combined or the production technology to be chosen. In the selection of resources and their combinations, farmer is concerned with the cost minimization.

c) How much to produce?

After having made the above two decisions, now the farmer has to decide about the amount of output to achieve in the production of farm commodities. This implies deciding upon the quantities of various inputs to be used in production as the level of production depends on amount of inputs used.

ii) Strategic management decisions

These decisions involve heavy investment and are made less frequently. The effect of these decisions is long lasting. These decisions cannot be altered. However, in the case of reversal of these decisions farmer has to incur high cost. These decisions are also known as basic decisions.

Size of the farm, machinery and labour programme, construction of farm buildings, permanent improvements on the farm like development of irrigation facilities, soil conservation, reclamation, etc. are some of the examples of strategic management decisions.

a) Size of the farm

This decision assumes greater relevance to the farmer because of slow and low rate of capitalturnover, but it is very difficult to decide on the most appropriate size of the farm to be operated , as it is influenced by several factors viz., availability of financial resources, state laws, managerial abilities, climate, type of farming, etc. There are advantages and limitations in operating the farm business on different scales. Large farms enjoy low cost of production, whereas productivity is high on small farms. The advantages and disadvantages of operating enterprises on different scales must be ascertained, while making decision on the size of the farm.

b) Machinery and labour programme

One of the important management problems is to choose appropriate resources and their combinations to produce output with minimum cost. Machinery and labour are substitutes. The availability and requirement of labour, the size of the farm, the financial resources, etc., are important factors in deciding the combination of labour and machinery.

c) Construction of farm buildings

This decision involves huge capital requirements. Here the decisions are made on construction of farm sheds, poultry sheds, dairy sheds, storage buildings, etc. Once the decision is taken about the design of a farm building and implemented then it cannot be reversed, for it involves high penalty.

d) Irrigation, conservation and reclamation programmes

All these programmes help in improving soil productivity. Adaptation of these programmes willhave long lasting effect on the organization of the farm business. Size of the farm, availability of funds, availability of ground water, etc, influence the decision on development of irrigation facilities. Mulching, bunding, contouring, strip cropping, etc., are the various alternative measures of soil conservation. Chemical and cultural practices are adapted for soil reclamation. The farmer should choose most appropriate and economical method of conservation and reclamation programmes.

2. Administrative management decisions

Besides organizational management decisions, the farmer also makes several administrative decisions like financing the farm business, supervision, accounting and adjusting his farm business according to government policies.

a) Financing the farm business: Majority of the Indian farmers are capital starved, hence theyhave to depend on borrowed capital. For borrowing, the farmer has to examine the decisions likefrom whom to borrow, when to borrow and how much to borrow.

b) Supervision: To get the desired results on the farm, farmers should keep a close watch on all the activities performed in the production of crop and livestock enterprises.

c) Accounting: Farmer should make a decision about the time and money to be allocated for themaintenance of farm records. Farm records provide control over the farm business.

d) Adjusting the farm production programme: The decision of allocating farm resources inthe production of farm products should be consistent with the price policies of the government. The government as a welfare state exercises its control over production and marketing of farm commodities according to the situation.

3. Marketing management decisions

Marketing decisions are the most important under the changing environment of agriculture.

These decisions include buying and selling.

a) Buying: Every farmer makes an attempt to purchase necessary inputs at the least cost. Inbuying resources, a farmer has to decide the agency, the timing and the quantity to be purchased.

b) Selling: Though farm product prices are not under the control of the farmers, yet by adjustingthe timing of sales, farmers can obtain better prices. What to sell, where to sell, whom to sell, then to sell and how to sell are the important selling decisions that are to be made by the farmer.

What will happen if the farmer does not do farm management?

In the absence of good farm management, the farmer may experience losses in farming for the following the reasons:

- There is continuous changes in supply and price of agri inputs like seeds, fertilizers, irrigation, power etc.

- There is continuous change in prices of the produce (outputs) in the market due to demand and supply changes.

- There is continuous change in the farm technologies.

Therefore the objectives of farming as a business are:

- How to choose best variety/crop/cropping pattern
- How to minimise input cost by judicious use
- How to increase the production and productivity
- How to enhance the quality
- How to plan market driven production
- Choosing the better source of finance and better avenues for investment
- Efficient risk management

For better farm management, the farmer should have thorough knowledge of the following aspects:

- Farm map
- Soil slope and topography
- Soil type (physical and chemical properties)
- Soil colour such as red soil or black soil
- Weather parameter such as rainfall, temperature, relative humidity, etc.
- Vegetative cover such as trees, weeds, etc.
- Irrigation potential from borewell/tubewell/nala/channels
- Drainage facilities - whether water gets logged or not
- Technology available and whether the farmer can access them easily
- Risk factors like hand loans and high rate of interest
- Market facilities - whether they are near to his farm or far off
- Communication facilities like cell phone and internet connectivity
- Physical and infrastructure facilities such as godowns, roads for transport, vehicles, custom hiring centers, etc.
- Whether a farmer can afford the crop/animal he/she wishes to grow or rear considering the above conditions
- Supporting programmes and schemes/subsidies

Farmers should maintain farm records to have a holistic knowledge of their production system

For example: If a farmer maintains a record for all the cost of production such as inputs, labour, etc. for the entire crop cycle along with yield and income obtained from selling the produce, he/she can compare with the next crop cycle to understand whether his/her profit increased or decreased. The records also provides information on activities which contributed for his/her profit or loss so that, the farmer can take alternative decisions to enhance his/her net income.

1:00 pm- 3:00 pm: AGRONOMY: Cropping System and Pattern

CROPPING SYSTEM AND PATTERNS

Cropping system is an important component of a farming system. It represent cropping patterns used on a farm and their interaction with farm resources, other farm enterprises and available technology which determine their makeup. Cropping pattern means the production of area under various crops at a point of time in a unit area. It indicates the yearly sequence and spatial arrangement of crops and fallow in an area.

CROP ROTATION

Crop rotation is a process of growing different crops in succession on a piece of land in a specific period of time, with an object to get maximum profit from least investment without impairing the soil fertility. One cycle may take one or more farming years to complete.

PRINCIPLE OF CROP ROTATION

- The crop with tap roots should be followed by those which have a fibrous root system. This help in proper and uniform use of nutrients from the soil.

- The leguminous crops should be grown after non leguminous crops because legumes fix atmospheric N into the soil and add more organic matter to the soil.

- More exhaustive crops should be followed by less exhaustive crops because crops like potato, sugarcane, maize etc, need more inputs such as better tillage greater number of irrigation etc.

  On sloppy lands which are prone to erosion an alternate cropping of erosion promoting and erosion resisting crops like legumes should be adopted.

  Under dry farming the selection of crops should be such which can tolerate the drought. In low-lying and flood prone areas the crops should besuch which can tolerate water stagnation. The selection of crops should suitable for farmer's financial conditions. The crop selected should also suitable to the soil and climatic condition.

ADVANTAGE OF CROP ROTATION

1. Agricultural operations can be done timely for all the crops because of less competition.
2. Soil fertility is restored by fixing atmospheric nitrogen, encountering microbial activity, avoiding accumulation of toxins.

3. An ideal crop rotation helps in controlling insects, pests and diseases. It also controls the weeds in the fields.

4. Proper utilization of all the resources and inputs could be made by following crop rotation.

5. The farmer gets a better price for the produce because of its higher demands in the locality.

CROPPING SCHEME

- The cropping scheme is a plan according to which crops are grown on individual plots rain during a given period of time with the object of obtaining maximum return from each crop without impairing the soil fertility. Thus a cropping scheme is related to the most profitable use of resources, land, labour, capital and management.

PRINCIPLES OF CROPPING SCHEME

- **Areas under building and layout**: A proportionate area is allocated for buildings and layout. The farm area is 50 hectares or less, and then the area under buildings and layout allocated is 8 -10 percent of the total area, if the farm area is more than 50 hectares then the area allocated are only 5 per cent.

- **Number of plots**: The number of plots should be either equal to the duration of rotation or a multiple of that ,e.g., if the total duration of rotation in a cropping scheme is 5 years, then the number of plots must be 5,10,15,or 20.

- **Selection of the crops**: Selection of the crops depends upon the situation of the farm as discussed below.

CROPPING SYSTEM AND PATTERNS

Cropping system varies widely from the simplest system of two crops a year in sequence to complex intercropping with many crops. Multiple cropped lands can be broadly grouped into lowlands, irrigated uplands and rainfed uplands. Cropping patterns are the yearly sequence and spatial arrangement of crops or of crops.

SHIFTING CULTIVATION/LAND ROTATION / JHUMMING

1. Forest land is cleared and cultivated. Due to cultivation of the same crop on the same cleared forest land year after year soil productivity is lost and the crop is shifted to other slashed and burnt land.

2. Here same crop is grown year after year. In this case land is rotated but crop is fixed. Therefore, it may also be called as land rotation.

CROP ROTATION

1. Crop rotation is the reverse of land rotation. Here land is fixed but crop is rotated year after year.

2. On a certain land, repeated cultivation of crop or crop fallow land in a certain sequence is called crop rotation.

   Rice – Wheat – Mung(Green gram): Rice – Mustard – Chilli.

3. Maintains and even improves soil fertility and stabilizes income.

4. It checks the soil erosion and conserves moisture.

3:00 pm- 5:00 pm: AGRONOMY: Intensive Cropping

Definition:

Cropping system based on climate, soil and water availability have to be evolved for realizing the potential production levels through efficient use of available resources. The cropping system should provide enough food for the family, fodder to the cattle and generate sufficient cash income for domestic and cultivation expenses. These objectives could be achieved by adopting intensive cropping. Methods of intensive cropping include multiple cropping and intercropping.Intensive cropping may pose some practical difficulties such as shorter turn- around time lapse for land preparation before the succeeding crop and labour shortage at peak periods of agricultural activities. These practical handicaps can easily be overcome by making modification in the cropping techniques. Alteration of crops geometry may help to accommodate intercrops without loosing the base crop population.

TERMS AND DIFINATION

1. **Multiple cropping**: Two or more crops are grown on the same field in one year. Intensification of cropping is in temporal and spatial dimension.

2. **Sequential cropping**: Growing two or more crops in sequence on the same field in a year. The succeeding crop is sown/ planted after the preceding crop has been harvested. Crop intensification is only in time dimension and there is no intercrop competition. Some variation of sequential cropping is:

Double cropping: growing two crops per year in sequence.

Triple cropping: Growing three crops per year in sequence.

Quadruple cropping: Growing four crops per year in sequence.

Relay cropping: A significant part of the life cycle of the second crop overlaps with the cropping circle on the first crop.

3. **Rationing:** Cultivation of crop regrowth after harvest, although not necessarily for grain.

4. **Monoculture**: Repetitive growing of the same crop on the same land.

5. **Crop rotation:** Repetitive cultivation of an ordered succession of crop(or crops and fallow) on the same land. One cycle may take several years to complete.
6. **Intercropping:** Intercropping can be defined as growing two or more crops species, simultaneously in the same field during the growing season. Different types of intercropping are:-

   Mixed intercropping:The practice of growing component crop simultaneously with no dist0.

   inct row arrangement.

   Row intercropping: The component crops are grown simultaneously in different rows.

Strip intercropping: It is simultaneously growing of component crop in different strip to permit independent cultivation each crop.

Relay intercropping : Component crops are relay sown so that growth cycles overlaps.

7. **Main crop or base crop**: The crop which is planted at its optimum sole crop population in an intercropping situation.

8. **Component crop:** Individual crop species that are a part of the multiple cropping systems.

DAY -17: 10:00 am- 12:00 noon: SOIL TESTING:

The Importance of Soil Testing

Every area is different when it comes to soil types and nutrient contents in soil. Soil sampling and testing can show you the plant available nutrients and other soil chemical factors important for plants.

Nutrients levels in soil also vary from year to year, so it is important to perform soil sampling and testing prior to planting any new crop. It is important for farmers to follow certain recommended steps for soil sampling and testing to develop a fertility management program.

To ensure accurate results, standards must be set for performing soil sampling and testing. Here are some of the guidelines:

- Begin by evaluating each field to determine representative areas.
- Major areas within fields that have distinctly different soil properties, such as texture, should be sampled and fertilized as separate fields because of the potential for different nutrient requirements.
- Samples should be taken at 0.6, 6 to 12 and 12 to 24 inch depthsfrom 15 to 20 locations within each field.
- Each depth should be bulked into composite samples, air dried, and sent to a reputable soil testing lab.

FIVE REASONS WHY SOIL TESTING IS IMPORTANT TO FARMERS

1) Farmers will know the current condition of ilu-ir soil and how to improve it

Soil fertility is determined by the soil’s chemical, physical and biological properties Properties such as soil texture, color and structure are visible to the eye. However you can't see the chemical composition of soil. Therefore it needs to be measured. That is why soil sampling is essential. Soil tests are used to determine the soil's nutrient content and pH level. With this information you can define the exact type and quantity of fertilizer needed to be applied to improve your soil.This is important because fertile soils are necessary to grow healthy crops.

2) Farmers can minimise fertilizer expenditure

Knowing the exact type and quantity of fertilizers your soil and crops need prevents you from wasting money on unnecessary fertilizers.

3) With soil testing farmers can avoid over-fertilization

Applying manure without knowing the actual nutrient needs of your soil might lead to over-fertilization. Testing your soil and receiving a fertilizer recommendation prevents applying excessive amount of fertilizers and the related environmental damages. Over-fertilization might result in nutrient leaching, water pollution and irreversible harm to the aquatic animal life. A simple soil test can prevent this negative effect. Furthermore, overuse of fertilizer is harmful not only to the environment but also to the crops as it might cause fertilizer burn.

4) Farmers can avoid soil degradation

It is estimated that each year 24 billion tones of fertile soil are lost due to erosion which is a result of unbalanced soil management. Moreover, land degradation directly impacts the health and livelihoods of an estimated 1.5 billion people. Soil restoration is a difficult, costly and time-consuming process. Therefore, proper soil management in the form of soil testing and application of the right fertilizers is more efficient and financially justified.

5) Farmers with fertile soils can contribute to feeding the world's growing population

Nowadays we put more pressure on our soil than ever before. We need fertile soils to feed the world s rapidly growing population. Improved soil fertility means more crops worldwide, potentially closing the world's food gap. This will bring a better life for millions of people particularly in developing countries. Soil testing is the first step in soil fertility management.

Soil testing gives valuable information and helps you improve your soil's health. And healthy soils meanhealthy crops.

HOW TO COLLECT SOIL SAMPLE

How to Take a Soil Sample: The reliability of a soil test is only as good as the sample you submit. The small amount of soil in the sample bag you send to the Agricultural Testing Lab must represent the entire area to be fertilized. Avoid unusual areas such as those where fertilizer or lime has spilled. Take samples before lime, fertilizer, or manure are added. Use only clean equipment for collecting soil samples.

Where to sample: The area to be sampled should he as uniform as possible in terms of soil type and cropping and fertilizing history. For practical purposes it should be an area you expect to fertilize as a unit. This means separate samples for annual mixed vegetables and a strawberry patch, for golf green and fairway, and for different major crops in a commercial nursery or vegetable operation. If you have a problem on part of a lawn, garden, or commercial production field, you may wish to determine if soil fertility is the cause by taking one sample to represent the "good" and the other to represent the "poor" area.

Take a good sample: Collect a number of cores of slices by walking in a zig-zag pattern over the area. Mix cores thoroughly in a clean pail for a composite lab sample. The greater the number of collected cores mixed together, the better the sample will represent the average condition of the sampled area. Consider 10 cores as the minimum for home gardens and lawns up to 10,000 square feet in size. Larger areas should be represented by at least 15 to 20 samples. Choose one of the following tools:

Soil Probe or Auger – A soil prove or auger, available from mail order catalogs and garden or farm supply outlets, is the best tool for sampling. An auger will be needed if the soil is very stony or gravelly. Simply push the probe (or push and turn the auger) into the soil to the desired depth, lift up to remove the core, and place it in the clean pail. Sampling depth should be 4 to 6 inches deep for lawns, turf, or other perennial sod, or tillage depth (usually 6-10 inches) for annually tilled crops.

Garden Trowel or Shovel - If a soil probe or auger is not available, collect your sample by pushing the blade of a garden trowel, shovel, or spade into the soil to the desired depth. Cut out a triangular wedge of soil and set it aside(to be replaced after sampling). Now slide your blade into the soil again taking a thin (half inch) slice from one side of the hole. With a knife, trim the slice to about a 1-inch strip of soil down the center of the spade - top to bottom. Save this “core” as part of your composite lab sample.

Mix the sample and fill the sample bag: Make sure that all the cores are thoroughly mixed together. Your soil test mailer contains a plastic bag intended for one lab sample. Fill plastic bag about ½ full (approximately 1 cup) with the mixed sample.

1:00 pm- 3:00 pm: HORT-I: Cauliflower Cultivation

Cauliflower (Brassica oleracea).

Cauliflower is a cool season grown for its white and tender curd. The curd contains a good amount of vitamin B and protein. It is also a rich source of minerals namely phosphorus and sodium.

1. Varieties:

Varieties must be selected according to their growing season.
Selection of the varieties is one of the factor for growth & development of the crop.

Yield potential of different varieties/hybrids.

Season	varieties/hybrid	Days of Maturity	Yield (qt/Ha)
Early	Himkaran (hybrid)	45	247
	Pusa Early Synthetic (OP)	68	230
Mid	Pusa Sharad (OP)	72	320
	No 497 (hybrid)	70	240
Late	Himani (hybrid)	90	440
	Mahima (hybrid)	92	310
	Poosi (OP)	95	250
	Meghalaya(OP)	150	420

2. Climate and Soil:- Temperature plays an important role for growth and development though it can be grown in a wide range of climate. Well drained soil rich in nutrients loam to sandy loam are considered to be the best soil. The optimum temperature range for curd initiation and development is 20^oc-25^oc for early season, 15^oc-20^oc for mid season and 8^oc-12^oc for late season. The crop can be grown in a pH of 6.0-7.0.

3. Time of sowing:-

Early season : June-July.
Mid season : August-September.
Late season : October-November.

4. Seed Rate:-

Early crop requires 600gm/ha.
Mid and late crop requires 400-500gm/ha.

5. Nursery Raising:- The nursery bed should be prepared by mixing well rotten FYM or compost@ 4kg/m^2 with the soil. Nursery beds should be 1m wide and raised 15cm.above the ground. Beds should be properly drenched with Trichoderma harzianum@ 5gm in lit of water to prevent the soil insecticides as well as fungal incidence. The seeds should be sown in lines at a spacing of 8-10cm between rows and 1.5-2cm between seeds at a depth of 1.5-2cm. The seed should be covered with sand and FYM mixture. in rainy season the nursery is raised under low cost poly house or poly tunnels. Weeding and intercultural operation should be alone at regular intervals. Nursery beds should be irrigated with watering can.

6. Spacing:-

Early season : 45x30cm.
Mid season : 60x45cm.
Late season : 60x60cm
.

7. Transplanting:- Generally, 4-6 weeks old healthy seedlings with 4-5 leaves should be transplanted. Before transplanting, hardening of seedlings should be done by withholding of water for 4-5 days prior to transplanting. Transplanting should be done in the afternoon for better establishment.

8. Manures and Fertilizers:- About 20 tonnes FYM or well rotten cowdong should be added in the soil one month before transplanting in the soil. Besides FYM, Biofertilizers such as Azotobacter 2.5kg + phospholika 2.5 kg for one hectare as seedling root dip method to enhance soil fertility. Organic manure such as Anandhan @ 100kg-150kg/ha can also be incorporated to improve soil fertility and provide nutrient to the crop.

9. Weeding and Earthing up:- Weeds need to be adequately controlled because they are efficient competitors with the crop for nutrients, moisture and light. Weed can be controlled physically, mechanically and biologically followed by earthing up. Two to three weeding is sufficient to control the weed

10. Plant Protection Measures:-
Leaf webber:- The leaves are skeletonized by the larvae which remain on the under surface of leaves in webs and feed on them. They also attack flower buds and pods. The insect commonly attack on early grown crops.

- Picking and destructing of the larvae at the early stages of crop.
- Spray with Helicon-L/biopower/baba (beauveria bassiana) @ 80gm/16lit of water as foliar application.

Damping off:- It is a common diseases of nursery. In severe condition, the affected seedling drooped and fall off due to infection at the collar region.

- Soil treatment is effective to control the diseases. Mix 1kg of Trichoderma Viride formulation in 100kg of Farmyard manure. Cover the mixture for 7(seven) days with polythene sheet. Turn the mixture in every 3 – 4 days interval and broadcast it in the field at an area of 1acre before transplanting.

Downey mildew:- it is a serious and may appear from nursery to curd formation stage. Fine hairs like Downey growth of fungus observed on the lower surface of leaves. Corresponding to the fungal growth, there is a minute pinhead brown necrotic spots visible on the upper surface of leaves, which later on coalesced to each other.

- Field sanitation is to be maintained.

- Select diseases free seed.
- Crop rotation with non-brassicaceae crops should be followed to reduce the disease.

Black rot:- The pathogen attacks primarily the above ground parts of plants. The leaves midrib forming ‘V’ shaped area, which is the most characteristics symptoms of the disease. The bacterium is transmitted through seed.

- Seed treatment with hot water at 50^{o} C for 30 minutes is found effective to control the disease.
- Seed treatment with Trichoderma spp @ 5-10gm/lit of water + 5-10ml/lit of water Pseudomonas fluorescens . Prepare this solution, dip the roots of seedlings for about 15 minutes and dry in shade for 30 minutes before transplanting.

11. DISORDER:-

Buttoning: - The causes for buttoning are over-aged seedlings, poor nitrogen supply, wrong cultivars (when early variety transplanted late). The cause of buttoning may generally be explained as any check in the vegetative growth of the seedlings.

Whiptail:- It is due to the deficiency of molybdenum. Young cauliflower plants due to this deficiency become chlorotic and may turn white, particularly along the leaf margins, they also become cupped and wither. The whiptail develops with high nitrate supply and low molybdenum. Apply 1 kg /ha. Molybdenum along with bio fertilizers at the time of sowing.

12. HARVESTING: - The harvesting is to be done as soon as the curds attain right maturity and compactness. If the harvesting is delayed, the curds becomes over mature, its quality deteriorated and turned into loose, leafy, ricy or fuzzy.

13.YIELD: - Early maturing varieties have an average yield of 150-200 qt/ha. The mid season varieties give an average yield of 250-300 qt./ha. However the late season varieties yield about 300- 450 qt./ha.

3:00 pm- 5:00 pm: FARM MANAGEMENT: Farm Resource and Farm Planning

FARM RESOURCES AND FARM PLANNING

Farm Resources*:*

To make good farm management decisions, farmers need some basic knowledge on farm resources such as the extent of land available for cultivation, source of irrigation, family labour, availability of labour, skill level of labours, livestock, availability of fodder, availability of farm machinery, availability of inputs such as seeds and fertilizers, credit requirement and availability, source of credit, market demand for produce, infrastructure such as cold storage and godowns. etc.

For example, regarding manpower and livestock the farmers have to understand following issue:

Man Power

- Skill:Is the labour employed is skilled, e.g. cotton picking skill?
- Knowledge: Does the farmer/labour have a thorough knowledge of the package of practices of the crop?
- Attitude:Does he/she have a positive attitude towards the technology?

Live Stock

- Breed: Selection of a suitable breed
- Production capacity:For instance, milk production, meat production and egg laying capacity.
- Adaptability:Does the selected breed adapt to the local situation?
- Drafting capacity:Knowledge on the draught capacity of animal.
- Resistance:Is the foreign breeds resistant to local Indian conditions. E.g. the Holstein Fresian

is highly sensitive to high temperatures.

- Feeding habit:Are the upgrade breeds or imported breeds capable of feeding on locallyavailable feed materials

Know your farm resources

Inputs	Tools and equipment	Labour	Money	Land
Seeds Fertiliser Insecticide Fungicide	Plough, hoe, sprayer, thresher, Tractors	Family and Paid workers	Self finance and credit	Own / Rented land Share-cropping

What does one need to know about the market if one wants to do good business?

The market for agricultural produce	The market for inputs and equipment
The location of the market	The locations of sale
Who is the buyer?	Who sells the inputs and equipments?
The quality of product that is demanded by the market	The quality of inputs and equipment
The price of the product compared to other markets	The price of sale of the inputs and equipments
When to sell	When to buy

How does the price of agricultural products change?

The price of agriculture products change according to the season of the year	The price of agriculture products change between years
At times of abundance, the prices are lowest	The price of a product that is needed by more and more people will rise from one year to the next
At times of scarcity, the prices are highest	The price a product that is produced in greater abundance will fall from one year to the next
The quality of inputs and equipment	
The price of sale of the inputs and equipments	
When to buy	

Manage your farm for enough income to sustain yourself

FARM PLANNING:

Farm planning is to help the farmers to move to a higher level of production

and income, starting from where he/she is now with the resource available to him/her. In this process,

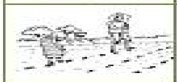
the farmer has to consider different types of enterprises like:

- Land based (agril. production activities, pisciculture, plantation, seed production, etc.)
- Animal component based (diary, poultry, goatery, piggery, duckery, etc.)
- Nursery/orchard
- Non-land based (mushroom, apiculture, vermiculture, etc.)

In the present example, three crops namely paddy, cotton and maize have been taken into comparison for one season. With these three crops, farmers can grow the following combinations in a year:

- Paddy – Paddy (Kharif followed by Rabi)
- Paddy – Maize (Kharif followed by Rabi)
- Cotton – Maize (Kharif followed by Rabi)
- Maize – Maize (Kharif followed by Rabi)

Example for Agricultural Calendar of Operations to Plan the Production of Paddy

The times of work...													
Of the main season are shown by a square													
Of the off-season are shown by a circle													
The tasks of the farmer		January	Feb.	March	April	May	June	July	August	Sept.	October	Nov.	Dec.
	Prepare the field												
	Plough the field												
	Purchase seeds												
	Sow												
	Fertilizer application												
	Weeding												
	Apply insecticide												
	Harvest and store												

Activity	Unit	Quantity	Price	Total (Rs.)
Preparatory cultivation				
a) Machine / labour	No of hours			
b) Animal / labour	Days			
Sub Total				
Seeds and sowing				
a) Cost of seed	Kgs			
b) Cost of seed treatment				
c) Cost of sowing (Human Labour)	Days			
d) Cost of thinning/gap filling	Days			
Sub-Total				
Manures and Fertilizers				
a) Cost of organic & Green Manuring (In-situ plouging)				
b) Application cost				
c) Cost of fertilizer	Kgs	N		
		P		
		K		
d) Application cost (Human Labour Male)	Days			
Sub-Total				
Weed control				
a) Cost of Manual weeding	Labour			
b) Cost of herbicide if any (butachlor)	Litre			
Sub-Total				
Plant Protection				
a) Cost of bio-agents				
b) Cost of pesticides (Thiamethoxam/profenophos)	Litres			

Example for Farm Manager tokeep Records on Cost of Cultivation and Return from Paddy

Activity	Unit	Quantity	Price	Total (Rs.)
Furadon-3G	Kg			
c) Cost of Application	Labour			
Sub-Total				
Irrigation cost if any	Power	month		
Sub-Total				
Cost of harvest				
a) Combined harvester	Hours			
Post harvest charges				
b) Cleaning and bagging (Human Labor)	days			
Sub total				
Total cost of cultivation				
Yield Kgs/Ha. and returns				
a) Qty. produced Qtls. per ha	qtls			
b) Gross returns received per ha (Rs.)				
c) Total cost involved per Ha (Rs.)				
d) Net returns per Ha (Rs.)				
e) Cost benefit ratio (Gross Returns divided by Total Cost)				

Main Lessons

- To know if you are doing successful business with a crop, you need to know the "Income" and "Expenditure" accurately.
- The farmer records the inputs & labour used in a field, and calculates the "Income" and "Expenditure"
- From the "Income" the farmer subtracts the Expenditure. The result indicates whether farm is making profit or loss.
- The farmer makes a PROFIT or GOOD BUSINESS if the "Income" is greater than the "Expenditure."
- It is a LOSS, if the "Expenditure" is greater than the "Income." In that case it is BAD BUSINESS.
- A loss is illustrated by the the minus (dash) and a profit by the plus in front of the number.
- A good farmer will abandon loss making crop or use a better technique to make a profit.
- To ensure a profit, the farmer needs to visualise Income and Expenditure before production.
- The Difference between Income and Expenditure indicates whether we are making a loss or profit from the use of the land.
- The Unit Cost of a crop indicates if it can compete with the same crop produced elsewhere.

In the case of food crops, the Unit Cost indicates if it is preferable to buy the produce in the market.

• The good farmer calculates well ahead of the season to decide what to produce and which techniques to use.

• During the production season the good farmer keeps records on money spent for farm operations and inputs.

• After the harvest, the good farmer evaluates the profit and identifies what changes are neededto improve the planning and profit for the next production season

What are Fixed Costs?

Certain costs are called fixed costs. These are costs for equipment and tools that the farmer owns and are used for various crops over several years, such as sprayers, irrigation pumps, buildings etc. The Fixed Costs do not vary with the size of the field.`

What are Variable costs (VC):

The costs that are incurred on variable inputs and hence vary with the level of production are called variable costs. Higher the production more will be VC and vice-versa. Expenses on fertilizer, seed, chemical fuel consumption, etc.

Comparing the gross margins of different crops and the production techniques, helps to make decisions on using the land to maximise revenue.

This comparison is important to all agricultural entrepreneurs.

• Comparing the labour productivity helps to identify the crops and techniques that make best use of labour (family or wage labour). It also indicates if it is profitable to work on your own farm.

• Comparing the capital productivity indicates which crops or production techniques make best use of money invested.

• Production decisions are based on these comparisons.

• The good agricultural entrepreneur knows that a fluctuation in prices constitutes a risk and revenues. Risks are concern for traditional as well as improved varieties and techniques.

• To evaluate the impact of this market risk, the entrepreneur calculates estimated the grossmargin with a much lower price (pessimistic) than the current price (or last season's price). Ifthe pessimistic gross margin estimate can still satisfy the revenue objectives, then the risk is acceptable.

• To evaluate the impact of production risks, the agricultural entrepreneurs calculate a grossmargin using a yield lower (pessimistic) than expected. If the pessimistic gross margin estimate can still satisfy the revenue objectives, then the risk is acceptable

DAY -18: 10:00 am- 12:00 Noon: ORGANIC FARMING: Vermicompost

Vermicomposting is a method of preparing enriched compost with the use of earthworms. It is one of the easiest methods to recycle agricultural wastes and to produce quality compost. Earthworms consume biomass and excrete it in digested form called **worm casts.** Worm casts are popularly called as **Black gold.** The casts are rich in nutrients, growth promoting substances, beneficial soil micro flora and having properties of inhibiting pathogenic microbes. Vermicompost is stable, fine granular organic manure, which enriches soil quality by improving its physicochemical and biological properties. It is highly useful in raising seedlings and for crop production. Vermicompost is becoming popular as a major component of organic farming system.

Vermicomposting materials

Decomposable organic wastes such as animal excreta, kitchen waste, farm residues and forest litter are commonly used as composting materials. In general, animal dung mostly cow dung and dried chopped crop residues are the key raw materials. Mixture of leguminous and non-leguminous crop residues enriches the quality of vermicompost.

There are different species of earthworms viz. *Eiseniafoetida*(Red earthworm), *Eudriluseugeniae*(night crawler), *Perionyxexcavatus*etc. Red earthworm is preferred because of its high multiplication rate and thereby converts the organic matter into vermicompost within 45-50 days. Since it is a surface feeder it converts organic materials into vermicompost from top.

Important characteristics of red earthworm (Eiseniafoetida)

Characters		
Body length	-	3-10cm
Body weight	-	0.4-0.6g
Maturity	-	50-55days
Conversion rate	-	2.0 q/1500worms/2 months
Cocoon production	-	1 in every 3 days
Incubation of cocoon	-	20-23days

Types of vermicomposting

The types of vermicomposting depend upon the amount of production and composting structures. Small-scale vermicomposting is done to meet the personal requirement and farmer can harvest 5-10 tonnes of vermicompost annually. While, large-scale vermicomposting is done at commercial scale by recycling large quantity of organic waste with the production of more than 50 – 100 tonnes annually.

Methods of vermicomposting

Vermicromposting is done by various methods, among them bed and pit methods are more common.

Bed method: Composting is done on the pucca / kachcha floor by making bed (6x2x2 feet size) of organic mixture. This method is easy to maintain and to practice (Fig.1).

Pit method: Composting is done in the cemented pits of size 5x5x3 feet. The unit is covered with thatch grass or any other locallyavailable materials. This method is not preferred due to poor aeration, water logging at bottom, and more cost of production.

Process of vermicomposting

Following steps are followed for vermicompost preparation

1. Vermicomposting unit should be in a cool, moist and shady site

2. Cow dung and chopped dried leafy materials are mixed in the proportion of 3: 1and are kept for partial decomposition for 15 – 20 days.

3. A layer of 15-20cm of chopped dried leaves/grasses should be kept as bedding material at the bottom of the bed.

4. Beds of partially decomposed material of size 6x2x2 feet should be made (fig.3).

5. Each bed should contain 1.5-2.0q of raw material and the number of beds can be increased as per raw material availability and requirement.

6. Red earthworm (1500-2000) should be released on the upper layer of bed (fig.4).

7. Water should be sprinkled with can immediately after the release of worms (fig.5)

8. Beds should be kept moist by sprinkling of water (daily) and by covering with gunny bags/polythene (fig.6)

9. Bed should be turned once after 30 days for maintaining aeration and for proper decomposition.

10. Compost gets ready in 45-50 days (fig.7).

11. The finished product is 3/4th of the raw materials used.

Harvesting

When raw material is completely decomposed it appears black and granular. Watering should be stopped as compost gets ready. The compost shout be kept over a heap of partially decomposed cow dung so that earthworms could migrate to cow dung from compost (fig.7). After two days compost can be separated and sieved for use (fig.8).

Preventive measures

1. The floor of the unit should be compact to prevent earthworms' migration into the soil.

2. 15-20 days old cow dung should be used to avoid excess heat.

3. The organic wastes should be free from plastics, chemicals, pesticides and metals etc.

4. Aeration should be maintained for proper growth and multiplication of earthworms.

5. Optimum moisture level (30-40 %) should be maintained

6. 18-25oC temperature should be maintained for proper decomposition.

Nutrient content of vermicompost

The level of nutrients in compost depends upon the source of the raw material and the species of earthworm. A fine worm cast is rich in N P K besides other nutrients. Nutrients in vermicompost are in readily available form and are released within a month of application.

Advantages

The following are the advantages of vermicompost :

1. It provides efficient conversion of organic wastes/crop/animal residues.

2. It is a stable and enriched soil conditioner.

3. It helps in reducing population of pathogenic microbes.

4. It helps in reducing the toxicity of heavy metals.

5. It is economically viable and environmentally safe nutrient supplement for organic food production.

6. It is an easily adoptable low cost technology.

Doses

The doses of vermicompost application depend upon the type of crop grown in the field/nursery. For fruit crops, it is applied in the tree basin. It is added in the pot mixture for potted ornamental plants and for raising seedlings. Vermicompost should be used as a component of integrated nutrient supply system.

Crops		**Dose/rate**
Field crops	-	5-6t/ha
Fruit crops	-	3-5kg/plant
Pots	-	100-200g/pot

1:00 pm- 3:00 pm: MARKETING: Meghalaya State Agricultural Marketing

There are at present, two APMCs in the state of Meghalaya

1. Mawiong Regulated Market
2. Garobadha Regulated Market

Mawiong Wholesale Regulated Market Its Activities, Functions and Achievements.

Market Regulation in Meghalaya:

The State Agricultural Produce Marketing Act was enacted in the year 1980 and the State Agricultural Marketing Board was set up in 1983, to develop marketing infra structural facilities and to provide marketing support to the farmers in the State. In the year 1991, with the assistance of the Centre for Agricultural Marketing, Government of India located at Jaipur, detailed survey was conducted and a project profile for development of marketing infrastructure in Meghalaya was prepared. Accordingly, it was proposed to set up secondary markets in each District in the State which are called Wholesale Regulated Market. Thus, land was made available at Mawiong in the East Khasi-Hills District, Garobadha in the West Garo Hills District and Williamnagar in the East Garo Hills District.

Objectives of Regulated Market:

The avowed objectives of regulated market since its very inception has been to regulate market practices, to protect the economic interest of the producers/sellers and to help them in obtaining remunerative price for their produce. The institution of regulated market, considered as a panacea against most of the evils that prevailed in the agriculture marketing system, helps ensure an orderly and efficient marketing system with rationalised trade practices and procedures.

Functions of Regulated Market:

Regulated market occupies a place of paramount importance in the contemporary agricultural marketing scenario. Creations of marketing infrastructure like storage godown, auction platform, grading platform, internal roads, other supporting services and facilities, introduction of standardised marketing practices, elimination of unauthorised deductions, reasonable and standardised market charges, correct weighment, timely payment, settling of market disputes etc. are some of the parameters of successful functioning of regulated market. Genesis of Mawiong Wholesale Regulated Market: The Development of Mawiong Regulated Market was started on a plot of land which consisted of a steep slope and depressed marshy land. In about five years time, the entire area was transformed. On 12th August 1996, the first actual transaction could be started in the regulated market, where the trading of potato was initially taken up for buying and selling. The response of the farmers and the traders was very enthusiastic and has stood in good stead to bring the market to this present form. With the commissioning of the Mawiong Wholesale Market, the wholesale trade of Potato, Tezpatta, Broomstick, Torch wood and CP Bark was taken up by the regulated market in right earnest.

The market was formally inaugurated by the then Hon. Chief Minister, Shri. SalsengMarak on the 17thSeptember 1996 which was a red letter day in the history of agricultural marketing in the State.

Infrastructure created in the Regulated Market:

With the establishment of regulated market in the State, the Meghalaya State Agricultural Marketing Board with financial assistance from the Government of India, has created the following infrastructure in the Mawiong Regulated Market.

1. Trader Store cum Storage Go-downs
2. Auction Platform.
3. Grading Platform.
4. Bank.
5. Rest House.
6. Parking Yard.
7. Drinking Water Facilities.
8. Latrines.
9. Entry and Exit Roads.
10. Market Committee Office Building.
11. 1000 MT capacity Meg Cold Storage.

Present Activities of the Market Committee:

The Mawiong Market Committee was duly constituted comprising of representatives from the government, farmers, traders, co-operative societies, local bodies to implement and enforce the provisions of the Act, Rules and Bye laws as provided in the Meghalaya Agricultural Produce Market Act, 1980. The Market Committee is collecting and disseminating market intelligence on prices, arrivals from villages and despatches to outstation markets on a daily basis. These reports are also regularly passed on to various central government department, State government departments etc. The Market Committee is also collecting market cess from traders @ one rupee per one hundred rupee advalorem (custom duties) within the regulated market. Training and other awareness generation programmes are also undertaken by the Market Committee functionary from time to time on the functions of regulated market. Facilities provided in the Regulated Market: As mentioned earlier, infra structural facilities have been created inside the market for the benefits of the traders and farmers who operate inside the market. Besides other supporting services and facilities are available for the benefit of the farmers. These are:-

1. Standardised and verified Weight and Measures.
2. No Entry or Toll tax. Free temporary storage of unsold produce in the market yard.
3. Transportation of farmer’s produce from villages to the regulated market by the market committee’s two nos. of trucks at very reasonable charges.

4. Round the clock security inside the market complex.
5. Provision of rest house for farmers who wish to stay overnight.
6. Clean drinking water supply.
7. Provision of latrines inside the market.
8. Spacious parking yard for vehicles coming from villages/outside the state.
9. A branch of the Meghalaya Co-operative Bank inside the Market for business transaction of farmers and traders.

3:00 pm- 5:00 pm: PRACTICAL

DAY -19: 10:00 am- 12:00 noon: PLANT HEALTH MANAGEMENT: Importance of Plant Health Management

DEFINITION

- Plant health management is the science and practice of understanding and overcoming the succession of biotic and abiotic factors that limit plants from achieving their full genetic potential as crops, ornamentals, timber trees, or other uses.

- The greatest scientific and technical advances for plant health management have come from the work aimed at management of the pathogens, pests, and other hazards that arrive by air.

IMPORTANT OF PLANT HEALTH MANAGEMENT

- Agriculture is influenced by an array of biotic and abiotic stresses, which have to be managed through multipronged strategies. A strategic science based approach is needed to address the plant health risks and issues that affect productivity. The looming threat of climate change may further exacerbate the crop losses due to pests. The integrity of agro-ecosystem is vital for sustainable agriculture.

- Intensive use of ecosystems to enhance productivity can affect agro-ecosystems through soil erosion, water depletion / contamination, biodiversity loss and disruption in flow of ecosystem services, which will have a bearing on plant health and biosecurity

- The indiscriminate use of chemical pesticides has been causing wide spread environmental pollution, resistance, resurgence of insect pests and is impacting food safety. Plant Health Management is vital for the sustainable agriculture, food security, food safety, agro based industries and economy of a country

CONCEPT OF PLANT HEALTH MANAGEMENT

A) Agro-ecosystem Analysis based Plant Health Management and Ecological Engineering for Pest Management

- Crop specific AESA - Rice

- Crop specific AESA - Vegetables

B) Agro-ecosystem Analysis (AESA) and Ecological Engineering (EE) for Pest Management

C) Fundamentals of Plant Health Management for Plant Health Doctors

D) Rhizosphere Engineering

E) Farmers Field School Methodology

Integrated Pest Management Strategies

B. Chyne, SMS (Plant Protection) KVK, East Khasi hills

Integrated Pest Management Strategies for Tomato

Nursery raising

- Prepare raised nursery beds about 10 cm above ground level for good drainage to avoid damping off etc.
- Cover the beds with polythene sheet of 45 gauge (0.45 mm) thickness for three weeks before sowing for soil solarisation.
- Mix 150 gm of fungal antagonist *T. harzianum* in 3 kgof *FYM* and leave for about seven days for enrichment. After 7 days mix in the soil in a bed of 3 sq. m.
- Treat the seeds of popular hybrids with *T. viride @ 4 gm/ kg.*
- Use nylon net of 40 gauge mesh for leaf curl management.
- Transplant a row of marigold after every 16 rows of tomato as a trap crop. Marigold should be 15 days older than tomato plants so that they flower at the same time.
- First and last row of plots should be marigold and it should be sprayed with *HaNPV.*
- Adopt wide spacing of 60 x 45 cm (for varieties) and 90x 60 cm (for hybrids) to reduce the chance of spread of diseases.
- Apply neem cake @ 250 kg/ha at 20 DAP to reduce fruit borer, leaf miner and nematode.
- Spray of 5% NSKE at 15 DAP has also been found to be effective against leaf-miner.
- Transplant a row of marigold after every 16 rows of tomato as a trap crop. Marigold should be 15 days older than tomato plants so that they flower at the same time.
- First and last row of plots should be marigold and it should be sprayed with *HaNPV.*
- Adopt wide spacing of 60 x 45 cm (for varieties) and 90x 60 cm (for hybrids) to reduce the chance of spread of diseases.
- Apply neem cake @ 250 kg/ha at 20 DAP to reduce fruit borer, leaf miner and nematode.
- Spray *Trichoderma harzianum* + *Pseudomonas florescence* for managent of late blight.
- Spray of *Pseudomonas florescence* for managent of bacterial blight.
- Use of yellow sticky traps for white fly

IPM Strategies for cole crops

Cabbage

Nursery raising

- Prepare raised nursery beds about 10 cm above ground level for good drainage to avoid damping off.
- Cover the beds with polythene sheet of 45 gauge (0.45 mm) thickness for three weeks before sowing for soil solarisation for reducing the soil borne pests. Sufficient moisture should be present in the soil.

- Seed treatment with *Trichoderma viride @ 4g/kg of seed in nursery to* prevent infection of soil borne/seed borne fungal
- Apply 1kg of FYM mix in 1m2 and can be applied even in main field.
- Drench the nursery beds with *Trichoderma viride* @ 4g/liter of water

Main crop

- Growing of two rows of mustard after every 25 rows of cabbage as a trap crop at the time of planting and ensure that first and last row of plot are also mustard.
- Adopt wide spacing of 60 x 45 cm to reduce the chance of spread of diseases.
- Use light traps for adult DBM @ 3 traps/acre. Hang a bulb over a bucket of water and within 3-4 days most of the adults get killed.
- Spray *Baccillus thuringiensis* or Dipel @ 1 g/lit orspray NSKE 5% if *DBM* is noticed early.
- Release egg parasitoid *Trichogramma brassicae* at 50,000 eggs/ha 3-4 times at weekly interval for cabbage butterfly
- For controlling *Spodoptera* mechanically collect and destroy gregarious young larvae and set up traps for mass trapping.
- Periodically remove and destroy disease affected leaves.
- Seed treatment with hot water at 50◦C for 30 minutes for management of black leg and black rot diseases.

IPM Strategies for Potato

Potato tuber moth

- Plant the tubers at a depth of 10 cm
- Cover all the exposed tuber during earthing up
- Store the potatoes in a shelve by spreading it with saw dust, sand and cover then cover with lanata dried leaves upto 2-2.5 cm
- Use light trap
- Cover the opening of the ventilators of the store room or godown with wire or nylon net

White Grub

- Spray multineem @ 2.5 ml/l of water
- Use EPN (Soldier) @ 2.5g/l of water in the soil
- Use *Beauveria bassiana* or *Metarhizium* sp @ 5g/l of water and drench in the soil

Cut worms

- Use *Beauveria bassiana* or *Metarhizium anisopliae* @ 5g/l of water and drench in the soil
- Spray multineem @ 2.5 ml/l of water

Diseases in Potato crop

Late blight

- Resistant varieties kufri Giriraj, Kufri Girdhari, Kufri Megha, and Kufri Kanchan, Kufri Himalini
- Tuber treatment with *Trichoderma* sp @ 5g/kg of seeds
- Foliar application with *Trichoderma* sp + Pseudomonas florescence @ 5g/l of water
- FYM treated with *Trichoderma* sp @ 2.5 kg/100 kg of FYM

Bacterial wilt

- Crop rotation with rice, wheat and maize
- Application of *Trichoderma* sp + *Pseudomonas florescence* @ 5g/l of water

1:00 pm- 3:00 pm: PRACTICAL

3:00 pm- 5:00 pm: PUBLIC HEALTH: First Aid

First Aid is the help given to any person who sustains an injury or suddenly falls ill, the first care provided to such a person, so as to preserve his life or prevent the condition from worsening.

First Aid Box, can be in the form of a first aid box or a synthetic bag or pouch made of leather or any such material.

The components of a First Aid Box are:

a) Roller Bandage
b) Cotton
c) Gauze Pad
d) Band aids of various shapes and sizes
e) Surgical adhesive tape
f) Pair of sterilized scissors, tweezers, 10 and 20 cc syringes.
g) Betadine Solution
h) Sterilized Water
i) Towels (Hand Towels)
j) A bottle of normal saline for clearing wounds
k) Antibiotic ointment like Neosporin ointments,soframycin, silverex, sucral m gel
l) Betadive ointment, calamine lotion sunscreen
m) Non-adhesive dressings
n) Sterile pair of gloves, mask, gown
o) Percil torch, thermometer
p) Towels, rolled into small pillows.
q) Safety pins
r) Splint/Krawer wire wrapped around with several layers of bandages and cotton or made with card board and wrapped around with layers of cotton and bandages that can be use to provide support to injured upper or lower limb.
s) Clean cloth, that can be folded into various shapes like triangular or rectangular to be used as sling.
t) ORS-powder, antibiotics to treat diarrhoea like Norflox tz, or O_2. Pain medication like zerodol, diclofenac, plain paracetamol. Antiemetics like ondensetron, anti allergy like livocetirizine tab 5 mg.
u) Cups of various sizes
v) Non adhesive pads for burns
w) First Aid manual, mirror blanket etc.
x) Sterile syringes 2cc and 5cc
y) ambubag

How to prepare gauze pads

1) Cut two parts of rolled bandage 5” by 6”
2) In between the two roller gauzes fill in sterile cotton so that it forms a sandwich in between.
3) Sterilize the pads, if sterilizer is available.

Common injuries treated are burns, cuts, abrasions, stings, splinters, sprains, strains, allergies, skin problems, open wounds.

Cardio Pulmonary Resuscitation (CPR) is a life saving technique useful in many emergencies, including a heart attack, near drowning in which someone's breathing or heart beat has stopped. The American heart association recommends that everyone untrained bystanders and medical personal alike begin CPR with chest compressions.

Advice from American heart association is-

For untrained persons – Provide hands only CPR. Uninterrupted chest compressions of 100-120 min. No need to try rescue breathing.

Trained and Ready to go.

First Aid

CPR

Check first to see if there is pulse and the patient is breathing. If there is no breathing or pulse, begin chest, compressions with 30 chest compressions starting with chest compressions first before giving 2 rescue breaths.

For the trained and rusty

Just do chest compression at the rate of 100-120 min. CPR can give oxygenated blood flow to the brain and other vital organs. Until more definitive medical treatment can restore a normal heart rhythm.

Remember the ABC.

1) Open the airway, by head tilt chin lift manoeuvre
2) Restoring the circulation

CPR in adult

1) Kneel by the patient, place the heel of one hand over the centre of chest, between nipples. Place the other hand on top of the first hand. Keeping elbows straight and shoulders above hands. Use upper body as your compress the chest atleast 2". Push at the rate of 100-120 compressions a minuter

Breathing

Rescue breathing can be mouth to mouth or mouth to nose breathing if the mouth is seriously injured.

1) Using head tilt chin lift manoeuvre pinch the nostrils, and cover the person's mouth with yours making a seal.
2) Prepare to give 2 rescue breathe, give the first breath – lasting one second and watch to see if the chest rises. If it does rise, give the second breathe. If the chest does not rise, repeat the head tilt, chin lift manoeuvre, and then give the second breath 30 chest compressions followed by 2 rescue breathe is considered one cycle. Please be careful not to provide too many breaths or to breathe with too much force.
3) Rescue chest compressions to restore circulation.
4) Continue CPR until there are signs of movement or emergency medical personnel take over.

To perform CPR on a child

From age 1 year through puberty. It is same as that of an adult:

1) Put the child on his or her back on a firm surface.
2) Kneel next to the child's neck and shoulders.
3) Use two hands or only one hand if the child is too small to perform chest compressions. Press straight down the chest for about 2". Push at the rate of 100-120 min.

Airway opening for child

Use 30 compressions: 2 breathe

1) With airway open, head tilt chin lift manoeuvre, pinch the nostrils give mouth to mouth breathing.
2) Give 2 rescue breathe.

Perform CPR on a baby 4 weeks old and older:

Most cardiac arrest in babies occur from lack of oxygen, as from drowning or choking.

1) Place the baby on his or her back on a firm flat surface, such as a table.
2) Imagine a horizontal line drawn between the nipples place two fingers of one hand just below this line, in center of chest.
3) Gently compress at 1.5 inches you should pump at rate of 100-120/min.

Opening the airway

After 30 compressions, gently tip the head back by lifting the chin with one hand, and pushing down on the forehead with the other hand.

Breathing/Breath for the baby

1) Cover the baby's mouth and nose with your mouth prepare to give two rescue breaths. Use the strength of your cheeks, to deliver gentle puffs of air. Take one second for the breath. Watch if the baby's chest rise, repeat the head tilt chin lift manoeuvre and then give second breath.
   If the baby's chest still does not rise, continue chest compressions. Give 2 breaths after every 30 chest compressions. If two people are conduction CPR, gives 2 breaths after every 15 chest compression.

Snake Bites

Most snake bites are innocuous and are delivered by non poisonous species. North America is home to 25 species of poisonous snakes world wide only 15% of the more than 3000 species of snakes are considered dangerous to humans.

Enzymatic proteins in venom imparts its destructive properties. Proteases, collage nases and arginine hydro lase have been identified in pit viper venom. Neurotoxins comprise the majority of coral snake venom hyaluronidase allows

1) rapid spread of venom through subcataneous tissues by disrupting mucopolysaccharides
2) Phospholipase A2
3) Thrombogenic Enzymes promotes the formation of a weak fibrin clot, which in turn activates plasmin and results in consumptive coagulopathy and haemorrhage. Rattle snakes can leave impressive wounds and cause systemic toxity. Coral snakes may leave a small wound that results in respiratory failure. Another effect local swelling, oedema increases, capillary leak and fluid in the lungs: cardiac failure can result from hypotension and acidosis. myonecrosis is raises concerns about, renal damage from myoglobinuria full recovery is the rule, though local complications from envenomation may occur. Death occur in less than 1 bite in 5000.

Clinical presentations

1) Local swelling, pain, tingling and numbness.
2) Systomic symptoms include nausea, syncope, difficulty swallowing or breathing.

Note the following – vital signs, BP, pulse rate, respiratory rate, fang marks or scratches, local tissue destruction. Soft pitting oedema, develops over 6-12 hours, but may start within 5 mins redness, discoloration and contusions. BP will fall, nose bleeds, vomiting of blood, small pin point haemorrhages on skin. Tingling numbness of extremities.

Treatement

Regional Centers

First Aid

1) Do not apply tourniquet or ice which are more harmful. The Government of India developed a national snakebite protocol in 2007, which includes the following advice.
2) Reassure the patient 70% of all snake bites are from non venomous species only 50% of bites by venomous species actually envenomate the patient.
3) Immobilize the patient. Use bandages or cloth to hold the splints, not to block the blood supply or apply pressure. Do not apply any tight ligaturs, they don’t work and can be dangerous.
4) Do not give alcohol or stimulants. They are known vasodilators and speed up the absorption of venom.
5) Remove any items or clothing which may constrict the bitten limb if it smells. (bracelets, watches, rings shoes)
6) Do not incise or manipulate the bitten snake bite side. Do not apply ice.
7) Transport the patient to a medical facility are definitive treatment.

Tetanus

An acute disease, induced by exotoxin of clostridium tetani, characterized clinically by muscular rigidity, which persists throughout illness, punctuated by painful spasm of the voluntary muscles especially the masseters (trismus/lock jaw), the facial muscles (risus sardonicus) muscles of the back and neck (opisthotonus) and those of the lower limbs and abdomen. Mortality tends to be very high (40-80%).

Maternal and neonatal tetanus is an important preventable cause of neonatal and maternal mortality.

The spores of tetanus are very resistant and remain in the environment in extremes of temperature for long periods.

Agent – Clostridium tetani, is a gram positive anaerobic spore bearing organism.

Reservoir of infection

The natural habitat of the organism is soil and dust. The bacilli is found in the intestine of many herbivorous animals Eg. Cattles, horses, goats and sheep and are excreted in their faces. The spores survive for years in nature. The bacilli may be found in the intestine of man, without causing ill effects. Agricultural workers are at risk because of their contact with soil.

Mode of Transmission

Infection is acquired by contamination of wounds with tetanus spores. The range of injuries and accidents which may lead to tetanus – comprise a trivial pin prick, skin abrasion, puncture wounds, burns, human bites, animal bite, stings, and sterile surgery, intrauterine death, bowel surgery. Unhygienic dental extractions. Incubation period is 6-10 days, or as short as 1 day or as long as several months.

Prevention is by

Active immunization: of monovalent vaccine purified tetanus toxoid (adsorbed) it stimulates a higher and longer immunity response.

Primary course consists of 2 doses of tetanus toxoid adsorbed given at intervals of 1-2 months. The longer the interval between the two doses the better is the immune response. The first booster should be given a year after the first two boosters. One additional booster; given 5 years after the third dose.

Passive immunization

Temporary protection against tetanus can be provided by an injection of human tetanus hyperimmune globulin

The infants born to mothers who have not received 2 doses of TT, are exposed to the risk of neonatal tetanus. They can be protected by injection of anti toxin given within 6 hours of birth.

Prevention of tetanus after injury

All wounds must be thoroughly cleaned, removal of foreign bodies, soil, dust necrotic tissue. This will abolish all anaerobic condition, which will favour germination of tetanus spores.

Protection during pregnancy

First dose at 28th week of pregnancy or after 28th week and Second dose 4 weeks after 1st dose.

DAY -20: 10:00 am- 12:00 noon: ORGANIC: ORGANIC SEED PRODUCTION

Organic seed production and its importance

Organic agriculture is a kind of diversified agriculture wherein crops and livestock are managed through use of integrated technologies. It depends mostly on on-farm resources rather than on external inputs. It emphasizes more on the optimising the yield potential of crop and livestock rather than maximization. The system does not deplete natural resources in and around the production site but maintains agro-biodiversity. The dependence of the state on other states for procuring seeds of HYVs and also sometimes the seeds of varieties procured are not properly tested for its adaptability. The seeds procured from the other states are not produced organically. Large gap has been felt in the demand and supply of the seeds due to its short supply and even if available, timely availability of seeds to the farmers is an area of concern. One basic strategy to fulfil this gap is to strengthen the seed production in the state.

Seed production constraints

1. Unavailability of Breeder seed- The state has to take steps to produce its own seeds. Availability of Breeder/ Foundation seed of the desired varieties can solve the problem as the seed can be multiplied in the state under organic conditions.
2. Storage conditions- High humidity and moisture conditions favour infestation of fungus and storage pests. Besides, the famers are ill-equipped with the efficient storage facilities.
3. Technical know-how of seed production- For producing certified seeds various parameters and handling techniques are to be addressed of which farmers are unaware. Seed production in maize and other cross-pollinated crops needs technical knowledge and lack of it may lead to loss of genetic purity.
4. The topography of the state is highly variable. Varieties performing well in one district may not perform similarly in other regions of the state. Varietal performance varies according to the altitude and local climatic conditions; thereby one variety does not perform well in all locations in the state.

Steps for efficient seed programme

1. Availability of breeder/foundation seeds of the recommended variety in the state will solve the problem of seed shortage in the region as seeds can be multiplied in the farmer's field or in Government farms.
2. Institutions like ICAR and KVK's should be actively involved in imparting technical knowledge to the farmers and linked the seed production programme of the state. These agencies shall be involved in breeding and multiplication of the breeder/foundation or production of breeder seed of the varieties released in the state or outside in the region. ICAR and other institutes may be involved in identifying suitable varieties for the region and procuring seed from the source institution.
3. Storage facilities at the farmer's level have to be improved. The infrastructure related to seed production, seed processing and storage has to be upgraded so that the seed availability shall be of good quality and purity.
4. The concept of Seed Village and seed production at farmer's level has to be implemented and undertaken at large scale.

5. Post harvest management of the seed produced is equally important. Minimum support price in seed production and subsidies in the transportation may be provided for supporting farmers' efforts.
6. Seed production will be successful only when it is economical. Seed producing villages/communities/farmers may be linked to marketing agencies for uplifting quality organic seed produce.

Strengthening stakeholders

Implementation of the seed program requires assessment of the topography of the region and various other issues like participation of the farmers in area specific varietal selection etc. Enhancing technical skill and knowledge of the farmers and other stakeholders in seed production technologies, safe storage, seed health and training farmers in better selection of the plants to be kept for seed will be important. Availability of varieties released by ICAR through multiplication and dissemination is essential.

Foundation and certified seed production of rice:

1. Land requirements- Land to be used for production shall be free of volunteer plants. The selected plots should be levelled and the soil preferably clay loam.
2. Isolation- Rice is self-pollinated crop but about 0 to 6.8 per cent cross-pollination occurs. Fields must be isolated at least by three metres from other fields of rice for pure seed production.
3. Cultural practices
    a) Land preparation- It is desirable to grow rice under puddle and transplanting systems for seed production.
    b) Nursery- Select land on which rice nursery or rice crop was not grown in the previous season. It is better to broadcast seeds on raised nursery beds and cover it with broad leaves or grasses to avoid bird damage.
    c) Seed rate and source- about 30 kg seed for coarse varieties and 25 kg see for fine varieties is adequate for one hectare area. Obtain nucleus/breeder seed/foundation seed from a source approved by the certification agency.
    d) Transplanting- Three to four week-old seedlings are uprooted and transplanted in the main field at spacing of 20cmx15cm with 2-3 seedlings per hill.
4. Seed Yield- Average seed yield varies from 35-45 q/ha depending on the variety.

Foundation and certified seed production of maize:

1. Land requirements- Selected fields should be free of volunteer maize plants and well drained. The soil should be well-aerated and suitable for maize growing.
2. Isolation- Maize is normally cross-pollinated by wind and the genetic purity is contaminated by the movement of foreign pollen. The seed fields must be isolated at least by 400 meters for foundation seed class and 200 meters for certified seed class from fields of other varieties of maize and fields of the same variety not conforming to varietal purity requirements for certification.
3. Seed rate and source- Obtain nucleus/breeder seed/foundation seed from a source approved by the certification agency. Seed rate of 20 kg/ha is enough for one hectare area with row to row and plant to plant distance of 60cmx20cm.
4. Seed Yield- Average seed yield varies from 25-30 q/ha.

Foundation and certified seed production of Blackgram:

1. Land requirements- Selected fields should be free of volunteer plants.
2. Isolation- Isolation distance of 10 metres for foundation seed and 5 metres for certified seed production from fields of other varieties and same variety not conforming to varietal purity for certification is necessary.
3. Seed rate and source- 15-20 kg for one hectare area. Maintain spacing of 30cmx15cm between row to row and seed to seed respectively. Obtain nucleus/breeder seed/foundation seed from a source approved by the certification agency.
4. Seed Yield- 10-15 q/ha.

Foundation and certified seed production of Pea:

1. Land requirements- Selected fields should be free of volunteer plants. The land should be well-drained and with neutral pH.
2. Isolation- Isolation distance of 10 metres for foundation seed and 5 metres for certified seed production from fields of other varieties and same variety not conforming to varietal purity for certification is necessary.
3. Cultural Practices- Mid-October to November is appropriate time for sowing pea for seed production. 60-75 kg seed/ha is required. Spacing of 45cmx15cm is optimum for pea seed production.
4. Seed Yield- Average seed yield of 20-25 q/ha

Foundation and certified seed production of French bean/Rajma:

1. Land requirements- Selected fields should be free of volunteer plants. The land should be well-drained.
2. Isolation- Isolation distance of 10 metres for foundation seed and 5 metres for certified seed production from fields of other varieties and same variety not conforming to varietal purity for certification is necessary.
3. Cultural Practices- Nucleus/breeder seed/foundation seed shall be obtained from a source approved by the certification agency. Seed rate of 25-30 kg/ha for pole type and 80-85 kg for bush type is optimum. Row to row and plant to plant distance of 60 cm and 15 cm is adequate. Ridge sowing is preferable.
4. Seed Yield- Average seed yield varies from 12-18 q/ha.

Foundation and certified seed production of Soybean:

1. Land requirements- Selected fields should be free of volunteer plants. The land should be well-drained.
2. Isolation- The crop is self-pollinated and usually less than 1 per cent cross-pollination takes place by insects. Isolation of 3 metres from other fields of soybean to maintain genetic purity.
3. Cultural Practices- Last week of June to first week of July is the optimum time for soybean seed production. Nucleus/breeder seed/foundation seed shall be obtained from a source approved by the certification agency. Seed rate of 65 kg/ha is required with row to row and plant to plant distance of 45cm x 15cm, respectively.
4. Seed Yield- Average yield varies from 20-25 q/ha.

1:00 pm- 3:00 pm: MARKETING: Value addition of Banana, Jackfruit, Lichi

Value Added Products of Jackfruit

Jackfruit often considered as a ‘wonder’ fruit, is eaten as a vegetable when tender. For vegetarians, it serves as a meat substitute. Ripe jackfruit bulbs (flakes) are consumed worldwide as a dessert fruit. The pulp is also used to flavour ice cream and beverages, and preparing drinks. The mature fruit can be used to prepare chips, papad. When ripen, it can be used to prepare squash, jam and jelly. The seeds can be eaten boiled, roasted or dried and salted as table nuts, or they can be grinded to make flour and blended with wheat flour.

List of Food Products Made From Jackfruit:

1) Jams
2) Juices, squash, Ready To Serve (RTS), syrup
3) Canned segments
4) Drum-dried powder
5) Flour
6) Jackfruit chips
7) Dehydrated jackfruit seeds
8) Jackfruit cake

Jackfruit Jam:

Jam is prepared from the pulp of ripe fruits with additives. Bulbs from a fully ripe jackfruit are blended and boiled for 5—7 minutes to extract juice. Then 700g sugar and 10g pectin is added to 1kg jackfruit pulp and cooked until the TSS reaches to 64° Brix, then citric acid (0.25%) is added . End point is determined through flake test and the jam is poured while hot in sterile bottle and stored at room temperature (Bhuyan et al.,2013).

Jam rind jelly

Fully matured ripe jackfruit are harvested and washed with clean water. Rind is separated and cut into small pieces. Then 1.5 lit water and 2g citric acid is added for each kg rind and the contends are boiled for 35 minutes and the juice is extracted from the rind .To this juice,700g sugar and 200mg citric acid is added and the juice is then cooked until the TSS reach to 65°Brix followed by addition of citric acid. The jelly is then poured into sterilized bottle and stored at room temperature (Bhuyan et al.,2013).

Jackfruit leathers:

Fully ripe jackfruit is washed and bulbs are taken after removing the seeds .These bulbs are blended with 10-15per cent sugar and boiled for 5 -7 minutes for extracting juice. After this KMS @ 0.1g/kg is added then further boiled for 3-5 minutes. The mixture is concentrated with steam jacketed pan and spread in a stainless steel tray.The tray is put in a cabinat dryer and dried for 20 hours at 60°C until the moister content reaches to 20 per cent. After cooling it is cut into pieces of desirable sizes and stored after packaging (Bhuyan et al.,).

Nectar: The bulbs are passed through pulping machine and pulp is made by mixing around 10 per cent hot water. Nectar is prepared from this pulp (Lal et al., 1960).

Ready to eat (RTE) products:

Ripe jackfruit bulbs can also be preserved with minimal processing into ready to eat convenience food product. But this product has a limited shelf-life and has to be stored and transported under refrigerated conditions.

Canning:

The unripe bulbs are canned with a small quantity of citric acid while the ripe bulbs can be preserved in sugar syrup or in the form of sweetened pulp for upto one year. This pulp can be used for preparing other value added products like squash, ready to serve(RTS) drink, chutney, toffee etc. and for flavouring ice-creams, custard, advances in processing technologies too, have pushed toward more new products (narasimham, 1990). Freeze-dried, vacuum-fried and cryogenic processing are some modern preservation technologies for jackfruit-based value added products.

Jackfruit seed:

Jackfruit seed is used for culinary preparation as vegetables and can be processed into seed powder. Moreover, the seeds are also roasted and eaten as nuts.

Jackfruit, being rich in nutritional, medicinal and processing qualities can play a significant role in the livelihood security of the rural communities through enhanced household income and household generation. Jackfruit also has a great potential for commercial cultivation for fruit as well as timber and fodder.

VALUE ADDED PRODUCTS FROM BANANA

Banana is one of the most important fruits crops of India. India is the largest producer of Banana in the world with the production of approximately 16.91 million tonnes annually from an estimated area of 4, 90000 hectares. Although, more than 50 cultivars are being commercially cultivated in India, only few have a significant role in trade.

Banana is the highest perishable fruit owing to its high moisture content and climacteric nature. The processing of banana adds value to the produce where the farmer or trader can get a better price for the produce. Most of these value added products of banana and shelf stable for 3-6 months. Important value added products developed are described below:

Chips/Crisps

Banana chips are mainly produced using Nendran variety of plantain. However, other varieties like Zanzibar and other pink fleshed bananas also are suitable. Nendran fruits of approximately 80% maturity are harvested and de-handed. The fingers are peeled, treated with 1% potassium metabisulphite, cut into slice of 1.2-0.8 mm thickness and deep fried in suitable cooking in oil, preferably coconut oil. Upon frying, this will yield crisps, yellow coloured chips which are sprinkled with common salt and packed in polyethylene bags. Generally they have a storage life of 30-35 days under ambient condition.

Banana Fig

Banana Figs are dried or dehydrated banana fruits with sticky consistency and very sweet in taste. Fully ripe banana fruits of variety ‘Karpuravalli’ or ‘Dwarf Cavendish’ are peeled, treated with 1% potassium metabisulphite solution and dried either in sun or oven at

50^{o}C for 24 hours. These figs are packed in polyethylene bags or any other suitable containers. They have a shelf life of about 3-4 months under ambient conditions.

Banana Flour

Banana Flour is prepared from mature green bananas which have high starch content.

The unripe fruits are blanched, peeled, treated with 1% of potassium metabisulphite and sliced. The slice are dehydrated and powdered in mixture or grinder to yield a good consistency and free flowing flour. It can be used as nutritious adjuvant in several food preparation like bread, cakes, biscuits, health drink and baby food formulation. It can also be blended with other cereal flours for making chapattis and roties.

Banana Powders

Banana powder is prepared from fully ripe banana fruits after peeling, pulping, homogenizing and spray drying at a temperature 30-32^{o} C and less than 30% R.H. it can also be produce using drum drier where the temperature should not exceed 94^{o} C. The moisture content of final product should be around 2-4%. This product has got high market value as it is extensively use in confectionary industry, ice-cream preparation and baby food making when suitably packed, it will have a shelf life of more than 6 months.

Banana Puree

The ripe banana fruits preferably 'Dwarf Cavendish' are peeled, pulp, homogenised, dehydrated, flash pasteurized and packed into sterile aseptic bags of varying capacity under high pressure of steam. It is use subsequently in the manufacture of dairy products such yogurts, milkshakes, ice-creams, baking breads and cake and also making banana flavoured drinks.

Banana RTS Juice

Since banana puree is very thick, juice cannot be directly obtained from it. Therefore, the puree is treated with pectolytic enzymes and clear juice is obtained through filtration or centrifugation. This clear juice is decanted and dilute $2^{1/2}$ times with water. The final total soluble solid content is adjusted to 16 brix and acidity of 0.3%. Then it is pasteurized, filled into sterile bottles and sealed by crown cork. The silk bottle are processed at 100^{o} C for 20 minutes, cooled and stored. This product has a shelf life of about 6 months at room temperature.

Banana Fruit Bar

Banana fruit bar is confectionery items prepared from ripe bananas fruit of any variety. It is made by homogenizing banana pulp, sugar, citric acid and pectin in suitable proportions and dehydrating the mass in ghee coated tray at 70^{o} C in an oven till it sets into a sheet. It is then cut into suitable size and packed in polyethylene pouches.

Banana Biscuit

Banana biscuit are made by mixing 60% banana flour and 30% maida. The dough is made using flour mixer and suitable proportion of sugar, dalda, baking powder, milk powder and essence. This biscuits are very tasty and highly nutritious.

Banana Jam and Jelly

Banana jam is made by cooking the fruit pulp with sugar along with pectin and citric acid in right proportions till it gives a good set. Several varieties of banana are suitable for making jam. This product has a good commercial value and good market.

Banana jelly is a semi solid product prepared by boiling clear strained fruit extract free from pulp after addition of required amount of sugar, citric acid and pectin. A perfect jelly should be transparent attractive and sparkling in colour with strong flavour of fruits.

Banana Wine

Banana wine is produce by fermenting the enzymes treated clear banana juice with wine yeast *saccharomyces cerevisiae var. Ellipsoideus.* The fermentation is carried out for about 14 days at 24-26^{o} C and then the wine is filtered and clarified, bottled and pasteurized. The pasteurized wine stored in bottles for aging. The alcohol content of banana wine varies from 9-12%.

Alcohol from Banana Peel

Banana peel alcohol is produced by macerating the ripe banana peel, followed by acidification, saccharification and fermentation. The fermented mass is filtered and distilled to obtain the commercial grade alcohol.

Health Drink and Baby Food

A highly nutritious and tasty health drink formulation and a baby food formula has been developed at NRCB using banana flour/powder after supplementing with suitable natural source of proteins, minerals, vitamins and fat. It has got a shelf life of about 6 months and is suitable for children and adults.

Banana Fibre

Banana fibre is extracted from the dried petioles and pseudo stem of the banana plant. The banana fibre can use in a preparation of special kind of papers, ropes, threads, baskets. Toys and several fancy items.

3:00 pm- 5:00 pm: MARKETING: Value addition of Ginger & Peach

VALUE ADDITION OF PEACH

Peaches are very nutritious fruit, it is grown in various states of India. Peaches are consumed as fresh fruit, as puree, mousse and smoothies, as topping for yogurt, ice cream, cereals, pancakes, or waffles, and as a filling for pies, tarts, cobblers, or strudels. Peaches are low in saturated fat, cholesterol, and sodium. They are a good source of dietary fiber. Furthermore, they have more vitamin C (11%) than nectarines and more vitamin A (7%) than pears.

Value-added products can open new markets, enhance the public's appreciation for farms, and extend the marketing season for farm produce.

Health Benefits Peaches contain phenolic compounds (84.07 mg gallic acid/100 g fresh fruit) and high levels of antioxidants such as carotenoids; in particular, beta-carotene (430 micrograms kg fresh weight) and crytoxanthin (70 micrograms kg fresh weight) which combat cell radicals that cause damage to body cellular structures. Peaches are also a good source of Vitamin C, which helps the body develop resistance against infectious agents. The phenolic content was found to be higher in the peels than the flesh of the peach.

Preservation Techniques for Peaches:

Since peaches have a very short shelf life, preserving them reduces waste and allows for them to be available year round in some form. Preservation of peaches provides microbial safety and stability, and maintains the sensory and nutritional quality of the food. Preservation is based on the delay or prevention of microbial growth through different factors, such as: temperature (low or high), water activity (aw), and acidity (pH), preservatives (e.g., nitrite, benzoate, sorbate, and sulfite). The most common preservation techniques for peaches include: drying/dehydrating, canning, and freezing.

Drying/Dehydration

Dehydration is the oldest technique of food preservation. The water is removed using warm air but not using very high heat, permitting the fruit to retain its food value and flavor. It commonly takes 6-20 hours for peaches to dry by this method. Drying helps to reduce the water activity of the fruit, thus increasing food safety by decreasing the risk of spoilage by molding.

Oven Drying

Use of temperatures below the 93°C will have good results. It is important to have good air circulation during the drying process.

Electric Dehydrating

This is the best method of dehydrating. An electric dehydrator or dryer is energy efficient and can be operated at low temperatures needed to maintain nutritive values in the food. Electric dehydrators also provide better control of the drying process and thus more uniformity of the food products.

Sun Drying

This technique uses the natural energy from sunlight to dry the product. Generally thin layers of fruit are exposed to sunlight. This is an easy preservation technique, but comes with certain drawbacks, such as: Non-uniform drying No control over the energy input, as there may not be series of days with constant sunlight and it generally requires three to four consecutively sunny days of at least 37°C (99°F) Poor sanitation of product (e.g., dust, insects, animal droppings)

Osmotic dehydration

In this method, the fruit is immersed in a hypertonic solution (such as a concentrated sugar solution). During this process the water and small amounts of natural solutes (such as pigments) are transferred from fruit to the solution and the solute is transferred from the osmotic solution to the fruit in a counter current manner.

Freeze drying

This is a generally a more expensive process. This technique has mainly two stages. In the first stage, water present in the fruit is cooled by refrigeration until it turns into frozen water. The next stage reduces the surrounding pressure to allow the frozen water in the material to change directly from the solid phase to the gas phase.

Canning

Canning is a food preservation technique developed by Nicolas Appert in 1809. In this process the food contents are processed and sealed in an airtight container. At high temperature, heat forces air to leave the jar or the can, and when the jar cools, it will "seal." Once the jar or can is sealed, no bacteria can enter the can container. Thus, these are also referred to as hermetically sealed containers.

Boiling-water Canning

This technique is used for canning high acid foods such as fruits and pickles. The kettle should be large enough to hold a jar rack and allow the jars to be covered with 1-2 inches of water. Process times vary depending on the size of jar used, initial temperature of the product, ratio of the solid to liquid brine and the altitude at which the canning is occurring. It is always recommended to consult with a process authority to determine the adequate thermal processing parameters for the product.

Pressure Canning

This technique is commonly used to can low acid foods such as vegetables, soups, and meats. The pressure canner has a lid which locks down tight and creates high pressure within the vessel. The pressure and temperatures within the kettle are high enough to kill bacteria that can cause botulism. It is always recommended to consult with a process authority to determine the adequate thermal processing parameters for the product.

Cooking

This is a more traditional method of preservation. The term cooking is a broad one. The type and number of products that can be made with peaches is vast. Depending on the extent of cooking, the temperatures and times used, and the different ingredients added, the final product may have different end result. The shelf-life of the final product will depend on the final product characteristics such as pH, water activity, processing time, temperature product is processed at, and ingredients added.

Slice canned peaches

Procedure

1. Dip fruit in boiling water for 30 to 60 seconds until skins loosen. Dip quickly in cold water and slip off skins.
2. Cut in half, remove pits and slice if desired. To prevent darkening, keep peeled fruit in ascorbic acid solution (1 tsp per gallon of water).
3. Prepare and boil a very light, light, or medium syrup or pack peaches in water, apple juice, or white grape juice. Raw packs make poor quality peaches.
4. In a large saucepan place drained fruit in syrup, water, or juice and bring to boil.
5. Fill hot, sterile jars with hot fruit and cooking liquid, leaving a 1/2-inch of headspace. Place halves in layers, cut side down.
6. Remove air bubbles. Wipe rim. Centre hot lid on jar. Apply band and adjust until fit is fingertip tight.
7. Put the jars in a boiling water canner for 25 minutes, adjusting for altitude. 8. Remove jars and cool. Check lids for seal after 24 hours. Lid should not flex up and down when centreis pressed.

Peach Jam

1. Wash and peel peaches, and remove pits and stems. Coarsely chop peaches, and then crush with a potato masher.
2. Measure crushed peaches into a kettle. Add lemon juice and pectin; stir well.
3. Place on high heat and, stirring constantly, bring quickly to a full boil with bubbles over the entire surface.
4. Add sugar, continue stirring, and heat again to full bubbling boil. Boil hard for 1 minute, stirring constantly. Remove from heat; skim.
5. Fill hot jam immediately into hot, sterile jars, leaving a 1/4 inch of headspace. Wipe rims of jars with a dampened clean paper towel; adjust two-piece metal canning lids.
6. Process in a boiling water canner for 5 minutes, adjusting for altitude.

Peach Jelly

1. Wash and slice peaches (do not pit or peel). Crush fruit.
2. Place crushed fruit and 1/2 cup water in a saucepan. Bring to boil. Reduce heat, cover, and simmer 5 minutes, stirring occasionally.
3. Place prepared peaches in several layers of dampened cheesecloth or a jelly bag. Let juice drip undisturbed.
4. Measure juice into a large saucepan. Add pectin and lemon juice to the saucepan. Measure sugar and set aside.
5. Bring contents in saucepan to a full boil over high heat, stirring constantly.
6. All at once, stir in sugar. Bring to a full rolling boil that cannot be stirred down. Boil hard for 1 minute, stirring constantly.
7. Remove from heat and quickly skim off foam.
8. Ladle hot jelly into hot, sterile jars leaving a 1/4 inch of headspace. Wipe rim. Center lid on jar. Apply band until fit is fingertip tight.
9. Put the jars in a boiling water canner for 5 minutes, adjusting for altitude. Remove jars and cool. Check lids for seal after 24 hours. Lid should not flex up and down when

center is pressed. Peaches can also be added to ice creams, and baked goods, among others

Food Safety Considerations before trying any preservation technique, one should consider the following:

pH

Acidity is an important quality attribute of fruits. Acidity changes during ripening, decreasing as fruit ripens, and fruit becomes sweeter, less green, and softer. pH may be defined as a measure of free acidity. Acids present in foods release hydrogen ions, which give acid foods their distinct sour flavor. Generally, pH ranges from zero to 14. A pH value of 7 is neutral, and pure water has a pH value of exactly 7. Values less than 7 are considered acidic, while those greater than 7 are considered basic or alkaline. Very low or high pH values will prevent microbial growth. Fruits usually have a low pH value. Peaches have naturally high acidity, and their pH is around 3-4.

Water Activity

Water activity is the amount of unbound water in food that can support the growth of microorganisms. Water activity is not related to the amount of moisture content of a food; however, items with high moisture content often have high water activity. The water activity scale ranges from 0 to 1.0 with pure water having a water activity of 1.0. Pathogenic microorganisms (those causing disease) cannot grow when the water activity of a food is below 0.86. Peaches have very high water activity, but dehydration of peaches, and preserving peaches as jams and jellies, can help reduce the water activity.

Ginger Value Addition

Ginger can be processed in many ways after its harvest, in order to avoid wastage and huge loss to the farmers of the region. Such value addition can provide maximum benefit and also an extra income, which in turn improves the livelihood of the ginger grower of the region. Some of the products are as follows:

a. Ginger pickle:-

Ingredients:ginger-1kg , mustard oil-750 ml, salt-as per taste, vinegar-100 ml, cumin seed-20 gm, coriander powder-20 gm, fenugreek powder-15 gm, saunf powder-10 gm, and turmeric-10 gm.

Method:

1. Wash, peel and cut the ginger into suitable pieces.
2. Drain it properly and smear it with salt and turmeric powder.
3. Put in the sun till all the moisture dries.
4. Heat oil and let it cool.
5. Take ginger pieces and mix all the spices, salt and oil. Mix properly and add vinegar.
6. Mix it properly and fill into sterilized bottles.
7. Seal the bottles. Pickle is ready for consumption after two weeks.

b. Ginger candy:

Ingredients: ginger-1kg, sugar-1kg, citric acid-3 gm

Method:

1. Prepared by selecting big sized rhizomes of low fiber content.

2. Rhizomes should be pricked properly with the help of fork so that sugar can penetrate deep into tissues.

3. The pieces boiled for 1hour until they become soft followed by drying in shade. Then they are spread in stainless steel utensil having alternate layer of ginger and sugar (1kg ginger:1kg sugar) and kept for 24 hour.

4. On second day the ginger pieces should be removed from sugar syrup and add 2gm of citric acid and boil the sugar syrup until strength reached upto 60º Brix.

5. Allow the syrup to cool then add ginger pieces and kept for 24hr.

6. On 3rd day remove the ginger add 1gm citric acid then boil the sugar with strength upto 65º Brix.

7. Next day the repeat the same process with 75ºBrix strength. Then dry the syrup upto 60ºC for 6-8hours. These pieces should be coated with sugar powder and stored in glass jar.

c. Ginger paste:

Ingredients: Fresh ginger-1kg, Acetic acid-1.2%, -2% and potassium metabisulphate (KMS)-0.1%

Method:

1. Take very fresh, tender and fiberless variety of ginger. Wash it properly.
2. Peel the ginger, wash and make small pieces of it.
3. Take the ginger pieces and make a pulp.
4. Take out the pulp and heat it for 10-15 minutes.
5. Add 1.2% -2.0% acetic acid and 0.1% KMS to the pulp. Mix properly.
6. Fill it into sterilized bottles.

d. Ginger Ale:

Ingredients: ginger juice-100 ml, lemon-150 ml, water-250 ml, sugar 500 gm, citricacid-5 gm, sodium benzoate- 1 gm.

Method:

1. Squeeze out the lemon juice and after filtration immediately fill into sterilized bottles.
2. Grind the ginger into paste and squeeze out the ginger juice. Filter it and immediately fill into sterilized bottles.
3. Prepare the sugar syrup by boiling sugar and water.
4. Add citric acid to the hot sugar syrup after boiling.
5. After cooling add the lemon and ginger pieces into the sugar syrup.
6. Mix sodium benzoate. With a little water and add it to the mixture.
7. Fill it in sterilized bottles and capped bottles tightly.
8. The ginger to be served is ready after two weeks.

e. Green ginger preservation:

The method of preserving fresh ginger slices in brine solution is known as green ginger preservation.

Ingredients: Fresh ginger-1kg, Citric acid-0.8%, -2% and salt 8%

Method:

1. Take fresh and tender gingers and wash them properly.

2. Peel the ginger and make even slices.
3. Blanch the ginger slices for 5 minutes in boiling water.
4. Fill the ginger slices into bottles or cans.
5. Make a solution of 8 % salt and 0.8% citric acid.
6. Cover the slices of ginger with the solution.
7. Seal the bottles tightly.

f. Ginger oil

Ingredients: dried rhizome

Method:

1. Used as a flavouring agent for soft drink, ginger beer and in food preparation.
2. For oil extraction, dried are grounded to a coarse slurry, paste or powder.
3. This steam containing the volatile components is condensed with cold water and collected in separate container.
4. The oil can be separated from the water upon cooling by the separate funnel. Re-distillation can be done to increase oil yield.

g. Ginger shreds

Ingredients: ginger, black salt, common salt 4%.

Method:

1. After washing the pealed ginger, they should be kept in muslin bag for squeezing of excess juice content.
2. Then add black salt and common salt @4% and kept in oven for drying at 60º for two days. They are ready to use after this process.

DAY -21: FIELD VISIT

DAY -22: 10:00 am- 12:00 noon: Fishery: Site selection and Construction of Fresh Water Fish Pond

"SITE SELECTION AND CONSTRUCTION OF A FRESH WATER FISH FARM"

Introduction

Appropriate site selection is one of the most important factors that determine the success of the fish farm. Before construction of the pond, the water retention capacity of the soil and the soil fertility has to be taken care of because these factors influence the response to the organic and inorganic fertilization in the farm pond. The selected site should have adequate water supply round the year for pond filling and other uses. The pond construction has to be based on the topographic area. In swampy and marshy areas, bunds should have a greater accumulation of soil to build the pond of a preferable size. Self-draining ponds are ideal for higher elevation areas. The site should be easily accessible by road or any form of transport to reach the market for easy fish disposal. In addition to this, the accessibility of inputs such as feed, seed, fertilizer and the construction material should also be available nearby the site. The site should be free from pollution, industrial waste, domestic waste and any other harmful activities.

For site selection the following ecological, biological and social factors need to be considered.

When to build the fish farm?

Before deciding at which time of the year you should build your fish farm, you should ask these questions:

i. When is the site easily accessible?

ii. When is the soil relatively dry, soft and easily workable?

iii. Will there be water available to fill the pond shortly after building it?

iv. Does it need to be prepared for stocking with fish at a particular time?

v. Will there be labour, machinery and materials available at that time?

vi. Should I consider building the farm in stages, over several seasons?

Ecological factors

In site selection for a pond, the ecological factors to be considered include soil, water, topography and climate.

Soil

The soil quality influences the pond productivity and water quality and determines the dyke construction. The properties of soil texture and soil permeability are determined to decide the suitability of a site. Pond bottom should have the ability to hold the water. Loamy, clay loamy and silt clay soil types are most suitable for pond construction. A good quality gravel should not exceed 10 percent. Thus the rocky, sandy, gravel and limestone soil types are to be avoided.

Evaluation of soil suitability

Soil suitability can be evaluated by three methods.

- In squeeze method, take the soil in wet hand and squeeze the soil by closing your hand firmly. If it holds its shape even after opening the palm of your hand, soil is suitable for pond construction.
- The ground water test is the best method to evaluate the soil suitability. Dig a pit of one-meter depth and cover it with leaves for a night. If the pit is filled with ground water in the next day morning then a pond could be built. However, in such soils, drainage may require more time due to the availability of sufficient groundwater. If the pit is empty the next morning, the site is suitable for pond construction, but the water permeability has to be tested.
- The third method is the water permeability test. Pour the water into the pit and cover with leaves. If no water is found in the pit on the next day morning then there is seepage. To confirm this, once again pour the water into the pit and cover it with leaves. If the water availability is high then the site is suitable for construction. But if the water is drained, the site is not suitable for pond construction. However, the site can be used through use of plastic or heavy clay to cover pond bottom.

Water

An adequate amount of water is required to build the fish farm because water depth needs to be adjusted at regular intervals. Natural water bodies such as reservoir, river, and lakes have stable water quality parameters (Water temperature, dissolved oxygen, pH, alkalinity and water hardness) when compared to borewell and well water. The site should be away from the flood area. Water should not be acidic or alkaline and if found to be so, suitable correction is to be done by applying lime or organic manure respectively.

The ideal water temperature is 20 – 300C for a fish farm. Water Salinity is the amount of salt dissolved in water. A few freshwater fishes such as tilapia and catfishes grow even in salt water, but the carps can withstand only in freshwater.

Topography

Type of pond construction is determined by the land topography. Normally, flood prone areas and poor rainfall areas need to be avoided. Areas such as industrial zones, fields with underground oil pipelines, irregular land area, fields with high electricity poles and radio masts and highly rooted vegetation area are also not recommended for pond construction.

Biological factors

Biological factors include the species to be cultured, seed source and culture type and they need to be considered before site selection of farm.

Social and economic factors

The ecological and biological factors are a prerequisite for good practices in aquaculture site selection and site management. It is also important to get to know the social and economic background of the area and understand the culture and traditions, particularly ideas and beliefs locally associated with aquaculture practices. The social fabric, market, and its structure, services directly or indirectly linked with aquaculture sector such as transportation, storage, wholesale market aspects etc are to be considered. The land identified for farm should be without legal issues and fish farming should be accepted by the local people. Other factors include availability of labour, electricity, medical facilities, and transportation.

Pond Construction:

An intelligent design and layout is a prerequisite for an efficient pond construction. The excavated earth should be used to construct the dyke and with a plodding slope towards the outlet for the proper draining facility. Preferably construction of pond has to be completed during summer so that the pond can be used for stocking.

Steps in pond construction

- Normally, the pond construction includes the following steps.
- Prepare the site by removing unwanted things such as the trees, bushes, and rock
- Construction of seepage-free and secure dyke by using the clay core
- Digging the pond and construction of dyke over the clay core
- Inlet and outlet construction
- Pond dyke covered with soil and plant grass species (avoid long rooted plants such as Rhodes grass and star grass)
- Pond should be fenced to avoid theft and entry of predatory animals

Site preparation

The place is cleared of ropes, cables and other items. Trees and bushes and other obstacles that hinder movement of heavy equipment around the site are to be removed - manually / animal power /using machinery. All vegetation including wood are to be cleared in the area (inclusive of 2 to 3 m beyond the dyke for workspace). Trees within 10 meters surrounding, tree slumps, large stones, are also to be removed. The surface soil which has the highest concentration of roots and organic material is not suitable for pond construction. Hence, about 30 cm of surface soil has to be removed.

Construction of dyke

Dykes should be compact, solid and leak free. A desirable dyke is constructed using 15 - 30 percent of silt, 45 - 55 percent of sand and 30 - 35 percent of clay. A sufficient width of the berm (not less than 1 m) is required to stabilize slope. The embankment slope in horizontal to vertical should be 2:1 in good quality clay soil and 3:1 for loamy silt or sandy soils. To raise the dyke, the clay buddle (1:2 sand and clay) is deposited as 10 - 15 cm thick layer and it can be formed at centre or inside the waterside of the pond. The crest of the dyke should be sufficient to help allied farm activities and the top of embankment should be above 1 m. Extra outlet is essential on the embankment as a safety measure to avoid damage due to excess raise in the water level.

Digging the pond and construction of dyke

Types of pond

Specific kinds of ponds are required for specific life stage development of fishes - such as nursery, rearing, stocking, treatment and broodstock pond. The rectangular pond is preferred than round shaped corners as it prevents the fish escape during harvest. An ideal length and breadth ratio of the pond is 3:1 is ideal, with breadth not more than 30 - 50 m. The total farm area can be divided as - nursery - 5 % of total farm area, rearing pond - 20 %, stocking pond - 70 %, and bio pond or treatment pond - 5 % of the total farm area.

- **Nursery pond** - The size of the nursery pond is about 0.01 to 0.05 ha with a depth of 1.0 – 1.5 m. The spawn (3 days old) are stocked in nursery pond, reared for a maximum of 30 days (to attain 2 – 3 cm length).
- **Rearing tank** - a tank where the fry are reared into fingerlings (to attain a size of 10 – 15 cm) and the culture duration is 2 – 3 months. The size of pond varies from 0.05 – 0.1 ha with water depth of 1.5 – 2.0 m.
- **Stocking pond** - In stocking pond, the fingerlings (TL 10 – 15 cm) are reared into marketable size. The culture duration varies from 8 – 10 months. The stocking density varies according to the target fish production. The stocking pond is used as broodstock pond and breeding pond as per the requirement. However, the pond area ranges from 1 – 2 ha with a greater water depth of 2.5 – 3.0 m. There are no hard rules regarding the size of the ponds.
- **Bio pond or treatment ponds** - these are large settling tanks, where the water used for fishponds is purified biologically. They may also be used as stocking pond. However, an even flat bottom is recommended for easy netting operation.

A productive farm should use its higher altitude area for construction of nursery pond followed by the rearing pond. The lowest area of the farm should be used to build the stocking pond, which will help in reducing the cost of construction and increase ease of farm management.

Pond construction types

The ponds are constructed by two types namely, dug out and embankment pond. The dug out pond is constructed by digging the soil and is most suitable to construct ponds in plain areas. It is to be scientifically constructed maintaining shape, size, depth and other factors.

Embankment pond is more appropriate for hilly areas. Dykes may be erected on 1 or 2 sides based on need. This pond is economically viable but not ideal for fish culture because the size, shape and depth of pond cannot be fixed as per scientific fish culture specifications.

Inlet and outlet construction

Feeder canals are constructed to provide sufficient amount of quality water to the ponds except in ponds which are filled by rainwater. Inlets are provided at top of the pond and screens are used to filter the pumped water to avoid entry of unwanted particles to the culture system. The inlet pipe size has to be designed is such a way that it should not take more than 1 or 2 days to fill the pond.

The outlet pipe is set up at bottom of the pond. It is used to dewater the pond during harvest and partial draining for pond water exchange to maintain the water quality of the pond during the culture period. The outlet is constructed prior to pond dyke construction.

Soil and vegetation coverage of Dyke

To reduce the soil erosion, creeping grass can be grown on the top and sides of dyke. The banana and coconut trees can be planted in the embankment. The slope of the embankment can be planted with grasses such as Hybrid Napier, gunny grass and elephant grass to supply feed to the grass carps reared in the ponds.

Pond fencing

The ponds are fenced to protect from theft. Live fences also serve as windbreak, increase farm diversity, provide privacy to farm and improve the appearance of the fish farm. There are several ways to make fences. These include live fence, piled fence, woven fence, post and rail fence, wire fence, wire netting fence and stone wall. Each type of fence has its own advantages and disadvantages. Wired net fence is primarily used in fish farms to stop intruders and protect the fish stock.

1:00 pm- 3:00 pm: MUSHROOM: SHIITAKE MUSHROOM CULTIVATION

Lentinula edodes

- Edible mushroom
- Medicinal mushroom in some forms of traditional medicine.

Scientific classification

Kingdom:	**Fungi**
Division :	Basidiomycota
Class:	Agaricomycetes
Order:	Agaricales
Family :	Marasmiaceae
Genus :	*Lentinula*
Species :	L.edodes

Habitat and distribution

Shitake grows in groups on the decaying wood of delicious trees, particularly oak, chestnut, maple, beech, sweetgum, willow, poplar, hornbeam, ironwood, mulberry and chinquapin.

Its natural distribution includes warm and moist climate in South East Asia.

Selection of wood species

Choice of wood species can affect

- Yield of mushrooms.
- Timing of mushroom production.
- Taste and size of the mushrooms produced.

The most recommended tree species for shitake cultivation belongs to the beech family (Fagaceae), particularly oaks (*Quercus spp*)

San Antonio (1981) found that red oak (*Q.rubra*) and white oak (*Q.alba* l) were the most productive spp. Over a range of shitake strains.

Steps :-

1. Spawn SElection
2. Tree selection and log cutting.
3. Hole drilling.
4. Inserting spawn in holes.
5. Plugging and waxing hole.
6. Stacking the logs.
7. Fruiting and harvesting.

Spawn selection:- "spawn" is a french word espandre , meaning to spread out or expand.

The vegetative mycelium from a selected mushroom grows on a convenient medium.

It comprises mycelium of the mushroom and a supporting medium which provide nutrition to the fungus during its growth.(Klingman, 1950).

To grow shiitake mushroom ,a one –time invesment in spawn is needed.

Different methods of growing :–

- Wooden dowels (plugs) – This is easier to use but more expensive.
- Mixture of sawdust and grain – It is cheaper and produces faster.

Procedure:

1. Selection of log:

- Cut logs of 2 to 6 inches diameter and 3 to 4 feet length
- The best time to inoculate cut logs is within two(2) weeks after cutting to prevent fungal infection.
- Do not use the logs immediately after cutting as they may contain a protective toxin that may killthe spores.
- Logs more than a few months after cutting might have dried out for too longtobe useful.

2. Drilling the logs:-

Drill for two(2)inches deep if using the plugs and one (1) inch deep if using sawdust with extremely higH Speed drill. The holes should be spaced two (2) inches apart down the entire length of the log.

Drill holes of one (1) inch deep in a diamond pattern, separated by six (6) inches along rows at two (2) inches apart. If inoculation holes are spaced too far apart , spawn run will be incomplete and contaminating fungi will gain a foothold.

3. Spawn insertion:-

Logs cut from healthy trees are inoculated with shiitake spawn by inserting into the holes.

The plugs are then tapped inside the holes with a hammer and with a piece of dowelling push they pressed slightly below the surface.

Sawdust can be poured by using funnel and pushing it into the hole with a piece of wooden chopstick.

4. Waxing:- The melted wax is either poured over the filled holes or painted over with paint brush.

5. Stacking.

6. Fruiting the Crop:-

The timing of production in nature depends on both temperature and the timing precipitation.

Once thelog has “flushed” (produced a crop of mushrooms) , it should be allowed to “rest” for 10 to 12 weeks to provide the mycelium time to replenish the energy required for fruiting.

SHIITAKE PRODUCTS:-

Shiitake can be usedasdried and preserved food.

Many people preferred dried shiitake to fresh, considering that the sun-drying process draws out the umami flavour from the dried mushroom.

MEDICINAL VALUES:-

High in vitamin D and world’s second most popular variety after button mushroom.

Other health benefits claimed include managing blood pressure , preventing heart disease , controlling cholesterol and anti – viral activity.

MEDICINAL RESEARCH:-

Strong correlation between Shiitake intake and low cholesterol in rats.

Young women who ate 90 grams of shiitake per day lowered their cholesterol on average by 12%.

Showed anti- viral activity in mice injected with influenza

3:00 pm- 5:00 pm: PRACTICAL

DAY -23: 10:00 am- 12:00 noon: HORT-II: Cultivation of Plum

Plum(*Prunus salicina*) belongs to the family Rosaceae is an important temperate fruit which is used both as fresh and in preserved form. Of the stone fruits, it ranks next to peaches in economic importance. Two types of plum- European (*P.domestica*) and Japanese (P.salicina) were introduced during 1870 in Himachal Pradesh. After evaluation only Japanese plum has been recommended for commercial cultivation in the temperate regions of the North Western Himalayas. It is known as Japanese plum due to its cultivation in Japan from where cultivars spread to other places. At present, plum is cultivated in all temperate climate countries of the world.

Trees are highly productive due to profuse flowering, high fruit set and early ripening habit of cultivars recommended for plains. On an average a full grown tree can yield 50-60 kg of fruit. Plums are rich in sugars and vitamin-A. Fruits are eaten as fresh or processed into jam and squash.

USES:

Plum fruit is rich in Vitamin A, B, (Thiamine), riboflavin and some minerals like calcium, phosphorus and iron. The well blended acidity with sugars is helpful in the preparation of jams and squashes.

The dried plums are known as prunes. All plum cultivar cannot be used for drying, that is why it said “all plums are not prunes but all prunes are plums.” The prunes have great Ayurvedic medicinal value. Water prepared from the prunes is helpful in curing jaundice and summer bite.

CLIMATE:

Plum prefers temperate climate. However, it has been found growing from higher hills in Srinagar to Jaipur in Rajasthan and areas around Delhi. It requires less chilling hours that is temperature below 7.2°C. It can tolerate frost and high summers both, that is why it can be cultivated in both low temperature to 0°C and up, highest up to 47°C in summers. Some cultivars like Santa Rosa can only be cultivated in higher hills (700-1000 chilling hours) but low chilling requiring cultivators (250-300 chilling hours) are preferred for plains.

SOIL:

Plum is performing very well in soils with high pH where peach fails. That is why it is preferred as filler over peach. For good performance of trees well drained sandy loam to medium loam soils are most suited. Root stock plays a major role in the preference of soil.

CULTIVARS:

- Santa Rosa
- Beauty
- Mariposa
- Doris

PROPAGATION:

Usually plums are propagated mostly by whip and tongue grafting during Jan – Mid Feb or by Shield budding or chip budding in autumn or in spring on wild peach or wild apricot in case of light soil or on wild plum on heavy and sticky soil.

PLANTING:

Plum plants in the nursery shed their leaves in January. Hence, these are uprooted along with the roots and can be transported long distances bare rooted. While planting the plants in the prepared pits, the lowermost branches should be removed. Keep only 3-4 side branches and clip the tops of all shoots so that secondary branching could be initiated.

Press the soil around the newly planted plants gently. Apply light irrigation to the plants so that soil settles down. Level the soil at 'wetter' condition. Continue to apply light and frequent irrigation till rainy season. .

SPACING:

5-6 Metres plant to plant

5 -6 Metres row to row

Pits of 1m x 1m x 1m size are dug and filled about a month before planting. While digging, the top soil and the sub soil should be kept separately. Pits should be filled first with sub soil well mixed with 30 kgs full rotten FYM and filled with top soil mixed with 10 – 15 kgs FYM.

TIME OF PLANTING: Month of June – July and December – January.

TRAINING AND OF PRUNING:

Training is done to give a proper shape and to develop a strong framework of branches. Plum trees are trained to open centre system.The top of the plant is headed back to 60 cm to stimulate the growth of lateral branches at the time of planting. During first summer,3-5 scaffold branches around the main stem are selected. Lowest scaffold branches should be about 30 cm above the ground level and the other scaffolds should be 15 cms apart in spiral order. Only wide angled branches should be selected and remaining branches are pinched off.

Plums should be pruned annually, including the year of planting and are best trained to an open center. When the tree is bearing fruit, it is important to thin the fruits to prevent the tree from over-bearing. Aim to have 1 fruit every 15–20 cm (6–7 in). This allows fruits to become larger and prevents the tree from reducing production the following year. Trees should be watered regularly during the growing season to aid with fruit development. During dry periods, water trees every 10 to 14 days. Apply water deeply and widely, to at least the width of the canopy.

FRUITING:

Plum bears fruit at the base of 1 year old shoots and on vigorous spurs on 2 years old wood. It comes to full bearing from 5 years to 10 years onwards.

DISEASE AND PEST MANAGEMENT OF PLUM:-

PLUM SAWFLY

Plum sawfly (*Hoplocampa flava*) - From the outside the plum looks fine but inside, the plum is completely inedible. In spring the sawfly emerges from the soil and lays eggs on the blossom of plum trees. When the plums develop the little caterpillars eat their way into the centre of the plum and feed off it as the plum develops. Plum Sawfly is difficult to control using organic methods, the only one being available is a pheromone trap which goes some way to controlling the disease. Look for the giveaway brown mark on fruits and when they are forming pick the fruit off and burn them, this will help in controlling the disease next year. Burn any fallen fruit which is inedible.

PLUM TREE LEAF CURL

This is often referred to as Plum Leaf Curl Virus or Plum Leaf Curl Disease. In the vast majority of cases it is cause by aphids. Often these aphids are called leaf curl aphids. To check for aphids, uncurl the leaves and look for signs of aphids. Plum trees are often attacked by aphids and the first signs are young leaves curling up, this is often referred to as Plum Leaf Curl. They are not normally discoloured just curled. If you uncurl the leaf the aphids will be seen inside - small green, white or light brown insects. By themselves they probably won't cause too much damage but often they secrete a sticky juice which attracts unwanted diseases. Neem oil can be sprayed under the leaves to control the aphids. The organic chemicals present in Neem oil act as a repellent against not only aphids, but also a wide array of other garden pests.

PINK MAGGOTS

This is caused by the caterpillar of the plum moth (*Grapholita funebrana*) and makes the fruit totally inedible. It is a particularly difficult pest to identify unless you cut a plum open, or worse still bite into an affected plum. Pinkish small caterpillar / maggot can be found inside the plums. Other signs are dried drops of gum which form near the entry hole, premature fruit drop and discolouration of the plums. The plum moth pheromone trap which attracts the male moths can be used to control them. The moths then stick onto the trap thus reducing the population of male moths.

POWDERY MILDEW

Plum trees often suffer from powdery mildew which is a fungal disease. The powder you see on the leaves are the spores of the fungus. As far as plum trees are concerned the problem is most frequently caused by bad air circulation especially in the centre of the tree. This fungus often occurs where the foliage and branches are crowded. Where the disease is left to progress secondary infections and pests may well attack the weakened tree. Vinegar, baking soda, garlic can be sprayed on the fruit trees to control the powdery mildew.

SHOT HOLE

The most likely cause of this problem is Shot hole (also known as Coryneum Blight). The most obvioussymptom is the appearance of lots of holes in the leaves. Initially they are brown circles of dying or dead tissue, as the leaf grows the brown circles fail to grow and eventually they fall off leaving the trademark round holes. Less obvious signs are brown marks around developing buds and / or grey spots on the fruit. The disease is a fungal infection which thrives in damp and crowded conditions. It does respond to chemical treatment both in spring and autumn. The fungus can also be controlled simply by reducing the number of affected leaves, buds and correct pruning especially of the lower parts of the centre of the tree. Firstly, remove all fallen leaves and twigs from around the base of the tree. If the area is water logged, try to provide good drainage to reduce humidity. Prune off all affected twigs which have infected buds.

MANURES

Plum requires adequate amounts of nutrients for better growth and quality of fruits. Application of manures depends on soil fertility, type of soil, topography, age of tree, cultural practices and crop yield. Plum trees prefer an organic high nitrogen fertilizer.In addition, FYM, Vermicompost , 18 days Compost can provide a balanced nutrition package for better plant performance.

HARVESTING

Plum fruits should be allowed to mature on the tree. Fruits can be picked by hand when the skin has turned the colour typical of the variety being grown.

1:00 pm- 3:00 pm: PRACTICAL

3:00 pm- 5:00 pm: AH & VET: Poultry Farming

POULTRY FARMING

INTRODUCTION:

Poultry is one of the fastest growing segments of Agricultural sector in India today. Poultry farming is an age old practice in Meghalaya which provides an excellent alternative to the people for livelihood. It provides not only the source of protein in terms of egg and poultry meat but also gives sustenance to the villagers particularly for the weaker section of the society. Table eggs and broiler meat are the major end products of poultry sector. Hence, there is need to increase production of poultry egg and meat in order to meet the requirement of the growing human population.

CLASSIFICATION:

- Broiler – meat purpose.
- Layer – egg purpose.
- Kuroiler-- Dual purpose – meat and egg type.

BROILER

Is a young chicken of either sex about 6 – 8 weeks of age weighing 2.0 – 2.5 kg body wt. They are tender with flexible bones. Broiler farming today has emerged as one of the fastest growing poultry segment with the increased acceptance of broiler chicken meat in cities, towns and villages the demand and consumption of broiler chicken is increasing day by day. Broiler are reared specifically for meat purpose and can be marketed at the age of 6 – 8 weeks. It is also an important source of protein.

LAYER

Layer farming means raising layer birds for the purpose of commercial egg production. Layer birds should be raised from when they are 1 day old. Layer start laying egg from 18 - 19 weeks of age and remain laying continuously till 72-78 wks of age.BV 380 breed lay about 250 eggs /year and egg production is about 65%, eggs are bigger in size and brown in colour. For commercial egg production always select a breed with high egg production. Egg production is very high during 26 -30 wks and after this period egg production reduces slowly.

KUROILER

Kuroiler chicken are dual purpose breed suitable for both meat and egg production, they are economical breed or low input technology breed of birds.Kuroilers starts laying egg when they are 5 – 6 mths old and egg production is about 150 -180 egg/ year and continue upto 2 years. Multi-coloured in appearance and highly preferred by consumers and small holder farmers.Kroiler farming requires small investment. They are relatively resistant to various poultry diseases and thrive well on locally available feed resources. Fast growing chicken breed and good scavengers.Kuroiler rooster weight approximately 3.5 kg and hens about 2.5kg.

BENEFITS OF POULTRY FARMING

- Profitable business opportunity for the entrepreneurs.
- Provide employment for job seeking people.

- Poultry product has a great demand in the market.
- Low cost investment.
- For successful Poultry farming, selecting high quality productive breeds is very important.
- Increase the economic status of the farmers.

Selection of site.

- Poultry house should be located away from residential and industrial area.
- Road facilities,
- Water and electricity supply
- Elevated area/dry and properly raised ground
- Avoid water logging
- Proper ventilation
- Market

Housing System

1. Extensive system
2. Semi-extensive system
3. Intensive system- Deep litter system

Deep Litter System

In this system the birds are kept inside the house all the time. Arrangement for feed, water and nest are made inside the house. The birds are kept in large pens on the floor covered with litter material like straw, saw dust, paddy husk. The litter is spread on the floor of about 3” - 4” depth. Litter act as an absorbent that helps facilitate evaporation of moisture, dilutes faecal materials. Good litter should be highly absorbent, light in weight, medium in particle size and dry rapidly, litter should be soft and comfortable for birds to walk. Periodic stirring or turning of the litter should be carried out regularly atleast once in a week for an effective functioning of built- up litter. Deep litter manure is used as fertilizer in agro-farming.

Floor space requirement

Broiler - 1 sqft / bird

Layer - 2sqft/ bird

Kuroiler- 3sqft/ bird

CARE AND MANAGEMENT OF CHICKS IN THE BROODER

- Clean the poultry house and the surrounding properly.
- Care and management of chick before arrival is very important.
- Chicks should be taken from good Hatchery.
- Temperature of the chick house should be maintained before arrival of the chicks.
- Adjust the temperature as per requirement of the chicks.
- Provide balanced standard mash.
- Provide clean fresh water at least twice daily.

- Clean the feeder and waterereveryday.
- When the chicks arrive they may be dehydrated and under stress because of transportation they should be provided with electrolytes.
- After arrival place the chicks under the brooder and check the chicks 2 hours after placement and ensure that they are comfortable with the temperature. If the chicks huddle together increase the temperature and if they spread beyond the brooder decrease the temperature.
- After bringing the chicks spread the chicks mash on the newspaper for 2 – 3 days, because chicks cannot take feed from the feeder for first 2 – 3 days.
- Use brooder guard around the chicks because it prevent the chicks to go away from the source of heat. After one week remove the brooder guard because within one week chicks starts eating from feeder.
- After 1 week reduce the brooder temperature.
- Continuous lighting should be provided during brooding time.
- After one month remove the Brooder.
- Avoid overcrowding as this will lead to slow growth and mortality
- Daily inspect the condition of birds and their faeces for any sort of abnormality.

REARING OF IMPROVED BIRDS

- Faster growth rate
- Higher egg production.
- Increase hatchability.
- Low mortality rate.
- High feed conversion ratio.
- Stable profit to the farmers.

DISEASES

Main diseases are:-

1. Ranikhet disease.
2. Infections Bursal disease.
3. Fowl pox.
4. Salmonellosis
5. Bird flu.
6. Marek’s disease
7. Infectious Bronchitis.

PREVENTION AND CONTROL

- Prevention is better than cure.
- Follow vaccination schedule.
- Maintain health card.
- Report to the nearest dispensary or aid centre in case of any outbreak, unusual death, etc.,
- Deworming.

FEEDING

- Feed play vital role in poultry farming and is the major cost of poultry production which seriously affect the production output of the birds as birds have high conversion rate. Improper feeding causes several deficiency disease which result in poor production performance.
- For achieving better profit from poultry industry one should be aware and have good knowledge on poultry farming.

Feeding schedule
BROILER

Pre starter feed	1day old – 1 week
Starter feed	1 week - 5 weeks
Broiler finisher feed	5 weeks -7/8 weeks
Age	**Quantity/Bird/ day**
0 – 1week	15gm / chick/day
1 – 2 weeks	40gm/chick/day
2 – 3weeks	55gm/ chick/day
3 – 4weeks	80gm/ chick/day
4 – 5weeks	110 gms/ chick/day
5 – 6weeks	140gms/ chick/day
6– 7weeks	160gm/ chick/day
7– 8weeks	170gms/ chick/day

FEEDING SCHEDULE FOR COMMERCIAL KUROILER

AGE	**TYPE OF FEED**	**QUANTITY/BIRD/DAY**
0-2 weeks	CHICK MASH	25gms
2-4 weeks	- do -	45 gms
4-6 weeks	do -	55gms
6-8 weeks	do -	65gms
8-10 weeks	Grower feed	80gms
10-12 weeks	Do-	90gms
12-20 weeks	Do- -	100gms
20-26 weeks	Layer feed	120gms
26-40 weeks	do-	130gms
40 weeks onwards	do-	125gms

VACCINATION SCHEDULE

AGE	TYPE OF VACCINE	DOSE AND ROUTE
7days	F1 Vaccine	1 drop intra ocular
14 days	I.B.D. Vaccine	1 drop intra ocular
24 days	I.B.D. Vaccine	Drinking water
28 days	F1 Vaccine	Drinking water
7 weeks	Fowl pox vaccine	0.2 ml 1/m
8 weeks	Deworming	Drinking water
9 weeks	R 2B Vaccine	0.5 ml 1/m
17 weeks	Fowl pox vaccine	0.2.ml 1/m
18 weeks	R 2B vaccine	0.5 ml 1/m

FEEDING SCHEDULE: LAYER BIRDS

0 – 4weeks	25gms/chick/day
5-8 weeks	35gms /chicks/ day
9 -112 weeks	55 gms / chicks/ day
13 - 18 weeks	100gms/ chicks/ day
19 - 24 weeks	115gms/ chicks/ day
24 weeks above	120gms/ chicks/ day

DAY -24: 10:00 am- 12:00 noon: HORT-III: CULTIVATION OF GERBERA

A. INTRODUCTION

Gerbera is a very attractive, commercial cut flower successfully grown under different conditions in several areas of the world as well as in India and meeting the requirements of various markets. This flower is originated in Asia and South Africa. Gerbera jamesonii has been developed through cross breeding program.

B. CLIMATE

Bright sunshine accelerates the growth and quality of the flowers, however, in summer this flower needs diffused sunlight. Gerbera plants grown in locations with insufficient light will not bloom well.

C. SOIL

Red lateritic soils are good for Gerbera cultivation as it is having all the essential qualities that an ideal soil should have. After fumigation with formaldehyde, the raised beds are prepared on which Gerbera plants are planted.

D. BED PREPARATION

Top width – 60 cm Bottom width – 70 cm Height – 45 cm

Path way – 40 cm
PLANTING DISTANCE Plant to Plant distance: 30 cm Row to Row distance: 40 cm

E. PLANTING MATERIAL

Plant should not be less than three months old. At the time of planting the tissue culture, plant should have at least 4 to 5 leaves. Gerberas are planted on raised bed in two rows formation. Zigzag plantation system is mostly preferred. While planting 65% portion of root ball should be kept below ground and rest of the portion i.e. 35% should be kept above the ground for better air circulation in the root zones.

F. VARIETIES

There are many multi colored varieties of Gerbera developed through tissue culture.

G. MANURES AND FERTILIZERS

Organic manures are required to be added so that top 30 cm of the soil has 30% organic matter content. Application of nutrients should be based on analysis of soil and plant. In the present model the cost has been estimated based on 250 fertigation days and 1.2g dose of fertilizers per day per sq. meter.

H. CULTURAL PRACTICES

i). Weeding & raking of soil: Weeds take the nutrients of the plants and affect the production. Hence, they should be removed from the bed. Due to daily irrigation, the surface of the gerbera bed becomes hard hence raking of soil is done with the help of a raker. It increases soil aeration in the root zone of the plant. This operation should be done regularly, may be twice in a month.

ii). Disbudding: Removal of inferior quality flowers at the initial stage after plantation is called disbudding. The normal production of gerbera plants starts after 75-90 days from the date of plantation. Production of flowers starts 45 days after plantation but initial production is of inferior quality, hence these flowers should be removed from the base of the flowers stalk. this helps in making the plant strong and healthy.

iii). Removal of old leaves: Sanitation helps in keeping the disease and pest infestation below the economic threshold level. The old, dry, infested leaves should be removed from the plant and burnt outside the green house or dumped in to a compost pit. This practice allows producing good, healthy new leaves and better aeration in the crop.

I. IRRIGATION

Gerbera plant require a lot of water, at least 6mm/day i.e. 60cum/ha/day. A drainage line may be laid below the beds for disposal of excess water.

J. PEST AND DISEASES

The principal diseases of rose are

1. *Pythium*
2. *Sclerotinia*
3. White rust
4. *Rhizoctonia*
5. *Fusarium*

Major insect pests of the rose are

1. Red Spider Mite
2. Aphids
3. Thrips
4. White Fly

K. HARVESTING

The first flowers may be harvested after 75-90 days after planting. Flowers of most of the varieties (single types) are ready to be picked when 2-3 whirls of stamens have entirely been developed. Some varieties are picked little riper, especially the double types. Skilled labors are required for harvesting of gerbera cut flowers. After harvesting the flowers should be kept in bucket containing clean water. Flowers are very delicate hence they should be carefully handled otherwise can be damaged and their quality gets deteriorated. For harvesting gerbera no secateurs are required and are done by naked hands.

L. YIELD

Average yield of roses is 30 to 35 stem/ plant per year.

M. GRADING

Flowers should be graded into different classes according to their qualities. Grading is done on a mechanical grader or by hand grading tables or work stations.

N. PACKAGING

Packing comprises three steps: bunching, wrapping and packing.

Many different cardboard boxes are used for packing. For long term transport it is best to use telescopic style boxes made of corrugated fiberboard. The size could be 100 cm x 45 cm x 22 cm. There may be 400 to 1000 stems per box and weight may vary from 14 to 18 kg/box.

Depending on the market, the box is either filled with one variety, one grade, or mixed color one grade.

1:00 pm- 3:00 pm: FINANCING: Kisan Credit Card Scheme

KISAN CREDIT CARD SCHEME: This scheme has been announced by the Govt. of India on 15.10.1998

1. Objectives/Purposes:

Kisan Credit Card scheme aims at providing adequate and credit support from the banking system under a single window to the farmers for their cultivation & other needs as indicated below:

i. To meet the short term credit requirements for cultivation of crops
ii. Post-harvest expenses such as labour expenses etc.,
iii. Produce marketing loan
iv. Consumption requirements of farmers' household

Note: the aggregate of components 1 to 4 above will form the short term credit limit portion.

2. Eligibility:

a. All farmers/individuals/joint borrowers who are owner cultivators, debt free farmers of co-operative societies.

b. Tenant farmers, oral lessees & share croppers.

c. SHGs or Joint Liability Groups of farmers including tenant farmers, share croppers etc.

3. How to apply: the eligible applicants will apply for loan through the concerned Primary Agricultural Cooperative Societies (PACS) to whom they are members. They will apply to the Society individually and society in turn will scrutinize and appraise the proposals and submit the same to the Branch supported by resolution of Annual General Meeting (AGM) & Managing Committee (MC) authorizing the Secretary & the Chairman of the Society duly approved by concerned Assistant Registrar of Cooperative Society/District Registrar of Cooperative Society along with latest financial position, latest balance sheet and a copy of Bye-law in case of a new society.

The Branch Manager on receipt of the proposal shall conduct a thorough enquiry into the proposal personally or through Field Officer along with the Officer from Cooperative department and submit a report along with appraisal in all respect covering land holding of individual under cultivation and requirements of loan. During such enquiry they will ensure that land holding under cultivation of the applicants are genuine for which they will verify the land records at PACS level and also ensure that amount of loan applied for are as per scale of finance and within individual borrowing limit. They will submit a report in the proforma prescribed by Head Office. On being satisfied with the proposal the Branch Manager will put up the proposal to the Branch Loan Committee for consideration.

4. Fixation of credit limit/loan amount:

The credit limit under the Kisan Credit Card may be fixed as under:

a. All farmers other than marginal framers.

b. The short term limit to be arrived for the first year: for farmers raising single crop in a year: Scale of finance for the crop (as decided by State Level Technical Committee)×Extent of area cultivated + 10% of limit towards post-harvest/household/consumption requirements + crop insurance & PAIS.

c. Limit for second and subsequent year: first year limit for crop cultivation purpose arrived at as above plus 10% of the limit towards cost escalation/increase in scale of finance for every successive year (i.e. 2^{nd}, 3^{rd}, 4^{th}& 5^{th} year) for tenure of Kisan Credit Card.

d. For farmers raising more than one crop in a year, the limit is to be fixed as above depending upon the crops cultivated as per proposed cropping pattern for the first year and an additional 10% of the limit towards cost escalation/increase in scale of finance for every successive year (i.e. 2^{nd}, 3^{rd}, 4^{th}& 5^{th} year). It is assumed that the farmer adopts the same cropping pattern for the remaining four years also. In case the cropping pattern adopted by the farmer is changed in the subsequent year, the limit may be reworked.

e. Documentation:

a. Society to Bank:

i. Letter of acceptance duly supported by M.C. resolution of PACS

ii. Pronote

iii. Letter of continuity

iv. Trust Deed

b. Individual borrower to society

i. Pronote

ii. Loan and hypothecation deed

iii. Letter of continuity

iv. Trust deed

f. Maximum permissible limit: the short term loan limit arrived for the 5^{th} year will be the Maximum Permissible Limit (MPL) and treated as the Kisan Credit Limit.

1. Drawing Limit: Drawing limit for short term cash credit is based on the cropping pattern and the amounts for crop production, consumption may be allowed to be drawn as per the convenience of the farmer. In case the revision of Scale of finance for any year by the State Level Committee exceeds the notional hike of 10% contemplated while fixing the five year limit, a revised drawable limit may be fixed and the farmer be advised about the same. In case such revision require the card limit itself to be enhanced (4^{th} or 5^{th} year), the same may be done and the farmer be so advised. It is to be ensured that at any point of time the total liability should be within the drawing limit of the concerned year.

2. Share Linking: Society shall contribute 5% of the total borrowing towards share capital to the Bank.

3. For Marginal Farmers: A flexible limit of Rs.10000.00 to Rs.50000.00 be provided as KCC based on the land holding and crop grown including post-harvest warehouse storage related credit needs and consumption needs etc. The composite KCC limit is fixed for a period of Five years.

4. Disbursement: KCC is limit is in the nature of revolving cash credit, there is no restrictions in number of debits and credits, and however the drawable limit have to be repaid within 12 months from the date of issuing of the same. A farmer can withdraw through Branch or by using cash withdrawal facility provided by the Bank or through KCC Rupay debit card recently introduced by the Bank.

5. Validity: KCC is valid for five (5) years and is subjected to annual review which may result in continuation of the facility, enhancement of the limit depending on the increase of cropping area. The Bank may grant an extension or re-schedulement in case of calamity or crop failure on declaration from the department concern.

6. Rate of interest: 7% simple interest with 2% interest subvention provided for timely repayment to be provided by the Govt. of India.

7. Insurance: A crop insurance facility is being provided though ICICI Lombard insurance in a form of Pradhan Mantri Fasal Bima Yojana (PMFBY) and the amount varies from 2% to 5% on a notified crop.

3:00 pm- 5:00 pm: HORT-I: BROCOLLI (*Brassica oleracea*)

Brocolli belongs to the family brassicaceae, it is an important cole crop after cabbage and cauliflower. It contains vitamins A, 130 and 22 times higher than cauliflower and cabbage respectively, and also contains thiamine, riboflovin, niacin, vitamin c and minerals (Ca ,P, K and Fe). Brocolli is the richest source of protein among cole crops. It has a very powerful anti – cancerous compound known as glycosinolate, which protects against bowel/colon cancer. Moreover, broccoli is the only vegetable which is rich in selenium which acts as anti-oxidant. From the last few years, it is becoming popular among the farmers of NEH region due to its high nutritive value and support potential.

1. **Varieties:** - Solan Green Head and KTS- 1 are the open pollinated varieties, which have good yield potential. Among the hybrids, Fiesta,Lucky, Packman,Everest, Montop,Green Magic and Pushpa are high yielding. These varieties /hybrids were found suitable for cultivation in our state.

2. **Climate and Soil**:- Brocolli is a cold season crop but sensitive to very low and high temperature .In warm weather ,bud clusters become loose quickly. The optimum temperature is 10 – 25^0C is ideal to get a good crop. It grows well in sandy and silty loam soils, well drained upland soil with ph of 5.8-7.2.

3. **Nursery raising** :- In our state , where the temperature is mild during August to September ,the seeds are sown in first week of August while in other parts the seeds are sown in first forthnight of September. The nursery bed should be prepared by incorporating of well rotten FYM at @ 4 kgs /sqm. About 500grams seeds are sufficient for transplanting in one hectare area. Seeds should be treated with biocure F @ 10ml / kg of seed and biocure magic@of 10 ml /kg of seed respectively.The seeds should be dipped in the above solution, dry in shade for 20 to 30 mins before transplanting .The seed should be sown at a spacing of 8 to 10 cm between lines, 2 to 3 cm between seeds and 1-1.5cm deep. After sowning light irrigation should be given by watering can. The nursery should be protected from heavy rains, weeding and intercultural operations should be done at regular intervals to get healthy seedlings.

4. Manures and Fertilizers:- About 20 tonnes FYM or well rotten cowdong should be added in the soil one month before transplanting in the soil. Besides FYM, Biofertilizers such as Azotobacter 2.5kg + phospholika 2.5 kg for one hectare as seedling root dip method to enhance soil fertility. Organic manure such as Anandhan @ 100kg-150kg/ha can also be incorporated to improve soil fertility and provide nutrient to the crop.

5. Transplanting :- The seedlings are ready for transplanting after 4-6 weeks of sowing.The good time for transplanting is when they are 4-5 leaves and it should be done in the afternoon hour if possible at a distance of 45 x 30cm.

6, Intercultural operation:- It should be done regularly to keep the crops free from weeds . Shallow hoeing should be done in order to remove weeds and avoid injury to the main crop.

This should be done after 20 to 25 days of transplanting, side dressing of nitrogenous bio fertilizers should also be applied during earthing up for healthy growth of the crop.

7. Plant protection measures:-

Cut worms:- The caterpillars are 3-4cm long, grey or brown to almost black with various markings. The caterpillars hide during daytime and feed at night. It causes damage by biting the foliage and by cutting down the young seedlings just above the ground level.

- Spray with Bacillus thuringensis(Bt) or Dipel @60ml /Lit of water.
- Soil application with SoldierWP@ 2kg/200litres of water and drenched for one acre. It can also be mixed with moist sand /FYM and broadcast.
- Spray with neem based biopesticide such as Nimbeccidine@5ml/Litre of water.
- Picking and destruction of the larvae at the early stage of the crops.
- Growing of 2 rows of mustard after every 25 rows of the crops.

Leaf Webber:-

The leaves are skeletonized by the larvae which remain on the undersurface of leaves in webs and feed on them. They also attack flower buds and pods. The insects commonly attacks on early grown crops.

- Picking and destruction of the larvae at the early stages of the crop .
- Spray with Helicom L/ Bio Power/ Baba (Beauveria bassiana @80grams / 16 Lits of water as foliar application.

Damping off":- It is the common diseases of nufrsery. In severe condition, the affected seedling droopped and fall off due to infection at the collar region.

- Soil treatment is effected to control the diseases. Mix 1Kg of Trichoderna Viridae formulation in 100 Kg Farmyard manure. Cover the mixture for 7 (seven) days with polythene sheet, turn the mixture in every 3 to4 days interval and broadcast it in the field at an area of 1 (one) acre before transplanting.

Scherotinia drying or white rot:-The pathogen is soil borne. It is a serious disease particularly in the hilly regions. The fungus advances to the bases of the outer leaves and plants suddenly wilt.

- Deep ploughing as the sclerotia of the fungus cannot survive below 15 cm
- Soil drenching with Pseudomonas fluorescens /biocure B @5ml /Litre of water. It can also be applied as soil applications @1-2Kg /100kg FYM/ acre.
- Seedling drying with Trichoderma Viridae @5-10ml/Liter of water.

Black Rot:- **Black rot:-** The pathogen attacks primarily the above ground parts of plants. The leaves midrib forming ‘V’ shaped area, which is the most characteristics symptoms of the disease. The bacterium is transmitted through seed.

- Seed treatment with hot water at 50^{o} C for 30 minutes is found effective to control the disease.
- Seed treatment with Trichoderma spp @ 5-10gm/lit of water + 5-10ml/lit of water Pseudomonas fluorescens. Prepare this solution, dip the roots of seedlings for about 15 minutes and dry in shade for 30 minutes before transplanting.

8. Harvesting and yield:-The crops become ready for harvesting after 80 to 90 days of transplanting.

The average yield of 175 -240qt/ HA can be obtained depending upon the varieties as per table below.

Sl no	Varieties /hybrids	Days to head maturity	Marketable head(Gm)	Yield Qt /Ha
1	Solan Green head	80	350	175
2	KTS	80	380	195
3	Lucky	85	410	225
4	Fiesta	78	425	240
5	Pushpa	82	375	180

DAY -25: 10:00 am- 12:00 noon: ENTREPRENEURSHIP: ENTREPRENEURSHIP DEVELOPMENT

Entrepreneur:

Entrepreneur is one who always searches for Changes, responds to it and exploits it as an opportunity.

Entrepreneur means a person who sets up his own business or Industrial undertaking with a view to make profit. (Drucker)

Entrepreneurship Behaviour: Entrepreneurship behaviour is of three types: high, moderate and low. In every social set up people exist in these three categories. People with high entrepreneurship behaviour are very few where as maximum percentage is in low entrepreneurship behaviour category. People can be moved from one category to another through motivation and learning. Characteristics of three different behavioural categories are:

1. High – Need for Achievement, Standard of excellence in a performance related situation,

   Active, work hard, set high goals and do different things

2. Moderate – Need for Power, One's desire to control or influence on going situation, Leadership and give directions to others.

3. Low – Need for Affiliation, One's concern to establish maintain and sustain effective relations with others and keep close emotional relationship.

In rural areas, young people have a major stake in how the natural, economic and social resources of their communities are developed. However, to feel a part of this process they must be given the opportunity to build their livelihoods on their own terms (Waldie, 2007). It is very crucial that this segment of population be oriented in the right direction to ensure an overall development of the country as youth is the future of nation and their degradation may prove to be a disaster for any country.

Employment of rural youth being a subject of great concern in the present agricultural scenario and entrepreneurship on small scale is emerging as a major factor in paving way for employment of youth. Entrepreneurship is the only solution to the problems of unemployment and proper utilization of both human and non-human resources. The youth should be made service provider rather than job seeker. But the question here arises that how can entrepreneurial culture be created among youth and what are the ways in which such enterprises be sustained and made successful? This requires vocationalization of agriculture and development of entrepreneurial abilities among youth. It can play an important role in providing them a livelihood and raise their standard of living. Although vocational training and self employment programmes are an integral part of all the Agricultural Universities, Rural Development Departments and Agricultural NGOs but with the introduction of World Trade Organization and globalization of agriculture, it has become essential for the farmers to develop more productive and higher value adding means of competing. Knowledge, education and training have become even more important for the reason that farmers can participate effectively and feel a part of the new global order.

More emphasis needs to be given on the orientation of training programmes towards quality production rather than only on increasing the production. Also development of entrepreneurial skills among the farmers, post harvest management, processing and value addition should become an important component of these vocational trainings. In the present agricultural set up; besides production sector, there exist a number of entrepreneurial opportunities in the field of different sectors of economy.

A. Production Sector:

More food grains and other eatables are required to feed the fast growing population of India. Scientific and hi-tech farming is the need of the hour for the production of food grains and other crops so that higher yields are obtained. With the globalization of agricultural trade, export facilities are liberalized by the government. Therefore, apart from producing more quantity of agricultural products, quality production is equally essential. For export purposes, the demand of quality product is increasing day by day. To fulfill this demand, the youth can set up various production units on scientific lines such as cereal, pulses and oilseed crops, vegetable crops, orchards (fruit plantations), nursery raising, bee keeping, calf rearing, poultry farming, cut flower production, hybrid seed production, fisheries, dairy farming, mushroom cultivation, rabbit rearing, piggery, goat & sheep rearing, etc.

B. Processing Sector:

Farmers who do not possess sufficient land and other resources for setting up their production units can look forward in setting up their processing units. These units can be started on small scale and can be expanded later. For example flour mills, grinding and packaging of spices, processing may be of cereals in the form of *dalia,* samolina, noodles etc., baking products, preservation of fruits and vegetables in the form of juices, squashes, jams, sauces, pickles and jellies and their packing and canning, oil seed extraction, preparation of milk products and their packing, paper mills, cardboard making, sugarcane products like gur, juice and *khandsari* etc., honey extraction and its packing, etc.

C. Service sector:

There is a sizeable number of youth who do not possess any land or resources for setting up their processing units. Such farmers can provide different kinds of services to the farmers such as custom hiring of agricultural tools and implements, artificial insemination in milch animals, feed shops for cattle and poultry, agro-chemical shops (pesticides and weedicides), inoculation and spawn services, agri-clinics, horticultural clinics, polyclinics, agro-service centres, etc.

D. Sale and purchase sector:

Farmers can go for sale purchase business of dairy cattle, cattle feed/ mineral mixture, chicks, fish seedlings, plant seedlings, agricultural machinery, milk and milk products, vegetables and fruits, fertilizers/ pesticides, Collection and marketing of farm produce etc.

Pre-requisites for a successful entrepreneur:

There are certain pre-requisites for becoming a successful entrepreneur as depicted in Fig.1.

1. Technical Expertise: Appropriate and relevant training is vital for farmers to improve their ability to run their enterprise successfully. Many people are unable to reach their potential in an enterprise because of lack of appropriate training in that venture. Therefore, it is essential to acquire requisite expertise in that particular venture. Employment opportunities can potentially be enhanced by enabling access to appropriate technology and providing expertise in using that technology. Farmers should be made well equipped in using different scientific and technical methods of running their enterprise. Well planned action-oriented training programmes need to be run by the Agricultural Universities, Agricultural and Rural Development Departments and NGOs for farmers to run the projects on scientific lines and cope with the obstacles and hindrances they are exposed to. *Krishi Vigyan Kendras* are trying to bridge the gap between the urban and rural populace leading to rural economic strength in the immediate future and a strong national economy in the long run.

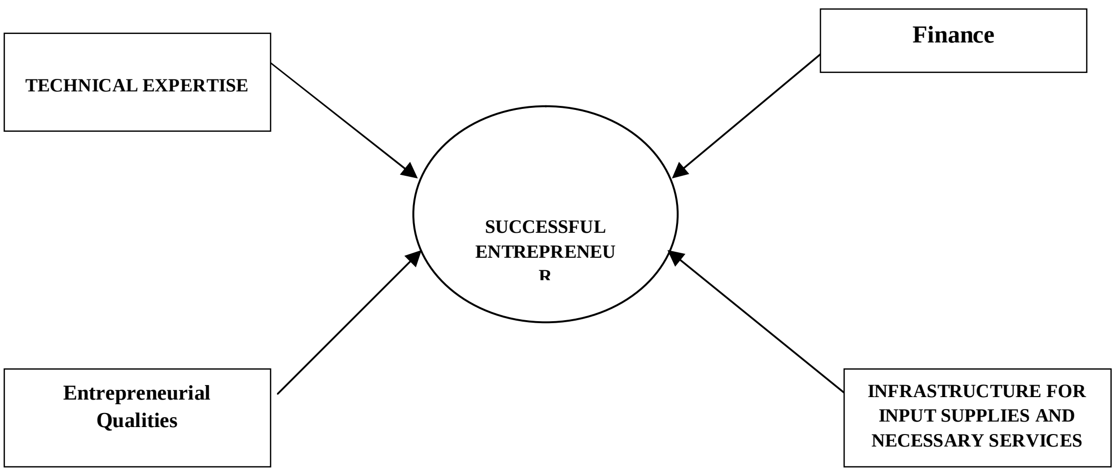


Fig.1 Pre-requisites for a successful entrepreneur

Various training programmes are being conducted on production and processing of agricultural produce. The duration of these training programmes ranges from two days to ten days. Apart from these short duration and vocational programmes, an exclusive Young Farmer’s Training Programme (YFTP) of three months is conducted twice a year. A comprehensive training on all the aspects of agriculture and allied enterprises is given to the young farmers in this programme. It also includes training on marketing and custom hiring services in agriculture and allied fields

Entrepreneurial Qualities: No doubt, technical expertises is very essential for gaining success in an enterprise but along with that management and motivational skills are equally essential for a youth to be successful. It is a pre-requisite to orient the youth's mind towards agricultural business. Farmers have limited work experience of business networks and cash-flow management skills. Also fear of failure is a strong dis-incentive to start one's own business. Therefore, a lot of motivation is required for orienting youth from a mere producer to an entrepreneur. Thus, the training programmes should include a component of developing entrepreneurial qualities among farmers. For example the International Labour Organizations (ILO) has started a "Start and Improve Your Business (SIYV)" programme. It is a system of training packages and supporting materials for small scale entrepreneurs. The programme aims to provide training and skills so that the barriers to start and successfully run an enterprise can be overcome. The programme includes training in people management, record keeping and determination of best kind of enterprise according to the skills and resources available with the individual.

An interaction with the successful entrepreneurs should also be ensured for inculcating entrepreneurial qualities among the farmers. A youth is said to be a good entrepreneur if he/she possess the following:

Entrepreneurial Qualities:

- Shoulders responsibility
- Moderate risk taker
- Wants to know the results
- Do not get discouraged with failures
- Innovative –goal oriented rather technology oriented
- Interpersonal competence
- Oriented towards the future
- Shows tolerance to ambiguity
- Mobile –travel for ideas
- adventurous
- Hints for increasing motivation
- Creating desire and giving alternatives

2) Finance: Finance is one of the most vital pre-requisite for any venture to be started. Often business start-up costs are the major obstacles preventing farmers from creating their own employment opportunity. When the technology is useful to the farmers and start-up costs are affordable and accessible, youth will take advantage of them and will create employment opportunities for themselves. If youth are then assisted through micro finance and support mechanism, including training in things like cash flow and business management, the enterprises are more likely to be adopted and prosper. To get a project financed from any bank/agency, proper project formulation is required. Training programmes, therefore, should impart training in the project planning, knowledge regarding economics of various enterprises and should also help the farmers to arrange finance for their projects.

3) Infrastructure for input supplies and necessary services: Besides technical expertise, managerial skills and finance, inputs and necessary services should also be easily available for the farmers to start their venture. The training programmes should ensure the awareness of sources of inputs and services to the farmers, and also effective market linkages need to be developed by the government.

Hints for increasing motivation among the farmers to become successful entrepreneurs:

- Creating Desire And Giving Alternatives
- Encourage Competition
- Broadening Outlook
- Give Recognition
- Encourage Sharing of Success
- Help in Goal Setting
- Assign Responsibility
- Help Building Self Confidence

1:00 pm- 3:00 pm: ENTREPRENEURSHIP: Successful Entrepreneur (Poultry)

3:00 pm- 5:00 pm: AGRONOMY: SRI (SYSTEM OF RICE INTENSIFICATION)

B R E A K T H R O U G H I N L E S S W A T E R R I C E C U L T I V A T I O N

SRI Technology

- SRI Technology was invented in the early 1980s by Fr. Henri de Laulanié, S.J., who came to Madagascar from France.

- Not known outside Madagascar until 1997. Its potential is now realized by many countries like China, Indonesia, Cambodia, Thailand, Bangladesh, Sri Lanka, India.

- Earlier everybody believe that Rice is an aquatic plant and needs standing water to grow. Now the concept has changed -Rice is not an aquatic plant, it can survive in water but does not thrive under hypoxic conditions.

- It needs air and it spends lot of its energy to develop air pockets (aerenchyma tissue) in its roots.

- Under continuous inundation 70% of Rice root tips get degeneratedby flowering period.

- It can be grown with only about half as much water as normally applied in irrigated rice.

- Necessity is the mother of invention so did Fr. Henri de Laulanié, S.J., proved it by successfully grown rice under drought condition using an approach of what is known now as ‘System of Rice Intensification”..

What is SRI?

SRI the acronym for System of Rice Intensification is a production technology for Rice WITH OUT exploiting more water resources and WITH OUT increasing cultivable area.

SRI is based upon a set of principles and practices for increasing the productivity of irrigated rice by changing the management of plants, soil, water and nutrients.

SRI technology has the potential to double the productivity with less water requirement.

“Less can produce more”.

Why SRI?

- Depleting water resources
- Stagnated rice productivity
- Growing importance for organic Agriculture
- Increased production costs
- For best utilization of family labour for small and marginal farmers.
- SRI Technology increases the productivity of Land,LabourandWater

Principles of SRI Technology

The Six principles are:-

- Early Transplanting
- Careful Transplanting
- Wide Spacing
- Weeding and Aeration
- Water Management
- Organic manuring (Compost / FYM)

Basic SRI Management Practices

1. Seedlings are transplanted very young -- usually just 8-12 days old, with just two small leaves.

2. Seedlings are transplanted carefully and quickly to have minimum trauma to the roots

Remove plant from nursery with the seed, soil and roots carefully and place it in the field without plunging too deep into soil. -More tillering potential

3. Seedlings are transplanted singly, only one per hill instead of 3-4 together to avoid root competition- widely spaced to encourage greater root and canopy growth in a square grid pattern, 25x25 cm or wider in good quality soil

Planting single seedlings, not in clumps, and in a square pattern, not rows, 25cm x 25cm or wider -More root growth potential

4. Weeding and Aeration needed because no standing water. Weeds become a problem because fields not kept flooded, weeding are necessary several times, starting 10-12 days after transplanting, and if possible, every 10-12 days until before the canopy closes. Using a rotary hoe/canoweeder has the advantage of aerating the soil.Weedsare incorporated in the soil to decompose so their nutrients are not lost. Additional weedings beyond two can increase yield.

More root growth, due to reduced weed competition, and aeration of soil, giving roots more oxygen and N due to increased microbial activity we left in soil; can add 1+tons per weeding? Each additional weeding after two rounds results in increased productivity up to 2 t/ha / weeding.

5.Water Management regular water applications to keep soil moist and aerobic but not saturated, with intermittent dryings, alternating aerobic and anaerobic soil conditions to support increased biological activity. Only a minimum of water is applied during the vegetative growth period, and thereafter only a thin layer of water is maintained on the field during flowering and grain-filling.

More root growth because avoids root degeneration able to acquire more and more varied nutrients from the soil

6. Organic Manuring (Compost / FYM) applied instead of or in addition to chemical fertilizer. Better quality compost can give additional yield advantages. Chemical fertilizer alone does not enhance soil structure and microbial communities in the rhizosphere as applying organic matter accomplishes.

More Plant growth because of better soil health and structure, and more balanced nutrient supply.

Nursery Management in SRI

- SRI technology requires 'Raised nursery bed'
- Seed rate 2 kg/ac
- Nursery area 1 cent / ac
- Select healthy seed
- Pre-sprouted seeds are sown on raised nursery bed
- Prepare nursery bed like garden crops
- Apply a layer of fine manure
- Spread sprouted seed sparcely
- Cover with another layer of manure
- Mulch with paddy straw
- Water carefully
- Banana leaf sheath may be used for easy lifting and transport of seedlings.

Comparative Cost of cultivation (per acre)

Particulars	Conventional method (in Rupees)	SRI method (in Rupees)	Difference
Nursery & Main field preparation	1500	1500	-
Seed rate	450	30	-420.00
Transplanting	1000	1500	+500.00
Manures and Fertilizers	2235	2118	-117
Plant protection	700	250	-450.00
Weeding cost	1600	800	-800
Harvesting &Threshing	2000	2500	+500
Yield	2100kgs	2800kgs	700kgs
Total cost(Rs.)	9485	8698	787
Gross Returns	12810	17080	5124
Net Returns	3325	8382	5057
C:B Ratio	1:1.35	1:1.96	

Advantages of SRI

- Less external inputs:Less seed (2 kg/ac). Less chemical fertilizer. Less pesticides. SRI requires only about half as much water as normally applied in irrigated rice.
- SRI encourages rice plant to grow healthy with:Large root volume , Profuse and strong tillers , Non lodging , Big panicle, More and well filled spikelets and higher grain weight, Resists insects because it allows rice to grow naturally
- Tillering is greatly increased:30 tillers per plant are fairly easy to achieve. 50 tillers pen plant are quite attainable. With really good use of SRI, individual plants can have 100 fertile tillers or even more.
- Maximum tillering occurs concurrently with panicle initiation because no set back due to early transplanting and no die back of roots.
- More filled grain per panicle and no lodging of crop.
- SRI is initially labour intensive:Needs 50% more man days for transplanting and weeding. Mobilises labour to work for profit. It offers an alternative to resource poor, who puts in their family labour. Once skills are learnt and implements are used, the labour costs will be lesser than the present day rice cultivation.
- Root growth can be massive in response to SRI practices:-3 plants per hill under conventional method required 28 kg of force to be pulled up. Single SRI rice plant required 53 kg of force for uprooting

Benefits of SRI

- Higher yields - Both grain and straw
- Reduced duration (by 10 days)
- Lesser chemical inputs
- Less water requirement
- Less chaffy grain %
- Grain weight increased without change in grain size Higher head rice recovery
- Withstood cyclonic gales
- Cold tolerance
- Soil health improves through biological activity

DAY -26: 10:00 am- 12:00 noon: POST HARVEST MANAGEMENT:

(a) Extraction of Fruit Juice (b) Preparation of Squash Pulp

Processing of Fruit and Vegetables

EQUIPMENTS -The following equipments are required for preparation of fruits & vegetablesproducts.

Stainless steel pan, stove, weight box & balance,Juice extractor wooden ladle, pineapple puncher (Stainless stell glass may also be usedRefractometer& Thermometer).

EXTRATION OF FRUIT JUICES/PULPS

Select fully ripe or matured fruits free from diseases and insect damages for processing.

1. **ORANGE:** Peel the oranges and immediately extract the juice with the help of juice extractor and simultaneously add 50gms/10 table spoonful approximately, from the require quantity of sugar to prevent bitter of the juice.

2. **PINEAPPLE:** Peel the selected pineapple with the help of a stainless steel knife and cut into small pieces, crush the pieces with the pineapple puncher or with a stainless steel glass, if puncher is not available. Put the crusher pineapple pieces in a muslin cloth and squeeze out thejuice, then filter the juice again in a muslin cloth.

3. **SOH PYRSHONG (CARAMBOLA):** Wash the fruit thoroughly and extract the juice with the help of juice extractor.

4. **SOHBRAP (PASSION FRUIT):** Wash the fruits and cut theminto halves with the help of a stainless steel knife and extract the pulp from the cut fruits with a spoon.Extract the juice by passing the pulp through a net cloth.

5. **SOHIONG (PRUNUS NEPALENSIS):** Clean and wash the fruits properly and boil in water till the fruits become soft. Extract the pulp by crushing the boil fruit in a bamboo sieve.

Preparation of Syrup

Dissolve the required quantity of sugar separately in water as per recipe on a slow fire with continuous stirring and heat up to boiling point. Then add whole quantity of Citric where ever is necessary in the sugar syrup. Filter the prepared syrup and let it cool down to room temperature.

Recipe for 4 litres (approx.) Squash

Sl. No.	Type of Squash	Juice (lit)	Water (lit)	Sugar (kg)	Citric Acid (gms)	Potassium Meta bi-sulphide (gms)	Essence	Colour (Drops)	Sodium Benzoate (gms)
1.	Orange	1.000	1.500	1.500	50	2.9	1 or 2 drops	1 pinch	-
2.	Pineapple	1.000	1.500	1.500	40	2.9	1 or 2 drops	-	-
3.	Sohpyrshong (Carambola)	1.000	1.285	1.680	30	2.9	-	-	-
4.	Sohbrap (passion fruit)	1.000	1.410	1.650	30	2.9	-	-	-
5.	Sohiong	1.000	1.400	1.560	30	-	1 or 2 drops (Strawberry Essence)	-	2

SQUASH

Mixed the juice with Syrup and add the whole quantity of Potassium Meta Bi-Sulphide by first dissolving it in a spoon of water or sodium benzoate in case of Sohiong preparations, one or two drops of essence and a pinch of colour where ever is necessary, fill the prepared squashes in clean sterilized bottles, seal properly and store in a cool dark place.

JAM

Jam may be prepared from a single fruit or combination of two or more fruits, dried, canned fruits or preserved pulps may also be used.

EXTRACTION OF PULPS- Fruits may be crushed or cut into small pieces with the help of stainless steel knife and boil with a sufficient quantity of water, then passed the boiled fruits through a fine sieve to obtain the pulp.

RECIPE:

1 Kg pulp
1 Kg sugar
5gmsready made fruit pectin
2 gms citric acid (Citric acid is not necessary in case of Plum &Sohiong jam)

Colour may be used in case of mixed fruit jam. Sprinkle the required quantity of Pectin mixed with small quantity of sugar to the pulp and boiled for 5minutes then add equal quantity of sugar to the pulp (i.e., 1 kg pulp &1 kg Sugar) and heat the content stir well with wooden ladle till heavy consistency and add citric acid. When the total soluble solids reached 68.5° Brix as determined by "Refractometer" then stop boiling, fill the prepared jam in clean and sterilized jars and seal properly. If the jam is to be packed in cans it should be filled while it is still hot, seal, invert the cans and pasteurized for about 30 minutes at 82° C to 85° C and cool in water. In case of larger size cans, i.e., above A-2 ½ cans pasteurization is not necessary.

PICKLES

Pickles maybe prepared from a single unripe fruits or vegetables or a mixture of both according to one likes.

Curing of fruits /vegetables: Dissolve 360 gms common salt in 1640 ml of water (18% salt solution)and filter in muslin cloth, then add 2 gms sodium benzoateand 5 gms turmeric powder and stir well. Place 1 kg of the cut fruits/vegetables in suitable containers having lids, fill in with the above prepared solution, close the containers properly and allow tocure for a minimum period of 2 (two) week's time.

RECIPE:

1 Kg fruit/vegetables
10 gms sarso
10 gms dhania
10 gms methi
10 gms kalajeera
10 gms sauff
10 gms ajwain
30 gms chilli powder
750 ml mustard oil.

After curing period is over, drain off the solution properly from the fruits/vegetables and mix with the already roasted and ground spices, then place the fruits/vegetables in sterilized bottles and fill in with pre-cooked & cooled mustard oil and seal properly.

TOMATO KETCHUP

Select deep red well matured tomatoes, free from blemishes and insect damage.

Recipe :-

Tomatoes	6 kgs	Cinnamon (Dalchini)	5 gms
Onion	100gms	Cunin (Jeera)	2 gms
Garlic	5 gms	(Salt to taste)	
Cloves (long)	2 gms	Red Chille Powder	5 gms
Cardamon (Elaichi)	2 gms	Acctic acid	10 ml
Black Pepper	1gms	Sodium Benzoate	1gm

Preparation: -

Cut the tomatoes into small pieces and boil in an aluminium pan till they become soft, then pass the boiled tomatoes through a fine bamboo sieve to obtain a clear pulp free from skin and seeds. Boil the pulp again along with the required quantity of sugar and dip ground spices tied in a muslin cloth while boiling and remove whenthe ketch up is ready and add salt towards the end of boding.

When the ketchup is ready add the required quantity of Acetic acid and stir properly followed by Sodium Benzoate, stir and keep in air tight containers.

1:00 pm- 3:00 pm HRD Leadership Leadership Development

Objectives

After going through this unit, you will be able to:

_ understand the concept of leadership

_ recognize various styles of leadership

_ understand bases of power and spheres of influence

_ understand how leaders of various organizations are influenced by their organizational context

Introduction

Several community-initiated projects have come to a grinding halt owing to a lack of leadership and other management skills. Many local leaders have the best of intentions for solving environmental problems in their community and initiate a project only to see it fail through poor leadership. Sometimes they have an out-dated philosophy of management which does not sit comfortably with volunteer members of government and non-government agencies. Ideas about leadership have changed considerably, and the expectations of groups and communities are changing also. As people become better educated they become more articulate and no longer respond to authoritative styles of leadership in every situation. There is a need and also a demand for community involvement in decision-making.

Participative styles of management are needed when addressing the complex problems that land and water management groups have to solve.

Leaders perform various roles such as planning and implementing, evaluating, monitoring, controlling, motivating, managing conflicts, organizing task groups, mobilizing human and financial resources, and above all, setting an example to the group.

Understanding Leadership

While most people already have their own idea of what leadership is, it is in fact a political concept. Attempts to define leadership therefore often generate strong personal reactions. We recognize that leadership is necessary for efficiency, but because of our egalitarian tradition, we are uncomfortable with any suggestion of superiority (1).

There are a number of major theories about leadership. Each focuses on a different aspect of human behaviour, and provides useful insights into what makes a good leader.

Leadership is sometimes viewed as headship, as in a formal position such as that of chairperson, director, or politician. A person who lacks leadership skills may still be appointed to such a position.

In due course, this person may be replaced by new leaders if he/she does not learn to exercise the functions of leadership in such a way as to satisfy the needs of the group or the community. While government officers or corporation staff are usually termed “managers”, and people elected from the community are labeled “leaders”, both positions involve leadership and management functions.

Source: Chamala Shankaraiah and Mortiss, PD, Developing Leadership Skills. Chapter Reprints from Working Together for Land Care, Australian Academic Press Pvt. Ltd., 1990

Leadership has been defined as “the process of influencing the activities of an individual or a group in efforts towards the achievement of goals in a given situation” (2). The source of influence may be formal, or informal. Leaders can emerge from within a group as well as being formally appointed.

Although we all start with different amounts of natural talent, leadership is a learned behaviour.

The skills involved can be acquired. Leaders are not born, they are made. Each person is a potential leader. As in any other field of endeavour, such as cricket, medicine or farming, natural abilities can be developed through study and practice. Many of today’s prominent leaders in the rural community began as inexperienced members of community groups.

GIVE A LEAD IN RESCUING THE FUTURE

Bases of Power

Why is it that we are able to influence people ? And why do some people have more power of influence than others? Research has revealed that there are in fact five bases of this influence (3).

1. Reward Power: In some situations, people have the ability to give out money, promotions, recognition or resources and they use this to influence others. Not everyone can offer these material rewards, but everybody has the ability to give praise and support.

2. Coercive Power: People who have the ability to punish those who do not comply with their wishes have coercive power. This power may be based on a formal position, as with police, employers, or supervisors, or it can stem from the ability to withhold such things as custom, recognition, or service It can also be based on the exertion of other pressures such as harassment or social censure.

3. Legitimate Power: This stems from internalized values which recognize that particular people, because of their position, -have the legitimate right to influence others. If legitimate power is used outside its recognized sphere, there will be a decrease in the legitimate power of the person exercising it. In other words, leaders who abuse power will be rejected in the long run.

4. Referent Power: This is based on the desire to identify and be closely associated with a person or group. The “reference group” is a concept which has emerged from the recognition of this power. Any person or group that people look up to and follow has referent power.

5. Knowledge Power: Sometimes called “expert power”. this results from the perception that a person knows more than oneself about certain things. The range of expert power is limited to particular areas of knowledge.

A sixth source of power is “people power”. By organizing into groups. a once loosely—knit community can acquire new strength and power. If these groups join at catchments, regional and national level, this will further increase and extend their influence. The participative action model provides a basis for building sustainable community groups.

These sources of power are interrelated and are found in everyone in every community, in varying degrees. The practical implication of understanding this concept is that you can increase your or community power in any of these areas except legitimate power, although this too may be acquired as a result of an overall increase in power. Leaders need to recharge their power bases periodically by gaining new knowledge and skills.

Spheres of Influences

In our society, different leaders influence different spheres of activity. Some will be opinion leaders on only one topic (monomorphic leaders); others will be opinion-leaders on a variety of topics (polymorphic leaders). It is important to understand in which area/s of knowledge an individual commands trust, respect and credibility. (An effective operational leader uses the different kinds of opinion-leaders for their various specialized skills).

Another facet of influence is that of its geographical extent. A leader may be influential at a district, shire, region, state, national or even international level.

In other words, the influence of a leader can be specific to a topic or to a geographic region.

The group can benefit from an understanding of the spheres of influence of various leaders and by networking with them.

3:00 pm- 5:00 pm: PRACTICAL

DAY -27: 10:00 am- 12:00 noon: FARM PLANNING

Farmers expectations in development of Agriculture

When asked on what is the expectations that farmers seek when agricultural development is concerned, majority of the farmers looks forward towards an increase in the income from their farm while others seeks the need to reduce the expenditure on the farm, both of these can be shortlisted into two parts i.e the efficient use of farm resources for avoiding unnecessary expenditures and increased profits. These broad needs can be achieved through Farm Planning whereby all activities in the farm are planned well before hand before the actual work happens. It is also one of the technique for bringing about change in the attitude of the farmers in terms of agriculture i.e to look at farming as a BUSINESS.

When we look at the similar characteristics of a hawker in the road, a shop and a company, we realized that the three have a clear understanding of the marketing question regarding what to produce, how much to produce, how to produce and how to market the products. However, when we look at farming, we see that a majority of the farmers don't have answers to the above questions which may be due to the underlying fact that most of them still don't take up farming as a Business. A step towards this direction would be to gain knowledge and practice farm planning which would bring about renumerative income from the farm.

Farm Planning

The underlying factor for bringing about the said development and change in attitude of the farming towards farming is to think of it as a Business and this will start with FARM Planning which is a process of seeking answers to questions about what, how much and how to produce and when and where to buy and sell. This planning of the operation and the successful execution of is the secret for economic success and improving farm income. Unfortunately most of our farmers are not bisiness minded, Apart from this, technology in farming is changing and a good farm plan helps the farmer decision making ability with respect to the incorporation of such successful technologies for bringing about cost of cultivation. Some farmers may plan but most of the times such plan are not successful as the farmers cannot execute their plan for lack of proper planning and most importantly lack of written plans.

Advantages of Farm Plan

Firstly, farm planning helps the farmers in bringing about income improvements through proper use of readily available resources in the farms which in turn helps ti reduce the input cost. Further it helps in maximizing income to help adapt and bring about desirable changes. Secondly, it also helps the farmers in increasing the knowledge as farm planning is an educational process for bringing about change in outlook for the farmers in particular and the society in general. It also helps the farmer to keep themselves updated with the information on the new technologies available. The farmers can also clearly study their own business and see more clearly their opportunities and limitation thus improving their managerial ability. Lastly, farm planning helps in bringing about desirable organizational changes and operation to make the farm a viable unit. Farm planninh wil help to bring about contemplated change in the method or practices followed on the farm and it can be a means for complete re-organization of the farm business.

How farm planning helps

The farm planning helps the farmer in the following ways:

a) It helps him examine carefully his existing resource situation and past experiences as a basis for deciding which of the new alternative enterprises and methods fit his situation in the best way.

b) It helps him identify the various supply needs for the existing and improved plans.

c) It helps him find out the credit needs, if any, of the new plan.

d) It gives an idea of the expected income after repayment of loans, meeting out the expenditure on production, marketing, consumption, etc.

e) A properly thought of a farm plan might provide cash incomes at points of time when they

may be most needed at the farm.

A farm plan is a programme of total farm activities of a farmer drawn out in advance. An

optimum farm plan will satisfy all the resource constraints at the farm level and yield the maximum profit.

Characteristics of a Good Farm Plan

A good farm plan generally should have the following characteristics:

a) An element of flexibility in a farm plan is essential to account for changes in the environment around the farm.

b) A farm plan should maximize the resource use efficiency at the farm.

c) It should provide for the attainment of the objectives of profit maximization through optimum resource use and balanced combination of farm enterprises.

d) Risk and uncertainty can be accounted for in a good farm plan.

e) The plan helps in timely acquisition and repayment of farm credit.

Other characteristics of a good farm plan is that it should encompass an integrated approach I,e includes both crops as well as animal rearing. It also look at the sustainable aspect of the soil and income generation as well as a balanced apporoach on use of farm labour, electricity for the whole year round.

Components of Farm Planning:

Any systematic farm planning necessarily has the following five components:

a) Statement of the objective function: Many farmers aim at profit maximization. However, some farmers do not go all out to maximize their profits, but have objectives like cereal equirements for the family and fodder needs for the livestock.

b) Inventory of scarce resources and constraints such as Land, Labour, Capital, Personal farmers experience and interest, Institutional infrastructures, credit and selection of crop rotations

c) Alternative Choices: Alternative choices in planning refer to the various enterprises, crops and livestock, which can be considered for attaining the stated objectives. There are alternate ways to use the scarce farm resources. There may be more than one ways to produce the same enterprise. A comprehensive list of different alternative enterprises can be prepared.

d) Input Output Co-efficients: The requirements of each of the several scarce resources and the financial returns per unit of each enterprise or activity need to be considered here. The precision in planning depends more on accurate input-output data than on the technique of planning.

e) Planning Technique: With a proper understanding of the planning environment and use of precise input-output data along with true and realistic constraints, sophisticated techniques give better results. However, common sense in the planning process could lead to fairly good results. The farm planning techniques include Budgeting and Linear Programming. Budgeting is most informal of all the planning techniques and the level of sophistication gradually increases as we move from budgeting to linear programming.

Steps in Farm Planning:

The various steps involved in planning include

a) Planning: This includes the identification and definition of the problem, collection of information, identifying alternative solutions and analyzing each alternative. Planning is the basic management function as it means deciding on a course of action, procedure or policy. The control function is a source of new information, as the results of the initial plan become known.

b) Implementation: Once the planning process is completed, the best alternative must be selected and action should be taken to place the plan into operation. This requires the acquisition and organization of necessary land, labour, capital and other inputs. An important part of the implementation function is the financing of the necessary resources.

c) Control: This provides for observing the results of the implemented plan to see if the specified goals and objectives are being met. Many things can cause a plan to go "off its track". Price and other changes, which occur after the implementation of the plan, can cause the actual results to deviate from the expected. Control requires a system for making regular checks on the plan and monitoring progress and results as measured against the established goals. The dashed line in the chart represents the continuous flow of information from the control function back to planning, an important part of the total system. Without some feedback procedure, the information obtained by the control system is of no use in making corrections in the existing plan or improving future plans. This feedback sets up a continuous cycle of planning, implementation, monitoring and recording progress, followed by a re-evaluation of the plan and the implementation procedures using the new information obtained through the control function.

Information in farm planning that famers needs

1. **Farm available resources**
2. **What to produce and how**
3. **Information about the variety**
4. **Input use and cost thereof.**
5. **Support available**
6. **Duration of crops**
7. **Pre knowledge on the Weather**

1:00 pm- 3:00 pm PRACTICAL

3:00 pm- 5:00 pm: HORT-III: Cultivation of Alstroemeria

About ten years ago Könst Alstroemeria started to develop garden varieties. In the beginning it were taller varieties that reached up to 50-60 cm in the garden, but the last couple of years the new varieties have become shorter with more or bigger flowers. Very suitable as balcony or terrace plants on pots. If treated well Inca alstroemeria varieties can flower from May to October. Now the whole range of the Inca selection contains Micro, Compact and Medium/large types;

Selections

Micro selections; 20-30 cm. This selection contains the shortest varieties, that have no problems with too much length in case it gets warmer in a greenhouse. Very suitable to grow totally in a greenhouse but also possible in plastic tunnel or (partly) outside. Varieties: Inca Vito, Inca Lolly, Inca Sweety, Inca Toto, Inca Husky, Inca Goal, Inca Noble

Compact selection; 30-35 cm. This selection can be grown in greenhouses in winter and spring. In case it gets warmer than 16 °C regularly with nights no cooler than 10°C they can grow fast and stretch too much (especially Inca Mambo, and Inca Lake. Inca Avanti and Inca Smile are more easy to control). Than it is better to finish the last part of the growth outside or in a plastic tunnel that can be opened from the sides. Culture totally outside also possible as long as it doesn’t freeze. Varieties: Inca Mambo, Inca Avanti, Inca Lake, Inca Milva, Inca Bandit, Inca Smile

Medium/tall selections; 35-45 cm; varieties suitable to grow outside or in plastic tunnels that can be ventilated much (open sides). Generally these varieties stretch too much in warmer greenhouses in spring. Which can result in long, weak stems. Excellent varieties as garden plants (also sold in 9-13 cm pots with label, not flowering) because of their long flowering period (May-October). Culture totally outside also possible as long as it doesn’t freeze. Varieties: Medium; Inca Yuko. Varieties:Tall; Inca Exotica, Inca Ice.

Youngplants

Könst Alstroemeria delivers plants on 3 cm plugs, from tissue culture. Normally 108 plants per box. Planting period; from October until May for plants that start flowering from March until August. The total growing period takes 18 to 28 weeks depending on the temperature and amount of light.(see cultivation period).

Pot size

Most common pot size for sale as flowering plant; 3,5 ltr/ 19 cm or 1 Gallon/8 inch. A few growers sell plants on 9 to 13 cm pots, not flowering, with a label to show the flower (10-12 weeks).

Planting

Plant 1 plug per pot . Use a standard herbaceous, well drained potting medium with a pH between 5 and 6, preferable sterilized. In our test greenhouse in Holland we start with a soil that contains several types of peat, a little bit of clay, a stock of fertilizer 17-10-14-4 (N-P-K-Mg) with an Ec of 1,0.

Plant density; 9-14 pots/m2 (19 cm pot). In the beginning the pots are placed close together and gradually given more space.

In order to develop an attractive, compact plant it is necessary that the plant gets sufficient growing space. Make sure that the plants are not too close to each other and see to it that the leaves of the various plants do not touch one another.

Cultivation period

Best planting period for a 19 cm pot will be between week 38 and 50. The sales of flowering plants normally starts in April. The cultivation period varies if the plants are cultivated under different temperatures than advised. Under warmer temperatures, the crop time will be shorter and vice versa.

1. Starting in autumn, with cutting back in winter ;start week 40 / week 5 cutting / ready: early spring week 14-15. [For advice on cutting back, see below in this information.]

2. Starting in autumn ; start week 46 / ready: early spring week 14-16.

3. Starting in winter ; start week 2 / ready: spring week 18-22.

4. Starting in late spring ; start week 20 / ready: end of summer or beginning of autumn week 32-35.

Irrigation

After planting make the soil totally wet. Then keep the soil very well humid. If the soil gets too dry for several days the plants start making thick roots to survive a dry period (storage of assimilates). This will diminish the quantity of shoots and flowers. The best irrigation system is drip irrigation, although an ebb and flood system works as well. Overhead irrigation is more difficult because of the umbrella effect when the vegetation gets bigger which causes the water to fall beside the plants instead of in the pot. Also it causes more leaf problems and botrytis in the flowers.

Climate/temperatures

Required temperature;

- After planting; 10-12 °C. For a quick development of roots and rhizome. For the micro types up to 14 °C - From 2-3 weeks after planting; 9-12 °C day/8-10°C night - Spring; maximum up to 16 °C during the day with enough daylight. Night 8-10 °C

Directly after planting the temperature should not be too low to stimulate the growth of the rhizome. If the rhizome doesn’t develop enough in the beginning plants will later not make enough shoots and the pot will not be filled enough.

Below 6 °C the plants hardly develop and some leaf problems can occur. Frost will destroy the leaves. As long as the rhizome in the soil is not frozen the plant can recover.

Culture outside is possible but below 6-8 °C it is too early to start planting. When the flowers start opening the climate should not be too humid because of botrytis in the flowers. Some protection against rain and hail is better.

When plants are moved from a greenhouse to the outside protect the plants by shade cloth. Because the leafs and flowers are not used to direct sunshine they are sensitive to leaf burning.

Screen; in greenhouse with a screen it can be closed at 600 watt/m2. especially at the end of the growing period to prevent leaf/flower burning.

Growing climates over the world

High light levels combined with no or hardly any frost. During the whole growing period plants are kept outside [temperature the first 3 till 4 weeks is important - see growing information]. For example: California (USA), the Spanish south-east coastline, Sicily (Italy) and New South Wales (Australia).

High light levels combined with lower temperatures and some frost. The growing period starts inside, but the plants are put outside rather early. For example: the French- and Italian Riviera and the southern part of Italy.

Low light levels combined with a long period of possible frost and higher temperatures already during late winter / early spring. Plants are only being grown in the greenhouse. For example: The Netherlands. 4. Low light levels combined with a long and cold winter. Plants are only being grown in the greenhouse. For example: Scandinavia.

Cutting back

If the plants grow too tall it is possible to cut off all the stems at about 3 cm. New shoots will appear and will start flowering on shorter stems in about 8-10 weeks after cutting in spring. Plants can growtoo tall because of a lack of light and/or too much temperature. Plants that develop a lot of vegetation (in winter) with greenhouse temperatures getting over 16 °C in early spring, can stretch too much.

This is mainly done with a few varieties like Inca Joli, Inca Glow, Inca Yuko, Inca Exotica and Inca Ice. Sometimes done with Inca Lake and Inca Mambo. Normally with Inca Avanti and Inca Smile it is not necessary. For the micro types it is not necessary at all. They hardly stretch in darker or warmer circumstances.

Pinching/pulling out leafy stems; some varieties like Inca Vito and Inca Noble can grow full with leaves in winter and early spring, while the stems with buds remain under these leafs. In such case it is better to pinch or even pull out some leafy stems in the middle of the plant.

Also if plants get too old for selling it is possible to cut them back and let them start growing again.

Fertilization

The pot soil to start with should have an EC of about 1.0. Gradually it is raised to an EC of 2 to get sturdy plants with nice dark green foliage.

In order to prevent the plants from stretching too much in January, February we advise to provide little nitrogen (N), and plenty of potassium (K). So start with fertilizers like 7-11-27-6 (N-P-K-Mg).

From March it is changed to 12-2-14-5MgO-8 CaO or something alike.

The fertilizers are given regularly during the growth with drip irrigation with an EC of 2,0-2,5. When grown outside too much rain will drain out fertilizers easily.

Target figures in a 1:1,5 extract with water; in mmol/l

pH	EC	NH4	K	Na	Ca	Mg	NO3	Cl	S	HCO3	P
5,6	1,4	0,5	1,6	2,5	2,0	1,2	2,0	2,5	1,5	-	0,20

Micro elements in µmol/l

Fe	Mn	Zn	B	Cu	Mo	Si
10	2,0	2,0	10	0,7	-	-

Growth regulators

The use of growth regulators in April and May can prevent too much stretching of the plants. Experience is limited. Most growers don't use them.

Micro types don't need growth regulators to control length.

Diseases and plagues

Alstroemeria can be sensitive for snails, caterpillars, aphids, thrips and spidermite. Normally the leafs are not sensitive for fungi. When the plants are flowering too much rain and humidity can cause botrytis in the flowers.

DAY -28: 10:00 am- 12:00 noon: ENTRENEURSHIP: Successful entrepreneur (Cattle)

NB. Training materials will be provided by the concerned lecturing entrepreneur during the session

1:00 pm- 3:00 pm: HRD: Theories of Leadership

The phenomenon of leadership has fascinated people since the earliest times. More recently, sociologists, psychologists, political scientists and historians have put forward a number of theories

A brief summary of the more important theories is given below, to provide an understanding of leadership behaviour.

Trait Theory (Great Man Theory)

According to this school of thought, leadership is rooted in biology. Researchers mainly focus on isolating physical and psychological qualities of leaders such as height, strength, body type, enthusiasm, intelligence, self-confidence, decisiveness, bravery and charisma. Some of those who support the trait theory believe that leaders are born, not made, while others take the view that everyone can lead, but he or she will lead differently. The most popular interpretation of this view is the leadership development philosophy based on the Myers-Briggs Type Indicator (MBTI), a long established personality assessment questionnaire. Using the MBTI supposedly allows people to discover and nurture their own leadership traits as well as understand and relate effectively to other leaders of differing types.

The trait approach basically states that you either have it or you don't, and the "right" person will be selected to fill formal positions. Some behavioural scientists however, have focused more on the behaviour of effective leaders. Maybe there is something unique about leadership behaviour, e.g. is it more democratic than autocratic? This approach has been seen as more useful than the trait theory as it may provide more definitive answers on effective leadership, and suggests that people can be trained as leaders.

Contingency Theories

(Leadership dependent or contingent on many factors)

Over time, researchers have realized that the process of successfully predicting leadership is much more complex than simply isolating a few traits or preferable behaviours. Instead, they focus on situational influences. As the situation changes so should the styles and roles of leadership. One of the most basic mistakes a leader can make is to use the same leadership approach in all situations.

Two major approaches stem from contingency theory — that of styles and roles, and that of situational leadership.

The Styles and Roles Approach : This approach analyses the leadership roles and behavioural styles of successful leaders. It acknowledges that group situations are often different, and emphasizes the need for flexibility in styles and roles. A person must play many roles and employ different styles in order to be an effective leader.

The leadership function moves around in a group depending upon who is doing what. For example, one person might lead in the initiation of a group task. Another may assume leadership by offering information. Yet another member may move into the lead by including everyone in the discussion. Leadership is dynamic and situational, requiring different skills and knowledge as a group progresses towards its goals.

Some researchers (4) have identified five major leadership roles: the Activator, the Controller, the Martyr, the Cavalier and the Abdicator. These roles can be described with regard to the degree of flexibility and of activity they exhibit.

The Activator : When a person plays the part of an activator, the chosen behaviour style is active and flexible. He/she is interested in involving other members of the group in a problem or situation and shares the decision-making process, operating on the principle that “People support what they help create”. The activator style also incorporates initiating, assimilating, reinforcing and solidifying functions.

The Controller : When a leader plays this role, the source of power comes from rewards and punishments. He/she attempts to frighten the group into action and the leadership behaviour is rigid but active. This rigidity comes from his/her role expectations. The controller style incorporates regimentation, judgmental behaviour, and giving rewards and punishments.

The Martyr : In this role, the leader attempts to induce guilt feelings in the followers. Martyrs try to impose their own values and policies on everyone. Rules may become an end in themselves, rather than a means to an end. Martyrs have a behaviour style which is primarily passive, but they can become very active in enforcing their own norms. Over-working themselves and seeking pity are other aspects of the martyr role.

The Cavalier: In this role, the leader wins group support through fun and games. The behavioural style varies between active and passive and has too much flexibility. The leader tries to entertain, avoids judgment, and seeks approval. There is an element of larrikanism in his/her behaviour.

The Abdicator : The abdicator avoids responsibility, postpones action, takes no risks, and often withdraws from the group. The style is passive and usually rigid, but it can be flexible on occasion. He/she manipulates every situation so that others take on responsibilities and get the blame when things go wrong.

While the activator role is usually the appropriate one in participative action groups, each of the other roles can be usefully adopted in certain situations.

Leadership can be exercised in a variety of social styles. Four such styles —Analytical, Amiable,

Expressive and Driver — can be represented by using two dimensions of behaviour, assertiveness and responsiveness (5). You should bear in mind that these styles are neither good nor bad, just different. People of each type have achieved impressive successes in both leadership and supportive roles.

Analytical style : People with an analytical social style combine a high level of emotional selfcontrol with a low level of assertiveness. They tend to take a precise, deliberate, systematic approach to their work. They gather and evaluate much data before acting. People with this style are generally hardworking, objective and well-organized. When their strengths are over-extended, however, they can be inflexible and given to 'nit-picking". Their preferred fall-back behaviour is avoidance.

Amiable style: Persons who have an amiable social style combine higher-than-average responsiveness with a comparatively low level of assertiveness. They tend to be highly sensitive and sympathetic to the needs of others. Their trust in other people may bring out the best in the people with whom they mix. Extremes of this style give rise to conformist and permissive behaviour. Amiable people fall back to an acquiescing position.

Expressive style: Persons with an expressive social style are the most flamboyant, having a high level of assertiveness integrated with much emotional expression. They tend to look at the broad picture and take a fresh, novel approach to problems. They are willing to take risks in order to realize their goals. Their love of fun, use of humour and spontaneous ways often lift the morale of their co-workers. Their ability to charm, persuade. excite and inspire people with a vision of the future can be a strong motivating force. When unrestrained, people with this style can be over-bearing and pursue unrealistic goals. Their back-up strategy is to attack.

Driver style: Persons with driver social style blend a high level of emotional self--control with a high degree of assertiveness. They are task-oriented, know exactly what they want, and express themselves clearly. They are competitive, willing to take calculated risks and are valued for their ability to get things done. Drivers, when over-extended, can become domineering and unfeeling.

Their back-up strategy is autocratic.

The group should capitalize on the strengths of each social style exercised by various members, and develop strategies to minimize the damage causes by any weaknesses.

Situational Leadership Theory: This is based on the idea that leadership style should vary with the maturity of the group (2). It means that task behaviour and relationship behaviour, two critical dimensions of leadership, should change with the level of group development. For example, in a group of competent and experienced professionals, the leader will need to give very little direction in structuring the group task, and members will probably be skilled in maintaining good working relationships. On the other hand, if most people in the group are new to the task and to the group, the leader must give a lot of direction on how the task is to be done, and spend time fostering relationships.

In situational leadership theory, maturity is defined as: the capacity of an individual or group to set high, but attainable, goals (achievement-motivation); a willingness and ability to take responsibility; and a degree of education and/or experience. Groups and individuals tend to have varying degrees of maturity, depending on the specific task they are attempting to accomplish. A group member may, for example, be highly competent in carrying out on-ground work, but require considerable help in formulating written proposals for projects.

The following Figure shows how leadership style changes according to the level of maturity. In any group, the leader must help achieve the common goal (task) and at the same time maintain appropriate relationships with fellow members. His/her style changes according to the level of maturity in the group. If the level is low, "telling" is the major style. As maturity increases, it changes first to "selling", then to "participating" and finally, when maturity attains a high level, to "delegating". Effective group leaders know their members well and adapt their own style to the ever-changing abilities of the members, and to the demands of the leadership role.

Organisational Theory

According to this theory, leadership is a function of position and role in a hierarchical organization. Some writers make a distinction between Managing and Leading. To manage means "to bring about, to accomplish, to have charge of or responsibility for, to conduct". Leading is "influencing, guiding in direction, course, action, opinion" (6). The distinction is crucial. Managers are people who do things right, whereas leaders are people who do the right thing. Leadership in this view refers to the head of some group or organization.

Any organization can usually be identified as having three distinct levels of management in terms of their roles and authorities (7). Corporate managers are concerned with the total operation of an entire organization or a division. Executive management is concerned with only part of the management function. Operating management is concerned with carrying out specific functional tasks in accordance with prior schedules developed by superiors. Managing involves delegating while operating means doing. As one moves up in the organization. the managing function increases and the operating function decreases.

Power Theory

Leadership as power involves the ability to make something happen to satisfy individual, group or task needs. It means being able to make a difference, e.g., getting something done or influencing the direction the group takes.

According to one view, this power emanates from positional power (a symbolic position such as President, Director etc.) or operational power (by people who get things done without any formal position). We all know people who passively occupy positions of authority while others without any formal position are able to achieve impressive results. In other words, operational leaders using nonpositional power bases can exert more impact than passive symbolic leaders.

A second type of power theory focuses more on empowerment of followers or fellow members than on accomplishing the will of the leader. Empowerment is the process/method in which people are actively encouraged to take responsibility for their actions. This process enables them to take charge rather than search for a magical leader to solve their own or community problem. Empowered members of the group/community help select projects, implement programs and monitor progress.

Leadership, according to this view, empowers people to do their own work. The leaders create structures and follow policies are followed. The focus is on the marshalling of resources so that people can get things done. Empowering leadership uses skills such as organizing, team building, problem solving and conflict resolution ("people skills"). Empowerment also involves raising awareness and increasing the knowledge and skills of followers and fellow group members. As people become empowered, a leader can first delegate some tasks to them, and may finally give over the entire project, including the leadership, to them. Empowerment is seen both as an end (democratic right) and a means (participative processes) for human action (8).

Vision Theory

According to this theory, the critical ingredient in leadership is vision. Leaders scan current trends and future threats and opportunities, then engage in strategic redirection of people/groups towards a desired future (9). Such vision is clearly communicated by the leaders, who from time to time are able to inspire their fellow citizens to strive for new national goals. Strategic management methods are designed to attain skills in this type of leadership. They are methods for increasing "vision".

Ethical Assessment Theory

Leadership, in this view, is inherently ethical. The view is. that ethics is at the centre of every human action, and hence, at the centre of leadership (9), (10). Some argue that leadership must be ethical on two counts: in the character of leader-follower relationships and in the leadership's vision of human needs.

This means that a leader must engage in dialogue and conflict with followers, recognizing that they too have the right to influence events. The person who simply imposes his/her will on followers is a tyrant. not a leader. A leader also take followers up the hierarchy of human needs while a tyrant drags them further down the hierarchy.

Very few psychological theories of motivation discuss the role of spiritual needs or ethical issues in leadership, but the human search for meaning in existence draws people to assess the world, and the decisions and actions in which they become involved, in moral terms. Ethical dilemmas emerge, along with competing needs and values, e.g. private property rights vs. the public interest, present need vs. future need.

Thus, the ethical leader must not only be able to exert leadership in a moral way, but be visionary and able to focus followers' concerns on fair and just solutions which promote the good of the community.

Developing a Leadership Framework Using All these Theories

Human action is generally a complex process, and leadership is a part of human action. Such action goes beyond any one aspect of leadership as described in each of the theories above. Thus no one theory on its own is adequate to explain leadership.

According to one writer "Leadership is grounded in traits, yet required skills are not exhausted by traits. Leadership is sensitive to shifting situations, yet it recognizes complexities beyond situational theory's reach. Leadership is shaped by roles and position, yet is greater than any organization hierarchy.

Leadership is activated by power, yet challenges the primacy of power. Leadership is driven by vision, yet is not satisfied with just any direction. Leadership is ethical, yet always tempered by an awareness of existence, ambiguities and unforeseen consequences" (6). Leadership empowers human beings to claim ultimate fulfillment.

This view holds that the six significant features of leadership that the various theories emphasize can be combined to form a framing tool to shape leadership action. According to this approach, every leader must have a mission and inspire others to strive towards a commonly-owned vision of a desired future. He/she must develop/work through structures (organizations) relevant to existing resources, and use the various types of power to achieve goals. The degree of fulfillment of goals in each situation is limited by the leader's abilities (natural talents and acquired leadership skills) and by the degree to which she/he can convince others of the ethical value and higher meaning of their efforts.

Guidelines for developing leadership functions which can be utilized within this framework are provided later in this chapter.

Transactional or Transformational Leadership

Common to all leadership theories is some description of how leaders motivate others. A major part of influencing people (leadership) is satisfying their needs. Human needs are the basis for transactions in which the leader and the followers exchange certain things (material and non-material).

Transactional leaders approach others with a view to exchanging one thing for another, such as jobs for votes, or recognition for services etc.

Transformational leaders motivate their followers, not by exchanging goods, but by sharply arousing or altering the strength of needs that may have lain dormant, e.g., higher order needs for self actualization.

Key skills include being able to crystallise community thinking and communicate action strategies persuasively to significant individuals and groups.

Transformation can be achieved in three ways :

1. by raising the level of awareness in people

2. by getting people to transcend their own self-interest for the sake of the team, country etc.

3. altering the need level on Maslow's hierarchy, or expanding the portfolio of needs and wants (I).

Let us sum up

This unit explodes various aspects of leadership, styles and bases of power and sphere of influence. Leaders perform various roles such as planning and implementing, evaluating, monitoring, controlling, motivating, managing conflicts, organizing task groups, mobilizing human and financial resources, and above all, setting an example to the group. Leadership has been defined as "the process of influencing the activities of an individual or a group in efforts towards the achievement of goals in a given situation" (2). The source of influence may be formal, or informal. Leaders can emerge from within a group as well as being formally appointed. Research was carried out to assess why we are able to influence people and why some people have more power of influence than others. It was found there are five bases of influence, I) Reward power ii) Coercive power iii) Illegitimate power iv) Referent Power v) Knowledge power. A sixth source of power is people's power. Leaders need to recharge their power basis periodically by gaining new knowledge and skills. There are different theories of leadership. The important ones include Contingencies Theory, Situational Leadership Theory, Organizational Theory, Power Theory, Vision Theory and Ethical Assessment Theory.

Key Words

Leadership: Leadership has been defined as "the process of influencing the activities of an individual or a group in efforts towards the achievement of goals in a given situation" (2). The source of influence may be formal, or informal. Leaders can emerge from within a group as well as being formally appointed.

Trait Theory: According to this school of thought, leadership is rooted in biology. Researchers mainly focus on isolating physical and psychological qualities of leaders such as height, strength, body type, enthusiasm, intelligence, self-confidence, decisiveness, bravery and charisma. Some of those who support the trait theory believe that leaders are born, not made, while others take the view that everyone can lead, but he or she will lead differently.

Contingency Theories: Over time, researchers have realized that the process of successfully predicting leadership is much more complex than simply isolating a few traits or preferable behaviours.

Instead, they focus on situational influences. As the situation changes so should the styles and roles of leadership.

Situational Leadership Theory: This is based on the idea that leadership style should vary with the maturity of the group (2). It means that task behaviour and relationship behaviour, two critical dimensions of leadership, should change with the level of group development.

3:00 pm- 5:00 pm: FISHERY: Integrated Fish Farming.

"POND BASED INTEGRATED FARMING SYSTEM"

Introduction

Integrated Farming System introduces a change in the farming techniques for maximum production in the cropping pattern and takes care of optimal utilization of resources. The farm wastes are better recycled for productive purposes in the IFS. IFS's activity is focussed round a few selected, interdependent, interrelated and often interlinking production systems based on a few crops, animals and related subsidiary professions. IFS envisage harnessing the complementarities and synergies among different agricultural sub-systems/enterprises and augmenting the total productivity, sustainability and gainful employment.

Advantages of IFS

- It improves space utilization and increase productivity per unit area
- It provides diversified products
- Improves soil fertility and soil physical structure from appropriate crop rotation and using cover crop and organic compost
- Reduce weeds, insect pests and diseases from appropriate crop rotation
- Utilization of crop residues and livestock wastes
- Less reliance to outside inputs – fertilizers, agrochemicals, feeds, energy, etc
- Higher net returns to land and labour resources of the farming family

Integrated Livestock-Fish Production Systems

1. Integrated Fish cum Pig Farming

The factors like breed, strain, and management influence the growth of pigs. Pig houses with adequate accommodation and all the requirements are essential for the rearing of pigs. The pig house can be constructed with locally available materials. It is advisable to provide 1 - 1.5 m2 space for each pig. Pens or sties can be built on the banks of the fish ponds (wastes are washed out in to the pond) or constructed over the ponds on piles or wooden slits and have a lattice type of floor (allowing waste to fall directly into the pond).Generally small pigsties are constructed over the pond and bigger ones on the dykes. Cemented floor are usually preferred for pig pens/sties.

Benefits of Fish cum Pig Farming

1. The fish utilize the food spilled by pigs and their excreta which is very rich in nutrients.

2. The pig dung acts as a substitute for pond fertilizer and supplementary fish feed. Hence, the cost of fish production is greatly reduced.

3. No additional land is required for piggery operations.

4. Cattle fodder required for pigs and grass are grown on the pond embankments.

5. Pond provides water for washing the pig - sties and pigs.

6. It results in high production of animal protein per unit area.

7. It ensures high profit through less investment.

8. The pond muck which gets accumulated at the pond bottom due to constant application of pig dung can be used as fertilizer for growing vegetables and other crops and cattle fodder.

Stocking of Fish

- The stocking rates vary from 8,000 – 10000 fingerlings / ha and a species ratio of 40 % surface feeders, 20 % of column feeders, 30 % bottom feeders and 10-20 % weedy feeders are preferred for high fish yields.

- Mixed culture of only Indian major carps can be taken up with a species ratio of 40 % surface, 30 % column and 30 % bottom feeders.

Selection of Pigs:

- Four types of pigs are available in our country - wild pigs, domesticated pigs or indigenous pigs, exotic pigs and upgraded stock of exotic pigs.

- The Indian varieties are small sized with a slow growth rate and produce small litters. Its meat is of inferior quality.

- Exotic upgraded stock of pigs such as Hampshire Large black etc are most suitable for raising with fish culture. These are well known for their quick growth and prolific breeding.

- They attain slaughter maturity size of 60 - 70 Kg within six months. They give 6 - 12 piglets in every litter.

- The age at first maturity ranges from 6 - 8 months. Thus, two crops of exotic and upgraded pigs of six months each are raised along with one crop of fish which are cultured for one year.

- 30 - 40 pigs are raised per hectare of water area. About two months old weaned piglets are brought to the pig-sties and fattened for 6 months an when they attain slaughter maturity are harvested.

c. Feeding:

- The dietary requirements are similar to the ruminants.

- The pigs are not allowed to go out of the pig house where they are fed on balanced pig mash of 1.4 Kg / pig / day.

- Grasses and green cattle fodder are also provided as food to pigs.

- To minimize food spoilage and to facilitate proper feeding without scrambling and fighting, it is better to provide feeding troughs. Similar separate troughs are also provided for drinking water.

- The composition of pig mash is a mixture of 30 Kg rice bran, 15 Kg polished rice, 27 Kg wheat bran, 10 Kg broken rice, 10 Kg groundnut cake, 4 Kg fish meal, 3 Kg mineral mixture and 1 Kg common salt.

- To reduce quantity of ration and also to reduce the cost, spoiled vegetables, especially the rotten potatoes can be mixed with pig mash and fed to pigs after boiling.

- The pigs are hardy animals. They may suffer from diseases like swine fever, swine plague, swine pox and also infected with round worms, tapeworms, liver flukes, etc.

- Pig - sties should be washed daily and all the excreta drained and offal into the pond. The pigs are also washed.

- Disinfectants must be used every week while washing the pig - sites. Piglets and pigs should be vaccinated.

Use of Pig Waste as Manure:

- Pig - sty washings including pig dung, urine and spilled feed are channelled into the pond.

- Pig dung is applied to the pond every morning. Each pig voids between 500-600 Kg dung /year, which is equivalent to 250-300 Kg / pig / 6 months.

- The excreta voided by 30 – 40 pigs is adequate to fertilize one hectare pond.

- When the first lot of pigs is disposed off after 6 months, the quantity of excreta going to the pond decreases. This does not affect the fish growth as the organic load in the pond is sufficient to tide over for next 2 months when new piglets grow to give more excreta.

- If the pig dung is not sufficient, pig dung can be collected from other sources and applied to the pond. Pig dung consists 69 - 71 % moisture, 1.3 - 2 % nitrogen and 0.36 - 0.39 phosphate.

- The quality and quantity of excreta depends upon the feed provided and the age of the pigs.

- The application of pig dung is deferred on the days when algal blooms appear.

d. Harvesting:

- Fish attain marketable size within a few months due to the availability of natural food in this integrated pond.
- According to the demand of fish in the local market, partial harvesting is done.
- After the partial harvest, same numbers of fingerlings are introduced into the pond. Final harvesting is done after 12 months of rearing.
- Fish yield ranging from 2500-3,000 Kg / ha / yr is obtained.
- The pigs are sold out after rearing for six months when they attain slaughter maturity and get 4,200 – 4,500 Kg pig meat.

2. Integrated fish cum duck farming

Duck-fish integration is the most common integration in countries like china Russia and to some extent in India. Duck eggs are an important source of food in India. Consumptions as well as production of duck eggs in India are mostly done by socially weaker sections of the community. A fish pond being a semi-enclosed biological system with several aquatic animals and plants provides an excellent disease free environment for ducks. The combination of duck and fish farming is considered as a means of reducing the cost of feed for ducks and a convenient and in expensive way of fertilizing ponds for the production of fish.

Benefits of fish cum duck farming

- Water surface of ponds can be put into full utilization by duck raising.
- Fish ponds provide an excellent environment to ducks which prevent them from infection of parasites.
- Ducks feed on predators and help the fingerlings to grow.
- Duck raising in fish ponds reduces the demand for protein to 2 – 3 % in duck feeds.
- Duck droppings go directly into water providing essential nutrients to increase the biomass of natural food organisms.
- The daily waste of duck feed (about 20 - 30 gm/duck) serves as fish feed in ponds or as manure, resulting in higher fish yield.
- Manuring is conducted by ducks and homogeneously distributed without any heaping of duck droppings.
- By virtue of the digging action of ducks in search of benthos, the nutritional elements of soil get diffused in water and promote plankton production.
- Ducks serve as bio aerators as they swim, play and chase in the pond. This disturbance to the surface of the pond facilitates aeration.

- The feed efficiency and body weight of ducks increase and the spilt feeds could be utilised by fish.

- Survival of ducks raised in fish ponds increases by 3.5 % due to the clean environment of fish ponds.

- Duck droppings and the left over feed of each duck can increase the output of fish to 37.5 Kg/ha.

- Ducks keep aquatic plants in check.

- No additional land is required for duckery activities.

- It results in high production of fish, duck eggs and duck meat in unit time and water area.

- It ensures high profit through less investment.

Stocking Density of fish

- The pond is stocked after the pond water gets properly detoxified.

- The stocking rates vary from 8000-10000 fingerlings/ha and a species ratio of 40 % surface feeders, 20 % of column feeders, 30 % bottom feeders and 10-20 % weedy feeders are preferred for high fish yields.

- Mixed culture of only Indian major carps can be taken up with a species ratio of 40 % surface, 30 % column and 30 % bottom feeders.

Use of duck dropping as manure:

- The ducks are given a free range over the pond surface from 9 to 5 PM, when they distribute their droppings in the whole pond, automatically manuring the pond.

- The droppings voided at night are collected from the duck house and applied to the pond every morning.

- Each duck voids between 125 - 150 gm of dropping per day.

- The stocking density of 200-300 ducks/ha gives 10,000 - 15,000 kg of droppings and are recycled in one hectare ponds every year.

- The droppings contain 81% moisture, 0.91% nitrogen and 0.38% phosphate on dry matter basis.

Duck husbandry practices*:*

The following three types of farming practice are adopted.

1. Raising large group of ducks in open water

- This is the grazing type of duck raising.

- The average number of a group of ducks in the grazing method is about 1000 ducks.
- The ducks are allowed to graze in large bodies of water like lakes and reservoirs during the day time, but are kept in pens at night.
- This method is advantageous in large water bodies for promoting fish production.

2. Raising ducks in centralised enclosures near the fish pond

- A centralised duck shed is constructed in the vicinity of fish ponds with a cemented area of dry and wet runs out side.
- The average stocking density of duck is about 4 - 6 ducks/sq.m. area.
- The dry and wet runs are cleaned once a day. After cleaning the duck shed, the waste water is allowed to enter in to the pond.

3. Raising ducks in fish pond

- This is the common method of practice.
- The embankments of the ponds are partly fenced with net to form a wet run.
- The fenced net is installed 40-50 cm above and below the water surface, so as to enable the fish to enter into the wet run while ducks cannot escape under the net.

4. Selection of ducks and stocking

- The kind of duck to be raised must be chosen with care since all the domesticated races are not productive.
- The improved breed, Indian runner, being hardy has been found to be most suitable for this purpose, although they are not as good layers as exotic Khaki Campbell.
- The number of ducks required for proper manuring of one hectare fish pond is also a matter of consideration.
- It has been found that 250 – 300 ducks are sufficient to produce manure adequate enough to fertilize a hectare of water area under fish culture.
- 2 - 4 months old ducklings are kept on the pond after providing them necessary prophylactic medicines as a safeguard against epidemics.

5. Feeding

- Ducks in the open water are able to find natural food from the pond but that is not sufficient for their proper growth.
- A mixture of any standard balanced poultry feed and rice bran in the ratio of 1:2 by weight can be fed to the ducks as supplementary feed at the rate of 100 gm/ bird/day.

- The feed is given twice in a day, first in the morning and second in the evening.
- The feed is given either on the pond embankment or in the duck house and the spilled feed is then drained into the pond.
- Water must be provided in the containers deep enough for the ducks to submerge their bills, along with feed.
- The ducks are not able to eat without water. Ducks are quite susceptible to afflatoxin contamination, therefore, mouldy feeds kept for a long time should be avoided.

6. Egg laying

- The ducks start laying the eggs after attaining the age of 24 weeks and continue to lay eggs for two years.
- The ducks lay eggs only at night. It is always better to keep some straw or hay in the corners of the duck house for egg laying.
- The eggs are collected every morning after the ducks are let out of the duck house.

7. Health care

- Ducks are subjected to relatively few diseases when compared to poultry.
- The local variety of ducks is more resistant to diseases than other varieties.
- Proper sanitation and health care are as important for ducks as for poultry.
- The transmissible diseases of ducks are duck virus, hepatitis, duck cholera, keel disease, etc.
- Ducks should be vaccinated for diseases like duck plague. Sick birds can be isolated by listening to the sounds of the birds and by observing any reduction in the daily feed consumption, watery discharges from the eyes and nostrils, sneezing and coughing.
- The sick birds should be immediately isolated, not allowed to go to the pond and treated with medicines.

8. Harvesting

- Keeping in view the demand of the fish in the local market, partial harvesting of the table size fish is done.
- After harvesting partially, the pond should be restocked with the same species and the same number of fingerlings.
- Final harvesting is done after 12 months of rearing.
- Fish yield ranging from 2500 - 3000 Kg/ha/yr are generally obtained with 6 - species and 3 - species stocking respectively.

- The eggs are collected every morning. After two years, ducks can be sold out for flesh in the market. About 18,000 - 18,500 eggs and 500 - 600 Kg duck meat are obtained.

3. Integrated fish cum poultry farming

Much attention is being given for the development of poultry farming in India and with improved scientific management practices; poultry has now become a popular rural enterprise in different states of the country. The production of poultry dropping in India is estimated to be about 1,300 thousand tons, which is about 390 metric tonnes of protein. Utilization of this huge resource as manure in aquaculture will definitely afford better conversion than agriculture. Improved birds such as Vanaraja Gramapriya Giriraj etc that are usually reared in backyard poultry farming are preferred in fish cum poultry farming.

a. Housing of birds

- In integrated fish-cum-poultry farming the birds are kept under intensive system. The birds are confined to the house entirely.

- The intensive system is further of two types - cage and deep litter system.

- The deep litter system is preferred over the cage system due to higher manurial values of the built up deep litter.

- In deep litter system 250 birds are kept and the floor is covered with litter. Dry organic material like chopped straw, dry leaves, hay, groundnut shells, broken maize stalk, saw dust, etc. is used to cover the floor up to a depth of about 6 inches.

- The birds are then kept over this litter and a space of about 0.3 - 0.4 square meters per bird is provided.

- The litter is regularly stirred for aeration and lime used to keep it dry and hygienic.

- In about 2 month's time it becomes deep litter, and in about 10 months time it becomes fully built up litter. This can be used as fertilizer in the fish pond.

- The fowls which are proven for their ability to produce more and large eggs as in the case of layers, or rapid body weight gains is in the case of broilers are selected along with fish.

- The poultry birds under deep litter system should be fed regularly with balanced feed according to their age.

- Grower mash is provided to the birds during the age of 9-20 weeks at a rate of 50-70 gm/bird/day, whereas layer mash is provided to the birds above 20 weeks at a rate of 80-120 gm/bird/day.

- The feed is provided to the birds in feed hoppers to avoid wastage and keeping the house in proper hygienic conditions.

b. Egg laying

- Each pen of laying birds is provided with nest boxes for laying eggs.
- Empty kerosene ins make excellent nest boxes.
- One nest should be provided for 5-6 birds.
- Egg production commences at the age of weeks and then gradually decline.
- The birds are usually kept as layers up to the age of 18 months. Each bird lays about 200 eggs/yr.

Stocking Density of Fish

- The application of poultry manure in the pond provides a nutrient base for dense bloom of phytoplankton, particularly nano plankton which helps in intense zooplankton development.
- The zooplankton has an additional food source in the form of bacteria which thrive on the organic fraction of the added poultry dung.
- In addition to phytoplankton and zooplankton, there is a high production of detritus at the pond bottom, which provides the substrate for colonization of micro-organisms and other benthic fauna especially the chironomid larvae.
- Another addition will be macro-vegetation feeder grass carp, which, in the absence of macrophytes, can be fed on green cattle fodder grown on the pond embankments.
- The semi digested excreta of this fish forms the food of bottom feeders.
- For exploitation of the above food resources, polyculture of three Indian major carps and three exotic carps is taken up in fish cum poultry ponds.
- The pond is stocked after the pond water gets properly detoxified.
- The stocking rates vary from 8000 - 8500 fingerlings/ha and a species ratio of 40 % surface feeders, 20 % of column feeders, 30 % bottom feeders and 10-20 % weedy feeders are preferred for high fish yields.
- Mixed culture of only Indian major carps can be taken up with a species ratio of 40 % surface, 30 % column and 30 % bottom feeders.
- In the northern and north - western states of India, the ponds should be stocked in the month of March and harvested in the month of October - November, due to severe winter, which affect the growth of fishes.
- In the south, coastal and north - eastern states of India, where the winter season is mild, the ponds should be stocked in June - September months and harvested after rearing the fish for 12 months.

c. Harvesting:

- Some fish attain marketable size within a few months.

- Keeping in view the size of the fish, prevailing rate and demand of the fish in the local markets, partial harvesting of table size fish is done.

- After harvesting partially, the pond should be restocked with the same species and the same number of fingerlings depending upon the availability of the fish seed.

- Final harvesting is done after 12 months of rearing. Fish yield ranging from 3500-4000 Kg/ha/yr and 2000-2600 Kg/ha/yr are generally obtained with 6 species and 3 species stocking respectively.

- Eggs are collected daily in the morning and evening. Every bird lays about 200 eggs/year.

- The birds are sold after 18 months of rearing as the egg laying capacity of these birds decreases after that period.

- Pigs can be used along with fish and poultry in integrated culture in a two-tier system. Chick droppings form direct food source for the pigs, which finally fertilise the fish pond.

- Depending on the size of the fish ponds and their manure requirements, such a system can either be built on the bund dividing two fish ponds or on the dry-side of the bund.

- The upper panel is occupied by chicks and the lower by pigs.

1. Integrated Fish cum Cattle Farming

Fish farming by using cattle manure has long been practiced in our country. This promotes the fish-cum-cattle integration and is a common model of integration. Cattle farming can save more fertilizers, cut down fish feeds and increase the income from milk. The fish farmer not only earns money but also can supply fish, milk and beef to the market.

2. Pond management practices:

- Cow dung is used as manure for fish rearing.

- About 5,000 - 10,000 Kg/ha can be applied in fish pond in instalments.

- After cleaning cow sheds, the waste water with cow dung, urine and unused feed, can be drained to the pond.

- The cow dung promotes the growth of plankton, which is used as food for fish.

3. Cattle husbandry practices:

- The cow sheds can be constructed on the embankments of the fish farm or near the fish farm.

The locally available material can be used to construct the cow shed. The floor should be cemented.

The outlet of the shed is connected to the pond so that the wastes can be drained into the pond.

Cultivable varieties of cows are black and white (milk), Shorthorn (beef), Simmental (milk and beef), Hereford (beef), Charolai (beef), Jersey (milk and beef) and Qincuan draft (beef).

DAY -29: 10:00 am- 12:00 noon: MARKETING: Value addition of Pine apple, plum, mango, Khasi mandarin, guava & cassava

VALUE ADDITION OF PLUM

Plums are considered to be a good source of bioactive ingredients like carotenoids, anthocyanins and other antioxidant polyphenolics. Processing of fruits into value added products is the best option to control the huge losses. The processing of plums generally relies on drying of fresh plums, canning and beverage preparation.

PREPARATION OF PLUM JAM

INGREDIENTS

1. 4 ½ Cup of pitted, chopped plums.
2. ½ cup of water.
3. 7 ½ cup of white sugar
4. 1 (1.75 ounce) of packaged powdered pectin fruit.
5. 2 or 3 empty jar bottles.

DIRECTIONS

1. Place the plums and water into a large pot, and bring to a boil. Reduce heat to medium-low, cover, and simmer for 5 minutes. Stir in the sugar, bring the mixture to a full, rolling boil over high heat, stirring constantly, and then mix in the pectin quickly. Return the jam to a full boil, and boil for 1 minute, stirring constantly. Remove from heat, and skim off and discard any foam.

2. Sterilize the jars and lids in boiling water for at least 5 minutes. Pack the plum jam into the hot, sterilized jars, filling the jars to within 1/8 inch of the top. Run a knife or a thin spatula around the insides of the jars after they have been filled to remove any air bubbles. Wipe the rims of the jars with a moist paper towel to remove any food residue. Top with lids, and screw on.

3. Place a rack in the bottom of a large pot and fill halfway with water. Bring to a boil over high heat, then carefully lower the jars into the pot using a holder. Leave a 2 inch space between the jars. Pour in more boiling water if necessary until the water level is at least 1 inch above the tops of the jars. Bring the water to a full boil, cover the pot, and process for 10 minutes.

4. Remove the jars from the stockpot and place onto a cloth-covered or wood surface, several inches apart, until cool. Once cool, press the top of each lid with a finger, ensuring that the seal is tight (lid does not move up or down at all).Store in a cool, dark area. Refrigerate opened jars for up to 3 weeks.

PREPARATION OF PRUNES

1. Cut your plums and remove the pits. Remove the stem. Then, cut the plum in half around using a sharp knife.

2. Pull the two halves of the plums apart. Remove the pit and discard.

3. Lay the plums on the dehydrator tray. It's a good idea to push the plums close together, as this will eliminate the need to do two batches. However, make sure the plums are not touching. This is important for air circulation, which allows the plums to dry properly.

4. Place the tray in the dehydrator .It should dehydrate at 115 °F (46.1 °C) when working with a conventional dehydrator. Make sure the dehydrator is at the right temperature before placing the plums in the oven.

5. Place the tray in the dehydrator slowly to avoid knocking the plums together.

6. Check the plums every 4 to 6 hours. Turn the plums at some point to complete the dehydration process.

7. When plums are ready to turn, the upside should be very dry. The plums should release easily from the tray. If the upside of the plum is still moist, and the plum does not come off easily, leave the plums for a bit longer before turning them.

8.Check every 2 hours when you begin removing prunes. The plums will turn into prunes at different rates. When some plums completely lack moisture, they've completed the pruning process. These should be removed from the dehydrator. After this, start checking on the plums ever 2 hours, as they're getting close to being done.

9.Allow the plums to dehydrate for 14 hours. Plums will take roughly 14 hours to fully dehydrate. However, they may take longer or shorter depending on the quality of the plums. This is why it's important to check your plums regularly during the dehydrating process. When fully dehydrated, you will have black, wrinkled, raisin-like prunes.

10. Dried prunes should be placed in an airtight container and stored in the refrigerator.

PREPARATION OF PLUM JUICE

INGREDIENTS

1. Fresh plums
2. Water-1 cup
3. Sugar

Method of preparation:

1. Wash, pit and chop the plum to small pieces with skin on.
2. Boil the water and sugar and when sugar dissolves add the plum and cook for 5 to 8 minutes.
3. Slightly mash the plum pieces to extract juice from it.
4. Turn of the heat and sieve the mixture using a fine mesh. Strain such that there is no flesh

in the strained juice.
5. Add about a cup of chilled water to the drink.

6. Preservatives like Sodium benzoate and Potassium sorbate can be added to the plum juice.

VALUE ADDITION OF PINEAPPLE

Pineapple (*Ananascomosus*) is non-climacteric fruit grown widely in Meghalaya. It is rich in vitamin C, magnesium calcium, potassium, iron and the protein digesting enzyme, bromelin. Kew and Queen are the two promising cultivars of pineapple In North East India. Kew variety is characterized by the big sized fruits (1.5-2.5 kg) which are oblong and tapering slightly towards the crown. The flesh is light yellow and very juicy when ripe. Queen variety fruits are of the weight 0.9-1.3 kg in general. The flesh is deep golden-yellow less juicy than Kew, crisp textured with a pleasant aroma and flavour. Pineapple plants flower 10-12 months after planting and fruits become ready 16-18 months after planting. In natural condition it is harvested during May-August. Fruits which mature in the winter are acidic. The fruits with crown can be kept for 10-15 days after harvesting.

Pineapple Juice

It is the juice extracted from pineapple that can be marketed by bottling in to sterilized bottles or can. By adding preservative at a specified level (KMS <70ppm or Benzoic acid < 120 ppm), the shelf life of the juice can be extended to 6-7 months. Flow chart for preparation of pineapple juice is shown below:

Slices from under-sized pineapple fruits, broken slices, cores, peel meat and trimmings

Crushing/pulping (Mixer grinder)

Juice extraction with the help of muslin cloth

Filling into glass bottles & sealing with hand sealer

Processing in boiling water (15-20 minutes at 85^oC)

Cooling

Labeling & Storing

Pineapple Squash

Pineapple squash should be prepared from fully matured and sound pineapple fruits free from insect infestation, diseases etc. For preparation of pineapple squash required quantity of juice, sugar, citric acid, preservative (Potassium metabisulphite or sodium benzoate), water, essence and colour are calculated as per FPO specifications. It should be diluted 2-3 times with water at the time of consumption. Flow chart for preparation of pineapple squash is shown below:

Slices from under-sized pineapple fruits, broken slices, cores, peel meat and trimmings
Crushing/pulping (Mixer grinder)
Juice extraction with the help of muslin cloth

Mixing of syrup with juice

Syrup
Sugar + Water + Clitric Acid
Addition of permitted essence, colour& preservatives
Mixing
Bottling and Capping
Labelling
Storing

Recipe for Pineapple Squash:

Sl.No	Raw materials	Quantity

1.	Pineapple Juice	1.0 kg
2.	Sugar	900g-1.2g
3.	Water	1.3 liter
4.	Citric acid	40-45 g
5.	Pineapple Colour	0.5 g
6.	Pineapple essence	5-10 ml
7.	Potassium meta bisulphite(KMS)	Not more than 1.0 g/kg

Pineapple Ready-to-Serve (RTS) Beverage

The pineapple RTS beverage is prepared from the extracted pineapple juice, adjusting its soluble solids and acidity as per FPO specifications for RTS beverage by mixing the juice with required quantity of sugar syrup prepared from sugar, citric acid and water. Colour and essence as per the requirements are also added and mixed thoroughly. The beverage is filled into bottles leaving a head space of 2.5 to 3.0 cm, crown corked and processed in water for 15-20 mins at 85^{o}C and air cooled. Flow chart for preparation of Ready-to-Serve Beverage is shown below:

Slices from under-sized pineapple fruits, broken slices, cores, peel meat and trimmings
Crushing/pulping (Mixer grinder)
Juice extraction with the help of muslin cloth

Mixing of syrup with juice

Syrup
Sugar + Water + Clitric Acid
Addition of permitted essence, &colour
Mixing
Bottling and Sealing

Processing in boiling water (15-20 minutes at 85°C)
Storing

Steps to be followed during Pineapples squash preparation

Recipe for Pineapple (RTS) Beverage

Sl.No	Raw materials	Quantity
1.	Pineapple Juice	1.0 kg
2.	Sugar	600-700g
3.	Water	4.0 liter
4.	Citric acid	10-15 g
5.	Pineapple Colour	1.5 g
6.	Pineapple essence	15-20 ml

Pineapple Jam

Pineapple jam is solid gel made from the fruit pulp or juice, sugar, and pectin. Different steps which are essential during this product preparation is shown below:

Pineapples (Fresh and firm fruits)
Peeling, removal of eyes, core
Cutting into small pieces & crushing
Addition of sugar & citric acid (1.0-1.4 kg sugar/kg product & 5-10 g citric acid)
Heating for 15-25 min.
Addition of Pectin powder (3.5-5.0 g/kg product)
Test for end point
Addition of colour and essence (optional)
Filling in sterilized glass jars while hot
Cooling for 4-5 hours
Sealing and storing

Recipe for Pineapple Jam:

Sl.No	**Raw materials**	**Quantity**
1.	Pineapple Pulp	1.0 kg
2.	Sugar	1.0-1.4g
3.	Citric acid	10-15 g
4.	Pectin powder	3.5-5.0 g/kg
5.	Pineapple Colour	1.5 g
6.	Pineapple essence	5-10 ml

Precautions

- All the processing steps should be done under hygienic conditions

- Only potable water should be used
- During jam making the pulp should not be overcooked
- The specifications for the minimum use of additives should be strictly followed

FPO Specifications

Products	**Min. % of total soluble solids in the final product wt.**	**Min. % of fruit juice in the final product**	**Min. ppm of preservative to be used**
Squash	40	25	$SO_2 \leq 350$ or Benzoic acid ≤ 600
Sweetened Juice	Natural	100	$SO_2 \leq 350$ or Benzoic acid ≤ 600
RTS	10	10	$SO_2 \leq 70$ or Benzoic acid ≤ 120
Jam	68	45	$SO_2 \leq 40$ or Benzoic acid ≤ 200

Value Addition of Orange (Khasi Mandarin)

Khasi Mandarin *(Citrus reticulate Blanco)* is one of the important Horticultural Crops, grown in Meghalaya. Mandarin is very important fruit crop, second only to banana. It is usually consumed in raw form or in fruit salads as well as juice. The fruit consists of three layers.

1. The outer yellow/orange peel is with oil glands which exude the essential oils, producing the typical orange odour.

2. The whitish thread like mesocarp.

3. The endocarp consisting of 8-10 segments filled with juice sacs (vesicles).

Mandarins are rich in Ascorbic acid (13-54 mg per 100 g of edible portion) and Calcium (25-46 mg per 100 g of edible portion). They are a great source of Vitamin C. One orange actually has all the Vitamin C that one needs for the day. The water content in the fruit is nearly 80 per cent to 90 per cent of edible portion.

Value addition of Khasi Mandarin

1. MANDARIN JUICE

The most common value added fruit product is fruit juice. It is prepared by the extraction of juice from fruit by manual or mechanical methods. Fruit juice should be prepared from any kind of sound, mature and juicy fruits. Flow chart for juice preparation is shown below

Washing and sorting

⇩

Cutting and crushing

⇩

Juice extraction using muslin cloth

⇩

Filling in glass bottles

⇩

Processing in boiling water for 30-40 minutes

⇩

Cooling

⇩

Store at dark and cool place

2. MANDARIN SQUASH

Mandarin squash should be prepared from fully matured and sound fruits free from insect infestation and diseases. For preparation of mandarin squash required quantity of juice, sugar, citric acid, preservative (potassium meta-bisulphite or sodium benzoate) and water are calculated as per FPO specifications. It should be diluted 2-3 times with water at the time of consumption. Different steps for preparation of mandarin squash is shown below.

1. Take fresh and ripe fruits free from any damaged or bruised one.
2. Wash properly.
3. Remove the peel and separate the segments
4. Extract the juice from the segments using a screw press or manually.
5. Strain the juice using a coarse muslin cloth.
6. Add the ingredients to the juice except the preservative and mixed thoroughly.
7. Warmed slightly and strained through muslin cloth if needed.
8. Add KMS either directly or dissolve in a small quantity of water and then mix thoroughly with the juice.
9. Fill into sterilized bottles and store it in cool and dark place.

Mandarin Squash recipe

1. Mandarin juice – 1.0 litre
2. Sugar – 1.7 kg

3. Water – 1.3 litre

4. Citric acid – 30-35 g

5. Essence – 8 ml

6. Colour – 0.8 g

7. KMS - 2.4 g

3. MANDARIN RTS (Ready-to-Serve Beverage**)**

The mandarin RTS beverage is prepared from the extracted mandarin juice, adjusting its soluble solids and acidity as per FPO specifications for RTS beverage by mixing the juice with required quantity of sugar syrup prepared from sugar, citric acid and water. Colour and essence as per the requirements are also added and mixed thoroughly. The beverage is filled into bottles leaving a head space of 2.5 to 3.0 cm, crown corked and processed in water for 15-20 minutes and air cooled. Different steps for preparation of Ready-to-Serve Beverage are shown below.

1. Extract mandarin juice.

2. Prepare sugar syrup by adding sugar and citric acid to water and heat the mass.

3. Filter the juice using muslin cloth.

4. Mix orange juice, syrup, essence and colour.

5. The product is mixed properly.

6. RTS is ready for consumption but for longer storage, fill into bottles, seal it and processed in water for 15-20 minutes.

Recipe for Mandarin RTS

1. Mandarin juice – 1.0 litre

2. Sugar – 1.4 kg

3. Water – 7.6 litre

4. Citric acid – 17 g

5. Essence – 5 ml

6. Colour – 1.5 g

4. MANDARIN JAM

Mandarin jam is a solid gel made from the mandarin fruit pulp or juice, sugar and pectin. Different steps, which are essential during this product preparation, are shown below:

1. Take good quality mandarin and remove the peel and separate the segments.

2. Remove the segment walls and seeds.

3. Mix required amount of orange pulp, sugar and citric acid.

4. Add required amount of pectin (per kg product add 8.0 g pectin powder mix with 20 g of sugar powder).

5. Cook till the sheet test shows positive.

6. Add essence and colour and mix thoroughly

7. Fill the product into sterilized glass jars till hot.

8. Seal the jars when the product temperature reaches near to ambient condition.

9. Store in cool and dark place.

Recipe for Mandarin Jam

1. Mandarin pulp – 1.0 kg

2. Sugar – 1.0 kg

3. Pectin – 8.0 g

4. Citric acid – 5.0 g

5. Essence – 1 ml

6. Colour – 1 g

Uses of Khasi Mandarin

Apart from the above value addition The Khasi Mandarins have the following uses.

Use for kindling:

Dried Mandarin and lemon peels are a far superior choice for use as kindling the newspaper. Not only do they smell better and produce less creep up than newspaper, but the flammable oils found inside the peels enable them to burn much longer than paper. '

As a pomander:

Pomanders have been used for centuries to fill small spaces with a delightful fragrance as we as to combat moths. They are also incredibly easy to make. Take a bunch of cloves and stick them into a Mandarin peer, covering the whole surface. Now suspend pomander using a piece of string, twine, or monofilament fishing line inside a closet or cupboard, and it will keep the space smelling fresh for years.

Simmer for stovetop potpourris:

Houses can be filled with a refreshing citrus scent by simmering several Mandarin peels in 1-2 cups of water in an aluminium pot for a few hours. . Add water as needed during the simmering. This process freshens up the pot as well as the air in houses.

Keeps kitties off lawn:

The littering problems of cats can be solved by making a mixture of Mandarin peels and coffee grounds and distributing it around the cats, "old haunts" lf they don't take the hint, lay down a second batch and try moistening it with a bit of water. .

As mosquito repellent:

Mosquitoes and gnats are totally repulsed by scent of the orange peel.

As ants repellent:

In a blender, make a smooth puree of a few Mandarin peels in 1 cup warm water. Slowly pour the solution over and into anthills to send the little pests packing. This will help in to get rid of the ants in garden, on terrace, and along the foundation of house.

As Essential Oils:

Three essential oils are obtained from Mandarins. Oil of orange, obtained from the rind of the fruit and used principally as a flavouring agent. Oil of pet grain, obtained from the leaves and twigs and used in perfumery. Oil of neroli, obtained from the blossoms and used in flavourings and perfumes.

Other Uses

Pulp: citrus pulp (3/4 being a by-product of orange juice extraction) is highly valued as pelleted stock feed with a protein content of 6.58 to 7.o3o/o. lt is a source of edible yeast, non-potable alcohol, ascorbic acid, and hesperidin.

Peel: In addition to its food uses, Mandarins peel oil is a prised scent in perfume and soaps. Because of its 90-95% limonene content, it has a lethal effect on houseflies, fleas and fire ants. Terpenes extracted from the outer layer of the peel are important in resins and in formulating paints.

seeds: oil derived from Mandarins and other citrus seed is used as cooking oil and in preparation soap as well as in plastic industry. The high-protein seed residue is suitable for human food and an ingredient in cattle feed, and the hulls enter into fertilizer mixtures

Flowers and foliage: The essential oils distilled from Mandarin flowers and foliage is important in perfume manufacturing. The oil is distilled from the leaves, flowers, twigs, and small, whole, unripe fruits.

Medicinal Uses . Mandarins are eaten to allay fever and catarrh. The roasted pulp is prepared as a poultice for skin diseases. The fresh peel is rubbed on acne. Whole Mandarins are much useful because of its protopectin, bioflavonoids and inositol (related to vitamin B).

VALUE ADDITION ON MANGO

Introduction

Mango (*Mangiferaindica L.*) is an important fruit crop in India and is referred to as the "king of fruits" because of its excellent overall eating characteristics. Mangoes thrive in tropical regionsand are cultivated throughout India and even in home yards, along field boundaries and roadside avenues.Mango is the most widely cultivated fruit in India. India is the major Mango growing country, contributing nearly 49.62 per cent of world's area and 42.06 per cent of world's production respectively. Area under Mango crop in Andhra Pradesh is the highest in the country. The fruit is very popular with the masses due to its wide range of adaptability, high nutritive value, and richness in variety, delicious taste and excellent flavour. It is consumed as a fresh fruit, in the frozen, preserved or dried forms or is processed into juices, purees, chutneys and pickles. Ripe mangoes are best eaten as fresh fruit, usually as a dessert and are used in the production of confectionery, ice cream, and bakery products. Mango contains a variety of phytochemicals and nutrients. The fruit pulp is high in dietary fibre, Vitamin C, pro-vitamin A, carotenoids and diverse polyphenols.

It is believed that Mangoes originated in northeast India, north-western Myanmar and Bangladesh. They have been cultivated, praised and revered since ancient times.

Mango nutrition

The fruit contains nearly 81 per cent moisture, 0.4 per cent fat, 0.6 per cent proteins, 0.8 per cent of fibres. It also contains nearly 17 per cent of carbohydrate. The fruit is rich with important minerals contains important minerals like potassium, magnesium, Sodium, Phosphorus, and Sulphur

Moisture	81 %
Fat	0.4 %
Protein	0.6 %
Fibre	0.8 %
Carbohydrate	16.9 %
K	205mg/100gm
Na	26 mg/100gm
Mg	27 mg/100gm
S	17 mg/100gm
P	16 mg/100gm
Carotene	2743 mg/100gm
Vitamin C	16 mg/100gm

Post-Harvest Practices

Sorting/Grading

Sorting is the process of classifying the mangoes into different categories based on their varieties whereas Grading is the process of classification based on the quality. In India the AGMARK standards are used for quality-based classification.

After harvest, mangoes are arbitrarily classified as “Class A” (good quality; for export or for institutional buyers like supermarkets and hotels) or “Class B” (local grade or for domestic market. Grading on the other hand, refers to the classification of mangoes based on the standard criteria acceptedby the industry.

Packaging

Usually, fruits are placed in layers one above the other, with a straw padding in between.Wooden boxes are commonly used for packaging and transportation of mango fruits. Temperatures between 19-21°C during ripening improve the quality offruits.The packing method tested for short-distance transportation compared the traditional farmer/trader method a bamboo basket with the capacity of 30-50kg with a rigid plastic basket with a capacity of 20 kg.

Storage

Mangoes are stored at a temperature between 8 and 13 ˚C, depending on the variety and ripeness. Storage is essential for extending the consumption period of fruits, regulating their supply to the marketand also for transportation to long distances. The mature green fruits can be kept at room temperature for about 4-10 days depending upon the variety. For exports, the harvested fruits are pre-cooled to 10-12°C and then stored at an appropriate temperature. The fruits of Dashehari, Mallika and Amrapali should be stored at 12°C, Langra at 14°C and Chausa at 8°C with 85-90% relative humidity. The fruits could be stored for 3-4 weeks in good condition at low temperature. Controlled atmosphere ($CO2$ 3 -4 % and $O2$ 4-5%) storage of Alphonso mango, under a continuous flow system held at 13-150C indicated that Alphonso could be kept for 30 days with a post storage ripening period of 4 to 5 days.

Transport

For local market the harvested fruits are packed in wooden boxes/CFB and transported by trucks.

Mango value addition

Value addition helps to widen market scope and reduce post-harvestloses. It gives the product a higher value. Green or ripe mangoes can be processedand value added into various products as follows: -

Green Mangoes

- Pickles
- Preserves
- Desserts
- Chutneys

Ripe Mangoes

- Dried mangoes
- Mango juice
- Mango concentrate
- Mango jam
- Mango jelly
- Mango syrup/ canned mango

Mangoes are perishable goods that losses it's freshness within a short time due to this value addition comes in so as to promote the fruit's taste, flavour and also the shelf life being the co-reason.

The following are some of the ways mangoes can be added value

1.Mango candy

- Candies are generally referred to as sweets or confectioneries. It is a familiar food treat available in different varieties and flavours.
- This type of candy comes under the hard candies category; they are hard in texture, which the mango pulp is boiled till hard(no added additives or preservatives)
- They are left to cool in the trays, after which they are cut into different sizes and shapes.
- Bars are packed in cellophane.

4. Mango juice

- The ripe mangoes are first peeled and cut into small pieces
- The blender is then filled with banana chunks. Sugar and milk are then added (milk is added to improve the taste and water to make it a low-calorie juice).
- All the ingredients are then blended together until smooth puree.
- More milk is added and blended again for 30 seconds.
- Consistency is checked and water added and mixed to the juice to make it light.
- Serve it cool.

5. Dried mango

- Chose mangoes that are ripe but not yet soft.
- Peel the fruit.
- Cut the flesh into strips just a few mm. thick.
- Dry these in the sun (it can be sun dried)

- The dried mangoes are ready when they feel like rubber.
- The dried mangoes can be stored in plastic bags if available. If not store them in pots or gourds with lids.

6. Mango pickles

- Put three cups of vinegar and three cups of sugar into a pan and heat until the sugar has dissolved.
- Peel the green fruit.
- Cut the flesh into small cubes or slices.
- Add the cut fruit to the pan with one cup of chopped onions if available.
- Boil for 20-30 minutes, stirring occasionally.
- When the mangoes are soft add salt pepper, chopped mint and two teaspoons each of ground ginger, cinnamon (any other spices that you like).
- Serve the delicacy warm.

5. Mango jam

- The Mangoes are sliced into very thin pieces and blended. The puree is then put in a clean bowl.
- The sufuria is then filled up with 1 cup of sugar and then stirred continuously under medium heat until the sugar turned brown.
- Once it turns brown, 1/3 a cup of water is added and left for some time for the crystallized sugar to melt and mix with water. After that the Banana puree is added and stirred to mix with the solution.
- Stirring continues until no banana pieces are seen, helps to dissolve the banana soluble.
- A test is done so as to know if the jam is ready by dropping a drop of the jam in a cup of water. If the jam dissolves, then it is not yet ready and therefore is to be left to cook for some time.
- After testing and finding out that the jam is ready, it is put in a container and left to cool

6. Toothpaste out of mango seed

- Mango is valued as a dentifrice to heal the gums and soothe toothaches. The benefits of mango seed may be due to the antibacterial properties it possesses, the seeds from all varieties of mangoes "inhibit growth of both gram negative and gram positive bacteria." If you have an Asian grocer in your town, you may be able to buy mango seed powder.

Procedure

- Pry open the fibrous, white, outer seed husk, using a spoon or butter knife, to access the smooth, inner seed. Remove the inner seed and discard the husk.

- Set the seed in a shady, warm area to dry. It takes about a week for the seed to completely dry. When it is dry, it will look shrivelled and leathery and will sound hollow when you tap it.

- Grind up the dried seed using either a mortar and pestle or a food processor, until it is the consistency of corn starch or flour.

- Store the powdered mango seed in a glass jar.

- Brush your teeth with the mango seed powder. To use the mango seed powder as toothpaste, pour a small amount of the powder into the palm of your hand. Moisten your toothbrush with water. Dip the moistened toothbrush in the powder that is in the palm of your hand. The powder will stick to the moistened toothbrush bristles. Brush your teeth as you would with ordinary toothpaste. Rinse your mouth and toothbrush with water when you are done.

7. Mango wine

- Bring water to boiling

- When the water boils, add the sugar to the water. Stir the hot water to make it absorb more sugar until it becomes syrupy.

- Let it cool a bit, and then pour the liquid on the mashed mango inside the fermenter.

- Add yeast nutrients together with the mixture in the fermenter.

- Cover the fermenter and leave it at room temperature for 24 hours. Then add the pectin enzyme. Leave it again for 12 hours.

- Add the wine yeast. Let yeast do its work for 10 days.

- Squeeze the straining bag 2-3 times a day for ten days. On the tenth day, squeeze the straining bag till dry, and then discard the bag and the pulp. Let everything settle overnight.

- Siphon the mixture to the secondary fermenter. Sieve the mixture

- Store the liquid (wine) in cool place or refrigerate it.

8. Mango Chutney

- Rinse the mangoes well then dry them with a kitchen towel.
- Peel and chop them into small pieces.
- In a blender or grinder, grind all the ingredients with little water to a smooth paste.

9. Mango Desserts

Mango Ice-cream

- Peel and chop the mangoes
- Blend the mangoes, vanilla extract and sugar to a smooth pulp
- Whip the cream till soft peaks are formed
- Add the mango pulp and mix well
- Check the sweetness and add more sugar if needed
- Pour in a tray or container and place in the freezer

- When the ice-cream is half frozen remove from the freezer
- Whip again for a minute
- Pour the mango ice-cream contents again in the container with lid.
- Freeze till set.

VALUE ADDITION TO GUAVA

Value added products of Guava:

A) Guava pulp:

1) Blend cut pieces of fresh guava fruits with water (up to 20%).

2) Filter out the seeds

3) Heat the pulp to 75-78°C and store with 1000 ppm So_2 in airtight containers aseptically packaged.

B) Guava juice:

1) Squeezing guava juice from fresh guava pieces through a hydraulic filter press.

Juice could also be made from pulp by diluting it with water and filtration.

Note: a) The use of pectic enzymes in association with fining agents in fruit processing is essential to get better juice yields, improve filtration rate and produce clear juices of high quality for the concentration process.

b) Commercial preparations containing pectinases, arabinase and cellulase may benefit guava juice production.

C) Guava nectar: Guava nectar is a juice made from the guava fruit.

Specifications for Guava Nectar are Brix 12.5° 13 ° Acidity 0.15 %, pH 3.4 – 4 (AzraYasmin).

1) Crush fresh guava fruits.

2) use the resulting guava pulp to create a rich, sweet juice which has a great deal of flavour.

D) Jelly: Use slightly under ripe fresh guava fruits for jelly (semi-solid) making.

1) Boil a clear strained fruit extracts free from pulp after the addition of required amount of sugar, citric acid and pectin.

Note: It should contain minimum 65per cent of total soluble solids and minimum 45 per cent of fruit portion (Dhawan, 1998).

E) Toffee: Toffee can be prepared with fig and guava pulp (75:25), 500 g sugar, 50 g skim milk powder, 100 g fat (cow ghee) and 2 g common salt per kg pulp.

Guava-soya toffees are prepared by blending guava pulp with soya slurry for developing protein enriched product.

3. FLOW-SHEET FOR EXTRACTION OF GUAVA PULP *

Ripe fruits

↓

Washing

↓

Cutting into pieces

↓

Mixing with water (1:1)

↓

Passing through pulper

↓

Pulp

4. FLOW-SHEET FOR PROCESSING OF RTS BEVERAGES *

Guava (Pulp / juice)

↓

Mixing with strained syrup solution

(Sugar + water + acid, heated just to dissolve) according to recipe

↓

Homogenization

↓

Bottling

↓

Crown corking

↓

Pasteurization

(at about 90°C) for 25 minutes

↓

Cooling

↓

Storage

4. GUAVA JELLY *

Ingredients

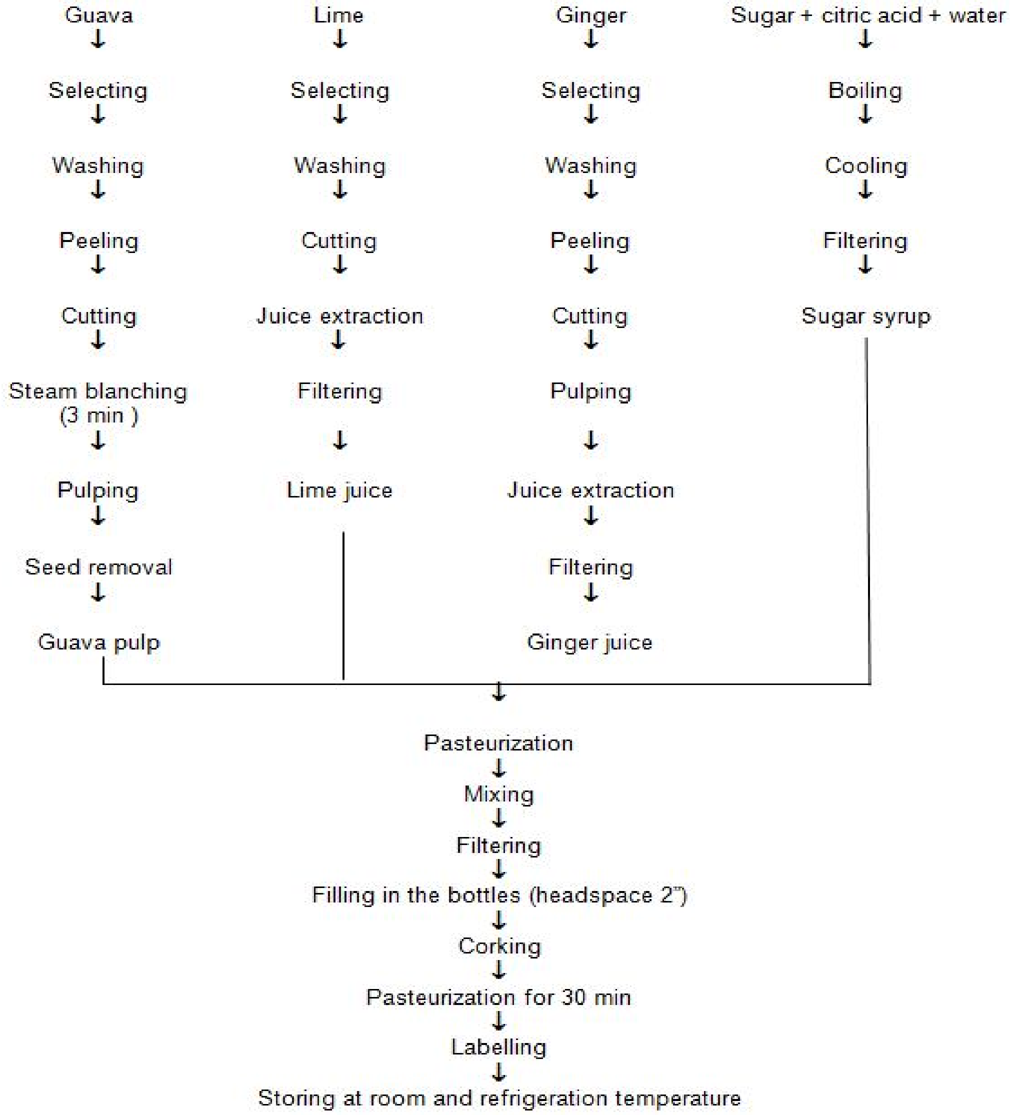
Guava	1 kg
Sugar	600 g
Citric acid	8 g

Method

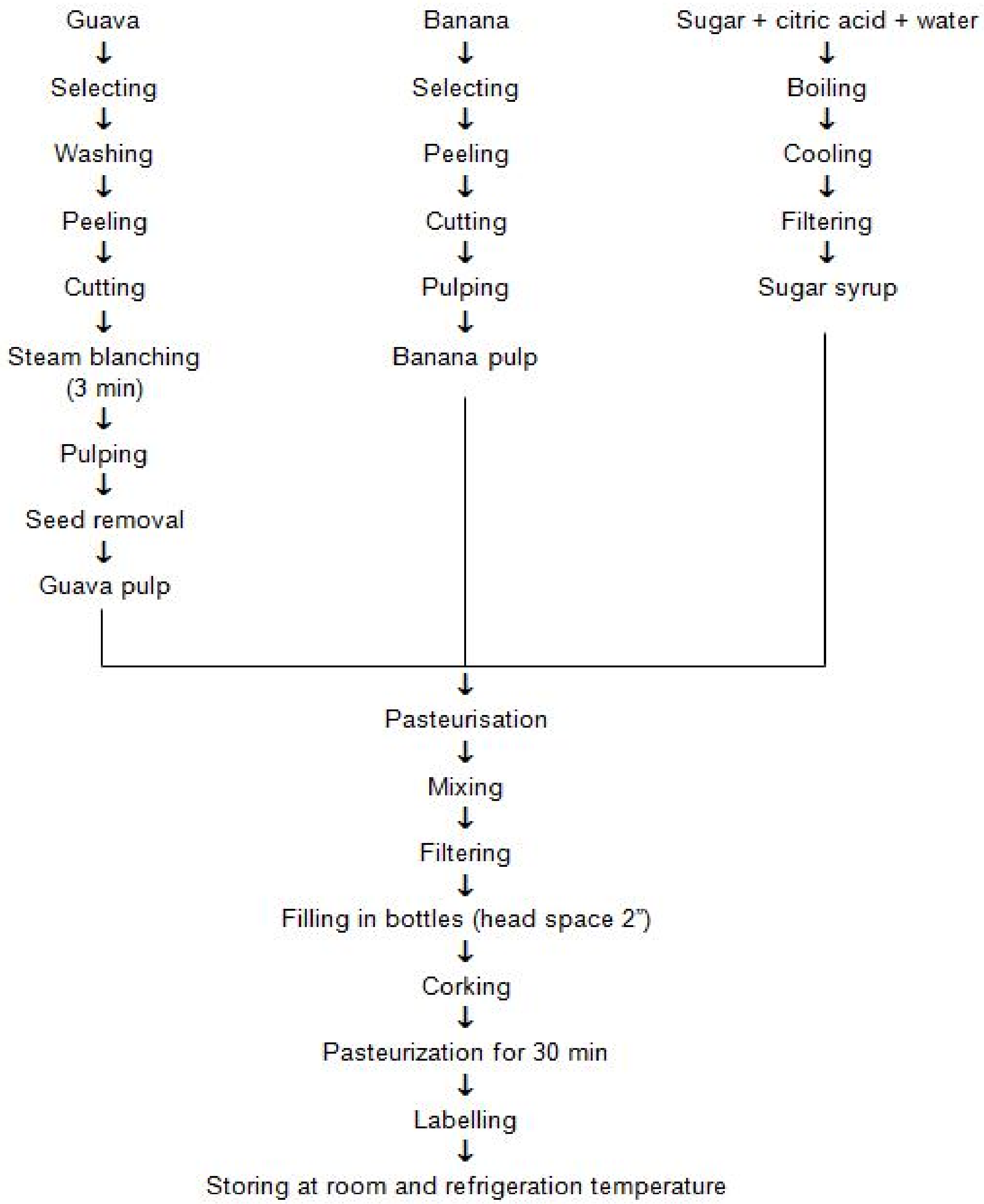
1. Select well matured sound guava fruits, wash well and cut into small slices.
2. To this add equal quantities of water and boil under low flame for 30 minutes.
3. Strain the pectin extracts, add sugar and citric acid.
4. Boil the pectin extract and sugar mixture upto 65°Brix and fill hot into sterilized bottles, cool and store.

6.GUAVA-LIME-GINGER RTS **

Flow chart for the preparation of guava-lime-ginger RTS



6. GUAVA-BANANA RTS



Flow chart for the preparation of Guava-banana RTS **

8. MIXED FRUIT SQUASH

Flow chart for the preparation of mixed fruit squash (Guava, banana, mango) **

Guava ↓ Selecting ↓ Washing ↓ Peeling ↓ Cutting ↓ Steam blanching (3 min) ↓ Pulping ↓ Seed removal ↓ Guava pulp

Banana ↓ Selecting ↓ Peeling ↓ Cutting ↓ Pulping ↓ Banana pulp

Mango ↓ Selecting ↓ Washing ↓ Peeling ↓ Cutting ↓ Pulping ↓ Mango pulp

Sugar + citric acid + water ↓ Boiling ↓ Cooling ↓ Filtering ↓ Sugar syrup

↓

Mixing

↓

Filtering

↓

Filling the bottles (head space 2")

↓

Capping

↓

Labelling

↓

Storing at room and refrigeration temperature

9.DEHYDRATION OF GUAVA PIECES**

Selection of guava

↓

Washing

↓

Cutting into eight portions vertically

↓

Scooping out the seeds

↓

Drying in cabinet drier (60 ^{0} C)

↓

Cooling to room temperature

↓

Tempering overnight

↓

Packing and storage

CASSAVA VALUE ADDITION

Cassava is a woody perennial and branched shrub that can grow up to 5 metre in height. It is a cheap and major source of calories for over 40% of the population. In India it is cultivated in the southern state and the northeast. The fresh tuber has a very short shelf life of about three days, therefore value addition is often done to the crop through processing into many types of product for different utilization and to prevent post- harvest loss. Cassava processing which adds value to the crop increases income from the product and also provides employment. The root is not the only part of the plant that can be put to good use but leaves can be cooked as a vegetable and for raising silkworms. The green part of the upper stem is fed to cattle and buffaloes, and the leaf-blades to pigs and chicken.

Some value added products derived from Cassava are:

A. Cassava Flour:

Procedure to make:

1. Cut into thin pieces the peeled root crop.
2. Place in a basin of water.
3. Spread the thin pieces on a tray to dry under the sun or in a solar dryer.
4. Grind the dried cassava and sieve fine.
5. Seal in a container with a tight cover.

B. Cassava Chips:

Procedure to make:

1. Wash cassava well, peel and slice very thinly.
2. Soak in 2% salt water with flavouring.
3. Spread on a tray and steam for 5 minutes.
4. Dry in a solar drier or sun at 60˚C for 5 hour.
5. Seal in plastic bags until ready for frying before serving.

C. Cassava Pasta:

Procedure to make:

1. Pour the cassava flour, add eggs and mix using a fork.
2. Mixed the egg with flour for 15 minutes by hand until it is compact, smooth and elastic.
3. Form it into a ball and leave it to rest for 1 hour at room temperature.
4. Then divide the ball into three equal sized pieces. Roll each pieces of Pasta through the rollers at the maximum thickness setting.
5. Use the pasta dryer or rest the pasta on a cloth for at least 10 minutes, then put it into bags.

D.Cassava Butter Cake

Procedure to make:

1. Sieve the cassava flour and baking powder together
2. Cream margarine in a big bowl until fine.
3. Gradually add sugar with constant stirring.
4. Add alternately and little by little, beaten egg yolk, cassava flour, munggo flour, baking powder and milk.
5. Mix well, stirring in one direction only.

6. Beat the egg whites until flubby and stiff, and;

7. Add little by little to the mixture.

8. Put mixture in pan and cook in oven at 307˚C for 25-30 minutes.

9. Remove from oven and cool serve.

E Cassava Shrimp Stick

Procedure:

1. Wash the cassava, peel and grate.

2. Remove excess juice.

3. Mix together in a bowl all the dry ingredients.

4. Add cassava and 2tbsp oil. Mix well.

5. With the aid of 2 knives, cut the dough fine into sizes like mongo seeds.

6. Add water and knead well.

7. Spread the flour on the board and flatten the dough with the aid of a rolling pin. If necessary, add more flour to facilitate dough flattening.

8. Cut up the flattened dough into thin sizes shape into rolls similar to cigarette sticks.

9. Arrange them in a baking pan and cook in oven.

10. Remove the baking pan and cool.

11. Remove the “sticks” from the pan with the aid of a knife.

12. Seal in a plastic bag and label or serve.

F. Production of Cassava Starch

1. Cassava starch is produced from unfermented cassava paste, the processes involve

2. Mix the cassava paste in a vat of water, at a ratio of 5 litres of water to 1 Kg of paste.

3. Sift the mixture and collect the starch milk in a basin. Allow the starch to settle for 1 hour.

4. Collect the paste that has been deposited at the bottom and leave it to dry in the sun. This extracts the starch.

5. Grind the starch and sift the powder, then package it into bags.

1:00 pm- 3:00 pm: MUSHROOM: CULTIVATION OF OYSTER MUSHROOM*(Pleurotus florida)*

North East India has a very good prospect for cultivation of mushroom because of the prevailing and favourable weather condition for its production. Mushrooms are called 'white vegetables' or boneless 'vegetarian meat'. It contains protein, vitamins and fibre apart from having medicinal properties. Among Oyster mushroom *P. sajor – caju* and *P. florida* are commercial species suitable for round the year cultivation. Its cultivation requires minimum investment but has maximum profit potential in the market. The used straw after harvesting is nutritious and can be incorporated into the soil for enriching it. Oyster can be grown in temperature of 20-30° C.

Sowing time – March to October.

Cultivation of Oyster in Polythene bags.

Requirements for cultivation

1. Clean Paddy straw
2. Transparent polythene bags of size 1.5 ' by 2 feet
3. Spawn
4. Dark room to induce germination
5. Well ventilated rooms
6. Drums
7. Sprayer
8. Firewood
9. Bamboo/cane baskets
10. Chaff cutter/ Dao
11. Watering can

Preparation of growing media

1. Clean paddy straw is chopped about 15 cm with the help of a chaff cutter or dao.
2. Soak the cut straw in a water drum for 6-8 hours.
3. Drain off the water and boil the straw in hot water for at least 30 minutes so as to disinfest the straw.
4. Drain off the excess water and allow it to cool in shade. Spray garlic solution @ 6 tsp in 1 litre of water to avoid any diseases.
5. Make about 20 holes in the poly bags at a distance of 10 cm.

Planting of Oyster Seeds

Seed requirement – 300 gms of seed is required for 1 kg of paddy straw. Whereas 100 gms of seed is required for planting 1 polythene bag.

1. Take 100 gms of Oyster seed and divide it into four equal parts in a clean tray.

2. Fill 6 cm of perforated poly bag with the straw and press it slightly. Then sprinkle one part of the above seeds uniformly over the straw. Cover again the seeds with straw for another 6 cm thickness.

3. Repeat the process 4-5 times in such a way that the level of straw should be 5 times and the level of seeds should be 4 times in one polybags. Then tie the mouth of the bag.

4. Place the filled polybags in a shelf in the dark room. The room temperature should be maintained at 25°C. Leave the bags for at least 12-20 days in the dark room. After 14 days white threads like growth will be seen covering the straw fully.

5. Remove the polythene bag cover carefully when the pin heads start emerging.

6. Keep these straws in a well-ventilated room. Allow partial light to enter the room. However, temperature should be maintained at about 23°C. If temperature rises, the floor of the room needs to be sprayed with water to retain humidity of 75 – 90%.

The following points should be remembered after planting of Oyster seeds.

1. Watering is not required until pin head formation is seen. Watering should be done 2 days after the removal of the plastic bags.

2. Watering can should be used to sprinkle water to the fruiting bodies i.e. in the morning and evening.

3. Within 5-7 days the first flush of fruiting bodies appears which can be harvested.

4. Subsequent flushes appear about every 10 days and 2-3 harvesting can be done.

5. Keep the surrounding areas neat and clean. Put mosquito net on the ventilation to check flies.

Diseases and Management

The main disease of Oyster mushroom is fungus. After 7-8 days of planting of seeds, a fungal like greenish substance may be seen in the straws. The main causes of this moss formation might be due to seed borne disease or the paddy straw used as media was not properly boiled.

Control

1. Spraying 6-7 tsp of garlic solution mix with 1 litre of water to the paddy straw before planting of seeds.

2. Select clean and disease free seeds.

3. Sanitation and hygiene are important measures to prevent pest and diseases.

4. Avoid using damaged and old straw as planting medium.

5. Remove and destroy the infected blocks immediately.

6. Avoid preparing block with more than 70% moisture.

7. Polythene bags should be properly washed and dried before re-use.

8. Water stagnation should be avoided on the floor to prevent insect/flies and to prevent unwanted growth of moulds.

Control of Pests on Oyster

1. Spraying Bleaching powder @ 2 g/ 10 litre of water all around the floor of the room.

2. Spraying Neemagon/Neemgol/Rakshak @ 3 ml mix in 1 litre of water to the paddy straw before sowing of seeds.

3. Covering the ventilation outlets with the help of mosquito nets.

4. Using fluorescent strip traps in the growing room.

Harvesting

In about 3-4 days, the first flush of fruiting bodies appears which can be harvested. The matured Oysters are harvested along with the roots. The harvested mushroom should be stored in brown paper bags or in perforated plastic bags for marketing.

Storage:

Being highly perishable, oyster mushroom should not be stored for a long time. However the followings should be followed for storage:

1. Dry the harvested oyster mushroom in shades for about 2-3 days.

2. Store the harvested mushroom in refrigerator and it may last for 7-15 days.

3. Keep the harvested mushroom in saline water by mixing 10-15 gram salt in 100 ml of water. Mushroom can be kept for 6-7 days in the saline water.

4. Mushroom can be processed by canning them.

5. It can be processed for pickles, nuggets, soup powder etc.

6. It can be processed for medicinal purposes.

3:00 pm- 5:00 pm: FINANCING: Poultry venture capital fund subsidy scheme EDEG

A centrally sponsored scheme implemented through NABARD with an objective to encourage poultry farming activity especially in non-traditional areas, provide employment opportunities in backward areas, improve production of poultry products which have ready market all over country, provide quality meat and poultry products and to improve productivity and facilitate rearing of other poultry species like quails, ducks, turkeys etc.,.

Eligibility

Farmers, individual entrepreneurs, NGOs, companies, cooperatives, groups of unorganized and organized sector which include Self Help Groups (SHGs), Joint Liability Groups (JLGs) etc.

(i) An individual will be eligible to avail assistance for all the components under the scheme but only once for each component

(ii) When more than one member of a family is assisted under the scheme, the units set up by each member should be with separate infrastructure at different locations with distinct identity. The distance between the boundaries of two adjacent farms should be at least 500m.

(iii) Biosecurity norms should be kept in view while locating the units.

Funding pattern

- Entrepreneur contribution (margin money) - For loans up to Rs. 1.00 (Rupees one lakh), banks may not insist on margin as per RBI guidelines.
- For loans above Rs 1.00 lakh : 10% (minimum)
- Back ended capital subsidy –35% for APL and 50% for BPL/SC/ST in North-Eastern Region/Hill Areas
- Effective Bank Loan (excluding eligible subsidy as above) - Balance portion, Minimum 40% of the outlay

Repayment Pattern: Repayment Period will depend on the nature of activity and cash flow and will vary between 5- 9 years. Grace period from 6 months.

DAY 31: 10:00 am – 12:00 Noon: FARM MECHANIZATION: Safety Measures for operating Agricultural Machineries

RUBBERCAN CUT

Even though the belts are made of rubber they can cut your fingers like a sharp knife. Never take your fingers anywhere near the transmission Belts or Fan Belts when the Engine is running.

Do not be tempted to check the belt tension when the Engine is running.

BOILING WATER IN RADIATOR

The water in the Radiator will be very hot and under high pressure, after the Engine has run for a few minutes.

Therefore never try to open the Radiator Cap when the Engine is running, Hot water may splash on your face and body. Always stop the Engine, wait for 5 to 10 minutes and only then open the cap very slowly.

PROPER TOOLS FOR SAFER WORKS

Always use only [he proper and correct size tools when carrying out any adjustments fixing attachments, changing wheels etc. II wrong tools are used the parts will get damaged and you too may get hurt.

A *FEWMQRE SAFETY TIPS*

***** Keep hands, feet and clothing away from moving parts.

***** Always wear relatively tight clothing when operating the Tiller. Loose clothing should be avoided because of the danger of their getting caught in moving parts or Controls.

***** Do not allow persons without proper training or children to operate the Tiller.

***** Clear work area of objects, which might be picked up and thrown.

***** Repair any damage before restarting and operating the Tiller.

WHEN CROSSING OVER BUNDS

Always stop the blade rotation before crossing over bunds or similar obstructions As far as possible, cross over in the reverse gear, Because the front of the .Tiller is comparatively heavier, it is likely to topple forward and you are liable to get hurt Moreover *when* operated in reverse gear, the blade automatically Stops.

WHEN CROSSING OVER CANALS

If you have to cross over a very high bund or a canal, use strong wooden planks across it. In such case also, do not move the Tiller unless the blade rotation has been stopped.

THE KILLER BLADES

The titling blades can be dangerous. So treat them with respect and due care. Never try to remove grass shrubs or paddy stubs etc, that may cling to the Blade Shaft when it is rotating, Remove them only after disengaging the Clutch and putting the Blade Speed Change Lever in Neutral position. You may even stop the Engine also; there is nothing to lose by it, whereas, if the engine is running, the levers can accidentally shift, and you may lose your hands or legs.

OVER INCLINED CURVES

Turning the Tilter while descending can become Uncontrollable and dangerous if you are not careful Take such turns at very slow and reduced speeds only.

1:00 pm – 3:00 pm AH & VET Dairy Farming

DAIRY FARMING

OBJECTIVE

- To increase the milk production and milk products.
- To motivate the farmers to adopt cross breeding programme by means of Artificial Insemination.
- Provide excellent opportunity for self-employment of unemployed youth.
- Increase the economic status of the farmer.

BREEDS

- Jersey
- Holstein – Friesian
- Sahiwal.
- Cross Bred(HF/Jersey)

SELECTION OF SITE FOR CONSTRUCTION OF DAIRY FARM.

- Location of the Farm.
- Accessibility
- Exposure to sunlight
- Proper drainage.
- Avoid water logging.
- Market.
- Water supply.
- Electricity.
- Marketing of milk and milk products.

HOUSING OF DAIRY CATTLE

Good dairy housing is important for quality milk production.Besides, providing shelter from adverse weather a well designed barn provides a clean dry, well drained and comfortable accommodation to the animals and a pleasant, efficient work place for the operator.It also offer easy access of the animals to feed and water, freedom of movement, ventilation that prevent harmful effect from poor air quality and light.

CARE AND MANAGEMENT

- Feeding and management of dairy cow are considered to be the key success of dairy farming.
- Economical ration with required nutrients are very essential for feeding the cow in milk.
- Good housing system
- Care and management of pregnant cows during and after calving
- Care and management of the newborn calf.
- Vaccination.
- Regular Deworming.

BENEFITS OF DAIRY FARMING.

- Dairy farming is an important source of income to small and marginal farmers and agricultural laborers.
- Generate self -employment.
- Animal manure improves soil health.
- Organic manure increase soil microbes which are beneficial for the crops.
- Reduce the use of chemical fertilizer.
- Chemical fertilizer pollutes the environment and are harmful to human health.
- Increase Milk production and milk products

BACTERIAL AND VIRAL DISEASES OF CATTLE

1. Foot and mouth Disease.
2. Black quarter
3. HaemorrhagicSepticaemia.
4. Anthrax.
5. Brucellosis.
6. Tuberculosis

PREVENTION AND CONTROL

- Prevention is better than cure.
- Follow vaccination schedule.
- Maintain health Card.
- Report to the nearest dispensary or aid centre in case of any outbreak, unusual death, etc.
- Deworming.

ADVANTAGE OF GOOD HOUSING SYSTEM

1. Increased production of milk.
2. Better utilization of labour.
3. Proper disease control.
4. Decrease in mortality.
5. Proper and control feeding of animals.
6. Production of higher quality of milk.

TYPE OF HOUSING

The most widely prevent practice in our country is to tie the cows with rope on a Katcha floor except some organized dairy farm belonging to Government, Co-operative or Private farm.
Good housing facilities should be provided. There are 2types of Housing:-

1. Loose Housing
2. Conventional dairy barn.

LOOSE HOUSING

- Animals are kept loose in an open paddock except at the time of milking and treatment.
- System is most economical
- Cost of construction is low.

CONVENTIONAL DAIRY BARN.

- The conventional dairy barn are comparatively costly..
- Inside the conventional barn animals are confined together and secured at neck by neck rope or neck chain.Animals are stall fed and milked inside the shed.Cows inside the conventional barn can be arranged in a single row if the number of cows are small or in double row if the herd is a large one.In double row housing system the shed should be arranged either tail to tail system or head to head system.Cattle are more protected from adverse climate condition in this system.

FLOOR SPACE REQUIREMENT

Cow	-	60sqft
heifer	-	30-40sqft
Calf	-	20-25 Sqft.

Vaccination Schedule.

	1St Vaccination	Revaccination	
•	F.M.D -	3 – 4 months old	Annually.
•	H.S. -	6 months old	Annually
•	B.Q. -	6 months old	Annually.

PRECAUTION FOR CLEAN MILK PRODUCTION

Clean milk is generally define as milk drawn from the udder of healthy animals which is free from extraneous matter like dust, dirt, flies, hay manure etc.

- Milk is a major constituent of the diet.
- To get clean milk, milking animals should be perfectly healthy and free from contagious disease.
- Animals at the time of milking should be perfectly clean.
- Milkers and milk handlers must be free from communicable disease.
- Utensils used for milking should be cleaned and washed properly.
- Quality of milk is affected due to poor animal health.

Lactation period – 305 days
Dry period – 60 days.

Feeding Schedule for a Calf

Calves	Milk	Feed
Upto 3 days	Colostrum	Nil
4-14 days	3 ltrs./day	Nil
14-28days	2.5ltrs./day	100grms/day
29-56days	2 ltrs./day	500 grms/day
57-70days	1.5ltrs./day	700grms/day
71-84days	1ltr./day	1kg/day
85-120days	Nil	1kg/day
121-180days	Nil	1.25kg/day

Fodder feeding

- Green fodder - 12-15kg/cow//day
- Dry fodder(straw) - 5kg/cow/day
- Green fodder - 7-8kg/heifer/day
- Dry fodder - 2-3kg/heifer/day
- Green fodder - 2.-5kg/calf/day
- Dry fodder - /2 -1kg/calf/day

Concentrated feed

- Dry cows ` - 2kg/day
- Heifer - 2kg/day
- Pregnant dry cow - 3kg/day
- Milch cow 3kg as maintenance ration + 1 kg of feed

per 3kg of milk

3:00 pm – 5:00 pm PRACTICAL

DAY 32: 10:00 am – 12:00 Noon: HORT I: Pea Cultivation

Pea is one of the vegetable which grows mostly in our state. There are two types of Pea namely Garden Pea *(Pisum sativum* varieties hortense) or Table Pea and the other one is Field Pea (*Pisum sativum* varieties arvense). The garden pea has white flower and it is grown for cooking purposes. The field pea has a purple flower and it is often used as making gram or as crop rotation to enrich the soil fertility. Pea is a crop which is very good for human's consumption as it has protein about 22.5%, minerals and vitamins.

1. Climate and Soil:- Pea is suited in mid attitude and high attitude in the North Eastern Region of India. Pea is grown in temperate climate and it can withstand frost. The high temperature at vegetative growth may hamper the crop. At the time of flowering stage, the crop requires moisture, hence during dry season, the crop needs proper irrigation. High humidity during planting season is very harmful as it increases disease infection.

Pea requires permeable soil. It should be free from water stagnation without much iron content which leads to crop damage. It can be grown in many types of Soil right from light sandy loam to clay soil with a pH of 6-7.5 is ideal. Liming improves the soil condition, if pH is lower than 6.0

2. Seed (Varieties) :- As per the ICAR Reasearch Complex for NEH Regiom, the seeds suited for this region are as follows:-

Sl.No	Varieties	Height	Attitude	Duration	Yield (Q/Ha)
1	DMR-7	Tall	Mid	110-125	75-80
2	DMR 50	Tall	Mid	115-130	65-70
3	TRC P8	Tall	Mid	130-140	70-75
4	TRC P9	Tall	Mid	130-140	70-75
5	Rachana	Tall	Low	125-130	60-70
6	Ambika	Tall	Low	100-125	60-70
7	Arkel	Short	Mid	105-110	50-60
8	Bonneville	Medium	Mid	105-110	80-85
9	Azad	Short	High-Mid	110-120	50-60

Cherrapunjee (local) is an open pollinated variety grown mostly by the farmers of East and West Khasi Hills.It is a tall variety having a duration of 120-140 days and the yield is 70-80 qt/ha.

3. Land Preparation**:**

Pea cannot be grown in acidic soil. Lime application @ 2 tons/ Ha about 10-15 days before sowing maximize the production. Deep ploughing and proper turning followed by two or three ploughings for land preparation. Avoid well pulverized soil for planting. The rows should be leveled properly and irrigated the land before sowing. In low lying area, a bed is made out of 6-10 inches height, 4-5 metres length and 1.25-1.5 metres width. In between beds, a drainage of 1 metre width is needed to facilitate air to the root zone. The optimum time of sowing is August in mid & high attitude, and 1st week of October in lower attitude. The time of sowing is very important to take care of as it affects fruiting.

4. Seed Rate:- For longer duration seed requires 60-80 kg/hectare if planted at a distance of 30cm-60cm from line to line. For shorter duration, seed like Azad P-1, and Kashmir requires 100-125 kg/hectare if planting at distance of 30cm from line to line.

5. Manures and Fertilizers:- Pea is one of the crop which belongs to Leguminous family which has sufficient Nitrogen. Apply 15-20 tonnes decomposed cow dung/FYM at the time of sowing. Bio-fertilizers such as Rhizobium and Phosphatika @ 200gm each in ½ lit of water solution has to mix properly to make a paste. This solution is well mixed and coated with 10-12 kgs of seed. Take the coated seed and dry in the shade for 15-30 minutes before sowing. This will enhance the fertility of the soil.

6. Water Requirement:- In high altitude, the crop requires water for growth. During flowering stage the plant should be irrigated carefully. Pea grows in lower altitude does not need much water instead it is necessary to take care of water stagnation, otherwise it will affect the branches as well as fruiting.

7. Staking:- Tall pea needs staking for support. Bamboo stick is used at a distance of (1.5 metres – 2 metres) from line to line and row to row using rope/wire to reduce the cost.

8. Weeding:- Proper weeding right from the date of sowing till it reaches 2 (two) months old. Weeding is done aft er 25-40 days after sowing to minimize weeds.

9. Plant Protection Measures:-

Aphids:- Greensoft bodied nymphs and adult feed on the leaves and tender short. The affected plant shows discoloration, yellowish and died.

- Plant with marigold in and around the field.
- Use sticky trap to reduce the aphids @ 15 Nos/Ha.
- Spray with nimbecidine /multineem @ 5ml in 1 litre of water

Pod Borer:- Tiny greenish caterpillars with five black spots on the Prothoracic shield enter the pods and eat the seeds.

Spray with Bacillus thuringiensis (Bt)/ Bio-lep @ 60-65ml/ 16 litres of water.

Leaf Miner:- It is a major pest of pea, maggots make zigzag mines in the leaves, eat green matter pupate inside, infested leaves become whitish and dry up.

- Spray with neem based bio-pesticides @ 5ml / litre of water

Powdery mildew:- White powdery patches appear at the upper side of the leaves.

- Spray with 5 ml baking soda mix with 3 litres of water
- Spray with 5ml powdery care in 1 litre of water.

Rhizoctonia Rot:- The leaves become yellowish in colour, the stems dry up and die.

- Spray with Viricon L @ 80 ml/ 16 litres of water .

- Mix the seed with 5-10 grams Trichoderma harzianum in 10-20 ml of water/ 1kg of seed. Spread the coated seed in shade and dry for 30 minutes before sowing.

- Drenching can be done in nursery bed with Trichoderma harzianum @ 5-10 gram / 1 litre of water.

Rust:- Yellowish powdery patches seen in the leaves.

- Remove and burnt all the diseased plant parts after harvesting.
- Spray with Pseudomonas fluorescens @ 5ml/ 1 litre of water after 45 days of sowing with an interval of 10 days.

1:00 pm – 3:00 pm: AGRONOMY: Package & Practices of Soyabean

INTRODUCTION

Soya bean is a short day plant and thrives best in varied climate. It is generally cultivated in Kharif season. It grows well in slopes as well as terraces. It is grown as a pure crop as well as inter crop with Maize, Achar etc. Productivity of Soya bean has increased considerably following the inproved production technology. Soya bean contains about 38-42% protein and it is potential oilseed crop of the country and contain about 17-22% oil. Soya protein is a low cost protein and is highly nutritious. Soya bean contains all essential amino acids and is rich in lysine. It can be used as a supplement to cereal diet.

Soybean is an important pulse as well as oilseed crop of the State.

Soil:-Soybean can be grown on a wide range of soils but it grows best on fertile well drained loamy soils.Water logging is injurious to the crop. In acid soil where PH is below 6.0, lime is to be added @ 2t/ha at least 21 days before sowing. Liming is necessary once in three years.

Time of sowing:

Under irrigated condition sowing is to be done in January.

When the crop is grown under rained condition, the optimum time of sowing is middle of January to middle of February.

Land Selection:

Medium type of land is suitable for rained condition, where there is sufficient moisture during January and February.

Field Preparation:

Well prepared seed bed with good tilth is essential for Soybean.

Apply organic manure:

Farm Yard manure for 15-20MT/HA.

Seed Treatment:

Seeds are to be moistened with clean water with care so as to avoid excessive wetting. Rhizobium culture is to be mixed with seeds @ 15 g/kg so that a thin coat of inoculum is deposited on the seed coat. Treated seeds are to be dried under shade. Inoculated seeds should not be exposed to the sun.

Seed Rate:

A seed rate of 75 kg/ha or 10.5 kg/bigha is required to obtain about 5 lakhs plants /ha or 70,ooo plants/bigha.

Method of sowing:

Seeds are to be sown in lines 25 cm apart and 5cm between seeds at a depth of 2-5cm. If the soil is dry, a pre-sowing irrigation of 2-5 cm depth is needed for proper germination at least 2 days ahead of sowing .The row are to be covered with a thin layer of paddy straw for better conservation of soil moisture.

IntercultureOperation:

(1) Weed Control: Two manual weedings, one at 15 days and another at 35 days are necessary to control weeds. A light earthing up may be given at the time of second weeding to keep the plants erect on the ground.

(2) Irrigation:- Two irrigations one at flowering and the other at pod formation stage are needed for proper growth and pod filling.

Moisture Conservation:

Under rainfed culture, soil moisture can be conserved by application of straw mulch over the rows after sowing. In such case only one weeding is needed at 30-35 days after sowing.

Utilization :

Besides preparation of various foods, the crushed grains can be used as feed for cattle, poultry and fish.

Soybean milk:

1. Seeds are to be soaked in water for 12 hours, changing water at least three times. Sometimes seed are required to be soaked for 24 hours.
2. The seed coats are to be removed by hand rubbing.

3. A past has to be made by crushing the peeled seeds.

Water is to be added at the ratio of 1: 3 and boiled while stirring with a laddle. The milk should not be over boiled, otherwise its nutritive value may be lost. Addition of a few drops of ginger juice/ bey leaf will remove the beany adour. Soybean milk is useful for maintaining intestinal disorder. It prevents summer diarrhea. It is easily digestible and can be used as diet for old debilitated and convalescents.

Soybean can also be used for preparation of chapatti, kachuri, malpowa, bhujia, Ludu,chatni, cake etc..

Soybean Curd: To prepare soya cured, soya milk is to be poured in an appropriated container while it is moderately hot.

Green Beans: Green soybeans are widely used as much in the same way the pea is used. When the bean reaches its full size but yet green and tender, it is collected from the plant. It is usually boiled and taken as green vegetables. The green bean is also used in salads. In order to secure the best flavours, the bean should be cooked as soon as they remain affixed in the pod. In such cases they are to be soaked in boiling water for a few minutes when it becomes easy to shel them.

Soyabean varieties

Sl No.	Soya bean variety	Area of adaptability
1.	Alankar	Northern plains
2.	Ankur	Northern plains
3.	Bragg	Throughout India

3:00 pm – 5:00 pm: PUBLIC HEALTH: NUTRITION

Nutrition is the source of food and its relationship to health, it deals with all aspects of interaction between living organism and the substance that help that organism to grow and sustain itself.

Classification of Foods: -

1) Classification by chemical composition
a) Proteins.
b) Fats.
c) Carbohydrates.
d) Vitamins.
e) Minerals.
2) Classification depending on their predominant function
a) Body building foods – (mainly protein)
Animal origin – Meat, Fish, Milk, Egg.

Plant origin – Pulses, Groundnut, soybeans.

b) Energy Yielding foods mainly contains carbohydrates and fats, cereals, sugar roots and tuberos, fats and oils.
c) Protective foods. (vitamins and minerals), Vegetables, Fruits and Milk.
Nutrients are organic and inorganic constitutes contained in the food which are useful for the body.

They are divided into micronutrients and macro nutrients

MACRONUTRIENTS

Macronutrients are needed in large quantities in day to day life. (Proteins, Carbohydrates, Fats) Indian diets contains 70% – 90 % carbohydrates, 10% - 15% proteins, and 10% - 30% fats.

MICRONUTRIENTS

Micronutrients are required in small quantities (microgram-gram per day). These are vitamins and minerals.

PROTEINS

Body Proteins are made up of 20 amino acids, out of these 8 are essential for the body. These are called essential amino acids. Human Body cannot manufacture these 8 amino acids. These are VILLMPTT valine, Isoleucine, leucine, lysine, methionine, phenylalanine, tryptophan, and threonine. Histidine is essential for infants.

Function of Proteins: -

1) Body Building and Growth.

2) Repair and Maintenance.

3) Maintain Osmotic Pressure.

4) Synthesis of anti-bodies and plasma proteins.

5) Synthesis of Haemoglobin and coagulation.

6) Synthesis of Enzymes and Hormones.

Source of Proteins are: -

Animal Source – Milk, Meat, Fish, and Egg.

Plant Source – Pulses, Cereals, Legumes, Beans, Nuts.

Biological Value of Proteins of Some Common Foods.

Egg – 96

Milk – 90

Meat – 74

Wheat – 66

Rice – 80

Red Grain – 72

Groundnut – 55

PROTEIN ENERGY MALNUTRITION

It is one of the common malnutrition's in India. Most are mild to moderate only 1% are severe from PEM.

Causes of PEM: -

1) Inadequate intake of food in both quality and quantity.
2) Infections – (diarrhoea, measles, RTI infections).
3) Worm infestation.
4) Premature termination of breast feeding.
5) Delayed supplementary feeding.
6) Poor environmental Sar elation.
7) Poverty, Large families, poor health of mother.
8) Failure of lactation.

Signs and Symptoms of Kwashiorkor

Piling oedema (swelling), failure to thrive, muscle wasting, weight for height is low, infections like diarrhoea, measles hair changes (sparse, irritability). Skin changes (pigmentation). Enlargement of liver in some.

Signs and Symptoms of Marasmus

1) Marked wasting of both muscle and fats.
2) No oedema.
3) No mental changes.
4) Weight for height is low.
5) Infections like diarrhoea, wearer, ARI.

Prevention and Control

Primary Prevention - Health Promotion.

Secondary Prevention – Early Diagnosis and Treatment.

Tertiary Prevention – Rehabilitation. Nutritional rehabilitation services.

FATS

Fats are made up of carbon, hydrogen and oxygen.

Simple lipids (Triglycerides).

Combined lipids (phospholipids).

Derived lipids (cholesterol).

Visible fats – Ghee, Butter, oils.

Invisible fats – Cereal, Pubes, and Nuts (present in)

Fat yields fatty acids. These are: -

1) Saturated fatty acids – Lauric acid, stearic, Palm etic.
2) Unsaturated fatty acids –
a) Monounsaturated – (Oleic acid).
b) Polyunsaturated – (linoleic acid).

Animal fats (except fish oils) are rich in saturated fatty acids. They tend to raise the serum cholesterol. Increase risk of CHD.

Unsaturated fatty acids

Oleic acid, linoleic acid linolenic acid arachidonic acid, known as essential fatty acids because our body cannot synthesize it. (all vegetables oils, except coconut and palm oil).

Function of Fats

1) Serves as vehicles for fat soluble vitamins (vitamins A,D, E, K)

2) Fats in the body supports the viscera.
3) Fats are rich source of energy.
1-gram fat = 9 K cal.
4) Increase palpability of diet.
5) Provides insulation against cold.
6) Maintains structural integrity of cell membrane.
7) Cholesterol is essential component of membrane and nervous tissue.

Source of fat: -

Vegetable source – Groundnut oil, Coconut oil, Sunflower oil and Palm oil.

Animal source – Animal fats, Milk and Milk products, Fish oils etc.

Fat requirements: - 20%- 30% of total dietary calories will be provided by fats.

CARBOHYDRATES

The main ingredient of our food, which is the principle source of energy.

Carbohydrates are classified into: -

Monosaccharides – Glucose, Fructose, Galactose.

Disaccharides – Sucrose, Maltose, Lactose.

Polysaccharides – Starch glycogen.

Functions of carbohydrates:

1) Carbohydrates are the main source of energy.
1 gram = 4 K cal.
2) Stored in muscles, liver in the form of glycogen (500 grams).These are exhausted during starvation.

Dietary fibre

Although it does not provide energy, it is use for good bowel habits.

Important sources of dietary fibre are fruits, green leafy vegetables, and other vegetables.

VITAMINS

Vitamins are organic compounds needed in minute quantities. Their presence in food is a must. They are useful for the utilization of proteins, fats and carbohydrates.

Vitamins are divided into

1) Fat soluble- vitamin A, D, E, K.
2) Water soluble – vitamin B complex and C.

FAT SOLUBLE VITAMINS

Vit A (Retinol)

Vitamin A occurs into forms: -

1) Preformed Vitamin A (Retinol)
2) Provitamin A (Beta carotene)

Carotenes are yellow pigments in food. They are converted into vitamin A, in the human body

1mg beta carotene = 0.25mg of Retinol.

Functions of vitamin A.

1) Normal Vision: It is needed for the production of retinal pigment. (deficiency leads to night blindness).
2) Required for normal functioning of epithelial cells of respiratory and UI tract. Deficiency leads to frequent respiratory and UI tract functions.
3) For the normal function of skin and eye. Deficiency leads to conjunctional and corneal xerosis.
4) For healthy development of skeletal system.

Daily Requirement of Vitamin A

Adults = 600mg.

Children < 1 year = 350mg.

Lactating Females = 750mg

VITAMIN D

It occurs in the form of cholecalciferol and calciferol.

Vitamin D increases calcium and phosphate absorption in the intestine.

It is needed in the calcification of bones and teeth.

Source of Vitamin D

Cod liver oil, halibut and shark liver oil, richest source, also present in milk, eggs, meat, butter, liver, cheese. Natural source is sunlight.

Signs and Symptoms of vitamin D deficiency

In Children – Rickets.

Adults – Osteomalacia

RICKETS

Seen mostly in 6 months - 2years of age.

Its deficiency leads to bony deformities.

Early Signs

a) Beading of costochondral functions of chest.
b) Enlargement of epiphyses at the lower end of the radius.

Late Signs

a) Frontal bossing of skull, delayed closure fontanelles rickety rosary, knock knee pigeon, Harrison sulcus.
b) Osteomalacia – common in women during pregnancy and lactation, generalized weakness body ache, backache, softening of bones.

Daily Requirements

Adults – 2.5mg

Children – 4mg

During pregnancy – 10mg

VIATMIN E

It is also called tocopherol. Main source of vitamin E is soya bean oil, cotton seed oil, sunflower oil, germinating cereals, green leafy vegetables and milk.

Some belief it has a role in preventing sterility. It has been used as an anti-oxidant which will reduce the problems of cancer, IHD, diabetes and hypertension.

Requirements – 0.8mg/g of essential fatty acids.

VITAMIN K

Its deficiency seen rarely.

Main sources are green leafy vegetables, cauliflower, gut flora manufacturing vitamin K.

Deficiency leads to prolongation of clotting tissue.

Vitamin K deficiency is sometimes seen in new born infants. So some centres give 0.5mg of vitamin K at birth.

Water soluble vitamins are: -

B Complexes

a) Thiamine (B1).
b) Riboflavin (B2).
c) Nicotinic acid (B4).
d) Pantothenic acid (B5).
e) Pyridoxine (B6).
f) Folic Acid.
g) Cyanocobalamin (B12)

a) THIAMINE (B1)

Thiamine is essential for utilization of carbohydrates. It is abundantly found in home pounded rice.

Source are wheat, pubes, nuts, rice oil seeds, meat fish, milk, eggs.

Daily requirement is 2mg/day

Deficiency

Now, clear cut deficiency of thiamine is rarely seen, mild deficiency leads to vague symptoms, like loss of appetite, calf muscle tenderness and cramps.

Severe deficiency leads to

Dry Beri – Beri – Nerve involvement leading to numbness.

Wet Beri – Beri – Heart involvement oedema, difficulty in breathing.

Infantile Beri – Beri – 2 – 4 months of age. Tingling and numbness.

Wernicke Encephalopathy: Mental deterioration. Muscle incardination, tingling and numbness of extrecutes.50% of vitamin B1 in cereals is lost due to polishing of rice, another 25% is loss during washing and cooking.

VITAMIN B2

Riboflavin

It is concerned with cellular oxidation. It is a cofactor in a number of enzymes which are involved in the metabolism of the body.

Sources

Animal – Milk, Egg, Liver.

Plant – Green leafy vegetables

Daily requirement – 2mg per day. Deficiency leads to angular stomatitis, (fissures angle of lips, glossitis, cheilitis.

VITAMIN NIACINB4

It is essential for the metabolism of proteins, fats and carbohydrates.

Required for the normal function of skin, intestine and nervous system.

Sources – milk, fish, cereals, pulses, meat, legumes and groundnut.

Deficiency leads to pellagra.Pellagra is characterized by diarrhoea, dementia, dermatitis of skin.

Daily requirement – 20mg per day.

PANTHOTENIC ACID (vitamin B5)

It has a role in the biosynthesis of corticosteroids. Deficiency is rare.

Symptoms of deficiency are vague, burning sensation in the feet.

Daily requirement – 10mg per day.

PYRIDOXINE VITAMIN B6

It exists in three forms, as pyridoxine, pyridoxal and pyridoxamine. It has a role in the metabolism of fats, carbohydrates and proteins.

Sources

Animal – Liver, Milk, Meat, Fish, Egg.

Plants – Whole Grain, Cereals and Legumes

Deficiency leads to:

Dermatitis of skin, loss of weight, Oedema (Swelling), Pere phal tingling and numbness.

Requirement – 2mg per day

FOLIC ACID

It has a role in the red blood cells formation and also white blood cells, which fights off infections.

Sources

Animal - Liver, Milk, Meat, Egg.

Plants – Cereals, Fruits, Green leafy vegetables.

Deficiency Leads to megaloblastic anaemia, glossitis, chilenos, diarrhoea, Fallieres. Severe deficiency leads to sterility.

Requirement – Adults – 100mg per day

During pregnancy and lactation – 400mg per day

Children – 100mg per day.

CYANOCOBOLAMINE (VITAMIN B12)

It is needed for the synthesis of red blood cells. It is also needed for the formation of red blood cells and it also is needed for formation of myelin sheath of nerves.

Deficiency leads to macrocytic and megaloblastic anaemia.

Source – It is not found in foods of vegetable origin. It is present in Liver, Meat, Fish, Egg, Milk. It is synthesized in colon by the bacteria.

Daily Requirement – Adults – 10mg per day

Children – 0.2mg per day.

VITAMIN C

Vitamin C (Ascorbic acid) is a water-soluble vitamin. It has an important role in tissue oxidation. It is need ed for the formation of collage, connective tissue and blood vessel. It also increases iron absorption. It is an important oxidant.

Its deficiency leads to scurry – swollen and bleeding gums, delayed wounds healing, defective bone growth sub periosteal bleeding and calcification anaemia.

Sources

Fresh fruits, mainly citrus fruits, green leafy vegetables, amla, guava, lime, germinating pulses.

Requirement – 40 – 60 mg per day.

BALANCED DIET

A Balanced diet is one which supplies all the nutrients in the right quantity and right proportions. It is essential for normal growth to maintain good health and to prevent deficiencies. It contains different nutrients in such quantities and proportions, that the need for calories, proteins, minerals, vitamins and other nutrients is adequately met and a small portion made for extra nutrients to withstand short duration of Leavers.

DAY 33: 10:00 am – 12:00 Noon: IPM: ON-FARM PRODUCTION TECHNOLOGY FOR MASS PRODUCTION OF *Pseudomonas fluoroscens*

Among the several biocontrol agents, *Pseudomonas flurescens* is known to occur in all agro-ecosystems, commonly associated with root, soil and plant debris/plant organic matter. *P. fluorescens* is recognized as biological agents to protect crops against several soil borne and foliar fungal and bacterial plant pathogens. *P. fluorescens* act though rhizosphere competition, antibiosis and induces resistance against soil borne and foliar phytopathogenic fungi, bacteria and sometimes their efficacy on plant disease is higher than fungicides. *P. fluorescens* also stimulate plant growth, enhance germination, plant survival, growth of roots & shoots and post harvest self life.

P. fluorescens can be produced at the farm level for which the requirements include an exlusive room, gas stove, 10-20 litre pressure cooker, wooden inoculation chamber, plastic trays, autoclavable glass bottles, candle/spirit lamp, inoculation loop/spatula/glass rods, non-absorbent cotton, rubber bands, sealing machine etc. in addition to the mother culture of the *P. fluoroescens* the media in liquid state fermentation is needed. Liquid media could be prepared by using readily available nutrient broth media or jaggery plus yeast media in the autoclavable glass bottles. For mass multiplication of *P. fluorescens* the following steps should be followed sequentially as noted below:

1. Take about 20 gm of jaggery and 5 gm of yeast and mix them in one litre of drinking water.
2. Take glass bottles and fill them 1/3 level and close the mouth of the bottle using cotton plug.
3. Sterilize the bottles with media in a 10-20 liter pressure cooker with water inside it for a period of 40 minutes.
4. The bottles with media are cooled at room temperature after sterilization.
5. Transfer the bottles into a wooden inoculation chamber. Spirit lamp/candle should be flamed after closing the inoculation chamber for about 5 to 10 minutes.
6. Inoculate with *P. fluorescens* mother culture in bottles inside the chamber with the help of a dropper. Shake the bottles properly for mixing the bacterial culture all over the media.
7. Keep the inoculated bottles at the room temperature (30- 35 ^{o}C).
8. Observe the inoculated bottles if there is increase in turbidity. Once bacterial growth starts, shake the bottles at every 4-6 hours for about 3 to 4 days in order to spread and allow the bacterial growth. After 3-4 days.
9. After 3-4 days ***P.*** *fluorescens* will be ready to use. Transfer the liquid media with bacterial growth into cleaned plastic trays and add fine compost material @ 1:3 (bacterial media: compost).
10. Mix the material properly and allow them to dry at room temperature.

The mixed formulation will be ready for use as soil application or for seed treatment and or foliar application.

1:00 pm – 3:00 pm: ENTREPRENEURSHIP: Successful Entrepreneur (Floriculture)

NB. Training materials will be provided by the concerned lecturing entrepreneur during the session

3:00 pm – 5:00 pm: FINANCING: Banking and financial access

BANKING AND FINANCIAL ACCESS

4) SCOPE OF MICRO LOANS BY BANDHAN BANK AND OTHER FINANCIAL INSTITUTIONS

BANDHAN BANK LTD. SHILLONG DIBURSED APPROX. 72 CRORES OF MICRO LOANS STARTING FROM Rs. 50 THOUSAND FOR DEVELOPMENT OF MICRO BUSINESS AND SMALL ENTERPRESISES.

OTHER BANKS AND NBFC ALSO PROVIDE SIMILAR KIND OF MICRO LOANS FOR MICRO BUSINESS AND SMALL ENTERPRESISES DEVELOPMENT.

PRADHAN MANTRI MUDRA YOJANA (PMMY)

Pradhan Mantri MUDRA Yojana (PMMY) is a scheme launched by the Hon'ble Prime Minister on April 8, 2015 for providing loans upto Rs.10 Lakhs non-corporate small micro enterprises. These loans are given by all Banks, MFI and NBFC. This loan can be applied online also through the MUDRA loan portal "WWW.MUDRAMITRA.IN".

Under the aegis of PMMY, MUDRA has created three products namely:

1. SHISHU: Covering loans upto Rs. 50,000/-
2. KISHOR: Covering loans above Rs. 50,000/- and upto Rs. 5 Lakhs
3. TARUN: Covering loans above Rs. 5Lakhs and upto Rs. 10 Lakhs

- **NPA and CIBIL**
  Impact of NPA and CIBIL

  Non-Performing Asset (NPA): Non-payments of loans, default loans.

  Credit Information Bureau (India) Ltd. (CIBIL): All loan/credit information database available to individual and financial institutions.

- **ADVANTAGES OF LOAN REPAYMENT**

1. Faster sanction of future loans.
2. Sanction of higher amount.
3. Flexibility to avail loans from any organisation.

- **DIGITAL AND CASHLESS BANKING**

Digital and Cashless Banking methods:

IMPS: Immediate Payment Service

RTGS: Real Time Gross Settlement

NEFT: National Electronic Fund Transfer

UPI: Unified Payment Interface (Bharat Interface for Money-BHIM)

E. **ADVANTAGES OF SAVINGS**

Bank's Savings Account: 3.50% to 6.55% interest p.a.

Bank's Fixed Deposit: 6.10% to 8.15% interest p.a.

Bank's Recurring Deposit: 6.10% to 8.15% interest p.a.

Post Office Deposit

Mutual Fund Investment

DAY 34: 10:00 am – 12:00 Noon: FISHERY: "CULTURE AND BREEDING OF ORNAMENTAL FISHES"

Introduction

Ornamental fish can be defined as attractive colourful fishes of peaceful nature that are kept in aquariums and even garden pool with the purpose of enjoying their beauty and recreation. One of the most important aspects of ornamental fishes is to produce new individual from the existing one thus ensuring the continuous supply of these fishes into the market for hobbyists. Fishes are also differentiated into males and females. The male produces sperm to fertilize the female eggs which develop into new generation. Some fishes have develop the system of internal fertilization where embryonic development takes place inside the body cavity of the fish are known as live bearer ornamental fish while some fishes release their eggs and sperm in water and fertilization takes place externally these fishes are known as egg layers.

Benefits of ornamental fish rearing as a hobby

- It gives pleasure to young and old people
- It enables relaxation of the mind and thereby contributes to a healthy living
- Children get to know more about nature and use their time productively.
- It creates a self-employment opportunity

Some of the commercially important exotic livebearers are *Poecilia reticulate* (Guppy) *Poecillia sphenops* (Marble Molly) *Poecillia velifera* (Sail fin molly) *Xiphophorus helleri* (Swordtail) *Xiphophorus maculates* (Platy). Among the commercially important exotic egg layers are *Balantiocheilus melanopterus* (Bala shark /Silver Shark) *Betta splendens* (Siamese Fighting Fish) *Carassius auratus* (Goldfish) *Cyprinus carpio var koi* (Koi carp) *Pterophyllum scalare* (Angelfish) *Helostoma temminck* (Kissing gourami) etc**.**

Culture Facilities

Most common culture facilities used for ornamental fish are cement cisterns, glass aquaria, earthen ponds, earthen pots, etc. Three to four cement cisterns are sufficient for a small scale rearing unit (3m x 2m x 1m) and are built above the ground level for easy drainage. All glass aquaria are preferred for breeding purposes where heaters and aerators can be used easily. Even, fish farmers with small earthen tanks can use them for rearing juveniles with the food fish. Marginal farmers even can use large earthen pots of 1.5m diameter for rearing of larvae and juveniles. Generally, rain water is the best source of water for ornamental fish culture. If the municipal supply water is in use, before using, it is aerated for couple of days for de-chlorination. Tube well water is also used directly in the rural areas. The average temperature of the rearing water in the area is 15-28 °C and the pH is slightly alkaline. Most of the species cultured prefer soft to medium hard water.

Food and Feeding

The small-scale farmers cannot afford different readymade packed pellet feed or purchasing of artemia cyst drum, which are costly. However, they have successfully substituted by low cost alternative live feeds. Water fleas, *Tubifex* or sludge worm, mosquito larvae and chopped earthworm are used by the farmers. Different homemade feed like whole-wheat bread, vegetable peelings and rice are also fed. However, most farms depend on *Daphnia*, *Tubifex* worms and mosquito larvae. The fish culturists can collect *Daphnia* from the nearby ponds by sieving through fine mesh in the early morning. *Tubifex* worms and mosquito larvae are collected from the sewage water channels. Generally the farmers dispense the feed once daily. Overfeeding is more harmful than under feeding as the excess feed destroys the water quality.

Management of Water Quality Parameters

Ornamental fish production unit required higher level of expertise for better water quality management as ornamental fishes are more sensitive to poor water quality. Many ornamental fish will perish in situations where more robust food fish species can survive. As ornamental fish are kept in tanks more numbers than their food fish counterparts, water quality is most critical. Where large numbers of fish are kept in small spaces, the build up of nitrogenous wastes, most notably ammonia, requires the producer to implement measures to manage it properly. Regular water exchange along with proper aeration overcomes this type of problem in the tanks.

Preventive Health Management

Proper water quality management in ornamental fish breeding and culture is the primary preventive measures as they are very sensitive to temperature and pH. The most common diseases of ornamental fishes are reported to be white spot, mouth fungus, tail and fin rot. Some of the easily available and economic chemicals and medicines can be used as preventive measures. The easily available chemicals and medicines for health management are common salt @15-30 g/L used as bath treatment for 30 min as disinfectant, methyline blue @2.5 g/L added in aquarium water for water purification and copper sulfate or potassium permanganate @0.5-1 g/L used as bath treatment for 1 min as disinfectant.

Breeding of live bearers

To breed livebearers simply put a few male and female fish in the same tank. The most successful ratio is 1 male to every 3 females. Males will constantly attempt to breed with the females. Having a lower number of males allows the females to have space and avoid being harassed during pregnancy.

Females will become swollen with eggs below their stomach. They will have visibly fat bellies and need to be fed twice a day. This is a good point to cover/slow the filter to prevent the fry from being sucked up.

Females that are close to birth can be moved to a rearing tank of 10 Gallons. The female can then be removed to the display tank so the fry can be raised on their own. Alternatively a breeding trap can be purchased and used in the display tank. The female should be placed in the plastic box very close to birthing. The fry will fall through the grill at the bottom of the trap. Out of the way of the mother which can sometimes eat her own young.

If Livebearer fry are kept in the display tank, plant cover and hiding places are necessary to protect the small fry from other fish.

Young should be fed very finely ground (powdered) flakes and day old baby brine shrimp. Guppy fry are larger than most fish fry and will grow very quickly. If possible fry should be fed 4-6 times a day to facilitate this fast growth.

Livebearers should be kept with little water turbulence. Weaker filters and powerheads are recommended as Livebearers often populate ponds and tire easily with strong aquarium currents.

Temperature ~76°F

 The optimum aquarium temperature for Livebearers is around 75°F - 81°F (24°C-27°C). They can withstand temperatures as low as 64 (18) degrees but at the cost of immunity and

pH ~7.5 | Hardness 10+

 Keep your pH between about 7 and 8. Livebearers prefer neutral water qualities, tap water is usually suitable.

 Relative water hardness should be 10dH+.

Max Size ~1.5"

Fully grown males and females can grow to around 1.5" maximum length. The vast majority of livebearers are around 1" in length.

Conclusion

Culture and breeding of ornamental fishes can be a promising alternative for many people as well as unemployed youths. It requires little space and less initial investment than most other forms of aquaculture. For ornamental fish farming, only a clear understanding of habits and biology of the fishes is required. It can be practiced even in urban areas with little alteration of backyard or roof of a house. As less manpower is needed, the women or the elders can run small home aquarium units and improve their social and economic upliftment.

1:00 pm – 3:00 pm: FINANCING: Banking and its facilities to farmers

BANKING AND ITS FACILITIES TO FARMERS

Pradhan Mantri FasalBima Yojana (PMFBY)

Farmers are always unsure of the yield they willl reap, but strive to draw the maximum benefits out of their investments and effort. Often farmers might be at the receiving end, with natural calamities like droughts and floods affecting their yield adversely. To resolve the problem of unpredictable nature of farming and prevent farmer suicides in the country, the Government launched Pradhan Mantri Fasal Bima Yojana in early 2016. It's a crop insurance policy with relaxed premium rates on the principal sum insured for farmers. Implemented with a budget of Rs 17,600 crore, this scheme will provide financial support to farmers and cover for their losses. All the funds for this scheme from government Krishi Kalyan Kosh.

Objectives:

Pradhan Mantri Fasal BimaYojana (PMFBY) aims at supporting sustainable production in agriculture sector by following ways:

- Providing financial support to farmers suffering crop loss/damage arising out of unforeseen events
- Stabilizing the income of farmers to ensure their continuance in farming
- Encouraging farmers to adopt innovative and modern agricultural practices
- Ensuring flow of credit to the agriculture sector which contributes to food security, crop diversification and enhancing growth and competitiveness of agriculture sector besides protecting farmers from production risks.

Crops covered by PMFBY:

These are the crops covered:

- Food crops (Cereals, Millets and Pulses)
- Oilseeds
- Annual Commercial / Annual Horticultural crops

Premium rates or premium subsidy on PMFBY:

The rate of Insurance Charges payable by the farmer are as follows:

- For Kharif crops, the farmer's part of premium is 2% of sum assured.
- For Rabi crops, the farmer's part of premium is 1.5% of the sum assured.
- For annual commercial and horticultural crops, the farmer's part of premium is 5%.

Condition for loanee and non-loanee farmers:
The scheme is mandatory for farmers who have taken institutional loans from banks. It's optional for farmers who have not taken institutional credit.

Risk covered under this scheme:

The scheme covers yield loss, post-harvest loss and localized calamities. Following risks leading to crop loss are to be covered under the scheme

Yield Losses

- This includes Natural Fire and Lightning; Storm, Hailstorm, Cyclone, Typhoon, Tempest, Hurricane, Tornado etc.; Flood, Inundation and Landslide; Drought, Dry spells; Pests/ Diseases etc.

Post-Harvest Losses

- Coverage is available up to a maximum period of 14 days from harvesting for those crops which are kept in "cut & spread" condition to dry in the field after harvesting, against specific perils of cyclone / cyclonic rains, unseasonal rains throughout the country.

Localised Calamities

- This includes loss / damage resulting from occurrence of identified localized risks i.e. hailstorm, landslide, and Inundation affecting isolated farms in the notified area.

However, this scheme excludes perils such as war & kindred perils, nuclear risks, riots, malicious damage, theft, act of enmity, grazed and/or destroyed by domestic and/or wild animals, In case of Post–Harvest losses the harvested crop bundled and heaped at a place before threshing, other preventable risks.

Use of technology in Pradhan Mantri Fasal BimaYojana:

Use of technology is mandatory. The scheme proposes mandatory use of remote sensing, smart phones and drones for quick estimation of crop loss. This will speed up the claim process.

Implementing Agency:

The Scheme shall be implemented through a multi-agency framework by selected insurance companies under the overall guidance & control of the Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW), Ministry of Agriculture & Farmers Welfare (MoA & FW), Government of India (GOI) and the concerned State in co-ordination with various other agencies; viz. Financial Institutions like Commercial Banks, Co-operative Banks, Regional Rural Banks and their regulatory bodies, Government Departments viz.

Agriculture, Co-operation, Horticulture, Statistics, Revenue, Information/Science & Technology, Panchayati Raj etc. It will be implemented in the block level as well as district level with ATMA and its field functionaries.

Awareness Campaign (Blockwise):

Awareness programme will be conducted along with BTT, ADO, SDO, ATMA and its field functionaries to the residing farmers of the block.

Benefits for the farmers:

- Farmers will receive compensation from the government.
- The farmers premium has been reduced for all food and oilseeds crops and kept at a maximum of 1.5% for Rabi, 2% for Kharif and 5% for annual horticultural/commercial crops.

Guidelines of the Scheme:

1. Issuance of Notification by State Government / UT for implementation of the scheme (PMFBY) will imply their acceptance of all provisions, modalities and guidelines of the Scheme. The main conditions relating to PMFBY which are binding on States/ UTs, are as follows:

- State has to conduct requisite number of Crop Cutting Experiments (CCEs) at the level of notified insurance unit area;
- CCE based yield data will be submitted to insurance company within the prescribed time limit;

2. Department of State Government already looking after implementation of National Agriculture Insurance Scheme (NAIS)/ National Crop Insurance Programme (NCIP) may be designated as Nodal Department for implementation of PMFBY. The State Level Coordination Committee on Crop Insurance (SLCCCI) presently overseeing implementation of NAIS and NCIP may be authorized to oversee implementation of PMFBY. The States/UTs which have not implemented the NAIS / NCIP shall constitute SLCCCI for implementation of PMFBY on the lines similar to that of NAIS/NCIP. The present composition of SLCCCI may be strengthened by including representatives from State Horticulture Dept., State Remote Sensing Application Centre, India Meteorological Department (IMD), Farmers' Representatives and Empanelled Insurance Companies for implementing PMFBY. Chairman of SLCCCI shall co-opt representatives from other departments / agencies, if considered necessary

3:00 pm – 5:00 pm: TEA CULTIVATION: CULTIVATION OF ORGANIC TEA

Keeping in view, the present day consumer taste and interest among health conscious people towards organic products, the Govt. of Uttarakhand decided to encourage organic tea cultivation in the state. To start with, the Uttarakhand Tea Development Board has converted 218 ha of plantation into organic tea in Ghorakhal (Nainital), Champawat (Champawat) and Nauti (Chamoli). The organic tea produced here has been evaluated by tea tasters in Kolkata. Recently, the director of Contemporary brokers (pvt. Ltd.) paid an official visit in the tea gardens and factories here and expressed interest over the tea produced and sought some quantity of teas at Kolkata auction through their catalogue on a regular basis.

The tea taster evaluated the tea produced here and found the quality comparable to good quality tea gardens of Darjeeling district.

The Benefits of Organic Tea Cultivation & Processing

A great cup of Assam tea starts in the soil, where the seeds of the tea plant Camellia Sinesis Assamica take root and start to grow. As they mature, the plants will continue to draw up nutrients from the surrounding environment, and eventually their leaves will be picked and processed to create the bold flavor that has made Assam tea the world’s most popular beverage. But with the growth of industrial farming, a lot more than just nutrients and water has been making its way into the tea we drink, which is why organic tea cultivation has become the go-to source for clean, flavorful tea leaves.

As with other organic farm products, organic tea is produced using environmentally-friendly methods of cultivation. Instead of relying on hazardous chemicals that damage the environment and can remain behind on the finished product, organic tea farmers use traditional, natural methods of pest and weed control. The result is an organic tea estate that works with the surrounding ecosystem to produce healthy, vibrant crops and strong, flavorful teas. And, of course, organic teas aren't just good for the environment—they’re also good for anyone who wants to enjoy the health benefits of a cup of Assam green tea while keeping chemical fertilizers, pesticides and herbicides out of their cup.

Organic Tea Cultivation and Manufacturing by Assamica Agro

The organic tea estate of Assamica Agro in north east India, relies on centuries-old farming methods and ancient Indian agricultural practices that create quality green leaves without the application of noxious chemicals. Cows that are kept within the tea estate provide dung to be used as fertilizer, and the cows’ urine acts as an insect repellant. Among the tea plants, Neem trees are planted for shade and to keep insects away while weeding is done manually to avoid the need for herbicides. To further develop soil fertility, the recovered plant material is then mixed with the cow dung to improve the quality of the organic fertilizer.

Organic green tea processing at Assamica Argo is also done by traditional methods using the tea leaves from the organic tea estate. Every leaf is picked by hand, and the leaves that will be used to produce the organic Assam green tea are boiled and then roasted in a traditional Indian fry pan and finally dried under the sun to craft a distinctive taste and flavor.

These sustainable techniques create high-quality organic teas while keeping the environment safe. Bigger manufactures may rely on mechanical processing to create large batches of lower-quality blended teas, but Assamica Agro uses organic cultivation and processing techniques to produce a bold, flavorful organic tea with unique qualities that can't be found in the blended teas available in the supermarkets.

Organic Certification

The international body for organic certification is IFOAM - International Federation of Organic Agriculture Movement. Each country including India has set up its local agency to deliver the certification program, but in order to be called "organic", the agency must conform to the standards set by IFOAM.

Over the past few years, there have been some criticisms made about these "umbrella" organizations due to their inefficiencies and administrative bureaucracies. This has led to high costs of operation, which trickle down to producers - especially small-scale farmers and tea growers. The cost of obtaining an organic certification for its tea estate becomes prohibitive for most small tea growers which is the reason most of the small tea growers in Assam has not been able to obtain the organic certification for their tea estates yet, in spite of following organic tea cultivation practices since the beginning. Moreover, the time taken to receive the final organic certificate is three years which is a very long period. However, buyers, especially the ones overseas, tend to rely heavily upon organic certifications, which they seem to consider indicators of authenticity. Keeping in view of this trend, Assamica Agro applied for an organic certification with the certification agency OneCert Asia Agri Certification Pvt. Ltd. to evaluate its organic tea estate in compliance with the NPOP standards. And subsequently, the company has been awarded the 1st year in-conversion organic certification by OneCert Asia in April 2013.

DAY 35: 10:00 am – 12:00 Noon: FARM MECHANIZATION:

ROUTINE MAINTENANCE OF AGRICULTURE MACHINERIES

Is the main important to understand to keep the machines in good running condition. .After every day field operation, we should remember to clean well the machines with a clean water all part of the machines. Not only washing and cleaning the outer parts of the body of machines also we should maintain the inner moving parts of the machines like engine, gearbox, air cleaner, engine cooling and radiator etc.

ROUTINE MAINTENANCE OF POWER TILLER AND OTHER MACHINES

Air Cleaner

The function of Air Cleaner is to provide clean air, free of all impurities like dust, moisture etc. Bowl, Filter and Oil provided in the Air Cleaner prevent the dust and all other impurities from entering the Engine. Naturally, after a certain period, holes in the filter may get blocked and the capacity of the oil to trap more dust may get reduced.

Therefore, it is extremely important to check the Bowl, Filter and Oil every day. If found dirty, clean the Bowl and Filter and change the Oil.

The important parts of the Air Cleaner are: -

1. Nylon Cap Nut
2. Bowl
3. Oil container
4. Clip
5. Filter

How to clean Air Cleaner

BOWL

a. Remove the Nylon Cap Nut at the top of the Air- cleaner and take out the Bowl.

b. Remove dirt from the Bowl, clean it and wipe with cloth.

c. Reassemble the Bowl by fixing Nylon Cap Nut.

OIL CONTAINER AND FILTER

d. Remove the ail container by releasing the three clips.

e. Take out the filter and clean with kerosene or diesel and drain off excess kerosene/diesel.

f. Remove the oil completely from the oil container and wipe it with a piece.

g. Pour fresh oil into the oil container up to the oil level mark.

h. Replace the filter and oil container Bowl in respective positions and close the three clips.

IMPORTANT

Cleaning the Air cleaner is simple and inexpensive. Failure to do it regularly will be extremely expensive.

Engine cooling and Radiator

If one Engine gets excessively hot, it will neither work efficiently nor develop the required power. That is why your Power Tiller, Tractor etc. has been provided with a special radiator to cool it.

Every day before starting the Engine, check the water level in the radiator; it should be full.

Use only pure and clean water (drinking water) to fill up.

After every 300 hours of operation, the water in the Radiator should be replaced. For this remove the radiator cap, open the drain plug and let the water flow out. Fill up and let the water out until you see clean water flow out through the Drain Plug. Now close the Drain Plug and replace the Radiator Cap, closing it securely.

IMPORTANT

1. **When replacing the Radiator cap always make sure that it is closed properly. Never open the cap when the Engine is hot, otherwise hot water will splash on to your face and body. After stopping the Engine, wait for 5 to 10 minutes to allow the Engine to cool and then only open the cap.**
2. **Always use only clean and pure water for filling up the Radiator as well as for cleaning it. Never the water from your fields because it be dirty and also may contain chemicals like fertiliser, pesticides, salt etc. which will damage your Engine.**

Lubrication

In order to prevent excessive wear and tear to the moving parts of Engine, Gear Box and Rotary Unit, oil lubrication id provided.

Engine Lubrication

3 litres of SAE 40 or equivalent oil is requires. Remove oil Feeder Cap and pour the oil.

To check the oil level:

a. Keep the Engine horizontal by adjusting the Rear Wheel.

b. Remove the oil Feeder Cap wipe it clean with a piece of cloth. Replace the cap and take it out once again. Check the oil level on the stick. It should be between the two oil level marks, nearer to the upper mark. If it is nearer to or below the lower mark, add the required quantity of oil.

Oil Pressure Indicator

Oil Pressure Indicator Informs you whether lubrication is taking place properly. When the engine is working the needle located inside the indicator cap should remain raised. If not, it means that there is something wrong with the lubrication system, If this happens stop the engine immediately and get it checked.

IMPORTANT
Even when you are operating the Power Tiller, take a look at the oil pressure indicator occasionally.

Gear Box Lubrication

5 litres of SAE 90 or equivalent oil is required in the Gear Box.

Check the Gear Box oil level every day by keeping the Tiller in horizontal position and using the oil Gauge (11-28). If the oil is less, add the require quantity.

Chain Lubrication

1.5 litres of SAE 90 or equivalent oil is required. Oil is poured through the hole provided at the top of the Chain Case Cover by removing the Oil Plug.

Checks the oil level every day before starting, keeping the Engine horizontal, loosen the bolt on the Peep Hole cover. Oil should flow out slowly; if not, it means that oil is less than the minimum required.

IMPORTANT

When you check the various oil levels, observe whether water has entered the oil sump and is mixed with the oil. This would be indicated if the oil level id higher than it was previously, or if the oil has become lighter in colour (somewhat milky). If so, check up and approach the dealer for repair.

Blade Shaft Lubrication

The two ends of the Blade Shaft require lubrication. Every day before starting field operations remove the plugs on side frame (L&R) and pour some oil into the hole.

Other Lubricating points

Daily before starting, a few drops of oil/grease should be put at the joints of all control levers especially;

1. Main clutch Lever
2. Mani Speed Change Lever

3. Blade Speed Change Lever
4. Cam Lever Main Clutch
5. Intermediate Shaft Bearing
6. Tension Pulleys
7. Rear Wheel Bolt

IMPORTANT

1. **Check the oil levels every day.**
2. **Use only the prescribed grades of oil.**
3. **Change oils at the prescribed intervals.**
4. **Look out for oil leakage and rectify the defect immediately.**

BY TRYING TO SAVE A FEW RUPES ON THE COST OF THE OIL, YOUWILL ONLY INCREASE THE REPAIR COST OF YOUR POWER TILLER/MACHINES.

Fuel Filters

The diesel is filtered at two different points. A filter net ia provided at the mouth of the fuel Tank to remove normal dust and dirt particles. Pour diesel only through this filter. The main Fuel Filter ASSY, located before the fuel pump contains a filter element which prevents even the very minute particle of dust. This fuel Filter element should be replaced with a new one after every 400 hours of operation.

To replace the Fuel Filter Element

Close the Fuel Cock; detach the fuel pipes from the filter body. Loosen the bolt and take the Fuel Filter Body from the cover. Take out the Filter Element, clean the interior of the Filter Body thoroughly.

Check the top Rubber pocking and replace if necessary. Replace the Filter Element in the body reassemble in the position. Do not over Tighten the Nut. Tighten the Bolt and Connect Fuel Pipes. Bleed Filter and Fuel Injection Pump and connections. Start Engine check for any leakage.

IMPORTANT

After every 300 hours of operation remove the Fuel Tank from the Engine by Unscrewing its fixing bots and disconnecting the Fuel Pipe and clean it thoroughly to remove all dirt that may have collected inside.

Belt Adjustments

The Fan belt and transmission Belts should be tensioned corrected.

Fan Belt Check the tension by pressing the belt down with your finger midway between the two pulleys. It should deflect freely about 5 to 20 mm. If the deflection is more or if the belt is too tight, loosen the nut on the Tension Pulley forward or backward as required and tighten the Nut.

Transmission Belts and Tensioner

Check the tension by pressing down the belt with your fingers midway between the Engine Pulley and the Main Clutch Pulley the deflection should be about 30mm. If the deflection is more or if the belts are too tight; adjust the tension as follows

Loosen the Nut and adjust the tension bolt to get the correct tension. Retighten the nuts.

The belts can be further tensioned by shifting the Engine forward. Check the alignment of the Engine after belt adjustment.

IMPORTANT

Even after the maximum adjustment, if the deflection of the belt is more than the prescribed limit

The two ends of Blades shaft require lubrication to prevent undue wear and tear. Before starting work with the Tiller each day, and at the end of the day's work, check whether there is any oil leakage from either end of blade shaft. If there is oil leakage get it checked.

Chain & Sprockets

The power and rotation from the Gear Box is transmitted to the Blade Shaft through a chain and two Sprockets.

After the long usage the chain may become loose on the sprockets. Therefore occasionally listen for any abnormal sound from the chain case (sound of Chan hitting against the chain case).

If such abnormal sound is heard get it checked and replaces the chain if necessary.

Normally, the sprocket with 15 teeth is fixed on the blade shaft and the one with 12 teeth at the other end with the arrangement, the Blade shaft will rotate at 215RPM when the blade speed change lever is 'H' position, and at 310 RPM in 'H' position. If for any special operation, you require higher speeds for the Blade shift, the Sprockets can be interchanged. Then the speeds will be 344 RPM in if position and 505 RPM in 'H' position.

A FEW MORE POINTS TO REMEMBER ABOUT MAINTANANCE.

a) A new power tiller should not be used for heavy work during the first 50 hours. Used it only for light work like tilling on soft soil. Tilling depth to be not more than about 100 mm or for transporting light loads.

b) For heavy work in the fields, operate the Super DI power tiller in 1st or 2nd gear only (With auxiliary speed change lever in if position)

c) Never drive the super Di Power Tiller over hard ground when steel wheel are fitted, otherwise the axles, bearings etc. will get damaged soon.

d) When the Power Tiller are kept idle for long:

(i) Never leave the Mani Clutch Lever in the off or Brake.
(ii) Start the Engine at least once in 3 days and let it run for 5 to 10 minutes.
(iii) Use only Genuine Spare Parts and accessories supplies the authorised dealer.

BEING ATTRACTED BY THE PRICE TAG OF CHEAPER SPARES AND ACCESSORIES AVAILABLE IN THE MKKET MAY TURN OUT TO BE A VERY COSTLY MISTAKE.

1:00 pm – 3:00 pm: HRD: OBJECTIVE AND INTRODUCTION ON TEAM BUILDING

Objectives

After reading through this unit you will be able to:

_ Understand the principles of teamwork and getting work done effectively in cooperation with the people;

_ Familiarize with various components and processes in team building;

_ Realize the importance of identifying and using skills of people.

_ Understand the practices which contribute to the formation of effective team.

Introduction

The effectiveness of the organisation will depend on the extent to which the individuals and groups work as teams. People vary in their need to belong to teams. Some people are loners while to others it gives them satisfaction to be a part of the team. However, the demands of an organisation are such people have to work as teams to get the work done and achieve set goals and objectives. When work together they use two types of skills-task and process. Since process influences, often critically, task results it follows that people need to develop both sorts of skills, and to be aware of them in others. The operative and cooperative processes will have bearing on team building. In other words, the extent to which the people in a group are able to develop a common vision and method of work to be done will help groups of people to emerge as teams. The common method has to be based on systematic approach starting with clarity and on aims of a given task. Secondly, the various processes such as supportive development of ideas, listening, receiving and giving feedback, identifying and use of skills, both self and others etc., will influence of development of team work among group of people and in getting the work done efficiently and effectively.

Task and Process

Whenever people work together they use two sorts of skills. First, in respect of the job itself, they use their professional or technical skills, such as accountancy, engineering, brewing, computer programming, pest control, soil conservation etc.

Second, they interact with the other people involved in the job, using skills such as listening to others' ideas, presenting their own ideas clearly, managing time, establishing common comprehension. In the first place they are dealing with the job itself, the task to be performed. In the second they are concerning themselves with people, the way they co-operate, the way they control their resources', the process of human interaction: 'process' for short.

An example of TASK would be the launching of a new product. An example oÿ PROCESS would be the interaction between people engaged in the launch, the things that each of them did to promote purposeful and methodical work, and the effects these efforts produced on their colleagues.

The kinds of process issues that occur when people interact are

- The way they think (with differing patterns of thought)

- The way they act (with a variety of behavioural skills)

- The way they feel (the emotions that arise)

- The values they respect, the ethics they uphold, the judgements they make

Process also embraces the reaction of people to the physical and emotional environment in which they work, how they are affected by it and what they do to influence it.

Since Process issues influence Task results, and often critically, it follows that people need to develop both sorts of skills, and to be aware of them in others.

Process Skills

People working together each bring a unique cluster of personal skills, not just those connected with their craft or profession but also ones that affect the interaction of people, no matter what the task is. These human, or process skills merit exploration since the way they are used will influence the team's working effectiveness, which in turn affects the job performance.

The more each of us is aware of the strengths that we bring to a group, the better able we are to use them in a timely and effective way. The more we are aware of the skills and qualities of others in the group, the better able we are to encourage their use, draw upon them, complement them and perhaps copy them.

Some skills can benefit a group even if only one person has them: for example, the ability to visualise clearly a desired end result, or a flair for detail and precision at the planning stage. Other skills are enhanced in their effect if everyone possesses them: for example, a respect for each others' views by carefully listening to them.

Some strength is readily apparent: for example, the ability to chart what is said quickly and accurately or skill in summarising. Others, such as an air of confidence or of caring for others, are harder to pin point and may be noticed more in their absence when a member is not present.

An interesting addition to our perception of others arises when we examine what at first sight appear as hindrances, Often an attribute can be seen as a valuable asset by one person and an irritation or hindrance by another: for example, a meticulous attention to detail may also be seen as 'nit picking'.

Again, behaviour which is seen as helpful in one set of circumstances would be distinctly unhelpful in another: thus a timely joke might help to relieve tension, but constant joking out of context can encourage flippancy.

So, obstinacy in a person may also be seen as tenacity, according to the circumstances and to our own view as to the validity of the point being expressed. This duality, which may be called the 'Principle of Obstenacity' can be used to advantage if what is first perceived as a hindrance is examined honestly for its reverse aspect, revealing, perhaps, how a slight change in timing or use will release a precious skill.

A Systematic Approach

'A Systematic Approach' is based on the way people think when they are getting things done in a purposeful and efficient way. Naturally, therefore, many people find the approach familiar. It may be akin to other patterns of logical thought they know, some of which may have been developed for other uses such as problem solving or systems analysis. According to their purpose such systems may omit certain stages of Systematic Approach and expand others.

Systematic Approach makes us more aware of the stages of thought we go through naturally.

This enables us to recognise where we are in our thinking at any time, and to recover a logical sequence if we digress. It provides us with a framework for. presenting a train of thought in a way that others can readily follow. It can help us to see the thought processes in which we are strong, and those where we are vulnerable, opening a way towards improving our actual skill at thinking.

Systematic Approach is directed at getting things done, and, importantly, at drawing lessons from experience. These features are especially significant when it comes to tackling problems, which are new and open. The future continually faces us with situations we are not able to predict. Unable to prepare for every particular situation, it is left to us to cultivate the thinking skills that will cope with the general case. We can develop confidence, not through knowing the answers, but through having the means of finding them.

While most people can quite properly claim to follow the stages of Systematic Approach, this is not to say that everyone does so in the same way, at the same pace and with the same degree of emphasis. One person may glance at the information, seize upon what has to be done and then really concentrate on planning the action stage in detail. Another may search out the information and analyse it rigorously before being ready to move on. Differences like these can cause difficulty when people come to work together; they find themselves immersed in different aspects of the task and find it hard to see the relevance of others' contributions. These same differences can be an asset to a group, which sees them in relation to the stages of a Systematic Approach. Used like an agenda, it shows which stage is being addressed at a particular moment, and offers some assurances that the following stages will be dealt with when the current one is complete. Systematic Approach provides a common language to help teamwork and co-operation.

The sequence of steps which make up a Systematic Approach can be entered at any point. It is not unusual, for example, to begin by reviewing some significant event in the past and then move into the information stage relating to a future action. Likewise, there are times when the most important thing is to act, now and fast, without formal planning.

Each stage of Systematic Approach may need handling differently for different applications.

The information stage may call for logical research and analysis on one occasion, and for organised brainstorming on another. Statements of what has to be done may take the form of a simple job list, or a complex critical path network.

No system is a substitute for judgement, and Systematic Approach must remain the servant and not become the master. Skill and discernment in its use come from practice.

Aims

'Aims' is a useful collective term embracing goals, targets, objectives, purposes, intentions, aspirations, standards, ambitions, ideals, mission, all of which relate to the direction we wish to take or the future we want, or need to bring about. The setting of aims calls upon the skills of imagination and foresight.

Three aspects of aims can be distinguished

- Purpose

- End Results

- Success Criteria/Standards

Which link together in a coherent form along the lines

We are doing this IN ORDER TO ... our desired END RESULT is ….. and the following STANDARDS …. will enable us to judge how effective our action has been.

Aims arise in various ways; they may be

- given, as part of our brief, instruction, or job description

- self-evident; circumstances being familiar and the needs obvious

- deduced, from what we know and can reasonably infer

- evolved by ourselves, faced with a new problem or opportunity

- latent, within us but not previously expressed.

In each case there are issues that have to be addressed. When aims are given, are they understood in the way intended by the originator? When self-evident or deduced is there a chance of assumptions being made that ought to be checked. If evolved by ourselves, are the immediate aims in line with longer term aspirations'. And if people are jointly evolving aims, is there common comprehension of what is agreed; do all have the same level of commitment to what is agreed?

Where aims have hitherto been latent, are the things we are doing really in keeping with what we now see as desirable?

There are obvious practical benefits in being clear about aims. Purposes give a basis for decisions, a reference point as we proceed. End Result provides a vision of what we want to bring to reality, so that we can begin devising the ways and means. Success Criteria identify parameters within which to work, standards to be attained, positive indications of our achievement. Then there are the emotional benefits. People like to know why they are being asked to do things. When they are strongly attached to the purposes being pursued their readiness to help is marked. When people share a common vision of what is required, their contributions are focused and a sense of pulling together is developed.

Conversely, when aims are unclear, purposes may be incorrectly assumed. Arbitrary decisions are made to satisfy the letter rather than the' spirit of instructions. Insufficient work may be done, or superfluous work, with consequent waste of effort. Initiative is stifled, since the overall direction being taken is unclear. With no way of knowing how worthwhile the activity is, commitment to it is low.

Undoubtedly there are occasions at work when, for certain reasons such as confidentiality, company or organisation aims cannot be adequately explained. In such circumstances it is as well for those who have to initiate tasks to be aware of the possible consequences and take whatever steps they can to compensate.

Purposes : A sense of purpose gives direction and motivation at individual, team and

organisation level. Few activities are simply an end in themselves-most serve a purpose, or a range of purposes, both short term and long term.

Questions which help clarify purposes include:

WHY is the task being done?

WHO or WHAT is it for ?

WHAT BENEFITS will it lead to?

WHAT USE will it be?

Establishing purposes is a forward-looking activity requiring vision and imagination, so it is worth remembering that the answers to the question' why? 'will fall into two categories:

- those which describe the future (purposes), often phrased 'to ... , so that ... , in order to...',

- those which describe past events and give background (reasons), often phrased 'because...'

Asking 'Why?' to a statement of something which is to be done may produce several purposes, many of which may be quite compatible. Commonly, for example, task and process purposes exist side by side and can be pursued simultaneously.

Eg “Secure contract with major new customer”

Why? - to improve sales volume (task)

Why? - to reduce seasonal variation in sales (task)

Why? - to improve morale within the sales team (process)

In addition, by exploring purposes and asking why repeatedly, we are able to check that our immediate goal is a worthwhile one in the long term.

For example, a task might be:

“Maintain a record of our customer comments”

Why? - To identify features of the service that attract customers.

Why? - To extend successful features to other locations.

Why? - To enhance company reputation.

Why? - To increase profitability.

Purposes give us a reference against which to make future decisions. Thus, in the example given, a proposal to record only customer complaints would be rejected after referring to the purpose ‘to extend successful features to other locations’.

Exploring and clarifying purposes needs to be done to the extent that is helpful to those undertaking work in order to give that work value and a context. Often, purposes are already clearly specified, or easily deducible on the basis of experience. Mindless use of ‘Why?’ as a ritual may not prove to be helpful.

Success Criteria : Success Criteria (standards) are part of the general area of Aims. They help us judge whether we have succeeded or are making satisfactory progress. When criteria are precise and measurable the question. “have we succeeded?” can be answered with certainly.

Success Criteria can be considered at different level

1. They may be linked to the purposes for which the work is being done, eg. ‘recommendations are implemented and lead to forecast savings.’ Often, the achievement of purposes can only be assessed some time by beyond the completion of the job in hand, so the success criteria can only be checked in the long term.

2. They can be associated with the desired end result, eg. ‘available in three colours’. In this case the criteria may simply be extensions of the description of the end result, rather then defined separately.

3. There are times when it is not possible to define an end result, for example, continuing task with no definable end point eg. ‘improving inter-departmental co-operation’. In this case, success criterial can replace the concept of end result, acting as “staging posts” for measuring progress.

4. they can relate to the means of achieving the end result or the way the work is undertaken,

eg. ‘within a budget of £2,000’.

Further dimensions of standards or criteria are

Subjective : eg. ‘people like it’.

Objective : eg. ‘less than 5% waste’.

Comparative : eg. ‘better than X in the following aspects….’

Direct (deliberate steps can be taken to meet them) : eg. ‘daily output of 10,000.

Indirect (they cannot be directly controlled) : eg. ‘complaints diminish’.

It is sometimes helpful to approach the establishing of criteria from one to other direction

:’What would not do? What kind of end result would we(or our mangers) reject? It may then, by contrast, be easier to define what will be satisfactory.

Like purpose, it is helpful always to think of criteria or standards in the plural. Even though there may be priority or key ones, there is rarely just on standard by which something succeeds or fails.

The Information Stage

In everything we do, time needs to be balanced between thinking and doing. Within the thinking, or preparation period, we need to apportion time between the Aiming, Information, What

Has To Be Done and Planning stages.

An understandable desire to get into detailed planning and action can lead to the Information stage receiving less attention than it should, thus leading to inadequacies in the subsequent action.

The information stage of a task embraces the following considerations:

- Background circumstances, needs, conditions

- Available resources and constraints of time, people, money, knowledge, skills, experience, equipment, materials

Ideas on how to set about the task - ‘what might be done’s’ ranging from an initial concept through its subsequent development and modification into a workable proposition. Note that the subsequent What Has To Be Done stage is a decision statement of what will be done; the build up and development to that decision is part of the Information stage.

- The risk associated with the different courses of action open to us, the risks of inaction, and corresponding proposals to reduce them or cope with them.

Having identified what information we need - more knowledge, check assumptions, more equipment - we can decide what has to be done to get it, plan who will get it, how, and then get it: a small and often very fast cycle of Systematic Approach simply to collect more information.

Similarly, the development of ideas into a workable possibility often requires mini cycles of action and review to test and develop the ideas and gain practical experience of their feasibility.

In complex situations, there is an armoury of techniques, whose sole purpose is the assembly, analysis or interpretation of information.

Some examples are:

• Problem Analysis

• Potential Problem Analysis

• Decision Analysis

• Brainstorming

• Force Field Analysis

• Lateral Thinking Techniques

• Systems for Creative Thinking

• Risk Analysis

A thorough treatment of the Information stage will be rewarded in the smoothness and speed of the subsequent stages and ultimately in the quality of the final job result.

Reviewing in order to improve

Reviews may be concerned with Task achievement or with Process. In either case, if their purpose is to bring about improvement and progress, they must deal with the future as well as the past.

Task Reviews

These can take place during a task, as well as at the end. Useful questions include:

- Have we achieved what we set out to do? Have we met our purposes and success criteria?

- What progress has been made and what remains to be done?

- What has gone well that can be repeated another time?

- What technical or other problems have occurred, and how should they be avoided in the future?

Process Reviews

Process reviews help to secure effective working relationships or teamwork, so that the job gets done well. Useful questions to consider are:

- When did the group make progress, what caused this?

- When were there delays, and why?

- What have individuals done that helped, how did they do it'.?

- What principles emerge that can be applied more widely

- When we resume our task how can we co-operate better, for example, by extending our successes and overcoming our difficulties?

Whether related to Task or Process, reviewing needs to analyse the past, derive lessons and look to future improvement.

Analysing Skills

Numerous process skills come to light once we analyse our initial assessments of contributions made in a group.

For instance, a person may be seen as ‘good at aims’. The skills that give rise to that impression may be any one or more of the following:

- Visualising results to be achieved in the short term

- Producing clear statements of purpose

- Questioning, probing, to discover and to clarify aims

- Proposing specific, measurable success criteria

- Keeping aims continually in sight

- Checking continuing relevance of aims

Similarly for each stage of Systematic Approach a variety of skills can be observed;

- Providing factual information

- Producing creative ideas

- Giving balanced assessment of risks

- Questioning to draw out facts

- Interpreting, recognising the implications of information

- Outlining things to be done, activities, sub-tasks

- Ensuring that plans are complete and understood

- Recognising when action is needed and giving the lead.

- Initiating review, checking achievement of aims

- Recalling what happened accurately

- Identifying successes and their causes

- Indicating improvements for the future.

It is also fruitful to look at the way particular functions are performed; Chairing /Co-ordinating

/Leading, for example. The skills involved will probably include some mentioned above, and in addition.

- Listening attentively

- Encouraging ideas

- Creating enthusiasm

- Observation, sensitivity to others' needs

- Summarising at important moments

- Clarity of expression

- Patience and tolerance of opposition

- Objectivity

- Setting and maintaining high standards

- Judging time requirements and monitoring the use of time

Note that the opportunity to exercise such skills remains, whether or not we are occupying a formal office in a group.

Other skills, qualities or attributes that have a marked effect include:

- Timely humour

- Integrity, reliability

- Courage, determination

- Honesty, humility

- Concern for human values

The list is probably endless, as is the particular combination of skills which makes each person different. A group grows as members recognise more of each other's unique value.

Feedback of Observations

• Feedback intended to help a person or a group to develop has to be acceptable and has to be useable. Otherwise, despite the best of intentions, it is wasted. in the right manner, feedback win support and reinforce the desire to improve. Badly done, it will provoke resentment and rejection.

• Identifiable details help the recipient to recognise the precise circumstances being referred to, whereas sweeping generalisations present a confused picture and open the way to misunderstanding.

• Facts provide the basis for reasoned interpretations of events, with constructive dialogue where appropriate. Opinions about performance, divorced from facts, offer little on which to build, and naturally invite counter arguments.

• Straight factual reporting often makes the most acceptable feedback, leaving it to the recipient to form whatever judgements are to be made. When this is the intention, tone of voice and facial expression must be taken into account, since both can communicate the views of the speaker in a very powerful way.

• Speculation, eg. “What would have happened if...”, might prompt ideas worth pondering for the future, but must be differentiated from fact. If not, rigid pronouncements are made, often with increasing vigour, forgetting that these are solely matters of opinion.

• It is so easy to spot failures and dwell on them that reviews become known as “postmortems”.

Annual appraisals are viewed with disquiet where such negative bias has been the rule.

Clearly, a balance needs to be struck between the attention given to success and that given to failure.

• Care and effort are required to analyse successes. But feedback of the details that emerge brings great rewards. It indicates positive and practical things to do in the future. It produces legitimate feelings of satisfaction and confidence.

• As a basis for self-improvement, we can also observe and give feedback to ourselves. We benefit from being sensitive not only to what we do, but also to how we do it and the effect our behaviour has on others.

3:00 pm – 5:00 pm: PRACTICAL

DAY 36: 10:00 am – 12:00 Noon: ORGANIC FARMING: Panchagavya & Jeevamrit

JEEVAMRIT

A microbial culture, prepared especially from dung and urine of cow is generally advocated for use in organic farming to meet the nutritional requirement of crops.

BENEFITS

- It helps increase microbial population in the soil which in-return protects the plant against any diseases.
- It also helps in nutrients uptake such as Nitrogen, Potassium, Phosphorous, etc., from the soil
- Jeevamrit acts as a pest repellent by deterring the pest from eating the plant
- Pest that feed on plants that have been applied with Jeevamrit stop eating and eventually die out of starvation

Materials used:

Plastic bucket- 20lt

Cowdung- 1kg

Cow Urine- 1ltr

Beson Powder- 250-500gm

Jaggery- 250-500gm

Garden soil- handful

Black cloth






Phase of Jeevamrit:

a. Mix all the ingredients in a plastic bucket.

b. Add 10ltr of water and stir and cover it with a black cloth and keep it in a dark place.

c. Stir twice a day for 7 days.

Steps to use Jeevamrit:

a. After preparation the mixture can be used for 3-9 days.

b. Take 1 ltr of jeevamrit and mix with 10 litres of water.

c. The area to be sprayed should be moist.

d. Can be spray on any crop every 15 days. Best suited to be sprayed thrice a month.

PRECAUTION:

➢ Avoid using metal/iron bucket.

➢ Avoid using the mixture during flowering.

PANCHAGAVYA

It is a concotion prepared by using mainly five products of cow. It is organic manure that can be used for all types of plants which is eco-friendly and safe to handle. It is cheap and can be easily prepared at home. It enriches the soil with beneficial soil micro-organisms thereby promoting a healthier and a favourable environment for plant growth.

Benefits

1. It is organic manure that promotes growth and vigor in plants

2. Helps by strengthening the roots to withstand against lodging and also maintaining water regulation in the soil

3. Improves in nutrient uptake by the roots

4. Helps plants by increasing their immunity against diseases

5. Increase fruit longevity there by prolonging harvest

6. It helps increase the population of beneficial organisms in the soil

7. It helps in soil rejuvenation by increasing humus helps farmers during transition from inorganic to organic farming

INGREDIENTS

a) Plastic bucket (20 litre)

b) Fresh cowdung (1Kg)

c) Cow urine 3-4 days old (1 litre)

d) Ghee (5gm)

e) Yogurt (250 ml)

f) Milk (250-500 ml)

g) Besa powder (100 gm)

h) Jaggery (100 gm)

i) Well ripened fruits (2-3 nos.)

j) Handful of soil

k) Water (10 litre)

l) Black cloth





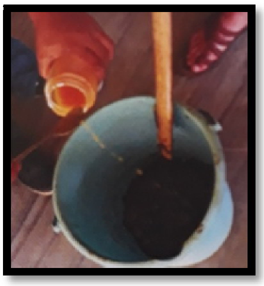
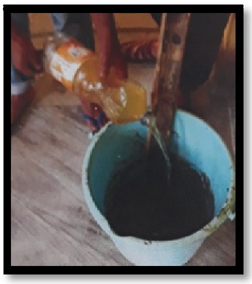
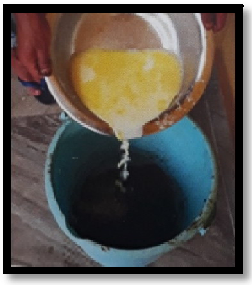
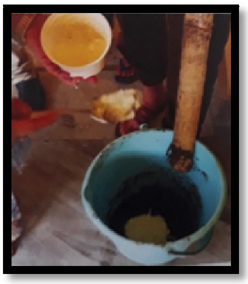
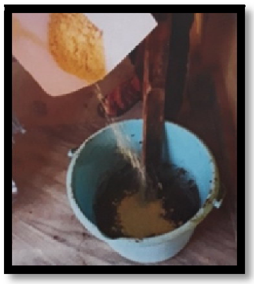


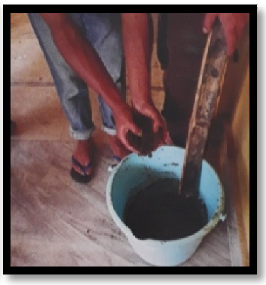

Preparation

In the bucket, take 1 Kg. of cow dung and mix with ghee. Stir the mixture twice a day for three days and cover the bucket with a black cloth when done.

After three days, we add:

Cow urine, yogurt, milk, besan powder, jaggery, well ripened fruits, handful of soil and water. Stir the mixture twice a day for twenty days

APPLICATION

- Take 1-3 litre of the stock solution and add 200 liters of water before application.
- Shelf life of the solution can last upto 90 days
- For 1 acre, 20 litres of the solution is recommended
- Seedlings can be soaked in 3% solution for 20-30 minutes before transplanting
- Rhizomes of turmeric, ginger and sets of sugarcane can be soaked for 30 minutes before planting.
- Panchagavya solution can be used to dip the seeds before drying and storing them.

PRECAUTION

- Avoid using iron or steel buckets
- Avoid the use of the solution during flowering stages

1:00 pm – 3:00 pm: PRACTICAL

3:00 pm – 5:00 pm: FRUIT PROCESSING: Preparation of Jam, Jelly, Marmalade

JAM

Jam may be prepared from a single fruit or combination of two or more fruits, dried, canned fruits or preserved pulps may also be used.

EXTRACTION OF PULPS- Fruits may be crushed or cut into small pieces with the help of stainless steel knife and boil with a sufficient quantity of water, then passed the boiled fruits through a fine sieve to obtain the pulp.

RECIPE:

1 Kg pulp

1 Kg sugar

5 gms ready made fruit pectin

2 gms citric acid (Citric acid is not necessary in case of Plum & Sohiong jam)

Colour may be used in case of mixed fruit jam. Sprinkle the required quantity of Pectin mixed with small quantity of sugar to the pulp and boiled for 5 minutes then add equal quantity of sugar to the pulp (i.e., 1 kg pulp & 1 kg Sugar) and heat the content stir well with wooden ladle till heavy consistency and add citric acid. When the total soluble solids reached 68.5° Brix as determined by "Refractometer" then stop boiling, fill the prepared jam in clean and sterilized jars and seal properly. If the jam is to be packed in cans it should be filled while it is still hot, seal, invert the cans and pasteurized for about 30 minutes at 82° C to 85° C and cool in water. In case of larger size cans, i.e., above A-2 ½ cans pasteurization is not necessary.

MARMALADE

Marmalade is generally a fruit jelly of citrus fruits where the shredded peels of a fruit is included as suspended materials.

PECIPE

1kg pectin fruit extract

1 kg sugar

10 gms readymade pectin

5 gms citric acid

62 gms shreds

Extraction of pectin or fruit Extract: The outer yellow flavedo portion of tight skin citrus fruits containing colouring matter and volatile oil are peeled off thinly from the fruit whereas loose skin citrus fruits like orange the whole skin is removed by hand, portion of the peels may be kept for preparing shreds for suspension in the marmalade. The fruits are then cut into thin slices (i.e. 0.30 cm to 0.45 cm thick) and boiled gently by simmering with water 2 to 3 times of its weight for 45 to 60 minutes.

STRAINING AND PECTIN TEST: Same as in jelly making

PREPARING OF SHREDS : The yellow portion of the peels of tight skin citrus fruits in case of loose skin fruits the white portion of the loose skin fruit the white portion of the skin are first removed and cut into shreds at 0.8 cms to 1.2 cms thick and 1.9 cms to 2.5 cms long. The shreds are then boil first 10 – 15 minutes and strain the content. Continue boiling for three times using fresh water each time to avoid bitterness. Keep the shreds after boiling covered with water till they are ready for use.

COOKING: The pectin extract is heated with equal amount of sugar over a brisk fire till the sugar is dissolved and filter through a muslin cloth to remove impurities .Boil it again, when it starts boiling ready made fruit pectin mixed with small quantity of sugar (approx 10 gms) is added. Continue the boiling till the end point reaches 68^{o} Brix. Strain the prepared shreds and tie in a muslin cloth and dip in the marmalade while boiling. When it reaches the end point . The shred or peels are removed from the muslin cloth and added to marmalade. Boiling process should not take more than 20 minutes. Short boiling produces a bright and sparkling marmalade.

Pour the marmalade in a shallow pan and stir to keep the shreds uniformly distributed in the marmalade. When the temperature comes down 82oC to 88 o C a thin film begins to form on the surface of the marmalade and it becomes thick to prevent floating of the shreds to the surface. When the marmalade is cooled, the scum on top is removed and if the prepared marmalade is to be kept for more than six months time, 9 gms pre dissolved potassium meta bisulphide in a spoon of water is added per 100 kgs marmalade. Stir well.

FLAVOURING: It is desirable to add a small amount of flavour to the product because most of the natural flavour volatizes during the boiling and cooking process. Generally a small quantity of orange oil may be added to the marmalade at the time of filling into jars or cans.

JELLY

RECIPE

1kg Pectin extract

1kg Sugar

10 gms ready made fruit pectin

7 gms citric acid

Ripe but not over ripe fruits are selected, slightly unripe yields more pectin than over ripe fruits, because as the fruit ripens the pectin present in it, decomposes into peptic acid which does not form into jelly with acid and sugar. In practice a mixture of ripe and under ripe fruits are used, under ripe fruits for their pectin content and ripe ones for their flavour.

Generally, fruits like guava, apples are not required to peel, they are only washed and cut into thin slices of not less than ½” thickness.

EXTRACTION OF PECTIN OR FRUIT EXTRACT:

Fruit slices are boiled with equal volume of water (i.e. 2lit water: 1 kg fruit in case of guava and oranges)without stirring. In case of highly juicy fruits (i.e berries like grapes etc) the fruits are merely crushed and boiled without addition of water.

TIME REQUIRED FOR BOILING (OPTIMUM):

Apple -	20 -25 minutes.
Guava-	30 – 35 minutes
Orange-	45- 60 minutes

PECTIN CONTENT TEST:

Pectin content of fruit extract may be determined by taking 1 ml of boil fruit extract in a test tube and add 3 ml alcohol (90%) and leave for few minutes till clotting is formed.If a single clot is formed it indicates that the fruit extract contains rich pectin whereas if small unstable clot is formed it indicates poor pectin.

STRAINING:

The pectin extract or fruit extract may be pass through bags of linen, flannel or through felt or cheese cloth folded several times to obtain a clear extract. The bags or cloth should be first scalded in boiling water, squeezed and use while still hot and wet . (bags containing fruit extract should not be squeezed otherwise the extract will not be clear due to fruit particles passing through the pores in the bag)

ADDING OF SUGAR AND COOKING:

Generally equal quantity of sugar (i.e. 1kg sugar:1 kg pectin extract) is sprinkled over the pectin while it is boiling with continuously stirring to ensure complete dissolution of sugar.The mixture is then filtered through a muslin cloth to remove impurities and boil all over again in a brisk fire till it starts boiling,sprinkle 10 gms readymade fruit pectin mixed with small quantity of sugar (10gms) over the mixture and add citric acid just before the end point i.e. when the temperature reaches 221^{o}F or total soluble solids reach 65^{o} Brix measured with a Brixmetre

DETERMINATION OF END POINT:

If refractometre and thermometer are not available the following simple test may be adopted to ensure whether the jelly is set or not.

1. **Cold plate test:** a drop of the boiling liquid from the pan is taken and placed on a plate and allowed to cool quickly. If the jelly is about to set, the mixture on the plate will

crinkle when pushed with the finger. The main drawback of this method is that while the drop on the plate is cooling the jelly mixture continue to boil in the pan with the result that there is risk of over cooking the product or missing the correct setting point.

2. **Sheet or flake test :** In this case a small portion of the jelly is taken with a large spoon or wooden laddle and allowed to cool for a few seconds and let it drop.If the jelly drops like syrup, it requires further concentration but it falls in the form of flakes or sheets the end point has reached.

DAY 37: 10:00 am – 12:00 Noon: PLANT HEALTH MANAGEMENT: IPM strategies for potato

Potato tuber moth

- Plant the tubers at a depth of 10 cm
- Cover all the exposed tuber during earthing up
- Store the potatoes in a shelve by spreading it with saw dust, sand and cover then cover with lanata dried leaves upto 2-2.5 cm
- Use light trap
- Cover the opening of the ventilators of the store room or godown with wire or nylon net

White Grub

- Spray multineem @ 2.5 ml/l of water
- Use EPN (Soldier) @ 2.5g/l of water in the soil
- Use *Beauveria bassiana* or *Metarhizium* sp @ 5g/l of water and drench in the soil

Cut worms

- Use *Beauveria bassiana* or *Metarhizium anisopliae* @ 5g/l of water and drench in the soil
- Spray multineem @ 2.5 ml/l of water

Diseases in Potato crop

Late blight

- Resistant varieties kufri Giriraj, Kufri Girdhari, Kufri Megha, and Kufri Kanchan, Kufri Himalini
- Tuber treatment with *Trichoderma* sp @ 5g/kg of seeds
- Foliar application with *Trichoderma* sp + Pseudomonas florescence @ 5g/l of water
- FYM treated with *Trichoderma* sp @ 2.5 kg/100 kg of FYM

Bacterial wilt

- Crop rotation with rice, wheat and maize
- Application of *Trichoderma* sp + *Pseudomonas florescence* @ 5g/l of water

1:00 pm – 3:00 pm: AGRONOMY: IPM strategies in Rice

What is IPM?

Integrated pest management (IPM) is:-

- A broad ecological approach for pest management.

- It is an ecological approach with a main goal of significantly reducing or eliminating the use of pesticides while at the same time managing pest populations at an acceptable level.

- It is a dynamic approach and process which varies from area to area, time to time, crop to crop and pest to pest etc.

- It employs- all available skills, techniques and practices such as cultural, genetic, mechanical and biological methods including application of chemical pesticides as a last resort in a harmonious and compatible manner in suppressing the pest population below economic injury level.

- Live and let live is the philosophy behind IPM.

Aims of IPM

- It aims at minimizing crop losses with due consideration to human and animal health besides safety to environment.
- By keeping the pest numbers below harmful (economic threshold) levels instead of their eradication
- Protecting and conserving the environment including biodiversity
- And making plant protection feasible, safe and economical even for the smaller farmer

Why IPM?

The excessive and inappropriate use of chemical pesticides in the last two decades has resulted in degradation of our environment with more and more reports of resistance of pests to pesticides

The number of pests outbreaks have increased and many innocuous species have attained the status of serious pests.

The extent of pesticide residue is also a matter of great concern and food commodities are highly contaminated with persistent pesticide residues.

Therefore, an urgent need is felt to evolve strategies and technologies that will not only meet the increasing demands for food and fibre but also those that will enable us to usher in the" Second GreenRevolution”-IPM is probably the right answer.

IPM Concept

The IPM concept is based on the principle that it is not necessary to eliminate all the pests but to suppress the pest population to a level at which these pests do not cause significant loses.

The first line of defense against pests is prevention through the use of good agronomic practices or cultural methods which are unfavourable for the development of pest problems.

Regular monitoring of pest activity is essential for decision-making and control measures to check pest are to be taken at economic threshold level.

The IPM strives to optimize rather than maximize pest control efforts

Principles of IPM

An IPM system is designed on the principles of *prevention*, *observation*, and *intervention*. It consists of six basic components:

1. Acceptable pest levels
2. Preventive cultural practices
3. Monitoring
4. Mechanical controls
5. Biological Controls
6. Chemical controls

IPM emphasis oncontrol, not *eradication*.

IPM programs first work to establish acceptable pest levels, called action thresholds, and apply controls if those thresholds are crossed.**How Much is Too Much? How Many is Too Many?**

- Selecting varieties together with sanitation is the first line of defense,
- Accurate pest identification is critical to a successful IPM program.
- Should a pest reach an unacceptable level, mechanical methods are the first options to consider.
- The main focus in IPM is on promoting beneficial insects that eat target pests.
- Synthetic pesticides are generally only used as required and often only at specific times in a pests life cycle.
- Naturally occurring substances (*e.g.*: nicotine, pyrethrum) are encouraged.

Process

1. Proper identification of pest
2. Learn pest and host life cycle and biology.
3. Monitor or sample environment for pest population
4. Establish action threshold (economic, health or aesthetic)
5. Choose an appropriate combination of management tactics
6. Evaluate results

IPM in Rice

- Suitable resistant or moderately resistant variety may be selected for cultivation.
- The seeds should be pure and free from any insects and diseases.
- Timely sowing and transplanting should be carried out.

- Nursery should be healthy and free from weeds.
- Recommended spacing should be maintained during transplantation.
- Fertilizers and micro nutrients should also be applied as per local recommendations. To reduce weed growth maintain a thin layer of water on soil surface.
- Shades in the paddy field should be removed as it serves as the foci for spread of diseases (bacterial blight) and insect pests (LFs and stem borers).
- Nursery treatment with carbofuran 3G @500g /100sq. m can be carried out as an alternative to root dip and it should be applied 5 days before pulling of seedlings.
- If hispa and case worm are observed in nursery, clipping of seedling tips minimized the carryover of pest from nursery to main field.
- If stem borers and GM infestation reach economic threshold level (ETL), apply carbofuran granules @ 0.333 kg of carbofuran 3G/ 100sq. m area or spray monocrotophos 0.05%.
- Alternate drying and wetting of field help in management against planthoppers (BPH, WBPH), bacterial blight and stem rot disease.

3:00 pm – 5:00 pm: SOIL TESTING: Procedure of soil sample:

SOIL SAMPLE COLLECTION AND PREPERATION FOR ANALYSIS.

The importance of having a truly representative sample can be very realized from the fact that only a minute fraction of the huge soil mass of the field representing all its heterogeneity is actually used for analysis in the laboratory. Hence, even a small error committed during sampling during

sampling gets magnified manifold.

The sample must properly represent the area. A field can be treated as a single sampling unit only if it is appreciably uniform in all respects.

Variation in slope, colour, texture, crop growthand management should be taken into account and separate sets of composite samples need to be collected from each of such area.

The depth of root penetration of plants is an important consideration for ascertaining the depth of the soil for drawing the sample. Fields growing cereals and other seasonal crops are normally sampled up to 15-20 cm/0.5 feet to 1 feet deep (generally expressed as plough layer). For deep rooted crops like sugarcane, horticultural plants or under dry farming conditions, it may be necessary to obtain samples from deeper depth/layers i. e. 20 cm-30 cm/ $^{1}/_{2}$ feet to 1 feet deep.In case of saline - alkali soils, salt crusts (visible or suspected) on the soil surface should be sampled separately and the depth of sampling recorded. Generally, the sample may be drawn from the plough layer (15 cm depth).

Sampling procedure

The best time for sample collection is when there is no crop. To obtain a composite sample, small portions of soil are to be collected upto the desired depth (0-l5cm or more) by means of suitable sampling tool from atleast 10 to 15 well distributed and random spots (from each sampling unit) after scraping off the surface litter, if any. When crops are planted in rows, samples can be drawn in between the lines if not recently fertilized.

Sampling Units

Demarcate the sampling units based on crop growth, appearance of the soil, elevation etc and collect soil samples separately from each block/unit.

COMPOSITION SAMPLING:

First remove the litter from the surface at each spot selected for sampling. Then take soil sample from the surface to plough depth (0.15 cm) in 15-20 spots in a random zig-zag manner as shown in Figure. Avoid sampling near bunds, channels, marshy spots, trees, recently fertilized area, compost pits, any other abnormal spots and other non-representatives locations. Collect these in a clean dry container or cloth bag for- sub-sampling.

If a khurpi or 'a Kassel (spade) is used, first dig a 'v' shaped hole and take thin slice from the side as shown as in figure. Repeat the same on the other side.

Mix the sample collected thoroughly with hands on a clean piece of cloth or polythene sheet or gunny bag (Not a fertilized bag) Level it and quarter it with hand as shown in fig. Discard the soil in the opposite quarters. Mix the rest of the soil and continue quartering till 500g of representative soil sample is obtained. Dry the sample in shade and fill in the cloth or polythene bag. If soil samples are collected in a plastic or stainless steel container, care should be taken NOT TO USE galvanized or brass equipment of any kind. It will contaminate the samples with important micronutrients.

TIME AND WHEN TO TAKE THE SAMPLE

The soil should be tested once in every three years before planting any crop preferably during winter season. However, soil samples can be taken any time except in rainy season from the farmers' fields provided there is sufficient time for the analysis of soil testing laboratories to give the soil test information to the farmers before the sowing of crops.

The closer the samples are taken to planting time, the less chance there is for changes to occur. This usually is a problem only with N.

TOOLS/EQUIPMENTS NEEDED FOR SOIL SAMPLE COLLECTION.

Equipments required for the samplings are spade, auger, polythene/ cloth bags and scale/ ruler.

PRECAUTIONS IN COLLECTION AND STORING OF SAMPLES

Care in handling the soil samples against contamination is extremely important. Special precautions are necessary if the samples are to be tested for micro- nutrients also. Any possibility of contact with chemicals, fertilizers or manures must be avoided. Cotton, jute or plastic bags, which had previously been containing fertilizers, salt or lime, should not be used at any stage. Soil samples should preferably be stored in clean cloth or polythene bags. Glass, porcelain or polythene jars -are 'useful for keeping special samples for long duration for research purpose. The bags can be re-used only after thoroughly washing and drying.

PACKING, MARKING & INFORMATION SHEET

Before sending the soil sample that have been collected to the laboratory for testing analysis the following information should be clearly written in a piece of paper.

1. Name of the farmer with contact No:
2. Name of the village:
3. Name of the locality:
4. Name of the block:
5. Name of the G/S circle:

6. Name of the post office:
7. Plot No:
8. Sample No:
9. Area of the plot:
10. Land form:
11. Mode of irrigation:
12. Crops to be grown:
13. Date of collection:

This piece of information paper should be placed in a separate plastic bag to avoid any stain or disappearance of information therein. Then insert this plastic bag containing the information sheet in the plastic bag where the soil sample to be tested is kept.

In addition to the location, field number, name of cultivator and identification marks, relevant information regarding slope, drainage, irrigation, previous cropping history, fertilizer use etc. of the field (s) must be recorded and send along with the soil samples. This is a specific requirement in soil testing and must be insisted upon.

When everything is done with this soil sample is ready to be send to the tothe office of the Research Officer, District and Local Research Station & Laboratories, Shillong, Tura and Jowai.

PROCESSING OF SOIL SAMPLES FOR ANALYSIS IN THE LAB.

The air dry is normally passed through 2 mm sieve for analysis. Before sieving the soil clods should be tightly crushed in wooden pestle and mortar. Plant residues, gravel and other foreign matter retained on the sieve are to be discarded.

SOIL HEALTH CARD

After the Soil Samples are Tested/Analysed the Test Report are recorded and maintained. Depending on the Test Report, Recommendation on fertilizer application for different crops are recommended as per their requirements in the form of a card which we called "Soil Health Card". At present the Soil Health Card is prepared on line through National portal which was done manually in the previous years. When the Soil Health Card is ready the same is distributed to the farmers through the Agriculture field functionaries available in different Blocks and Circles of the State.

DAY 38: 10:00 am – 12:00 Noon: COOPERATION: SELF HELP GROUP

The origin **of self-help group** can be traced is from Grameen bank of Bangladesh, which was founded by Mohamed Yunus. SGHs were started and formed in 1975. In India NABARD initiated in 1986-1987. The absence of institutional credits available in the rural area has led to the establishment of SHGs.

What is a Self Help Group?

Self-help groups, also known as mutual help, mutual aid, or support groups, are groups of people who provide mutual support for each other. In a self-help group, the members share a common problem, often a common disease or addiction. Their mutual goal is to help each other to deal with, if possible to heal or to recover from, this problem. While Michael K. Bartalos (1992) has pointed out the contradictory nature of the terms "self-help" and "support," the former U.S. surgeon general C. Everett Koop has said that self-help brings together two central but disparate themes of American culture, individualism and cooperation ("Sharing Solutions" 1992).

In traditional society, family and friends provided social support. In modern industrial society, however, family and community ties are often disrupted due to mobility and other social changes. Thus, people often choose to join with others who share mutual interests and concerns. In 1992, almost one in three Americans reported involvement in a support group; more than half of these were Bible study groups ("According to a Gallup Poll" 1992). Of those not involved in a self-help group at the time, more than 10 percent reported past involvement, while another 10 percent desired future involvement. It has been estimated that there are at least 500,000 to 750,000 groups with 10 million to 15 million participants in the United States (Katz 1993) and that more than thirty self-help centers and information clearinghouses have been established (Borman 1992).

How has the Self-Help Group movement evolved over time in India?

This paper traces the origins and progress of the Self-Help Group (SHG) Movement in India from 1985 to 2006, focusing particularly on the role played by

the International Fund for Agricultural Development (IFAD). The paper looks at the roles of non-government organizations (NGOs), the National Bank for Agriculture and Rural Development (NABARD), other banks, and central and state governments in the evolution of the SHG program. The author examines:

1. The early years of the SHGs in India and their emergence from the breakdown of the large cooperatives in the Mysore Resettlement and Development Agency (MYRADA)

2. The first phase of the SHGs, from 1987 to 1992, when NABARD focused on supporting NGO initiatives to promote SHGs and on analyzing their potential and performance;

3. The second phase, from 1992 onwards - the SHG-Bank linkage program;

4. SHG contribution to agriculture and on-farm credit;

5. Reasons for the rapid spread of the SHG movement;

6. Features that weakened the SHG movement;

7. IEAD s role in promoting the SHG movement in India;

8. MYRADA s understanding of ‘self-help affinity groups (SAGs)’.

Objectives

The Objectives of Forming SHG are as Follows

- To build mutual trust and confidence between the bankers and the rural poor people. To encourage banking activities in a segment of the population in which formal financial institutions fell difficult to cover.

Main features

Some Common Features of The Functioning of SHGs are as Follows:

- The SHGs create the common fund by contributing their small savings.
- Every member of the group actively participates in the functioning of SHGs and they meet regularly.
- Their accounts and proceeding are maintained by the leader and leader is selected or elected among the group members.
- Amount of loans are small and for short period.
- Loan is sanctioned on ‘trust’ with minimum documentation and without any security.
- The rate of interest differs from group to group. It is generally little higher than that of charged by banks.
- Repayment of loan amount is generally on time.

Groups are facilitated to access bank loans after six months of formation. After the SHG, 10-12 groups are associated at cluster level and 12-15 clusters at block level into federation. The whole process takes 3-5 years. A group of 10-15 females form a self help group.

TYPES OF SELFHELP GROUPS

The various types of self-help groups range from regular, informal meetings of two or three individuals to large, organized groups with a national presence. Some of the most common self-help group models include:

Twelve Step Groups — Alcoholics Anonymous (AA), founded in 1935, developed this popular type of self-help group. The 12 steps provide a guide for recovery from alcoholism, drug addiction, and a number of other addiction-like behaviors.

AA and the other 12 step programs modeled from it work from a spiritual basis that guides participants to turn their lives over to a “higher power,” like God or other spiritual guide. Relinquishing control to a personal higher power is essential to recovery in these programs. Participants remain anonymous, only giving first names when sharing with the group.

Members must also admit powerlessness over their alcohol or drug addiction. Group members offer support and guidance to one another as they work through the 12 steps on the road to recovery. In addition to help with alcoholism, other 12 step programs include: Narcotics Anonymous (NA), Cocaine Anonymous (CA), Gambler’s Anonymous (GA), and Overeaters Anonymous (OA), and more.

Online Groups — online support communities represent a growing trend in the self-help movement. These groups include chat rooms, forums, and closed social networks. One benefit of these is that they provide around- the-clock access to support. Occasionally, a professional moderates online groups, especially during certain planned discussions, but a great many are organized and run by peers. Check out the Healthy Place Online Forum to see the wide variety of topics discussed there. The Internet offers a vast array of these online groups that address just about any mental illness or challenge you can think of.

Traditional Support Group — these support groups usually meet in a community meeting room or other public space. They address specific mental illnesses like bipolar disorder, anxiety, depression, personality disorders, and many more. You can also find groups that offer support to people living with a mentally ill loved one. Getting together with others who have experienced similar challenges and adversity can help ease the stress and feelings of isolation when you care for a mentally ill family member. Likewise, people with mental health issues can benefit greatly by socializing with others with the same illness. A traditional face-to-face support group offers a safe place to do so.

BENEFITS OF SELF-HELP GROUPS

Those who participate in self-help groups are 50% less likely to be hospitalized due to their mental illness than people who simply go to therapy or other community programs that do not include self-help strategies. That amounts to an immense savings in medical costs alone.

Further, these programs provide a social support system for members, which is especially helpful for people with conditions that tend to isolate them. The mutual help aspect of self-help groups helps the person providing help as well as the person receiving it.

According to a study conducted in 1995 by *the Center for the Study of Issues in Public Mental Health,* self-help group participation increases self-esteem and gives a higher personal confidence of recovery. People who participate in these groups regularly have reduced symptoms and are more likely to return to work.

SELF HELP GROUP

PRINCIPLES:

1. Homogeneous membership: Small group for face to face inter action and relationship.
2. Secular in character.
3. Regular attendance in all meetings (participatory) Decision making Process.
4. Has a code of conduct-by laws
5. Small savings (thrift)
6. Mobilize savings for loans

COOPERATIVE AND SELF HELP GROUP

SIMILARITIES

1. A member should not be less than 18yrs of age
2. Transparency
3. Mutual trust
4. Equal distribution of surplus/ profit
5. Training
6. Audit

DIFFERENCES

Sl. No.	COOPERATIVE	S.H.G
1.	Voluntary association of a number of individual working together to secure their united endeavour	• A group of people who provide mutual support for each other for overall development.
2.	Not less than 15 persons and may increase the nos.to thousands	Membership 8 – 10 persons
3.	Registration is necessary	• Not necessary to register with the Government
4.	Open Membership	• Membership restricted only between same income earnests i.e. BPL same Gender
5.	F.A. from the Govt. depending on the working as society ranging from 1 (one) lakhs as S.C.; and Rs. 5,000/- as M.S.	• Only Revolving Fund from the Govt. (Rs. 25,00/-) only.
6.	After regd. may seek assistance from the line Deptt.	• May seek assistance from line Deptt. only if with SGSY now known as NRLM (National Rural Livelihood Mission)
7.	If N.F. the cooperative societies will still remain unless and until Section 61 of Act & Rules is conducted	• If Non-functioning will automatically disappear.

1:00 pm – 3:00 pm: AH & VET: Zoonoses

ZOONOSES

Disease and infections whose causative agents are naturally transmitted between vertebrate animals and man.

Zoonosis - A public Health problem.

Zoonosis are among the most frequent and dreaded risks to which mankind is exposed since their evolution in particularly those cultures and societies that domesticated and bred animals for food and clothing. Increased mass movement, tourism, movement of animal population, trade with animals and animals products have often resulted in the spread of these diseases throughout the world by transcending national and international borders. So zoonoses are not only an emerging health problem but also an international problem.

Zoonotic disease are not new to India, Rabies continue to be a serious health problem in the country. Japanese encephalitis, Swine flu, Bird flu are emerging Zoonotic disease causing many outbreaks in several State with considerable morbidity and mortality. There are certain groups of population who come in close contact with animals or animal products as part of their occupation. The attack rates are higher among these groups because of occupation than the rest of the population.

CLASSIFICATION OF ZOONOSES

Bacterial Zoonoses:
1. Anthrax
2. Brucellosis
3. Salmonellosis.

Viral Zoonoses :
1. Rabies
2. Japanese encephalitis
3. Bird Flu
4. Swine Flu.

HelminthZoonoses: Taeniasis&Cysticercosis.

Approximately 150 Zoonatic diseases are known to exist.

IMPORTANT ZOONOSES PREVELENT IN INDIA ARE:

1. Anthrax.
2. Bird flu
3. Swine flu
4. Japanese encephalitis
5. Brucelosis
6. Camphylobacter infection.

10. Ringworm
11. Toxoplasmosis
12. Salmonellosis
13. Tetanus,
14. Leptospirosis.
15. Giardiasis

7. Cysticercosis
8. Dengue fever
9. Rabies

TRANSMISSION

Zoonosis can be transmitted in various ways.

- Through air.
- By eating contaminated meat or food.
- Through close contact with an infected animals.
- Through insect bites like mosquitoes or ticks.

PREVENTIVE AND CONTROL MEASURES:

- Use repellent or other methods to keep mosquitoes, flies, ticks away.
- Practice safe food handling.
- Avoid being bitten or scratched by an animals.
- Wash your hands properly after handling the animals.
- Routine cleaning and disinfection of shed, farm premises.
- Clean the drains and no stagnated water should be there.
- Avoid raw or undercooked meat.
- Proper immunization of animals against infectious disease.
- Awareness and education of people about the risk of infection through pictorial poster, radio,

TV, Newspaper etc.
- Animals shed should notbe constructed too near the house where people live.
- If you have Zoonotic disease you should contact a medical profession
- as early as possible.
- Inform the nearest Veterinary Dispensary/ Hospital immediately about the presence or occurrence of the disease in your locality and they will do what is required.

World Zoonoses Day – 6th July.

3:00 pm – 5:00 pm: HORT II: Strawberry & Kiwi cultivation

Strawberry *(Fragaria ananassa)*

Strawberry is an attractive tasty and nutritious fruit with a distinct and pleasant aroma, and delicate flavour.It has a unique place among cultivated berry fruits. Rich in vitamin C and iron it is mainly consumed as fresh. Among all the different types of berries, strawberry gives the quickest return in a shortest possible period. Strawberry is found in different parts of the world and this heart-shaped fruit of love had been mentioned by the Roman Poets Virgil and Ovid in the first century and in England gardeners had cultivated strawberries since the sixteenth century.

Over the last few years, strawberries have experience one of the highest rate of consumption growth, where it is the highest consumed fresh fruits, rich in proteins, minerals Ca, P and K, fair source of Vit -A, B1, B2, niacin and Vit – C and it is regarded as one of the best natural sources of antioxidant. Besides, strawberry can be processed for making wine, jam, jelly,syrup, ice cream and soft drinks etc.

Varieties – Strawberry varieties are Camarosa, Ofra, Sweet Charlie, Chandler, Elisa, Fair Fox, Searcape, Blakemore, Douglas, and Fertility. Strawberry is the only crop in which all cultivars have been developed by hybridization.

Soil – Strawberry plant grows best in sandy loam soil. Very light soil is needed with frequent irrigation for the establishment of runners. It prefers soil rich in humus as 70% - 90% of its roots were found in the top 15 cm soil. It grows best in slightly acidic soil of pH 5.5 – 6.5.

Climate – Strawberry grows well under temperate climate. Some cultivars are grown in sub-tropical climate also. Day light period of 12 hrs or less and moderate temperatures are important for flower bud formation. Each cultivar may have a different day length and temperature requirement. Temperature plays a critical role in the development of strawberry at a particular place.

Propagation – Propagation is done through seeds, vegetative means as well as through Tissue Culture. Propagation through seed is not advisable because they do not produce true to type plant. Seeds also require stratification to break their dormancy. Strawberry is commercially propagated by runner plants. Generally one plant produces 7 – 10 runners but under proper management, it can go upto 15 runners / plant.

Runner production – Viral disease are often transmitted through runners. A separated bed should be used for runner production. The site or soil where the strawberry had not been grown for at least 3-4 years should be selected. The planting should be done at 1.2 x 1.2 m or 1.8 x 1.8 m distance. For greater survival and fast growth, the runners should be lifted in September and planted in poly sleeves using potting media of 1 soil: 1 sand : 2FYM for one month. In this method mortality in the field is less and growth picks up within 3-4 days after transplanting.

Land preparation – Soilpreparation is very important for strawberry cultivation,It should start during summer when the soil is ploughed with a soil turning plough followed by repeated ploughings to make the soil friable as the roots are confine in top 40 cms soil. Deep cultivation improves water absorption by the crop. FYM should be applied on the top soil.

Time of Planting – In Meghalaya strawberry is planted during 15th September to 15th October.

Training & spacing – There are 4 training systems- matted row, spaced row, hill rows and plastic mulch. Hill row system is followed for the cultivars developing few runners.All runners are removed from the mother plants. Plants are grown either in single or double row on 15 – 20 cm raised beds. Runners are set 20-30 cm apart and in twin rows 30-35 cm apart and distance of 90-120 cm is kept between twin rows. A small tractor can be used for tillage. Where cultivation is done manually, the rows can be spaced closer at 60 cm. In some triple rows are set.

Irrigation – After transplanting irrigation is essential for rooting of runners. Drip irrigation is used so as to avoid excessive watering of the seedlings. Excess irrigation increases the incidence of Botrytis rot and discourages the growth of leaves and stolon.

Nutrient Management - Application of 20 tonnes of FYM/ha should be done before planting of seedlings. After 2 months of planting the soil should be inoculated with *Azobacter* + *Azospirullium* @ 2 kg / ha by mixing with 50 kg of well dried FYM. Bone meal and wood ash may be added to supply P&K to the plants. Bio-fertilizer and Nitrogen levels influenced the plant nutrient content. This maximises growth in terms of plant height, number of leaves, leaf area, crown and total biomass.

Mulching – Mulching minimizes the freezing injury, suppresses weed growth and reduces soil erosion. Clean white straw, marsh hay, pea vines and saw dust can be used as mulching materials.

Cultural Practices - Removal of 1-2 buds improves fruit yields and quality, however excessive bud removal reduces production of numbers of fruits and reduces yield. The runners should be allowed to root along the rows until sufficient crowns are formed and excess runners should be removed from the rows.

Harvesting – Berries are harvested when 50-75% skin of the berry develops colours. Fruit are picked with cap and stem of 12 mm length. During peak period, berries should be picked daily or in alternate days. Fruits are harvested in shallow trays as it is highly perishable and easily get damaged if bulky containers are used.

KIWI

Kiwi fruit (*Actinidia deliciosa*) is among the very few recent introductions which have surpassed in popularity due to its tremendous commercial potential in the Sub Himalayan region. In India kiwi was first planted in the Lal Bagh Garden at Bangalore as an ornamental tree. With extensive Research & Development support its Commercial cultivation has been extended to the mid hills of Himachal Pradesh, Uttar Pradesh, J & K, Sikkim, Meghalaya, Arunachal Pradesh & Nilgiri Hills.

- Kiwi contains high vitamin C levels, evidently exceeding those of any citrus fruit.
- It can survive for long periods after picking. After reaching full size, the fruit can take as long as two months to ripen but this can be speeded up by exposing them to ethylene gas which in a household situation can be achieved by keeping them enclosed with bananas or apples. They can be kept 4-6 months in cold storage. These long storage periods are particularly favourable to hill growers because they are so far from the main markets.

CLIMATE & SOIL

In India, Kiwi can successfully be grown at 800- 1500 m above mean sea level. A rainfall of about 150 cm / year is sufficient. It should be well distributed throughout the growing period.

It can be grown on a wide range of soils but deep rich well drained sandy loam soils are ideal. A soil pH slightly less than 6.9 results in maximum yield but higher pH up to 7.3 affects adversely because of Mn deficiency.

Heavy wet soils are not suitable as plants do not tolerate wet feet for long.

VARIETIES:

1. Abbott
- Early flowering & early maturing cultivar.
- The oblong, medium sized fruits are covered with dense hairs.

2. Allison
- Fruit resembles to that of Abbott except that it is slightly broader in proportion to its length.
- Early ripening, heavy bearer & sweet in taste.
- It is used for pollinizing different cultivars

3. Bruno
- Requires less chilling period
- Fruits are tapering in shape longest among all cultivators.

4. Hayward
- Requires more chilling hours
- The fruit is broad and flat

5. Monty
- Late flowering cultivar but fruit maturity is not late
- The fruits resembles those of Abbott and Allison

6. Tomuri
- Good pollinizer for Hayward and Monty
- Late flowering kiwis

PROPAGATION:

The propagation through cuttings is most rapid and suitable method of multiplication. Various types of stem cuttings hard wood, semi hard wood & soft wood are quite successful, though the technique& success in rooting varies,the cuttings of 0.5 cm – 1cm thick with relatively short internodes & 15-30 cm long are ideal.

Hardwood cuttings can be raised under poly house. The rooting media consisting of sand, FYM, soil, sand dust & coal in 2:1:2:1:1 ratio gives a good success.

Semi Hardwood cutting with 3 buds & 0.5-1 cm in thickness from the middle portion of the current season growth is taken in July. A wound of about 1 cm length is made on one side of the base just below the node. Lower leaf on the basal bud are removed while 2 leaves are retained but reduced to 20- 50 % by a circular cut maintaining the natural leaf shape.

The cuttings are treated with IBA (4,000- 5,000 ppm) for 10 seconds & planted in the mist chamber having sand as the rooting media. Intermittent mist should be applied at 10 minutes intervals with this method 70-75% success are achieved.

GRAFTING:

Kiwi plants are also propagated by grafting. Though it takes almost 2 years to develop a nursery plant through grafting or budding onto a seedling but this method is easiest & most economical. The Kiwi plant can be raised through grafting of Kiwi seedlings during Jan- Feb.

BUDDING:

Seedlings become ready for budding normally at the end of fruit growing season. When the stem diameter is about 6-8 mm scion buds are obtained from the current season's growth. One or two buds are inserted on the main stem by T budding method at 10 cm above the ground level.

CULTIVATION:

A thorough preparation of soil is essential for the successful establishment of its vineyard. Preparation of pits mixing with FYM & filling of pits should be completed by December. Planting distance varieties according to variety and system of training. To have the male plants evenly spread throughout the area so that every female plant is in direct sight of a male is also essential. Planting male & female plants in a 1:9 ratio is common. More number of male plants is beneficial although they should not occupy more than one ninth of the total area. This can be achieved by cutting the male plants short as their leaders run along the wire allowing the adjacent female to grow along into the space formed.

TRAINING:

Training of Kiwi vine is very important and requires constant attention. The main aim of training is to establish & maintain a well formed framework of main branches & fruiting arms. Training also facilitates soil management & harvesting properly.

The T- Bar usually consists of an 8-10 ft wooden post (4/4 inch minimum thickness and pressure treated with preservatives), firmly set (at least 2-1/2 feet deep) in the ground or concrete, with a 6 foot long, 2/4 inch cross bar about 6 feet from the ground.

A third wooden piece is often added as a brace between T-bars, which are spaced 15 feet apart. Pulled, 8-10 gauge galvanized wires are strung between T-bar and are pulled taut. Attach the wires to a very sturdy end post or anchor them firmly to the ground or a building. Place T-bars no closer than 2 feet from the vines. The centre wire will support the main cordons, and the outer wires will support the fruiting laterals.

Pollination

Kiwi plants are pollinated mainly by insects, honey bees being the most important one. A Large population of honey bees is required in its orchard for a rapid an effective pollination.

Kiwifruit plants are normally dioecious, meaning that individual plant is male or female. Only female plants bear fruit, and only when pollenized by a male plant. One male pollenizer is required to be planted for each six to eight female vines.

Insect

Compared to other fruits type, kiwi has few insect pests. European red mite can build up in late summer in hot, dry areas. Scale insects and leaf rollers are other pests affecting it.

Management & Control

i. Hand picking of the caterpillar

ii. Damage parts should be collect and burned can be sprayed.

iii. Spraying with Bio-catch (*Verticillium lecanii*) or *Bacillus thuringiensis var* @ 5 ml per 1 litre of water.

iv. Spraying with Neembicidine @ 6 – 7 tsp per 16 lits of water.

Harvesting and storage

Mostly fruits ripe in the last week of October to the first week of November. Fruits can be stored up to three months at room temperature due to hairy fruit surface and less evaporation.

DAY 39: **FIELD VISIT**

DAY 40: 10:00 am – 12:00 Noon: HORT III: LILIUM CULTIVATION

INTRODUCTION

Lilium belongs to Lilleaceae, and are believed to have emerged 55 million years ago andhas been in culture for the last 3,000 years (plot of lilies made its entry and was very popularin Egypt's 18th dynasty).

Many bulbous plants called lilies. Many of them however belongs to other genera. The here mentioned all belongs to the genus Lilium.

All modern lily hybrids derives from approx. 100 lily species, of which approx. a dozen tribesfrom Europe, approx. two dozen from North America, approx. 40 from China and the remaining approx. 25 come from Japan, Nepal, Myanmar and Korea. Lilies can be foundonly in the northern hemisphere.

BOTANICAL DESCRIPTION

Lilies appear in all shapes and sizes. All parts are divisible by three and some of these partsare twofold. The flower has three inner and three outer petals. There are six anthers, stigmais three-fold, and so is the ovary, each with two chambers.

Flower

The flower associated with the stalk through a flower stalk can be funnel-shaped, sphericalor backward bending. It can be upturned, outwards turned or downwards turned.

The flowers may sit as an umbel where all flower stalks arises from a common centre.

If the flower stalks do not arise from a common centre it is called a united umbel, or when all the flower stalks arise arbitrarily like the leaves, it is a raceme.

Leaf

The leaves arise mostly horizontally from the stalk. In some case, when the leaves arise from the same centre, they are forming whorls.

Many garden lilies have very similar leaves, but there are also variations, so if you have many lily species in the garden, there will be several fascinating leaf types for detailed study.

Lily species as L. cernuum, L. pumilum and L. davidii and hybrid 'Elf' has many filamentousleaves emanating from the stalk.

At the other end of the spectrum there are the lanceolate leaves with the widest part approx.halfway down the leaf from the tip, and the leaves narrows again. This is seen in e.g. L.auratum var. platyphyllum.

Then there are a large number of leaf types, which lies between filamentous and largelanceolate.

The leaves which are fastened in a wreath around the stem, usually are broad in shape.

Root

Throughout the growing season Lilium will develop a root system in the area below the surface and around the bulb. These roots serve to attach the stem into the soil so it does not fall over in wind and rain and when the lily blooms - often with heavy flowers. These roots also serve to record food and water for the plant.

Lily has a bulb, which is composed of scales. These scales are transformed leaves that can sit more or less loose.The bulbs are usually white or yellow, but can be a little coloured when exposed to light. The size of the lily buds vary greatly. They can be as small as a grain or as large as a grapefruit. The greater flower the larger bulbs.

The bulb has a flat area at the bottom called the basal plate. Lily will usually, in the growing season, form a system of roots that radiate out from this point. These roots are constricting and will pull the bulb deeper into the earth until it is satisfied with the depth. In some lilies works this mobility very well, while in others it goes less well.

These basal roots collects important nutrient and moisture early in the season before the roots around the stem erupt.

Throughout the growing season the lily will gather nourishment and energy for the next growing season. It will shape the new flower and embed it in dandruff. If the growing conditions are optimal, the lily will form more than one new flower and more than one new bulb for the next season.

Some lilies, for example. L. canadense form offshoots arising near base. These stolons vary in length depending on the clone, its power and ground conditions. The stolon has small scales, which becomes a bulb, and it can have a good size at the end of growth period, when the stolon begins withering away.

In a few North American types, e.g. L. pardalinum and its hybrids are formed rhizom-liking stems. A broad basal plate is formed on which the upturned scales are located.

Scales of this type are very fragile, and are often narrowed in the middle so they break in half. Use any a sharp knife by dividing.

A few Asian species forms stolons on which breaks one, two or three bulbs. These new plants can easily emerge 30-60 cm from the mother plant. This group includes L. duchartrei.

Some lilies form bulbils (small bulbs) from the stalk.

LILIUMIN THE WILD

Lilies grow under very different conditions in nature. They are found on dry grassland, close to rivers, literally in swamp, in alpine canyons, on limestone mountains and rugged mountainterrain. There are lilies only growing in acid soil and others in lime soil, while others grow best in neutral soil.

Some lilies have very limited distribution such. L. regale which is only found on a steepChinese slop, while, for example. L. martagon is found from Siberia across to Poland and down to the Balkans.

Differences in generic sizes and colors are often caused by growing conditions. Oneexample is L. formosanum which grows in Taiwan in 0-3500 m. The lilies that grow in thelowlands may be 180 cm tall with numerous flowers, while those that grow high only are 25-30 cm and usually only get one single flower (L.f. var. pricei. Between these extremes aremany stages.

LILIUM IN CULTURE

Most lilies require a well drained soil. Heavy soil and soil with standing water is fatal to lilies.Therefore, low-lying areas and areas where water collects and heavy clay soils, must be avoided.

If the soil is too heavy, add sand, gravel or similar material to drain the soil.

In nature, many wild lilies are covered by snow in winter and thus kept free of precipitation.In the spring rain and meltwater will bring the lily start growing. In culture, we must try tominimize water flow in winter and then maybe add extra water in spring and summer. Bywatering leaves, stems and flowers must be kept dry. By planting lilies between shrubs and similar (so that the Earth is covered) can prevent dehydration and thus reduce wateringneeds. This however should be weighed against the fact that lilies likes air around the plant.

Lilies prefer a cool soil for the bulb. Cover the soil with pine needles, bark or similar. PHmostly should be around 6.5.

Lilies are remarkably impervious to both heat and cold, but new shoots can be damaged bylate frosts.

Fertilizer shall be applied twice a year. First time on 15 April by mixing fertilizer 14-14-14 andthe second time on 15 May with 11-22-25.

It is best to plant lilies in autumn, so the basic roots may develop within the new growing season.

Lilies should be planted 10-15 cm deep, because the stem-roots will develop on the lowerapprox. 10 cm of the stalk.

Some believe that the size of the bulb is irrelevant when talking about the depth of planting, while others believe that small bulbs not shall be covered as much as big bulbs.

There are however a few exceptions, such as. Lilium candidum, where the bulb should be placed in the surface or covered only slightly.

When the bulbs after a few years will be located too close, the lilies will be smaller andweaker, therefore dig up the bulbs and divide them in appropriate intervals.

PROPAGATION

Scale

A simple way to propagate lilies is to take the scales from the bulb.Scales is usually taken from the bulb in the fall, but it can also happen at other times. By Asiatic hybrids scales can be taken in September, when division normally occurs. If taken scales in August they will develop small bulbs before November when the rest period begins. When the bulb is exhumed rinse it in a fungicide. Brake the scales gently from the parent bulb as close to the basal plate as possible, preferably with a bit of the plate if possible. Do not use the outer dry scales, but only the thick-claims scales. The scales can be planted directly in a pot with moist soil or placed in a plastic bag with moist sphagnum peat moss. The bag is placed in a warm place for approx. 2 months. Check the bag regularly to ventilate and keep an eye on the moss not to dry out. When the first leaf emergence it is time to pot the scales. However, it has no hurry, since scales can survive several weeks. See also the above "root" various forms of growth (stolons etc.) are described.

Bulbils

The lilies which forming bulbils can be propagated very simple by peel of the bulbils in late summer and place them in a plastic bag with damp moss. When the bulbils have formed roots it is time for potting. The bulbils can also be potted directly after harvesting in moist soil. Place the pot shade and take care it don’t dry out.

Small bulbs

Many lilies form small bulbs just below the surface. These small bulbs are in many respects similar to the previously mentioned bulbils. They're both formed on the stalk and they form their own basic roots.

Propagation is done by picking the small bulbs from the mother plant and pot them in a moist soil mix in the shade.

Seeds

The above mentioned propagating forms gives plants which are identical to the parent plant. A fourth way of propagation is by seed. But in this way the new plant will not necessarily be identical to the parent plant. In return, you may, if you like pollination, produce all sorts of lucky and unlucky hybrids. When the seed pot opens the seeds are matured. Harvest the seed and plant in a pot, either immediately or dry the seeds and store until December-January months and then do the potting. Set the pot outdoors in the shade.

Some seeds sprouts immediately - so-called epigeale - (trumpet, Asian and Chinese), while others - the hypogeale - requires alternating hot and cold periods in order to germinate. They form initially a little bulb with a primitive root, then they require a cold period, sometimes several, before the increasing continues, and they shoot a leaf up from the ground. To the latter group belongs martagon, the oriental and most if not all American. It may take up to seven years before these lilies are in bloom.

Diseases and pests

The greatest scourge of lilies are undoubtedly the lily beetle. A small red guy who lets itself fall to the ground when disturbed. Here it will land on its back and is becoming difficult to find as it is black underneath. An effective remedy for lily beetles is to pick them by hand and kill them. There also is a systemic agent in the trade, which means that beetles do not like the taste of the plant, and they disappear. If we don’t control the beetles on one way or another, we must pay the price later into the summer, where the beetles have left their larvae on the lily leaves. Larvae are wrapped in the excrement of the beetle, and it's a pretty disgusting task to assemble them. The larvae eat the lily leaves. One must control the lily beetle from early spring to autumn. Another problem is the larvae or worms that eat the bulbs. Here is so far known only one solution: dig up the bulb, remove the pest, plant the lily in a pot and care it until recovering from the attack. Fungus diseases are one of the most prevalent and there are many forms. E.g. gray mold (Botrytis) that starts with brown spots on leaves, which can fade completely into the summer. Botrytis only attacks the leaves and not the bulbs, but early wilting of the leaves and stalk, can make the bulb weak. The supply of fungicides on the market is severely limited. Experiments with the available, and preventive - and by milder attacks try Atamon (a remedy used in the housekeeping for preserving). Ensure that the lily has ideal growing conditions, such as good drainage, damp soil, right fertilizing, etc, which might keep fungus away. If the bulb is attacked, you can dig it up, put it in a fungicide a few hours, let it dry slightly and then plant it in a good lily soil, preferably sterile.

Some species and varieties can be attacked of virus, but it is not always damaging the plant, and sometimes it will not be shown. If the bulbs are infected, it often means the plant dies. Destroy the infected parts to avoid infection. Some lilies are say to be particularly susceptible to be attacked of viruses such as L. longiflorum and L. formosanum.

1:00 pm – 3:00 pm: MARKETING : 1917 iTEAMS

Integrated Technology Enabled Agri Management System (iTEAMS) wasLaunched on 29th December 2017 which marked the 100 years after Gandhiji's Champaran Satyagraha of 1917,

Vision statement of iTEAMS:

To design and implement an Integrated Technology Enabled Agri Management System (iTEAMS) that provides access to markets, consistent & complete response, resolution, knowledge & skills in a transparent convergent manner leading to improved efficiency & effectiveness of farmers in the areas of agri and allied sectors and also bring a change in attitude & behaviour amongst all stakeholders.

1917iTEAMS is collaboration

1. Department of Agriculture, Govt of Meghalaya
2. Meghalaya Institute of Entrepreneurship (MIE)
3. IT Department, Govt of Meghalaya
4. Department of Animal Husbandry, Govt of Meghalaya
5. Digital India Corporation (DIC)
6. Water Resources Department, Govt of Meghalaya
7. Meghalaya Small Farmers Agri-business Consortium (MgSFAC)
8. Central Agriculture University

1917iTEAMS is a disruptive farmer centric, market oriented, cloud based based facilitation service linking buyers and sellers, liberating them from the clutches of middlemen and exploitative traders by directly connecting them with potential buyers across the globe. It also offers advisory services, market intelligence, domain expertise and life skilling facilities for Agriculture, Horticulture, Animal Husbandry, Apiculture, Fishery, Sericulture and Weaving. Offering affordable, safe, GPS based transportation, evacuation and logistics services to farmers to any markets of their choice. The **CALL TOLL FREE NO iTEAMS is 1917** from anywhere in India.

It operates through a cloud based technology driven a call and dispatch center, called the Agri Response Center (ARC) and linked, through the cloud, to a fleet of dedicated customised entrepreneur owned Agri Response Vehicles (ARV) spread out across the state. Farmers are advised to call the ARC through 1917 and register and post registration, they can access the Advisory Services which includes Subject Matter Specialist from the concerned department of Agriculture and all allied fields. In cases where a farmer requires logistics support, they can call the ARC and the ARVs will be dispatched under the direction and tracking of the ARC. ItLoosely modelled on the 108 Emergency Response Services.

Process Flow

- Farmer calls 1917
- Communication Officer (CO) picks up call & fills profile, requirements,

- CO gives required info to caller or transfers call with voice to Dispatch Officer (DO) for transport requirements or escalates call with voice to experts for higher level enquiries
- CO also dials callers for giving specific info – outgoing
- DO identifies nearest ARV and dispatches with info to caller and transfers the caller info to ARV pilot.
- DO tracks vehicle movement till the trip is completed.
- Experts provides desired info and closes
- ARV pilot starts vehicle and informs DO and Farmer about his movement and seeks additional info if required.
- ARV pilot after reaching destination will check the load quality and quantity and accept load if suitable.
- Farmer accompanies the load if he wishes
- ARV after reaching buyer / market unloads, informs DO and returns to base upon instructions of DO.
- Content Communication Officers (CCO) regularly sends out advisories, package of practices, market information, scheme information, buyer and seller information, market prices etc to registered farmers.

Agri Response Vehicles (ARVs)

- Entrepreneur owned and leased to iTEAMS on fixed monthly rental
- 19 vehicles onboarded
- Minimal freight charges of Rs.0.02/kg/km
- Equipped with phones, dash camera, toolkit, weighing balances and GPS
- Minimum of 2 trips/day
- Two way loads
- Integrated ARV pilot – multi tasker (Driving, pre load inspection, palletizing, on road fitness, record keeping, communicating with ARC, farmers, markets etc, mobilizing awareness / training
- Operations started Feb 2018

3:00 pm – 5:00 pm: PRACTICAL

DAY 41 10:00 am – 12:00 Noon PLANT HEALTH MANAGEMENT IPM Strategies for tomato

Nursery raising

- Prepare raised nursery beds about 10 cm above ground level for good drainage to avoid damping off etc.

- Cover the beds with polythene sheet of 45 gauge (0.45 mm) thickness for three weeks before sowing for soil solarisation.

- Mix 150 gm of fungal antagonist *T. harzianum* in 3 kgof *FYM* and leave for about seven days for enrichment. After 7 days mix in the soil in a bed of 3 sq. m.

- Treat the seeds of popular hybrids with *T. viride @ 4 gm/ kg.*

- Use nylon net of 40 gauge mesh for leaf curl management.

- Transplant a row of marigold after every 16 rows of tomato as a trap crop. Marigold should be 15 days older than tomato plants so that they flower at the same time.

- First and last row of plots should be marigold and it should be sprayed with *HaNPV.*

- Adopt wide spacing of 60 x 45 cm (for varieties) and 90x 60 cm (for hybrids) to reduce the chance of spread of diseases.

- Apply neem cake @ 250 kg/ha at 20 DAP to reduce fruit borer, leaf miner and nematode.

- Spray of 5% NSKE at 15 DAP has also been found to be effective against leaf-miner.

- Transplant a row of marigold after every 16 rows of tomato as a trap crop. Marigold should be 15 days older than tomato plants so that they flower at the same time.

- First and last row of plots should be marigold and it should be sprayed with *HaNPV.*

- Adopt wide spacing of 60 x 45 cm (for varieties) and 90x 60 cm (for hybrids) to reduce the chance of spread of diseases.

- Apply neem cake @ 250 kg/ha at 20 DAP to reduce fruit borer, leaf miner and nematode.

- Spray *Trichoderma harzianum* + *Pseudomonas florescence* for managent of late blight.

- Spray of *Pseudomonas florescence* for managent of bacterial blight.

- Use of yellow sticky traps for white fly

1:00 pm – 3:00 pm PRACTICAL

3:00 pm – 5:00 pm FISHERY Composite fish culture

“COMPOSITE FISH CULTURE IN HILLS”

INTRODUCTION

The fast growing compatible different species of Indian and Exotic carps of different feeding habits are stocked and cultured in the same water body, so that all its ecological niches are utilized by the fishes. This technique of fish culture is called **Composite Fish culture** or **Polyculture** or **Mixed Farming**

SELECTION OF PONDS

Size and shape of stock ponds in which fingerlings are raised to table-sized fish through composite fish culture may vary. A desirable pond should be preferably around 0.5 hectare in area rectangular in shape, 2 to 3 meters deep (1.5 m minimum depth) exhibiting a gentle slope and an even bottom. Embankment should be firm with guarded inlets and outlets. Soil should be retentive with an assured supply of water. Perennial ponds with at least 1.0 meter water depth during peak summer are preferable. Even seasonal ponds retaining sufficient water for 8–9 months can also be utilized.

METHODOLOGY OF COMPOSITE FISH CULTURE

Essentially, the methodology of composite fish culture consists of the following principal steps.

(i) Pre-stocking

(ii) Stocking

(iii) Post-stocking management operations.

Pre-stocking operations

This phase refers to pond preparation to ensure maximum survival and proper growth of cultured fishes and involve repairs of embankments, removal of weeds and undesirable aquatic biota, and correction of physicochemical properties of water and soil.

Eradication of aquatic weeds - Why?

- Reduce the leaving space
- Prevent sunlight
- Consume nutrients
- Provide shelter for predators
- Obstruction while harvesting
- During cloudy days causes serious oxygen depletion

Eradication of weed and predatory fish- Why?

- Compete for food, space and oxygen with the cultivable carps
- Predatory fish directly prey on cultivable species of fingerlings

How?

- Dewatering ensures complete removal of unwanted fish.
- In ponds, where dewatering is not possible, mahua oil cake @ 2000-2500 kg/ha-m depth is recommended or Bleaching powder @ 150kg/ha-m followed by urea @ 150kh/ha-m after 24 hours.

Liming

Liming is done to correct the acidity of water and soil and it also helps to keep the pond hygienic. Ground limestone (Calcium bicarbonate) or slaked lime (Calcium hydroxide) or quick lime (Calcium oxide) are applied at the pond bottom or spread over the water surface. Under Indian conditions, lime is used in stock ponds at the rates of 200–1000 kg per hectare per year in instalments based on soil pH as given below:

Soil pH	**Soil type**	**Requirement of lime(kg/ha)**
4.0 – 4.9	Highly acidic	2 000
5.0 – 6.4	Moderately acidic	1 000
6.5 – 7.4	Near neutral	500
7.5 – 8.4	Mildly alkaline	200
8.5 – 9.5	Highly alkaline	Nil

DAY 42: 10:00 am – 12:00 Noon: COOPERATION: Management in Co operative

Management is defined by various authors as follows:

(1) Management is what the Manager does.

(2) Management is the effective & efficient utilization of people and things to put ideas into effect.

(3) Management is the co-ordination of all resources and attains stated objectives.

(4) Management is getting things done through others.

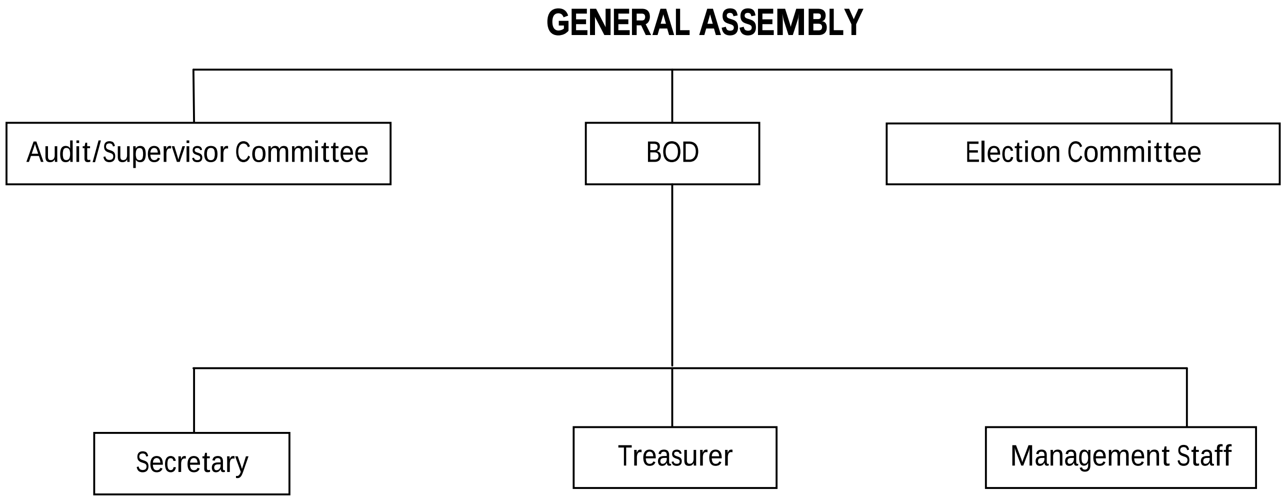
(5) Management is the accomplishment of objectives by the establishing an environment favourable to performance to people operating or organized groups

(6) Management is managing an affair of utilizing people and things to attain the stated objective.

(7) Management of planning & organizing, consist of controlling utilizing of both science and art to follow in order to accomplish pre-determined objective. This definition is more acceptable as it briefly explains the fundamental principle of management.

(8) The great American author and the president of American Management Association have stated that management is the accomplishment of results through the effort of the people. He further stated that management is the maintenance of pre establish goals by the direction of human performance along pre-established lives. Management do not wait for the future but they make the future. So, the destination is also perhaps the most widely used and contain virtues of approach in management and other and he further says that management is personal administration, Principal and function of management:- Function of management is not static but flexible, they changes from time to time keeping in view and local conditions viz. economic social and political. But such changes however do not change the basic character of management but motivates the management in executing effectively to suit the changing need of time. Hence, study of basic functions of management is necessary.

STRUCTURE OF CO-OPERATIVE MANAGEMENT



The basic functions of management are as follows:-

1) **Planning** – planning is the most important function of management in co-operative sector. Generally speaking without planning no organization nor Govt. of any kind will be able to function effectively. Planning makes things function easily and systematically. Hence, planning involves the advance determination of things to be done. The future course of action is decided at present. Planning consist of formulation of objectives policies, programme, procedures and other norms of achieving these objectives

2) **Organizing** – Organizing means grouping of activities required to achieve the enterprise objectives and assigning of these activities to groups sectors, departments and so on. Necessary authority is to be delegated. Proper co-ordination should be ensured by the manager for smooth functioning of the enterprises.

3) **Staffing** – Staffing connotes the recruitment of right and competent personnel to manage the organization sector, training, promotion, compensation, appraisal, communication etc. The success of an organization depends mainly on this function of management.

4) **Directing** – In this function, the high authorities, directs and entrust the responsibilities to the sub-ordinates as per work allotment accordingly. Directing warrants efficient leadership, which includes decision-making, guiding, supervising, motivation etc. Hence this is another important function of management.

5) **Controlling/Decision making** – Controlling looks after the overall performance to ensure whether the performance is as per original plan. Deviation are detected and corrected. Controlling involves performance appraisal, correctives actions and so on. Instruments of control also include budget, costing etc.

PLANNING IN CO-OPERATIVES

Planning – Like any other economic organization co-operative too being a business and economic organization require proper planning for their economic activities and overall development as a whole.

1. In co-operative, planning is required in both vertical and horizontal growth of individual co-operatives. Many co-operatives are stagnant due to lack of proper planning. The primary agricultural credit societies were supposed to undertake multipurpose activities but in practice were confining only in credit activities in many states. Hence, only through proper planning, that additional activities can be undertaken for increasing the volume of business.

2. In co-operatives, planning and objectives can be framed for achieving within a stipulated time.

3. To increase the competitive power and to provide good service to their member customer efficiently, proper planning is required.

4. Co-operatives does not have only economic functions but have a mission too. The mission is to teach the social values of co-operation, viz., self help through mutual help one for all and all for one i.e. unity in diversity. Their motto and benefits is to extend to the people exploited by evil forces. The above can be achieved only through proper planning.

Objectives in Co-operatives:

Objectives of management in co-operatives: There are two objectives of management in co-operatives viz., (1) Immediate objectives and (2) Ultimate Objectives.

1) Immediate objectives are the objectives which form part of the objectives that are discussed in management planning. Again, the objectives for co-operative organisation, differ from each other. For e.g. co-operative processing units like co-operative sugar factories, fertilizers units, rice mills, etc. functions mostly by applying all modern management techniques. On the other hand, small co-operatives like the village credit societies, weaver's societies, etc. does not follow such management techniques, but follow the same old techniques in a routine manner.

Immediate objectives are laid down in their bye-laws. These objectives in most cases are uniform to a particular type of co-operatives societies.

2) **Ultimate objectives** – Ultimate objectives of co-operatives are long term objectives. Achieving the immediate objectives may lead to the achieving of ultimate objectives. Ultimate objectives are social processes and they are intended to form part of social reform. These objectives are not confined to a particular co-operative. The ultimate objectives are being implemented by all co-operatives to eliminate poverty and backwardness, avoiding exploitation in the society, ensuring social and economic justice bridging the gap between the rich and the poor. These ultimate objectives can be achieved only by following the principles of co-operation laid down by the International Co-operative Alliance (as guidelines) where

joint efforts be taken up by all types of co-operatives by embracing the principles of co-operation among co-operatives.

Decision making in Co-operatives – This is another process of planning. There are two aspects of decision making in the co-operatives.

1) The role of the Board of Directors.

2) The role of the external agencies.

1) **The role of the Board:** In a co-operative organisation the Board takes the decision on behalf of its members. The Chief Executive representing the professional management is also taking part in the process of decision making, and give suggestions and advise to the Board. It is the responsibility of the Board to decide and assigns necessary power to the Chief Executive for achieving the goal of success.

2) **Role of External Agencies:** In a state sponsored and State aided movement, it is prominent that the Government takes control of co-operatives.

In this case, the Registrar of Co-operatives societies has enormous control over the co-operatives under the implementation of the co-operative societies Act. The primary co-operative societies in most cases are supervised by the Apex Level Societies. These agencies greatly influence the policies of co-operatives. Hence, planning is very much necessary for and individual society to check the controlling, suggestions and policies of the external agencies. In other words any plan of a co-operative society is being influenced by external factors and these must be checked and weights.

As far as Govt. is concerned, generally, decisions made by individual co-operatives were as per Government advice. Introduction of re-organisation and revitalization has been an element of compulsion for the Primary agricultural credit societies. In most cases, the Registrar imposes amendments of the bye-laws of various types of societies. Central Bank and the monetary authority of the country have statutory control over co-operative banks where policies and payment procedures etc. be approved by it.

Organising function in Co-operatives – Organising functions comes after planning, and, to achieve the objectives of planning organisation has to be established.

Principles of organisation– Co-operatives are different from other private enterprise and hence, things should be organised differently for achieving their objectives. K.G. Howard laid down the following principles of organisation for co-operatives.

1) Analyse the job to be done set out in the objective of the plan, then group and identify the specific task to be performed.

2) An organisational chart should be prepared, provided with proper co-ordination and effective communication.

3) Objectives should be written clearly on the organisation chart.

4) The responsibility and corresponding authority should be clearly written.

5) The period and deviation of each supervisory authority should be established to ensure that the task is carried out effectively and systematically.

6) The supervisory authority should ensure that a person or employee should not be accountable for more than one supervisor in the same key result area. An employee, however, may be accountable, to two supervisors, only if they are in different key result areas.

Decentralisation of Power in Co-operatives

Power of authority should be decentralised in order to achieve the objectives and goals. Here, trained personnel are very much required. Most of the co-operative leaders lack knowledge relating to scientific management. One reason for this might be the fear of sharing the authority with the professionals lest they may lose their importance. This trend is common especially in small co-operatives. Hence, decentralisation is an important factor in co-operatives to enable sharing of authority by the leaders.

Another trend, is when the leaders were not educated and were not enlighten about the management principles, so the professionals exploits the ignorance of their fellow members and at times misguides them. This result to the complete surrender of those less educated to the professional members and in turn hinders the development of the co-operative.

On the other hand, in the case of processing Co-operatives, and consumer stores. Skilled personnel are employed, decentralisation of authority and delegation of power does not create any problem. As these are business organisations run to compete with private organisation, the co-operative leaders were compelled to share authority with their professional managers.

Organisational Structure of a Co-operative

The organisational structure of a co-operative is in a pyramidal form. The members who exercise the ultimate power stand at the top of the organisation. They exercise their power through the general body, which is convened whenever called by them. The Board of Directors frames the objectives of co-operatives and laid down policies to achieve the objectives. The president has to consult and convene the Board very often. The Board decides the powers to be delegated to the executive, who is usually called as general manager or Secretary, while power is delegated, responsibility for performance is also fixed. The professional management is under the control of the Chief Executive. The Chief Executive in consultation with the Board decides the organisational set up for the Staff. Necessary powers are delegated to the sector managers and responsibilities are fixed. Control and communication system are established.

Performance is reviewed frequently and is reported to the Board. In a co-operative processing units like sugar co-operatives, fertilizers units and in consumers co-operatives, the organisational aspects, like any other private organisations. But in small co-operatives and in agricultural credit co-operatives this function is not undertaken scientifically, because they employ few staff and their volume of transaction is also low.

Staffing in Co-operatives: Staffing which may ultimately lead to Human Resource Development for the organisation need inter alia includes, initiating and implementing following action stages:

1. Systematic methods to be adopted at unit level and at different levels and sectors.

2. Induction of professional qualified, competent and dedicated personnel at various levels of management.

3. Demarcation of responsibilities between the elected management and professional management.

4. Development of Human Resource Management policies and procedure including placement, promotion, transfer, performance appraisal and grievance settlement as may be conducive to organisational goals and management objectives.

Directing / Controlling Function in Co-operatives:

The directing function of management consists of the following.

1. Leadership

2. Motivation

3. Communication

The main function of directing or controlling depends on the above three factors to reach the goals of co-operative. The leaders must have good communication and motivate the members so as to create awareness about the working of their co-operatives and to inculcate the rights and responsibilities. Most co-operatives, especially in the rural areas, the members does not even have the elementary knowledge about their organisation and its functioning. It is the duty of the co-operative leaders to educate the members about the co-operative movement and about the working of their co-operatives society and entrust the members with responsibilities through encouragement and motivation.

1:00 pm – 3:00 pm: ENTREPRENEURSHIP: Successful Entrepreneur (Food processing)

<u>NB</u>. Training materials will be provided by the concerned lecturing entrepreneur during the session

3:00 pm – 5:00 pm: HORT II: Citrus cultivation

Orange (Khasi Mandarin) ***Citrus reticulate***

Khasi Mandarin is one of the most common citrus fruits grown in the North Eastern region. It is cultivated in almost all states of the North East. There is a worldwide demand of mandarin as fresh fruit. The fruits can be used for the preparation of processed products like marmalade, bottled and canned juices, squash, jam, jelly etc. Orange oil is used for flavouring purposes like hard candy, ice cream, chewing gum and confectionaries. Orange are very nutritious and contain vitamins C, A, B and phosphorous.

Climate – Mandarin prefers sub-tropical climate up to a height of 1500 m above msl. Rainfall of 40 - 45 inches (up to 60 inches) uniformly distributed and temperature of 26^{o} C – 32^{o} C are most favourable for mandarin. Fruit maturation including production of sugars and development of rind colour is best in the lower range of growth temperature. Under heavy rainfall, fruits became poor in keeping quality and inferior in taste. High winds and hailstorm during flowering and fruit set hampers fruit bearing. Flowers and fruits are sensitive to frost conditions and shed within a very short time under low temperature. Low humidity gives good colour and external appearance, whereas, high humidity favours the production of thin layered skin, juicy fruits which are smaller in size but high in quality.

Soils – Mandarin requires light textured sandy loam with deep fertile soils and high in organic matter. The soil should have good drainage and slightly acidic with pH range of 5.5 – 6.5. It requires soil depth of about 180 cm for proper root growth and fruit production.

Cultivars – The following are the orange cultivars.

a. **Coorg** – Fruits are medium to large, bright orange in colour. It is ovate in shape and the base is depressed with thin rind. It matures during February – March. This cultivar is grown in Assam, Meghalaya and North Eastern states.

b. **Khasi** – The fruits are depressed, globose to ovate in shape with orange yellow to orange in colour. It has a smooth surface with an even base or short necked. It is grown in Assam, Meghalaya and North Eastern states.

c. **Nagpur** – The fruits are medium and shape are sub-globose. The surface is smooth with the base slightly drawn out. This is the most popular variety and it matures during Jan- Feb. This is grown in the Satpur Hills of central India, Darjeeling and Coorg.

d. **Kinnow** – The fruits are medium and ovate. The colour is deep orange yellow with a flattened base. The rind is thin and irregular bearing. It matures during mid of January. It is grown in Rajasthan, Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir, Uttar Pradesh, Nilgiri, Palni and in the states of Northeast India.

Propagation – The fruit can be raised from seeds and through budding. If Mandarin is to be grown by seeds, then some criteria are to be followed before sowing. They are:-

a. The mother plant selected for seed extraction should be regular bearing with high yield and good fruit quality. It should be healthy and vigour.

b. It should be disease free.

c. Mature and healthy fruits should be selected for seed extraction.

d. The seeds should be treated with *Trichoderma* @ 5-10 g mix with 10-20 ml water for one kilogram of seed. Mix the seeds properly and dry in shade for half an hour before sowing.

The seeds are sown at a depth of 1.5 – 2 cm with the spacing of 10 cm row to row and 5 cm seed to seed. When the seedlings start bearing 4-6 leaves they should be transplanted to poly sleeves of size 8 by 4 inches. The soil media prepared for filling the poly sleeves should be 1:1:1 of sand, soil and well decomposed cow-dung. The transplanted seedlings should be kept in poly-house for quick growth and easy monitoring of pest and diseases.

T- Budding/Shield Budding – This is one of the common way to propagate mandarin, and it gives better performance as compared to the plants raised through seeds. Budding is done during the month of February – March and July –August. T- Budding can be performed in fruit lime or peaches and are called rootstocks. These rootstocks should be healthy, free from diseases and should be one year old. It should be at the height of 1- 1½ feet and thickness of 1 inch. For successful T-Budding the buds should be fully formed, matured and peeled with little damage. The plant being propagated is called scion, while the plant being grafted on is called rootstock. The bud and a small sliver of the wood underneath it are cut from the bud stick selected using an upward slicing motion. The cut should be about ½ - ¾ inches below the bud, and giving another cut across the top of the upward cut. Budding knife should be sharp and less damage should be done to the bud. A vertical cut is made on the stem of the rootstock. Then a perpendicular cut is made at the upper end of the vertical cut forming a shape of „T‟. The bark is carefully slipped from the stem of the rootstock exposing a pocket into which the bud shield can be placed. Care should be taken not to tear the two flaps of bark in the process of spreading them. Then bud shield is then carefully slipped in between the bark flaps. The bud shield should be fitted tightly against the horizontal cut i.e. **T cut**, within the pocket. The bark flaps are held tightly against the bud as they are wrapped with a budding tape. This tape should be removed in 2-3 weeks after the union has healed. After the union has healed the upper part of the rootstock plant can be cut away to force the bud to grow, as this will help the scion to grow vigorously.

Grafting – Grafting is done during the month of July – August. Usually rootstock like Rough Lemon and Rangpur Lime of 90-120 days old is used for grafting. We should select healthy and vigorously growing branch bearing 3-4 buds. This selected branch should be of 3-4 months old and has thickness of 2-4 mm. The leaves of this selected branch should be cut off 7-10 days ahead, before it is used for grafting. The rootstock should be cut away leaving it at a height of 4-6 inches from the soil level and it should bear few leaves before grafting. With a sharp knife, make a one-inch vertical cut through the bark of rootstock stem. Make one inch cuts on both sides of the selected scion and insert it in between the cut rootstock. Now, secure and protect the graft by wrapping it with grafting tape. It takes about 20-25 days for the new buds to appear after grafting.

Air Layering – This method of propagation can be done during the summer season. The followings are the steps to be followed for air layering.

a. Select a branch of about 1-2 years old with one inch in thickness. The branch should be healthy and free from any pest attacks.

b. Two clean cuts should be made around the branch about one inch apart with a sharp knife.

c. Make a soil mixture of moss, sand and wood ash. This soil media can be mix with 500 mg AA or IBA in 1 litre of water before applying to the cut area of the branch.

d. Cover the cut area with the above soil media.

e. With the help of plastic sheet of the right size wrap the soil on the branch.

f. With a cotton thread tie both ends of the plastic tightly to avoid entry of water and air.

g. Wait for 8-10 weeks to allow rooting of the branch.

h. When roots have developed inside the plastic, the branch is cut off below the rooted portion with hack saw with-out damaging the root ball, and is ready to be transplanted.

Preparation of pits and sowing – Before digging pits the soil should be well pulverised and perennial weeds should be removed. Square pit size of 0.75 x 0.75 x 0.75 m (length, width and depth) should be made. Distance from one pit to another should be 5-6 m. Mix the top soil with 20 kg well decomposed FYM together with 500 g *Trichoderma veridae* and filled the pits at least one month ahead of planting.

Time of sowing – Orange seedlings are usually planted during July- August. Irrigation is essential after planting if there is no possibility of immediate rainfall.

Nutrient Management – Manures should be applied when the newly planted seedlings are 4-6 months old. Take 3 kg *Azotobacter* or *Azospirilium* mix well with 100 kg FYM and 3 kg *Phosphatika* and leave the mixture overnight. In the next day the mixture should be applied around the seedlings by giving light ploughing. This manure application should be repeated every 4-6 months. Liquid *Azotobacter* @ 2-3 ml per seedling can also be sprayed.

Water Management – Irrigation improves the plant growth, flowering and fruiting. Lack of irrigation makes the plant look weak and the leaves turn pale. Irrigation should be given lightly after planting of seedlings and should be followed every 15-20 days during the months of December – March.

Mulching – In slopy and hilly areas orange planting should be done by making terraces or half-moon terraces to avoid erosion of the fertile top soils. Mulching with paddy husk or plastics can be done to cover the soil which helps to conserve moisture particularly during winter seasons and suppress weed growth.

Weed Management – Frequent hoeing, hand weeding and light tillage should be done to reduce weed growth and to maintain porosity. Weeding is usually done every two months.

Intercropping – During the pre-bearing stage i.e. within 1-5 years, inter cropping with vegetables like French bean, Soybean, groundnuts can be done. Care should be taken that water does not log around the trunks of the orange plants. Leguminous crops like peas and cucurbits can also be intercropped successfully.

Pruning and Training – Plants should be trained during the first year. All unwanted branches should be pruned leaving only the single trunk about 0.5 m from the soil level. After harvesting of fruits, removal of dead, diseased and over-crowding branches should be done.

Flowering – In Meghalaya orange tree flowers during the months of February – March and fruits ripen during November – December.

Fruit Drop – Fruit drop or flower drop is a physiological disorder in orange plants. The main causes of fruit drop may be due to unfavourable climatic factors, lack of nutrition and improper water management.

Control –

a. Spray multiplex @ 2.5 ml in 1 litre of water.

b. Proper irrigation should be given to the fruit plants.

c. Application of organic manure and nutrients to the plants.

Insect/Pest

1. **Citrus Trunk Borer** – Both the adult and the larvae cause damage to the plant. Neglected orchards are severely affected by trunk borer. The activity of the larvae increase during the rainy season. The pests bore into the stem and branches and cause damage to the fruit plants.

Control & Management – Pests and larvae should be manually collected and burnt. Multi neem can be sprayed @ 6 tsp in 16 litres of water for three times during April _ July. The holes made by the borers can be cleaned and plugged with cotton dipped in petrol/Kerosene oil. Then the holes are blocked with soil or mud.

2. **Citrus Butterfly** – These pests and larvae mainly infest the orange seedlings in the nursery and the young plants during April –August. The infected plants become weak and bear less fruits.

Control & Management – Collect the pests and larvae and burn them. Organisms like *Coccinela septempuntata* or *vespa orientalis* could be released to the plants so that they can eat all the larvae of the butterfly. We can also spray garlic paste mixed with 3 ml of neem oil into one litre of water. Spraying *Beauveria bassiana or Bt* @ 1 tsp in 1 litre of water can also be done.

3. **Citrus Psylla** – The adult and the nymphs suck the sap from the plants. The nymphs are more destructive and usually feed on the terminal shoots, buds and tender leaves. The nymphs also inject toxins into the plants and the affected branches dry and die away. The adults are a carrier of viral diseases called Greening which spread from plant to plant. These pests occur mostly during March – October.

Control & Management – Release *Coccinella septempuntata* or *chrysopid* to the plants as these organisms feed on the nymphs of the pests. Spraying Bio catch *(Verticillium lecanii)* @ 5 ml in 1 litre of water can be done.

4. **Citrus Aphids** – Aphids are of two types i.e. black and green. The black aphids infest the plants throughout the year. While the green aphids can be seen during March – April in the fruit plants. Aphids act as a vector for *Tristeza* virus which causes quick decline. These aphids suck the sap from the growing leaves, shoots and flower buds. This results in shortening of internodes, curling and twisting of leaves.

Control & Management – All infested leaves and branches should be collected and burnt away. Spray Bio-catch *(Verticillium lecanii)* @ 1 tsp or 5 gram in 1 litre of water during the month of February – March, June – July and September – October.

5. **Mealy bugs** – These bugs usually appear during July – October. They infest both the seedlings in nursery and the full grown plants. The eggs are laid in clusters in a protective cottony mass. They secrete a white sticky coating and suck the saps of tender branches and fruits. Later, the affected parts become pale, wilt and dry up.

Control & Management – All infested leaves and branches should be collected and burnt away. Digging should be done around the base of the trunk during summer. Then spray *Beauveria bassiana* or Bt @ 5 kg for 2.5 acre of the orchard. During December we can wrap the trunk of the plant with a plastic sheet of about half meter from the ground. Then applying grease all around the plastic sheet will prevent the bugs or ants to climb and infest the plant.

6. **Leaf Miner** – Leaf miners are more prevalent during the months of March- May and July – October, both in nursery and field. The pests are active throughout the year, except severe winter. Small larvae mine into the leaf tissues making silver coloured tunnels on the lower portion of the leaves. Then the leaves become yellowish and fall off.

Control & Management – Damage parts should be collect and burned. Bio-catch *(Verticillium lecanii)* @ 5 ml per 1 litre of water can be sprayed.

7. **Scale Insects** – These insects feed on tender leaves. They secrete honey dew which attract ants to feed on the dew forming a sooty mould fungus. The infested leaves and fruits die and fall off.

Control & Management - Damage parts should be collect and burned. Bio-catch *(Verticillium lecanii)* @ 5 ml per 1 litre of water can be sprayed.

8. **Fruit fly** – Fruit fly is usually prevalent during the months of August – September. The infestation by fruits flies causes fruit drop and yield loss. Flies deposit the eggs inside the fruit and the larva drop down in the soil for pupation. Maggots feed on the pulp and the affected fruits fall down.

Control & Management – Light tillage should be done to the soil at the base of the trunk, to destroy the fallen larvae. After ploughing Pacer *(Metarrhizium anisopliae)* @ 5 kg for 2.5 acre of the land is to be applied.

9. **Bark Eating caterpillar –** This is a serious pest of orange and the infestation of the larva is throughout the year. Eggs are usually laid in cracks on the bark of the plant and after hatching the brown-coloured larva starts feeding on the bark. Larva bores into the trunk of branches and feed inside. In severe cases the plant may die.

Control & Management – Cotton balls dipped in petrol or kerosene oil are inserted into the holes in the branch and trunk of the plant. Later the holes are blocked by filling with soil and cow-dung mixture.

Overall Management of Insect Pests –

1. Pruning and cleaning of the orchard should be done after harvesting.

2. The trunks of the orange plant should be smeared with Bordeaux paste up to 1 m height.

3. Installation of pheromone traps to manage fruit flies aphids, leaf miner and psylla.

4. The orchard should be monitored frequently.

Diseases of Orange plant

1. **Citrus gummosis –** The pathogen is soil borne and attacks the plant in the basal portion. Large water soaked lesions on the basal portion of the stem is seen. The lesions turn brown and crack. Later, gum comes out of the affected area.

Control & Management –

a. The affected parts of the stem should be scraped out properly followed by applying Bordeaux mixture to the trunk about 20-30 feet from the soil level.

b. The soil should be drenched with *Trichoderma viridae* or *viricon L* @ 1 teaspoonful in 1 litre of water.

2. **Powdery Mildew –** This disease affect the plant both in nursery and field. The powdery growth appears on both sides of the leaf surface. The leaves become small, distorted and fall off causing premature fruit fall. The affected branches may have die back symptom because of secondary infection.

Control & Management:

a. Affected plant parts should be removed.

b. Baking soda @ 1 tsp in 3 litres of water can be sprayed.

c. It can be managed by spraying powdery care *(Ampelomyces quisqualis)* @ 1 tsp mix in 1 litre of water.

3. **Scab** – Formation of scabby or corky outgrowth is seen on the leaves, twigs and fruits. The spots are more common on the lower surface of the leaves. The surface of fruits becomes rough and distorted.

Control & Management:

a. The infested parts should be removed and destroyed.

b. Bordeaux mixture @ 1% (100 g lime + 100 g CuSO4 in 1 litre of water) can be sprayed.

4. **Canker and Bark eruption** – The pathogen affect all parts of the plant. Canker-like out growth can be seen on leaves, twigs, thorn and fruits. The lesions appear like water soaked spots which enlarge slightly and turn brown and corky. Severe infection leads to defoliation and die back.

Control & Management:

a. Pruning and destruction of infected plant parts

b. Spraying of Neem oil @ 6-7 tps in 1 litre of water.

c. Spraying of Bordeaux mixture 1% (100 g of lime + 0.5 litre of water + 100 g of CuSo4 + 0.5 litre of water). This mixture should be sprayed three times during February, October and December.

5. **Greening** – The general symptom of this disease is blotched mottling and yellowing of veins. Leaves fall off during summer followed by twig die back. In severe attack there is reduction in flower and fruit formation. Uneven ripening with one side yellow and other side green is a characteristic symptom on the fruit. This disease is spread by citrus psylla.

Control & Management:

a. Proper selection of seedlings before planting.

b. Removal and uprooting of infected plants and burning.

c. Spraying of Neem oil @ 6-7 tsp / 1 lit of water.

d. Spraying of *Beauveria bassiana* or Bt @ 5 g per 1 litre of water

6. **Blue and Green Mould** – The common symptoms is appearance of sooty growth and powdery growth on the fruits usually fruits that have been attacked by fruits flies are more prone to this disease.

Control & Management:

a. The infested fruits should be removed and burned.

b. After harvesting fruits should be stored in a place having proper temperature and humidity.

7. **Fruit Drop in Orange** – Fruit drop usually occurs during the months of May – June. The main causes of fruit drop may be due to climatic changes and improper irrigation. The cause may be also due to lack of manuring or nutrition and plant being infested by pests and diseases.

Control & Management – Proper irrigation should be maintained specially at the time of fruit bearing period. Proper manuring should be given to the plant. Pruning should be done after harvesting and there should be no water stagnation at the base of the plant. All the dropped fruits should be collected and buried. Spraying of Multiplex @ 2.5 ml in 1 litre of water can be done.

8. **Citrus Decline** – Citrus decline is one of the main problem in orange plantation which affects the yield badly. Tristeza is a serious viral disease causing various deficiency symptoms in leaves like leaf falling, root decay, die back of shoots and finally death of the tree. Citrus decline may advance in badly maintained orchard, in ill drained soils and also due to malnutrition and insect pest attack.

Control & Management – Though appropriate control measures are not available as a means of rejuvenating the decline plant, the following measures may be followed.

a. Removal of all dead woods before new growth starts and spraying Bordeaux mixture and covering all cut surfaces with Bordeaux paste.

b. Applying more organic manure to the plant.

c. Regularly following the recommended plant protection for control of pests.

d. Select seedlings from disease free field.

e. Use of tolerant rootstock for grafting like Rangpur lime.

9. **Granulation in orange –** Granulation is drying up, becoming hard with greyish colour and enlargement of the juice vesicles. This condition increases the content of pectin, lignin etc. resulting in reduction of the juice content. Granulation occurs more in young Vigorous trees. Factors affecting granulation are:

a. Climate (Humid).

b. Cultivars.

c. Rootstocks.

d. Mineral nutrition.

e. Enzyme and plant growth regulator.

f. Crop load.

Control & Management – There is no successful method to control granulation in orange. But it can be minimize by spraying Bordeaux mixture 1%. Less irrigation and early picking of fruits can be done.

Harvesting – Mandarin being non-climacteric should be harvested at the right stage of maturity. The tree starts bearing from the 4th year but commercial yields can be obtained from 10th -12th years onwards. Harvesting season starts from August and extends up to April depending upon the location and the variety grown.

DAY 43: 10:00 am – 12:00 Noon: HORT III: Cultivation of Gladiolus

Gladiolus is a classic perennial known for its tall flower spikes. A great cutting flower, gladioli look beautiful in midsummer bouquets. Here's how to grow gladioli in your garden.

Available in a multitude of colors, gladioli grow between 2 to 5 feet in height.

The taller varieties, which should be staked, are often placed in the back of a garden to nicely complement shorter plants.

In Zone 7 and colder, gladioli corms need to be lifted in the fall and replanted the following spring.

PLANTING

Plant gladiolus corms in the spring once the danger of frost has passed and the soil has warmed.

- Gladioli like well-drained soil and full sun.

- Ready your garden by using a garden fork or tiller to loosen the soil to about 12 to 15 inches deep. After loosening the soil, mix in a 2- to 4-inch layer of compost or aged manure.

- If your grow gladioli primarily for cut flowers, plant them in rows. It's easier to tend the plants and to harvest the flowers.

- If planted with other flowers in borders or annual bes, plant the corms in groups of 7 or more for best effect.

- To ensure large-sized blooms, plant corms that are 1¼ inch or larger in diameter.

- Set the corm in the hole about 4 inches deep with the pointed end facing up. Cover with soil and press firmly.

- Space the corms 6 to 8 inches apart.

- Water the corms thoroughly.

- If you’re planting tall varieties, be sure to stake them at planting time. Be careful not to damage the corms with the stakes.

- It takes about 60 days from the time gladioli are planted for the corms to root, grow, bloom.

CARE

- Put a 2- to 4-inch layer of mulch around your gladioli to keep your soil moist and help prevent weeds.

- If you get less than 1 inch of rain a week, water your plants regularly throughout the summer. Otherwise, water them moderately when in growth to keep the soil moist.

- Remove the faded/dead flowers to ensure continuous blooms. Once all the flowers on a stalk are gone, cut the stalk off at about 2 to 3 inches above the soil.

- Be sure to leave the plant intact so it can mature and rejuvenate the corms for the next season.

- If you live in Zone 8, put down a layer of hay or straw for winter protection.

- Corms should be dug before the first fall frost if you live in Zone 7 or colder.

PESTS/DISEASES

- Gladiolus corm rot (*Fusarium wilt*)

- Gray mold

- Viruses

- Aster yellows

- Spider mites

- Thrips

- Aphids

HARVEST/STORAGE

CUTTING GLADIOLUS FLOWERS FOR BOUQUETS

- Cut the flower stalks early in the morning or at night, not during the heat of day.

- Use a sharp knife and bring a bucket of lukewarm water to the flower bed.

- Cut stalks with only one or two open flowers. The rest of the buds will open after you put them in a vase.

- Cut diagonally through the stalks and place them in the bucket.

- Leave at least four leaves on the plant in the ground if you want to re-use the corms.

- Place the bucket with the flowers in a cool dark place for a few hours before arranging them in a vase.

- Remove lower fading flowers and cut about 1 inch off the bottom of each flower stalk every few days.

STORING GLADIOLI CORMS

In colder regions, dig up gladioli corms once the foliage has faded but before the first fall frost.

- Use a spade and dig up the entire plant, grasping the top to pull it out of the soil. Avoid bruising or injuring corms while digging. Shake off all loose soil and discard damaged corms. Cut the stalk within 1 inch above the corm. Save the small cormels separately if you so desire. These will bloom in 2 to 3 years if you replant them each spring.

- Allow the corms to dry in the sun for 1 or 2 days if the weather agrees. Sift out excess soil and place corms in wooden flats or trays. Cure in a warm and airy location for 2 weeks at a temperature of 80 to 85°F (27 to 29°C). Remove and throw away the oldest bottom corms (from the base of the new one).

- Don’t remove the husks on the corms.

- Dust the corms with a fungicide (“bulb dust”) to avoid disease problems. Place dust and bulbs in a paper bag and shake vigorously.

- Store the corms in paper or cloth bags, pantyhose, or old onion sacks. Stack or hang the containers so air can move among them. Store the corms at 35 to 45°F (2 to 7°C) in low humidity. A cool basement is quite suitable. Do not allow corms to freeze.

- Replant these corms in the spring for another year of beautiful blooms.

- Learn more tips for storing gladiolus through the cold winter.

RECOMMENDED VARIETIES

- ‘Candyman’, for its beautiful deep pink flowers

- ‘Dream’s End’, which makes a good back border plant because its flower spike is up to 3 feet tall (and it has pretty light orange flowers with large yellow centers)

- ‘Prins Claus’, which has white flowers with splashes of pink on its petals

- ‘Black Star’, which has deep purple-red blooms and reaches 36 to 60 inches tall

- Glamini Glads are pest resistant and bloom in full sun or partial shade. Their shorter height is perfect for the middle or front of flower beds.

WIT & WISDOM

- Gladiolus is one of the August birth flowers.

- Gladiolus is sometimes called a Sword Lily due to its sword-shaped leaves.

- In the language of flowers, gladiolus signifies remembrance.

1:00 pm – 3:00 pm: APICULTURE:

1. INTRODUCTION TO APICULTURE:

Before Man learned to manufacture sugar, he depended for his sweets largely upon honey. Bee-keeping therefore, is one of the oldest agricultural pursuits of man. The modern scientific and commercial method of bee-keeping for the production of honey and beeswax is known as apiculture.

The primitive method of collecting honey is by killing the resting bees by flames and procuring their combs. The combs are then cut and squeezed to extract honey. This method is not crude but also the honey thus extracted is not pure. The honey bees are now reared in artificial hives invented by Longstroth in 1951. The bees are attracted to form cells and combs on the comb foundations which are then removed for extraction of honey.

For extraction of honey, the combs are placed in a honey extractor which throws out the honey by centrifugal force without damaging the combs which are used repeatedly. Thus pure honey is obtained in large quantity.

Bee-keeping or apiculture is widely practiced in USA, Canada and Australia. In India also it is thriving cottage industry. The Khadi and Village Industries Commission (KVIC) and the Indian Council of Agricultural Research (ICAR) are making efforts to raise the industrial status of apiculture in India.

In Meghalaya, some farmers are practicing the rearing of honeybees in addition to their farm activities mostly for domestic consumption. There are few farmers only who are rearing the honeybee for commercial purpose. The Meghalaya Khadi and Village Industries Board is imparting training on beekeeping time to time and the bee boxes are being sold at 50% subsidized rate. Recently the KVIB in collaboration with Horticulture Department launched awareness campaign on bee keeping in the whole of Meghalaya and the bee boxes are being sold at Rs. 400/- each (50% subsidized rate) to encourage the farmers of the District.

2. KINDS OF HONEYBEES

There are four species of honeybees in India. They are the giant rock bee *Apis dorsata* F., and the little bee A. *Florea* F., the Indian honeybee A. *Indica F. and the* Dammer bee or mosquito bee, *Melipona iridipennis* Dal. The former three have well-developed stings but the last has only a vestigial one. All the four species are social insects.

ApisdorsataIt is the largest of the honeybees. It builds an open single comb of huge size. The comb is fully exposed and hangs from inaccessible branches of trees, along the sides of steep rocks in the forest and even from the walls, roofs and other parts of buildings. It produces plenty of honey and the annual yield from a colony is about 37 kg. It is impossible to domesticate because of its irritable and ferocious nature.

Apis florae It is known as the little bee since it is the smallest of the three species of Apis. It is seen only in the plains. It builds single but small combs on bush plants and corners of roofs. It yields very little honey, about 0.5 to 1 kg per year from a colony, and so, it is not domesticated and reared.

Apis indica It is the common Indian bee found both in the forests as well as in plains. It builds many parallel combs in the cavities and hollows of trees, caves and such other hidden sites. It is mild and is the only from capable of being domesticated and is commonly reared in South India. The annual yield of honey is 2 to 5 kg per colony.

Melipona iridipennisThe dammer bee istiny with a vestigial sting. It inhabits crevices in wallsand hollow trunks of trees. The comb is made up of a dark material called "cerumen" which is mixture of wax and earth of resin. The brood cells are of the shape of tiny ellipsoid pellets. It is a very poor honey gatherer and yields only 60 to 180 ml per colony per year.

In Meghalaya the Rock bee, Apis dorsata and Indian bee, Apis indica are found abundantly. The Apis indica (Indian bee) is domesticated by the farmers for commercial purpose. The other small bees like Melipona Sp. (little bee) and Apis floral (Bammar bee) are also found in Garo Hills but the Melipona Sp. Is domesticated in the villages for it home consumption only.

3. HABITS AND HABITAT

Honeybees are social and colonial insects found all over the world. They have developed one of the most highly organized societies known to the animal world. Their colonies live in nests or bee hives, harboring and thousands of individuals, exhibiting a remarkable polymorphism and division of labour. They feed on pollen and nectar of flowers and manufacture honey and beeswax. They communicate with each other through a sign language. Mating occurs in nuptial flight, after which the males die. Development includes complete metamorphosis.

4. ECONOMIC IMPORTANCE OF BEE-KEEPING

Apiculture is important for the production of honey, a valuable nutritious food and other byproducts like waxes and for environmental protection. It is an income generating activity which provides farmers with pollinators for agricultural crop production and forestation. Bee-keeping is one area of Agro-industries where it provides employment, income and a measure of economic security and well-being. The honey bees are beneficial insects by giving very useful by products to mankind in the form of honey, wax etc.

Apis dorsata

Apis indica

Honey:

In nature, the bees are able to make honey, but man could not. The salivary enzyme of bees converts the complex sugar of nectar into a simple sugar of honey. Honey is a natural antiseptic due to the presence of an anti-bacterial agent. It prevents infection if placed on the wound.

Beeswax:

It is secreted in the form of small flakes. Bees consume 10-20 kg of honey to produce one kg of wax. It is used extensively in the manufacture salves, varnishes, polishes and various waxes. It is used for medical purposes.

Pollination:

The honey bees are probably of greatest importance to agriculture in the pollination of plants. Certain orchard trees yield very little without the aid of the bees. Probably more than 80% of the insect-pollination of fruit and seed crops today is done by honey-bees.

5. ROLE OF BEES AS POLLINATORS

CROSS-POLLINATION isessential for proper fruit set for a number of an Agricultural and Horticultural crops. Honeybees are, considered to be the most effective pollinators. In fact cross-pollination of entomophilous crops by honey bees is one of the most effective and cheapest methods of enhancing crop yields.

Honeybees are most efficient pollinators of several cultivated and wild plants on account of the following characteristics.

- Its body parts are specially modified to pick up pollen-grains in a large number.
- The bee shows flower fidelity and consistency.
- The bee has potential for long working hours.
- Does thorough micro-manipulation of flowers.
- Maintains high populations when and where and where required.
- Adapts itself to different climates and niches.

Table 1. Increase in yield due to bee pollination.

Crop	Increase (%)
Almond	15 – 20
Apple	15 – 20
Cashew	5 – 15
Cherry	5 – 15
Citrus	10 – 20
Coconut	3 – 5
Cucurbit	15 – 20
Grapes	10 – 20
Guava	2 – 10
Litchi	20 – 25
Mango	3 – 5
Papaya	5 – 10
Pear	10 – 15
Plum	10 – 15

This increase in yields of various crops due to pollination by honeybee's ranges from 5 to 25%, while there is a tremendous increase in fruit set. The increase in yield due to honeybee's pollination for selected crops is given in Table 1.

Many of these crop require 3 – 9 bee colonies/ha for an adequate pollination. The requirement of honeybee colonies for different crops in given in table 2.

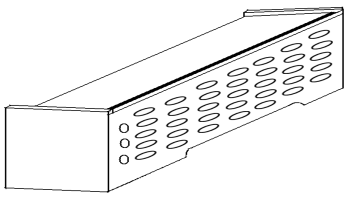
Table 2. Requirement of bee-colonies per ha.

Crop	Hives/ha	Crop	Hives/ha
A. Fruits		**B. Vegetables**	
Almond	5 – 8	Cucurbit	Up to 10
Apple	2 and above	Onion	12 – 36
Cherry	2 – 3	Pumpkin	2 – 4
Grape	1	Radish	5
Mandarin	4	Turnip	5

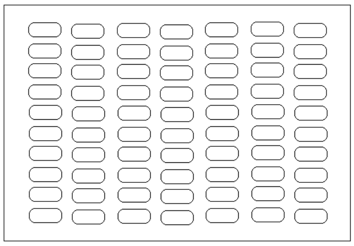
Mango	8 – 15
Watermelon	1 – 8
Peach	1 – 3
Plum	2 – 5
Strawberry	20 or more

6.FUNCTIONING OF DIFFERENT TYPES OF HONEYBEE

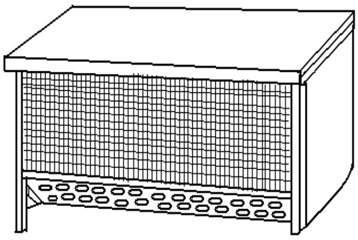
Queen: Every colony has a queen which in the mother and only sexually developed female. All the members of colony are the product of queen, so that it is called as mother queen. She mates with the drone, the male bee, in the air once or more in her lifetime and lays eggs throughout her life. Her reproductive organs are well developed. A well developed queen is generally two or three times bigger than workers measuring 15 – 20 mm in length. She can be distinguished by her extended abdomen and provided with a combine sting and ovipositor. The lays 2 to 2,000 eggs per day and about 15 lakhs eggs are laid in her life time. Queen lives for 2 to 5 days and when it is weak or unable to lay eggs it is replaces by one of the daughter's queens.



Drone Trap



Queen Excluder sheet



Swarm Trap

Drone: The drone is the male bee, the main function of which is to mate with queen. It is smaller than the queen and measures 15 – 17 mm in length. They are not permanent members of the colony. They are driven out of hive before the setting of monsoon and winter, therefore, die due to colony to starvation and rose only when new queens and are reared. They are reared from the unfertilized eggs and do not possess structural modifications, therefore, incapable of collection food or defending themselves against enemies.

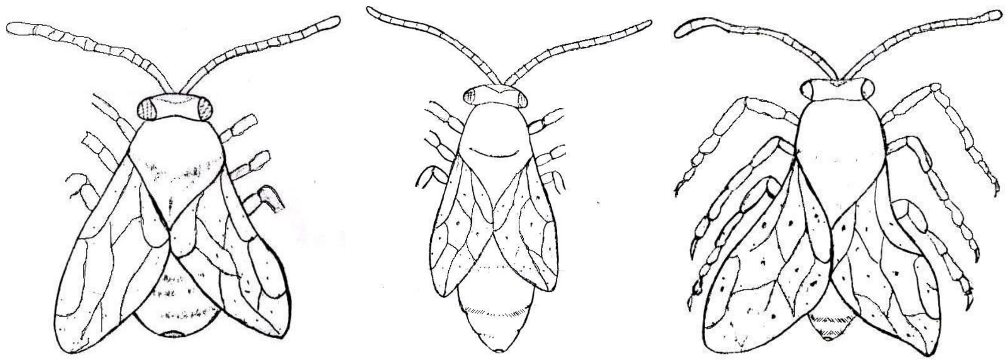
Workers: They are under developed females which are produced from the fertilized eggs but remain sterile due to non availability of royal jelly. Following are the main characteristics of workers.

1. It is smaller in size than queen and has a sting on the terminal end of abdomen.

2. On ventral side of abdomen, wax glands are found.

3. Hind legs are modified for pollen collection.

4. The mandibles are flattened and spoon shaped which are used for molding the wax for comb building.



DRONE QUEEN WORKER

Honey bees are responsible for all the works necessary for the maintenance and welfare or responsible.

- o Building of comb with wax and its maintenance.
- o To collect honey, pollen and water for the use of the colony.
- o To take care of the queen and feeding of royal-jelly.
- o To guard the coolly against enemies.
- o To maintain the temperature of hive by cooling and heating the comb as per requirement.

7. Activities during the year

The honey bees remain active generally throughout the year except during severe winter. Following are the main activities of honey bees.

(a) Combing: The comb of honey bees comprises of several hexagonal cells on both side of mid-rid. They build their comb to the ceiling of the cavity or lower side of the branch. In the upper cells they store honey and pollen and in middle and lower raise their young ones. Freshly built comb is generally white, but becomes dark after some times. The filled cells are closed with a cap.

(b) Swarming: Duringspring and summer when conditions are favorable and food is plenty, multiply greatly with the result the comb becomes crowded and the bees begin to make preparation for swarming. At this stage daughter cells are built at the bottom and when new queen is ready to emerge out, the queen and a large number of workers which have previously filled the cells with honey, leave the nest to start a new colony. Swarm settles in a suitable place already searched out by the workers for building new comb.

In a parent colony the first queen daughter which emerges after swarming, kills the baby queen in the other cell and establish herself as a queen mother. After that, they start their routine work of gathering nectar and pollen.

Migration or Absconding: The following are the main reason for the migration of bee.

i. Scarcity of food.

ii. Unfavorable environment.

iii. Destruction of combs by man or other animals.

When they migrate from one place to another they take all honey nectar with them from the old comb. But on disturbance, they fly to save their life and will return to same place after sometime.

8. SOCIAL LIFE IN HONEYBEES

A colony of honeybees is really a family in which the association between the three castes for common benefit is so highly organized and their activities so efficiently coordinated that the individuality of the single bee becomes merged with the complex social organization. The qualities which help honeybees to lead a successful social life are given below:

1. The colony has a single queen. Due to her long span of life she develops a parental care and love for the other members of the colony, thus strengthening the foundations of family life.

2. In a family, each individual has to work for the mutual benefit of the other. There is a remarkable degree of division of labour among the nurse bees as well as among the foraging bees.

3. The bees in a colony have a "hive mind" and live together be the "hive Adour" peculiar to each hive.

4. The habit of storing food in the comb for long periods helps the family life.

5. Coordination of activities.

There is close cooperation and understanding between the different members of the colony. While they wander about the colony the nurse bees gather information as to the tasks to be undertaken. The young bees receive food from older bees which receive from still older ones.

In the colony, the pheromones are transferred between bees either by direct bodily contact, through their food or through the hive atmosphere. The most important pheromone is the "queen substance". It is licked by workers and may be regurgitated along with food and passed on to other workers. The secretion of mandibular glands of the queen controls queen rearing and ovary development in workers and attracts drones in mating flights and workers in swarming flight. According to the needs of the colony, the bees collect either or pollen, or both, in a single trip or during a number of successive field trips.

9. LIFE HISTORY

The eggs are laid by queen and when queen a colony wants to produce a new queen, the special cells are constructed at the lower border of the brood comb. On these cells, single eggs are laid by the queen in each cell which hatches after 3 days. The newly hatched grubs are provided with royal jelly. The grubs is fully developed in 5 days or 6 days and the queen is capped where grub changes in to pupa and after a week adult come out by biting the cap of queen cell. The adult who comes out earlier becomes the queen daughter and it kills the remaining before their emergence.

Honey Comb

Bee Box

Honey Chamber

3:00 pm – 5:00 pm: APICULTURE: REARING OF HONEY BEES

Bees are rear for the production of honey, pollen, bee-venom, bee-wax, royal jelly, pollination of crops, etc. First of all, we should select suitable place for rearing bee colonies, purchases complete bee-hive boxes and affixes foundation in half portion of each frame and places them in bee-hive boxes.

After this we should catch the bees and induces them into and transfer consisting of queen bee, workers bee and drones then inspects beehives to locate formation of surplus queen cells and catchers or destroy them clean wax hives and removes dirt.

At this stage, we should detect wax moth and removes it before it spread into different combs, feeds the bees with sugar solution when necessary dearth period (June – September) keeps the hives on stools with their legs dipped in water bowls to prevent ants from attacking the hives. The hives are covered with wire nets for protection against birds. Beekeeper should be vigilant to catch swarming queen and bee with the help of swarming net and keep them in hive to starts new colonies. As the flow of honey start to upper chamber of beehives boxes and replace fresh unfilled once periodically.

After raw honey is collected from the extractor, it needs to be processed by heating, filtering and sealing in good bottles.

The following apparatus and equipments are required for beekeeping is as follows:

1. Bee hive, 2. Comb foundation, 3. Smoking apparatus, 4. Hand gloves, 5. Scrapper, 6. Sharpen knives, 7. Honey extractor apparatus, 8. Net, 9. Swarm bag, 10. Queen Excluder sheets, 11. Drone trap, 12. Transfer box or capturing box, 13. Queen Cage, 14. Hive stools, 15. Frame stands, 16. Ants proof cups

Bee hives - Various types of bee hives are available for bee keeping. They are wooden boxes having two parts upper ¼ combs chamber and lower ¾ brood chambers.

In between these two chambers a net (series of parallel wires) is used by which worker may go from one chamber to another but not the queen. This net is known as queen excluder. The queen is kept separate in the lower chamber only so that she may not lay eggs on the upper chamber. The hive remains closed from all sides and is provided with a small on the bottom from which only a worker may pass. Since the Indian honey bee by nature makes parallel comb in a place, therefore wooden planks are hanged at a distance of 10 to 12.5 cm in lower chamber.

Comb foundation – It is a sheet of pure bee wax with a base of worker brood cells embossed on it. It is fixed in a frame with wires and the bees construct a complete comb on it. It helps in obtaining regular strong worker brood cell comb.

Smoking apparatus: It is a thin container, from which smoke is generated when bees are furious, which become silent due to smoke.

Hand gloves: These rubber gloves are used at the time of handling the bees.

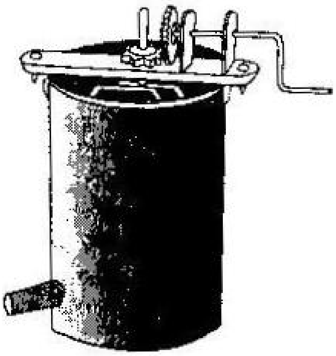
Scrapers: It is a flat iron plate used for handling the bees.

Net: It is made of either silken or cotton thread and wore on head, to get protection from their attack.

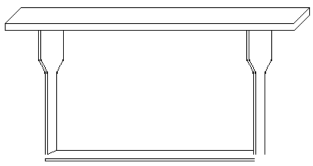
Honey extracting apparatus: Honey extractor works on the principle of centrifugal force and throws out honey from cells without breaking the combs.

Knife: Knife is used for recapping the cells in which honey is filled so that it may be extracted easily.

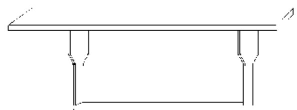
Cleaning the Honey Combs



Honey Extractor



Supper Frame



Brood Frame

BEEHIVE OR NEST

The beehive or nest is commonly built hanging down vertically from a rock, building or branch of a tree. The nest is made of a series of vertical combs parallel to each other, leaving a little gap in between them. Each comb consists of two layers of hexagonal chambers of "cells" that lie back to back and nearly horizontal. Their walls are extremely thin and fragile. These cells are made of wax produced by abdominal glands of the worker bees. Before use, the wax is masticated and mixed with secretions of cephalic glands to convert into a plastic substance. The cells are meant for storing or for breeding.

The storage cells, containing honey and pollen, are usually built near the top and margins of the comb. They are capped with wax. The brood cells generally occupying the lower and central position contain the young stages.

ESTIMATION AND SCHEME OF BEE KEEPING

Fixed Capital:

(A) Land - Own

(B) Building - Rs. 50,000

(C) Machinery/Equipments

Sl. No.	Items	Rate	Qty.	Total (Rs.)
1	Bee boxes with lids	720/-	12 nos.	8440/-
2	Bee box standing pole	200/-	12 nos.	2400/-
3	Queen cage	50/-	12 nos.	600/-
4	Extractor machine	950/-	12 nos.	1900/-
5	Bee colony	200/-	12 nos.	2400/-
6	Capturing Net	75/-	5 nos.	375/-
7	Smoker	450/-	2 nos.	900/-
8	Bee Knives	15/-	5 nos.	75/-
9	Bee Capturing Boxes	450/-	2 nos.	900/-
10	Hand Gloves	-	-	150/-
11	Misc Equipment (feeding pots, ants protection cups, etc	-	-	3000/-

Total = Rs. 21340/-

(D) Furniture's and Fixtures

Sl. No.	Items	Rate	Qty	Total (Rs)
1	Working table	2000/-	1 no.	200/-
2	Office table	800/-	1 no.	800/-
3	Storage table	2000/-	1 no.	2000/-
4	Chairs	350/-	1 no.	350/-

Total = Rs. 6,200/-

Total fixed Capital (A+B+C+D) = Rs. 77,540/-

Working table:

A) Raw Material:

Feed for bees - Rs. 0

B) Salary Wages:

Worker @ Rs. 800 2 Nos. - Rs. 800/-

C) Other necessary Experiences:

Miscellaneous - Rs. 700/-

Total working capital (A+B+C) = Rs. 1500/-

Total capital investment = Total Fixed Capital + Total Working Capital

= Rs. 79,040/-

Cost of production per annum

1) Raw Material: = Rs. 0
2) Salary and Wages = Rs. 9600/-
3) Necessary Expenses = Rs. 8400/-
4) Depreciation:
   a) Building @ 5% pm = Rs. 2500/-
   B) Equipments @ 5% pm = Rs. 1067/- 3

Total = Rs. 21,567/-

Turnover per annum:

In 1 cycle of production, production of Honey – 8 kg per colony

For 12 cycle colonies, production of Honey – 96 kg

For 3 cycle in 1 year, Production of Honey – 288 kg

(Sold @ Rs. 150/- per kg)

Turn Over per annum = Rs. 43200/-

Net profit per annum:

= Turn Over-Cost of Production

= Rs. 21,633/-

DEVELOPING OF BEEKEEPER:

Presently there are about 2.29 lakhs beekeepers producing honey worth about Rs. 43.21 crores in the county (Table 3)

Table 3. Development of beekeeping industry in India (Handbook of Horticulture)

Year	Number of beekeepers	Number of bee colonies	Production of honey (tones)	Value of honey (Lakh Rs.)
1953 – 53	232	800	128	0.02
1963 – 64	57,198	1,64,597	713	37.63
1973 – 74	1,50,421	5,22,714	2,435	365.25
1984 – 85	2,00,000	8,68,000	5,500	950.00
1990 – 91	2,46,000	10,61,000	9,288	2,322.00
1995 – 96	2,73,000	6,10,000	7,837	3,173.46
1999 – 2000	2,29,000	76,400	13,098	4,321.07

The role of insects in cross-pollinating the horticultural crops in established fact. The honeybees have been considered to the most efficient pollinators. They not only help on pollination but also produce honey and other produces which add to the farm income. The benefits derived through enhancement in crop yields are much more than the income derived sale of honey and other hive products.

CONCLUSION:

Beekeeping is one of the ventures which can provides income to the farmers. It can generate self employment and satisfaction to the farmers, and on the other hand increases the production of different crops with the help of cross pollination. So, beekeeping is an ideal activity for development as a subsidiary occupation providing supplementary income to the people in rural, hilly and tribal areas particularly because of rich flora. Besides supplying honey and other bee products, and agro-horticultural crop pollination services, bee-keeping gives the person a mental satisfaction and happiness irrespective of sex, are and qualification.

DAY 44: 10:00 am – 12:00 Noon: INTEGRATED NUTRIENT MANAGEMENT

Integrated Nutrient Management is the use of different sources of plant nutrients integrated to check nutrient depletion and maintain soil health and crop productivity.

It is a practice where all sources of nutrients namely organic manures, inorganic/chemical fertilizers, bio-fertilizers are supplied as plant nutrients for better utilization of resources and to produce crops with less expenditure.

Mineral Nutrients: These are elements present in the soil which can be absorbed by the plants for its growth and development.

Nutrient Management: The adequate and timely application of essential nutrients by way of application of manures, fertilizers, bio-fertilizers, etc.

List of 16 Essential Nutrients

1. Carbon
2. Hydrogen
3. Oxygen
4. Nitrogen
5. Phosphorous
6. Potassium
7. Calcium
8. Magnesium
9. Sulphur
10. Iron
11. Manganese
12. Zinc
13. Copper
14. Boron
15. Molybdenum
16. Chlorine.

Classification of essential Nutrients based on amount required by plants:

- ✓ Basic Nutrients
- ✓ Macro nutrients
- ✓ Micro nutrients

NUTRIENT MANAGEMENT

The resource components available for nutrient management in organic farming

Green Manure

Ploughing or turning down tender and fresh green biomass into the soil, for the purpose of improving fertility and physical condition of the soil.

Crop residues and weed biomass

The crop residues can be recycled through direct incorporation, compost making and mulch material.

Hedge row /alley cropping

1. Growing leguminous hedge row species in the boundaries will not only protect the field from outside contaminations but also a very good source of plant nutrients and feed forcattle.
2. The pruning of N fixing hedgerow species can add 20 - 80; 3 – 14 and 8 - 38 kg N, P and K / ha / year, respectively.

Vermicomposting

1. Vermicomposting is a method of preparing enriched compost with the use of earthworms
2. Vermi-wash is a liquid manure obtained from earthworm used in vermicomposting and is used as foliar spray. It contains plant growth hormones like auxin and cytokinin apart from nitrogen, phosphorus, potash and micronutrients.
3. Integrated application of FYM @ 10 t/ha and vermicompost 2.5 t/ha along with 150 kg rock phosphate

Mulching and cover crops

1. Paddy straw, crop residues, grasses, locally available weeds like Eupatorium, Ambrosia etc are widely used as mulching and covering material and improved soil fertility on decomposition.
2. Application of 5 tonnes FYM + 2 tonnes vermicompost + 3 tonnes green manures /
3. weed biomass (Eupatorium/Ambrosia) before 20 days transplanting and 250-300 kg
4. neem cakes during transplanting of rice crop is the best nutrient management options forrice.

Panchagavya

This contains all nutrients, microorganisms and plant growth nutrients in large quantity and acts 75 per cent as manure and 25 per cent as pest controller.

How to apply

Dilute 1litre of mother solution in 10 litres of water (10 % strength) and use as a foliar spray or 5 – 10 litres per acre in irrigation water

Biofertilizers

Types of biofertilizers

1. Nitrogen biofertilizers eg. Rhizobium (most widely used), *Azotobacter*, *Azospirillum*, BGA, Azolla etc.
2. Phosphate biofertilizers eg. *Bacillus*, *Pseudomonas*, *Aspergillus*, *Trichoderma*, VAM etc.

Application method

Seed treatment

Suspend 200 gm each of nitrogen fixing and PSB in 300-400 ml of water and mix thoroughly. Pour this slurry on 10 to 12 kg of seed and mix by hands, till all the seeds are uniformly coated. Dry the treated seeds in shade and sow immediately.

Seedling root dip treatment

Suspend 1 to 2 kg each of nitrogen fixing (*Azotobacter* /*Azospirillum*) and PSB into just sufficient quantity of water (5 -10 lit depending upon the quantity of seedlings required to be planted in one acre). • Dip the roots of seedlings in this suspension for 20-30 min before transplanting.

Soil treatment

1. 2-4 kg of *Azotobacter* / *Azospirillum* and 2-4 kg of PSB are required for one acre.
2. Mix two types of biofertilizers (100-200 g) in 2-4 liters of water separately and sprinkle this suspension on two separate heaps of 50-100 kg of compost.
3. Mix the two heaps separately and leave for incubation over-night.
4. After 12 hours, mix the two heaps together.
5. In potato it is to be applied after 20 days of planting or at the time of earthing-up operations.

Use & contribution of NBF

Biofertilizer Contribution Use	**Biofertilizer Contribution Use**	**Biofertilizer Contribution Use**
Rhizobium (Symbiotic)	50-100 kg N/ha 10-35% increase in yield	Pea, lentil, black gram, green gram, soybean, ground nut etc.
Azotobacter (Non symbiotic) &*Azospirillum* (Associative)	20-25 kg N/ha 10-15% increase in yield	Wheat, maize, cotton, sorghum, sugarcane, rice, vegetables etc.
BGA or Cyanobacteria	20-30 kg N/ha 10-15% increase in yield	Flooded rice
Azolla (Symbiotic)	30-100 kg N/ha 10-25% increase in yield	Flooded rice

Use of Phosphate BF

Bio fertilizer	**Use**
PSB (*Bacillus, Pseudomonas, Aspergillus, Penicillium*etc.)	All crop
Mycorrhiza (Glomus, Gigaspora, Endogene etc.)	Forest trees, forage grasses, maize, millets, sorghum, barley

1:00 pm – 3:00 pm: HORT III: ROSE CULTIVATION

Varieties

Gladiator, Baby Pink, Sofia Lawrence, YCD 1, YCD 2, YCD 3 are commonly cultivated.

YCD 1

YCD 2

YCD 3

Soil and climate

It is generally suitable for higher elevation (1500 m and above). It can also be grown in the plains under ideal condition of fertile loamy soils with salt-free irrigation water. The ideal climate for rose growing should have temperature with a minimum of 15°C and maximum of 28°C. Light is important factor which decides the growth. The growth is slowed by day length, i.e. > 12 hours and heavy overcast, cloudy/mist conditions. High relative humidity exposes the plant to serious fungal diseases. In tropics the ideal temperature is 25°C – 30°C on sunny day and on cloudy day 18°C – 20°C. The optimum temperature should be 15°C – 18°C. These temperatures are extremely difficult to find and it's therefore to compromise.

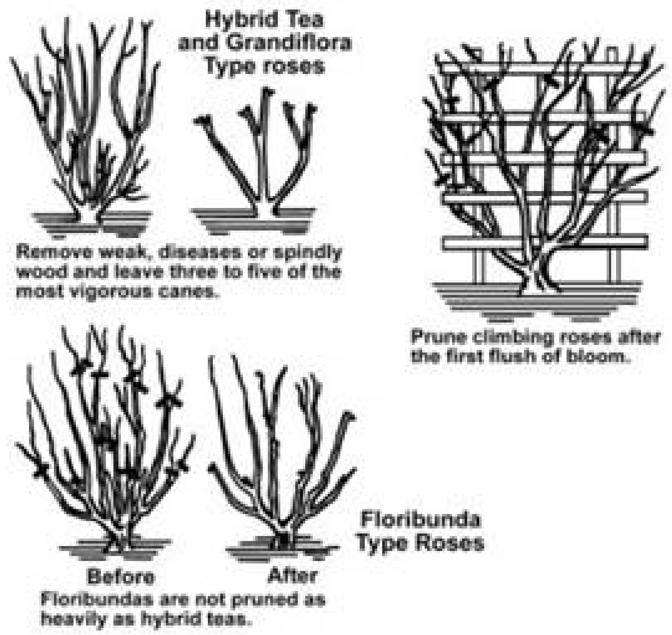
Propagation and planting

The crop can be propagated by rooted cuttings or by budding on Briar root stocks in hills and on Edward Rose and *Rosa indica* in plains. One year old budded plants are planted in July - August at 75 cm x 75 cm spacing.

Planting of Rose

After cultivation

The plants should be watered daily until they establish and thereafter once in a week. Pruning is done during March and October. Spray Diuran 2.5 kg a.i/ha to control weeds. Avoid spray fluid coming in contact with Rose plants.



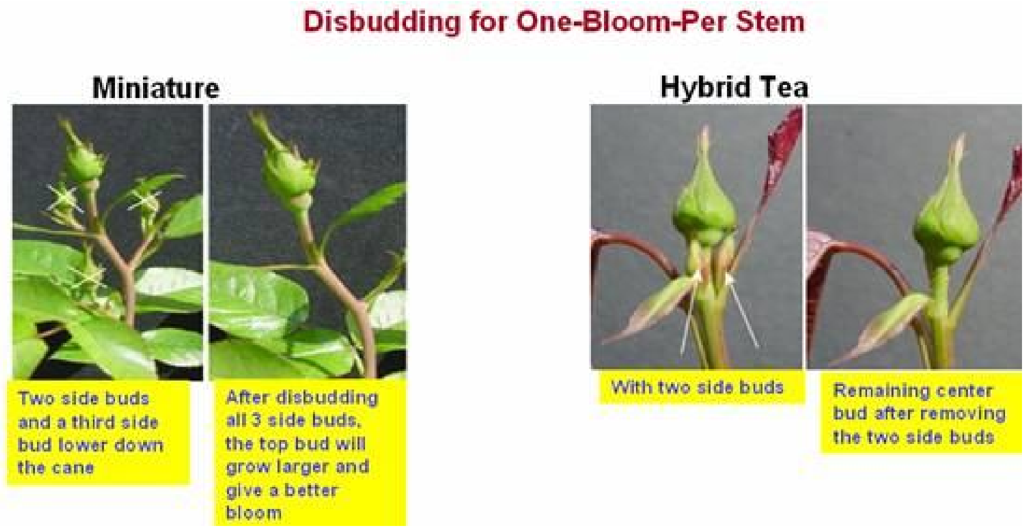
Pruning

Support of the plants

Post is placed at internals of 3m on both sides of the bed. Along the sides of the bed, galvanized wires or plastic string are fastened at the posts at 30cm – 40cm intervals to support the plant. Between the wires across the bed, thin strings can be tied to keep the width of the beds constant.

Disbudding

Varieties produce some side buds below the center bud. These side buds have to be removed or disbudded. The disbudding must be done regularly and also as soon as possible in order to avoid large wounds in the upper leaf axil.



Dead shoot removal

In the old plants the dead shoot or dried shoots on plants will serve as the host for fungi. So regularly these have to be removed.

Soil loosening on beds

After 6 months or so, there is every chance that the soil become stony and it has to be loosened for efficient irrigation.

Bending

Leaf is a source of food for every plant. There should be balance between Source (Assimilation) and sink (Dissimilation). After planting, 2 to 3 eye buds will sprout on main branch. These sprouts will grow as branches and these branches in turn form buds. The mother shoot is bend on 2nd leaf or nearer to the crown region. The first bottom break or ground shoot will start coming from the base. These ground shoots form the basic framework for production and thereon the ground shoots should be cut at 5th five pair of leaves and medium ground shoots should be cut at 2nd or 3rd five pair of leaves.

Bending

Defoliation

The removal of leaves is known as defoliation. It is done mainly to induce certain plant species to flower or to reduce transpiration loss during periods of stress. Defoliation may be done by removal of leaves manually or by withholding water. The shoots are defoliated after pruning**.**

Manuring

At three months interval, apply FYM at 10 kg and 8:8:16 g NPK/plant after each pruning. For cv. Happiness NPK may be applied @ 75:150:50 g/plant/year.

Harvest

Harvesting is done with sharp secateure at the tight bud stage when the colour is fully developed and the petals have not yet started unfolding. There should be 1-2 mature leaves (those with five leaflets) left on the plant after the flower has been cut. The reason for leaving these matures leaves is to encourage production of new strong shoots. Harvesting is done preferably during early morning hours.

Secateur for harvest **Harvesting technique**

Postharvest handling

Roses must be placed in a bucket of water inside the polyhouse immediately after harvesting and transported to cold storage (2-4°C). The length of time depends upon the variety and quality of the roses.The flowers are graded according to the length. It varies from 40-70 cm depending on the variety and packed in 10/12 per bunch.

Pre cooling **Grading** **Packing**

Physiological disorders
Blind wood

The normal flowering shoot on a greenhouse rose possesses fully expanded sepals, petals, and reproductive parts. The failure to develop a flower on the apical end of the stem is a common occurrence. Such shoots are termed as blind wood. The sepals and petals are present, but the reproductive parts are absent or aborted. Blind wood is generally short and thin, but it may attain considerable length and thickness when it develops at the top of the plant. This may be caused by low temperature, insufficient light, chemical residues, insect, pests, fungal diseases and other factors.

Bull heads or malformed flowers

The center petals of the bud remain only partly developed and the bud appears flat. They are common on very vigorous shoots, particularly bottom breaks, and it is possible that there is a lack of carbohydrates to develop the petals. The cause of bull heading is yet unknown, however, thrips infestation will also cause malformed flowers. Also at low temperature, some varieties will form bull heads.

Colour fading

The off- coloured flowers are seem to be a problem with some yellow varieties. In these varieties the petals may be green or a dirty white instead of a clear yellow. Raising the night temperature several degrees will reduce the number of off-coloured flowers. Occasionally the pink or red varieties develop bluish-coloured flowers. This is very often associated with use of organic phosphate and various other kinds of insecticides.

Limp necks

The area of the stem just below the flower "wilts" and will not support the head. This may be due to insufficient water absorption; cutting off the lower 1 to 2 inches of stem and placing the cut stem in water at 37°C will revive the flower.

Blackening of rose petals

This is caused by low temperature and high anthocyanin content. GA3 treatment causes accumulation of anthocyanin in petals of Baccara roses. This effect was more pronounced at low temperature (20°C at day and 4°C at night) than in higher temperature (30°C at day and 20°C at night).

Nutritional disorders

Iron deficiencies can cause pale foliage. Adjusting the pH of the soil may solve this problem.

Yield

The Hybrid Teas roses can yield about 70 – 80 stems/plant/year, while the Floribundas yield yields 80 -90 stems/plant/year.

3:00 pm – 5:00 pm PRACTICAL

DAY 45: 10:00 am – 12:00 Noon: AGRONOMY: Cultivation of maize (*Zea mays)*

Cultivation of maize (*Zea mays)*

INTRODUCTION

Maize is an ideal forage crop grown throughout the country. It is quick growing high yielding and supplies palatable and nutritious forage which can be fed at any stage of growth without any risk to animals. It can be fed as green or dry and makes excellent silage. It is one of the most versatile emerging crop shaving wider adaptability under varied agro- climatic conditions. Globally, maize is known as queen of cereals because it has the highest genetic yield potential among the cereals.Maize in India, contributes nearly 9% in the national food basket. In addition to stable food for human being and quality feed for animals, maize serves as a basic raw materials as an ingredient to thousands of industrial products that includes starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceutical, cosmetic, film, textile, gum, package and paper industries etc.

CLIMATE AND SOIL

Maize does well on a wide range of climatic conditions, and it is grown in the tropical as well as temperate regions, from sea-levels up to altitudes of 2500m. It is however susceptible to frost at all stages of its growth. The ideals soils for its cultivation are the loams and sandy loams which should be fertile, deep and well –drained.

SOWING TIME

- For higher altitudes: mid – March to mid –April.
- For lower regions : April to May
- Rabi (winter) crop: October to November in lower altitudes (Irrigated)

SEED RATE & SEED TREATMENT

- Seed Rate: 15-20kg per Hectare.
- Seed treatment: Seed treatment with Trichoderma.

@ 5 gms/Kg Maize seeds is advocated before sowing.

LAND PREPARATION

- Maize requires a firm and compact bed free from stubbles and weed. One deep ploughing should be given, followed by two or three harrowings to bring the soil to a fine tilth.

MANURES

- Manures: Spread 12.5 tonnes/ Ha of FYM or compost on the unploughed field along with 2Kgs /Ha of Azospirillum and incorporate in the soil.

SOIL

- Soil however should be tested regularly as the recommendations will differ from region to region and will also depend on other factors related to previous crop grown, soil management pH, etc. It thriver well in soil Ph between 5.5. to 8.0.

SEED TREATMENT

- Seed are to be moisture with clear water with care so as to avoid excessive wetting.
- Rhizobium culture is to be mixed with seed @ 15 gm/kg so that a thin coat of inoculums is deposited on the seed coat. Then thase treated seed is to be tired under shade. Inoculated seed should not be exposed to the sun.

Uses of Annada Brand Bio-fertilizers: For maize add AnnadaAzocare/ Azotocare300gm +AnnadaPhosphocare 300gm/5-10kg seed / corns. For maize repeat same dose in the eight leaf stage with irrigation water.

We can also treat the seed with Trichoderma mix 50gms or 5ml of bio pesticide per kg of seed per liter or water leave it for around 15-20 minutes and shade dry for 15-20 minutes then sow the seed.

SOIL APPLICATION.

- Drench the soil with five gram or five ml per liter of water during land preparation.

MULTIPLICATION IN THE COMPOST

- Mix one kg of any Biopesticides 100kg well decomposed dried manure compost/ FYM, sprinkle the mixture with water and cover with polythene and leave it for two weeks. Turn the mixture at alternate days and check the moisture content. The compost will be enriched with the bio-pesticides after the end of the two weeks and ready for use in the field. Then apply this enriched compost for any crops.

SOWING

- Furrows are made in the beds at a distance of 70 cms and depth of 7.5. – 10cms. Manure is applied as basal dose in the furrows and mixed well with the soil. Seeds are then sown in these furrows in lines, at a distance of 20 cms(8 inches) and covered over with soil.

IRRIGATION

- The Kharif crop requires irrigation only when there is an extended period of water stress. However the Rabi crop needs frequent irrigation at intervals of 15-20 days.

INTERCULTURE

- Weeding is necessary as weed interfere with the plant growth, particularly during the initial stages. 2-3 weeding may be required. Plants should also be earthed up after every weeding for a better crop stand. Intercultural operations should not be continued after flowering.

PLANT PROTECTION

Diseases:-

- Leaf Blight:- Manifestation of oval to round, yellowish- purple spots on leaves. The affected leaves dry up and appear as if burnt. In severe cases, the plants may become stunted, resulting in poorly- formed ears. We can also found in maize pythium stalk rot. We can arrange proper drainage in the field to drain out excess of rain water.

CONTROL

- The crop can be sprayed with Trichoderma @ 5gms/litrewaer + Pseudomonas fluorescence @ 5ml / litre water.

INSECT PEST

STEM BORER :

- These borers feed on leaves in the earlier stages. Later on they bore into the stem and cobs, rendering the plant unproductive.

CONTROL

- After harvest, the stalks and stubbles should be collected from the field and burnt.

RED HAIRY CATERPILLARS:

Caterpillars feed and destroy the whole plant if the attack is in the early stages of growth.

CONTROL

- Egg masses and young caterpillars should be collected as soon as detected, and destroyed.
- The field should be ploughed out after the crop is harvested, so as to expose pupae.

Aphids:

- Tiny, soft bodied insects, usually green in colour. Nymphs and adults suck the sap from leaves and young shoots.

CONTROL

- The crop can be sprayed with Beauveriabassiana @ 5gms/ litres.

TERMITES

These pests attack young seedlings as well as mature plants: attack is also visible on roots and lower parts of the plants.

CONTROL

- Soil treatment with Soldier @ 2 kg per hectare is applied and mixed well with the soil.
- Soil drenching with Metarhizium @ 5 gms / litre water.

HARVSTING

- Cobs which are to be utilized as grain should be harvested when the grains are almost dry or containing roughly 20 % moisture. The appearance in the grains of composite and high yielding varieties however may be misleading as grains becomes dry while the stalk and leave are still green. The cobs are removed from the standing crop and sun dried before shelling, otherwise retained in their jackets, if kept for seed or to be consumed or utilized at a later stage.

VARIETIES

VARIETIES TYPE	NAME OF VARIETIES	DURATION (DAYS0	POTENTIAL YIELD (Q/ Ha)
(a) Hybrid	Ganga – 5 Ganga – 101	110-120 110- 128	48 45
(b) Composite	Kisan Vijay Vikram	110-120 110-120 110-120	45 46 48

YIELD

- Local varieties: 15 to 20 quintals (grain) per hectare.
- High yielding varieties: 40 to 50 quintals (grain) per hectare.

1:00 pm – 3:00 pm: PRACTICAL

3:00 pm – 5:00 pm: AH & VET: Farm Visit

DAY 46: 10:00 am – 12:00 Noon: HRD: Supportive development building on idea

Supportive Development describes the process of building on one another's ideas so as to get things done and achieve worthwhile results. When this process operates, progress is fast and the atmosphere rewarding, Ideas are nurtured rather than criticised. Credit for results is shared.

The absence of Supportive Development becomes apparent in lengthy circular discussion, competing ideas and destructive comments, all of which waste time and produce a sense of frustration and ill-feeling. The causes often include

- A reluctance to proceed without examining all alternatives

- Making the best the enemy of the good

- Injecting ideas whether they are needed or not

- Thinking aloud: tentative phrasing, posing questions or dilemmas

- Seeking the imperfection rather than the potential of ideas

- Careless use of 'not necessarily... isn't there a danger that... Yes, the only thing is though... it might be better if... yes but... what if?' all of which easily lead to ideas being squashed.

A supportive and progressive atmosphere in a group is marked by contributions like

- 'Yes and ... '

- 'As well as that we can...'

- 'One way around that would be to...'

- 'Good idea - lets try it' or simply actioning a proposal.

Supportive Development can only come about through:

- a common understanding of the aims being pursued

- positive actionable proposals worthy of support

- concern for the meaning of what people say

- respect for others and for the ideas they offer

- weighing the risk of moving on against the risk of delay

Support demands active listening and careful thought. It is not simply agreeing or merely conforming for the sake of harmony. It is carrying ideas forward, with energy and conviction, towards purposeful action.

Handling Ideas

When people speak of 'ideas' they mean a range of things such as facts, suggestions, questions or just random thoughts. Furthermore, the ideas may be related to different stages of a Systematic Approach. It is not surprising then, that when asked to think of 'ideas', people respond in many different ways. A useful practice before any thinking period is to agree the kind of ideas required and also how they will subsequently be handled.

A chart can be, for a working group, what a notebook or jotting pad is for an individual. It can serve as a group memory of agreed aims, key pieces of information, decisions made and operating plans. It can also be used to develop tentative ideas into workable proposals and to clarify understanding, a picture being worth a thousand words.The method used to chart ideas needs to suit the type and status of the ideas being gathered.

FACTS...

- Where statements are not open to dispute, for example, when individuals say what they personally want from a meeting, the need is to chart accurately to help everyone understand.

The same applies to charting known, factual information. The contributors must provide comprehensible statements at a pace that can be charted, so minimising time wasting repetition.

SUGGESTIONS...

- A search for possible ways forward may bring out a number of tentative ideas. Chart rapidly to capture the ideas, recognising the chart as a working aid, not an historical record. Then, identify what has been agreed or developed, for reference when required. Contributors should provide suggestions they see as relevant, feasible and capable of being developed.

CREATIVE IDEAS...

- When pure creativity is required, rather than logical deduction, it is important to remove barriers and to stimulate thought. This is the function of ‘Brainstorming, the guidelines being: many ideas wanted - all are welcome - no debate - chart everything quickly - set a time limit.

Whatever the nature of what is being charted, the person writing should resist the temptation to change what is said into different words or to summarise it to such an extent that the real essence is lost. Debates about ‘what shall I write?’ can be very time consuming and it is generally far quicker to write exactly what is said, especially if the contributor helps by a concise and exact use of words in the first place.

Contributions in a Group

A working group makes progress only through the contributions made by its members. The effect of a contribution is influenced by the way it is made as well as ‘its substance. Some considerations are:

RELEVANCE ... to the aims and current needs of the group. We easily become so captivated by our own idea that we voice it regardless of its relevance to the task, to the aims, to the current situation, to what has already been said.

Others may need help to see the relevance of what we say or do. Introductory phrases such as

‘About resources...’,’One criterion could be....’, ‘To get over that problem I suggest...’, ‘To further

Mary’s idea ... ‘can help to do this.

TIMING ... choosing a moment when our contribution is likely to be accepted and used. Matching it to the appropriate stage of Systematic Approach helps. So, our idea for how to do the job is best offered when the group is in the information stage and is looking for ideas. In contrast, totally new ideas or pieces of information will probably not be welcomed just before the group goes into action, unless there are compelling reasons for stopping the group in its tracks.

It is hard to justify launching our thoughts while another person is speaking. Interruptions demonstrate our lack of respect for what another person has to say. It is salutary to realise that when we do interrupt, often we have no real understanding of what the other person was saying, so absorbed have we been in our own thoughts.

WORDS ... that will be understood by other people and will convey the meaning we intend.

There are pitfalls to avoid: even fairly common-place words can mean slightly different things to different people, especially if the word is abstract, like ‘objective’. A phrase made up of simpler words: ‘by the time we finish, we want to have produced ...’ will reduce the risk of misunderstanding.

Jargon saves time and aids precision when used between people who commonly understand it. When they do not, it confuses, irritates, frustrates and wastes time.

PHRASING ... such that our contribution helps the group forward. As a general rule, questions, alternatives and dilemmas cause a group to pause, think and debate, Highlighting problems and pointing out difficulties in an existing idea promotes discussion and, in excess, leads to resentment, frustration and depression. Positive proposals for how to proceed or for how to overcome a problem tend to gain ready acceptance and help to move the group towards action.

A common self-inflicted difficulty occurs through introducing suggestions in the form of questions: ‘Shall we ... ?’,’What about if ... ?’ Being directed at no-one in particular, no-one answers, and the suggestion dies. Or it can divide the group, prompting an alternative suggestion (there is always an alternative) and discussion, rather than action, ensues.In short, the most effective contributions to any group are relevant, timely and understandable proposals.

Degrees of Agreement

When people signify their agreement or disagreement, different strengths of feeling behind what they say give their words different shades of meaning. Some examples of what can be meant by ‘I agree’ l disagree’ are given below. These are arranged in levels or degrees of agreement, and obviously there will be intermediate positions as well.

SHARE ‘I am fully committed to that aim and will do everything in my power to achieve it with you’

SUPPORT ‘I shall willingly help you to pursue that aim’

SYMPATHISE ‘I respect your intention and will not stand in your way, though I do not feel obliged to helly

ACQUIESCE ‘I do not care one way or the other. I am quite indifferent to your intentions’

REJECT‘I will have nothing to do with that. Count me out!

OPPOSE ‘I will do everything in my power to prevent you achieving what you want

Reference to such a scale may help group members assess the state of agreement between themselves over proposed aims or courses of action. This in turn will lessen the chance of assumed unity, and false expectation as to the energy each person will apply. It can prompt efforts to secure greater commitment, avoiding the disintegration that can occur as the need for action, and consequently the risk, approaches.

A similar scale can be used to illustrate the contrasts between

Co-operation — where people hold aims in common and have the will to work together towards their achievement, And

Negotiation — where people have different or conflicting aims but share a desire or need to find common ground and an agreed course of action.

Active Listening

Listening demands effort. It is all too easy to follow our own line of thought while someone else is talking. Often we are just waiting for the chance to speak our own piece, without regard for what the other person is trying to say.

Active listening involves ‘switching on’ and staying ‘tuned in’ to others, giving thought to several questions, such as:

What are they saying?

What does it really mean? How does it fit in?

How can I support it?

What shall I say in response?

We think fast, but it still takes time. So effective listening can be difficult during animated discussions. A pause when a speaker has finished helps, and serious conversations are often notable for the periods of silence, rather than for volume of talk. Quality takes precedence over quantity.

Speaking and listening are interactive processes, each one influencing the other. If the listener shows clear signs of attention, the speaker is less inclined to repeat things. Equally, if the speaker is concise, the listener finds it easier to maintain concentration.

Authority: To have authority is to have the power to take action. The sources of authority are several; no one source is universally or probably even widely effective.

There is:

Authority based on the ability to reward or punish

Authority based on the control of resources and upon hierarchical position

Authority stemming from contacts and influence with powerful people

Authority related to the possession of information or technical expertise

Authority deriving from personality, character, process skills, and personal attributes

One kind of authority, task authority, is linked to the position that a person holds in an organisation. People hold different degrees of task authority according to their job and its position in the hierarchy. This authority is delegated by other people, generally people in positions of higher authority. Correspondingly, this authority can be withheld or withdrawn, and it has no value outside the organisation which supports it.

Another kind of authority is inherent in each one of us: process authority. It finds expression in our ability to offer relevant information, listen to others, question to clarify understanding, make proposals, offer skills and expertise, synthesise and build ideas, encourage and help others. Equally, it lies within our power to withhold such help. Such authority is not given to us for we already possess it; neither can it be taken away or denied.

We face choices repeatedly: whether to try to help others and improve situations, remain silent and inactive, or seek to hinder and destroy. We can choose to co-operate to mutual benefit or manipulate to personal gain.

Often, a skilful remark or question will benefit a situation at little or no risk to the person making it, for example, a question which prompts discussion about the desired end point of a meeting.

Sometimes, considerable personal risk is involved, as when speaking out against a popular tide of opinion or established order. In all such matters, there is personal choice and consequent personal responsibility.

Aspirations: There is no intrinsic virtue in complexity. A call to 'keep it simple' can lead to results, which are neat, economical and satisfying. It can also encourage low aspirations and poor results, satisfying no-one.The challenge for a group of six or seven people faced with a job can be expressed by the question, 'How can we get the best from the group in the time available to us?". And useful check in review is to ask 'Do the results we have achieved merit the total ma-hours that were available to us ?'

'Keep it simple' may be avoiding the risk of setting challenging standards. People may be

'playing safe' to avoid all possible risk of failure. It is worth examining this attitude, especially as 'playing safe' can seriously impair the learning opportunities the course provides.

To illustrate : we often ask groups to 'Make paper note-pads'. An extreme of 'keep it simple' would lead to the group having one member make on paper note-pad while the rest watch. Needless to say this approach involves negligible risk of failure. There is little planning to be done and very few interaction occur. Little can be said about the experience during the review and little learned from it.

Alternatively a group may decide to stretch itself by setting a target of making dozens of note-pads.

Much detailed planning is needed; there are many ideas to handle and test. A lot needs to happen and be managed by the group in order to achieve the target. During the review there is more to be learned from the experience, and crucially, a greater potential for taking useful practices and principles back to work.

Let us sum up

The operative and cooperative skills and processes formed important component of teamwork.The systematic approach in getting work done while working with others will help to have common method and vision of the given task. Whenever people work together they use two types of skills relating to task and process. As process influences task results people need to have the skills in the same and to be aware of these in others. Processes such as supportive development of ideas, listening, the way feedback is received and given and the method reviewing will have a bearing on the developing teamwork among the people. In this context, what is also more important is awareness of identification and use of one own skills as well as others, which influences critically the task results.

Key words

Task and Process : Task relates to the job itself consisting of professional or technical skills such as accountancy, engineering and computer programming etc., process skills relate to interactions with other people involved in the job using skills such a listening to other ideas, managing time etc.,

Process Skills : People working together each bring a unique cluster of personal skills, not just those connected with their craft or profession but also ones that affect the interaction of people, no matter what the task is. These human, or process skills merit exploration since the way they are used will influence the team’s working effectiveness, which in turn affects the job performance.

A Systematic Approach : ‘A Systematic Approach’ is based on the way people think when they are getting things done in a purposeful and efficient way. Naturally, therefore, many people find the approach familiar. It may be akin to other patterns of logical thought they know, some of which may have been developed for other uses such as problem solving or systems analysis. According to their purpose such systems may omit certain stages of Systematic Approach and expand others.

Aims : ‘Aims’ is a useful collective term embracing goals, targets, objectives, purposes, intentions, aspirations, standards, ambitions, ideals, mission, all of which relate to the direction we wish to take or the future we want, or need to bring about. The setting of aims calls upon the skills of imagination and foresight. Three aspects of aims can be distinguished are Purpose; End Results;

Success Criteria/Standards.

Purposes : A sense of purpose gives direction and motivation at individual, team and organisation level. Few activities are simply an end in themselves-most serve a purpose, or a range of purposes, both short term and long term.

Success Criteria : Success Criteria (standards) are part of the general area of Aims. They help us judge whether we have succeeded or are making satisfactory progress. When criteria are precise and measurable the question. “have we succeeded?” can be answered with certainly.

Analysing Skills : Numerous process skills come to light once we analyse our initial assessments of contributions made in a group.

Feedback of Observation

• Feedback intended to help a person or a group to develop has to be acceptable and has to be useable. Otherwise, despite the best of intentions, it is wasted.

• Given in the right manner, feedbacks win support and reinforce the desire to improve. Badly done, it will provoke resentment and rejection.

Authority : Task authority, is linked to the position that a person holds in an organisation.

People hold different degrees of task authority according to their job and its position in the hierarchy.

This authority is delegated by other people, generally people in positions of higher authority.

Correspondingly, this authority can be withheld or withdrawn, and it has no value outside the organisation which supports it.

Aspirations : There is no intrinsic virtue in complexity. A call to ‘keep it simple’ can lead to results, which are neat, economical and satisfying. It can also encourage low aspirations and poor results, satisfying no-one.

1:00 pm – 3:00 pm: FRUIT PROCESSING: Squash, Pulp extraction

Processing of Fruit and Vegetables

EQUIPMENTS - The following equipments are required for preparation of fruits & vegetables products.

Stainless steel pan, stove, weight box & balance, Juice extractor wooden ladle, pineapple puncher (Stainless steel glass may also be used Refractometer & Thermometer).

A. SQUASH:

EXTRATION OF FRUIT JUICES/PULPS

Select fully ripe or matured fruits free from diseases and insect damages for processing.

1. **ORANGE:** Peel the oranges and immediately extract the juice with the help of juice extractor and simultaneously add 50gms/10 table spoonful approximately, from the require quantity of sugar to prevent bitter of the juice.

2. **PINEAPPLE:** Peel the selected pineapple with the help of a stainless steel knife and cut into small pieces, crush the pieces with the pineapple puncher or with a stainless steel glass, if puncher is not available. Put the crusher pineapple pieces in a muslin cloth and squeeze out the juice, then filter the juice again in a muslin cloth.

3. **SOH PYRSHONG (CARAMBOLA):** Wash the fruit thoroughly and extract the juice with the help of juice extractor.

4. **SOHBRAP (PASSION FRUIT):** Wash the fruits and cut them into halves with the help of a stainless steel knife and extract the pulp from the cut fruits with a spoon. Extract the juice by passing the pulp through a net cloth.

5. **SOHIONG (PRUNUS NEPALENSIS):** Clean and wash the fruits properly and boil in water till the fruits become soft. Extract the pulp by crushing the boil fruit in a bamboo sieve.

Preparation of Syrup

Dissolve the required quantity of sugar separately in water as per recipe on a slow fire with continuous stirring and heat up to boiling point. Then add whole quantity of Citric where ever is necessary in the sugar syrup. Filter the prepared syrup and let it cool down to room temperature.

Recipe for 4 ltrs squash

Type of squash	Juice (ltrs)	Water (ltrs)	Sugar (kg)	Citric acid (gms)	KMS (gms)	Essence	Colour	Sodium benzoate (gms)
1. Pineapple	1	1.500	1.500	40	3	1-2drops	1 pinch	
2. Orange	1	1.500	1.500	50	3	1-2 drops	1 pinch	
3.Sohiong	1	1.400	1.560	30	-	-	-	2
4.Sohpyrshong (Carambola)	1	1.285	1.680	30	3	-	1 pinch	
5.Sohbrap (Passion Fruit)	1	1.450	1.550	30	3	-	-	-
6. Sohphie	1	1.400	1.600	-	3	-	-	
7. Strawberry	1	1.350	1.600	36	-	1-2 drops	1 pinch	2
8. Litchi	1	1.550	1.400	50	3	-	-	-

HDO(FP), SHG.

1. SQUASH

Mixed the juice with Syrup and add the whole quantity of Potassium Meta Bi-Sulphide by first dissolving it in a spoon of water or sodium benzoate in case of Sohiong preparations, one or two drops of essence and a pinch of colour where ever is necessary, fill the prepared squashes in clean sterilized bottles, seal properly and store in a cool dark place.

3:00 pm – 5:00 pm FRUIT PROCESSING Preparation of Pickles & Tomato Ketchup PICKLES

Pickles maybe prepared from a single unripe fruits or vegetables or a mixture of both according to one likes.

Curing of fruits /vegetables: Dissolve 360 gms common salt in 1640 ml of water (18% salt solution) and filter in muslin cloth, then add 2 gms sodium benzoate and 5 gms turmeric powder and stir well. Place 1 kg of the cut fruits/vegetables in suitable containers having lids, fill in with the above prepared solution, close the containers properly and allow to cure for a minimum period of 2 (two) week's time.

RECIPE:

1. 1 Kg fruit/vegetables
2. 10 gms sarso
3. 10 gms dhania

4. 10 gms methi

5. 10 gms kala jeera

6. 10 gms sauff

7. 10 gms ajwain

8. 30 gms chilli powder

9. 750 ml mustard oil.

After curing period is over, drain off the solution properly from the fruits/vegetables and mix with the already roasted and ground spices, then place the fruits/vegetables in sterilized bottles and fill in with pre-cooked & cooled mustard oil and seal properly.

DAY 47: 10:00 am – 12:00 Noon: PLANT HEALTH MANAGEMENT

IPM strategies for cole crops

Cabbage

Nursery raising

- Prepare raised nursery beds about 10 cm above ground level for good drainage to avoid damping off.

- Cover the beds with polythene sheet of 45 gauge (0.45 mm) thickness for three weeks before sowing for soil solarisation for reducing the soil borne pests. Sufficient moisture should be present in the soil.

- Seed treatment with *Trichoderma viride @ 4g/kg of seed in nursery to* prevent infection of soil borne/seed borne fungal

- Apply 1kg of FYM mix in 1m2 and can be applied even in main field.

- Drench the nursery beds with *Trichoderma viride* @ 4g/liter of water

Main crop

- Growing of two rows of mustard after every 25 rows of cabbage as a trap crop at the time of planting and ensure that first and last row of plot are also mustard.

- Adopt wide spacing of 60 x 45 cm to reduce the chance of spread of diseases.

- Use light traps for adult DBM @ 3 traps/acre. Hang a bulb over a bucket of water and within 3-4 days most of the adults get killed.

- Spray *Baccillus thuringiensis* or Dipel @ 1 g/lit orspray NSKE 5% if *DBM* is noticed early.

- Release egg parasitoid *Trichogramma brassicae* at 50,000 eggs/ha 3-4 times at weekly interval for cabbage butterfly

- For controlling *Spodoptera* mechanically collect and destroy gregarious young larvae and set up traps for mass trapping.

- Periodically remove and destroy disease affected leaves.

- Seed treatment with hot water at 50◦C for 30 minutes for management of black leg and black rot diseases.

INSECT PEST MANAGAMENT

1. **Cut-worm**: Seedlings are cut in the base at night by cut-worm.

Management:

- Sow two rows of mustard for every 25rows of cabbage.

- Drenched the soil with Helicon-L or Biopower (*Beauveria bassiana*) @5gm/lt of water.
- Spray with Multi neem@ 6-7 tea spoons in 15 liters of water.

2. **Diamond back moth**: One of the most notorious pests throughout the world on Cole crops causes extensive defoliation of young leaves, mostly on growing part by green, small larvae. When damage is serious, aborts head formation.

Management:

- Used Indian mustard as trap crop and apply neem-seed kernel extract to manage diamond back moth, leaf-webber, stem borer, aphids and bugs.
- Grow mustard as intercrop as 20:1 ratio to attract diamond back moths for oviposition.
- Install pheromone traps at 12nos/ha. Foliar spraying of 10% garlic-chilli extract 3 times on 45^{th}, 60^{th} and 75^{th} day after planting.

3**. Leaf webber**: Group of hairy larvae feed on leaves and damaged heads, which may rot.

Management:

- Sow mustard in one row for every 25 rows of cabbage (also keep first and last row of mustard in field). Bold-seeded mustard is preferred as trap crop.
- Spray with Multi-neem / Nimbicidine@ 6-7 tea spoon in 15 liters of water.
- Plant tomato along with cabbage.

5. **Cabbage caterpillar**: Holes are eaten in the outer leaves and damage may also be seen on the inner leaves of cabbages when the heart is cut through. Caterpillars and their excrement are often found on the plants.

Management:

- Install Trichocard (*Trichogramma barssicae*) one week after transplanting helps in controlling the pest.
- Growing Marigold as border crop or in between the rows also control the damages caused by the caterpillar.
- Spray the plant with Tobacco juice/ Tobacco water. Spray with Multi neem@ 6-7 tea spoons in 15 liters of water.

6. **Semilooper**: The larvae eat large holes in the underside of leaves and consume developing cabbage heads.

Management:

- Grow cabbage along with mustard. Spray with Multi neem@ 6-7 tea spoons in 15 liters of water.

7. **Aphids**: Aphids feed by sucking sap from their host plants. They produce a sugary waste product called honey dew, which is fed on by ants. In turn, the ants provide protection for the aphids from natural enemies. Cabbage aphids feed on the underside of the leaves and on the centre of the cabbage head. Continued feeding by aphids causes yellowing, wilting and stunting of plants.

Management:

- Install yellow sticky trap @12 no/ha to monitor the pest.

DISEASES MANAGEMENT

i. **Damping off:** The infection takes place at the base of the young stems or at the soil level. Tissues become water-soaked and rapidly collapse thus toppling the seedlings. These pathogens cause pre- and post-emergence damping-off and wire stem of seedlings. It causes mortality of seedlings.

Management:

- Drenched the field with *Trichoderma viridae* @ 1 teaspoon/lt of water before transplanting. After the seedlings has established and attain growth spray the plant with *Trichoderma viride* at the same dosage mention above.
- Always sow hot-water treated seeds.
- Do not raise seedlings at the same site every year.

ii. **Alternaria leaf spot**: Symptoms of Alternaria leaf spot on cabbage may first develop on young plants in seedbeds, where leaf spots, stunting or damping-off may occur. Dark brown to black leaf spots may appear on tissues of any age and vary in size from pinpoint to 2-inches in diameter. The leaf spots enlarge in concentric circles and mature lesions have a bull's eye type appearance.

Management:

- To reduce the level of seed-borne inoculums, a hot water treatment may be used by soaking the seed in hot water for half an hour.
- Some varieties show more tolerance than others; growers should avoid using varieties that have shown chronic problems with the disease.
- A minimum two year crop rotation is recommended, alternating with non-cruciferous crops.

iii. **Black leg:** Blackleg is a fungal disease that can be highly destructive. The leaves of an infected seedling will have grey lesions with pinprick black spots.

Management:

- Soaking the seed in hot water for half an hour before sowing reduces the infection of the diseases.

iv. **Black rot:** Infection of leaves takes place through water pores at the margins of wound caused by insects. At the point of infection, tissue turns yellow and chlorosis progresses towards centre forming wilted 'V' shaped lesions with the base towards the mid-ribs.

Management:

- Dip the seed in 100 ppm Streptocycline for 30 minutes.
- Two sprays with Streptomycin 100 ppm after planting and at head formation are recommended.

v. **Clubroot**: Clubroot is a fungal disease the affects a number of plants in the cabbage family. The first symptom is usually wilting during average daily conditions but recovery at night. The older leaves may yellow and die and the plant look stunted. Examination of the root system reveals enlarged roots that make them look club-like and reduced feeder root. The reduction in feeder roots as well as disruption of the water conducting tissue in the root causes the drought-like symptoms.

Management:

- Since problems are more severe in acid soils (pH 5.0-7.0) adding lime to acid soils can help control the disease.
- Seed treatment @ 10 g/kg of seeds or soil application @ 2.5 kg/ha or seedling dip in solution of 5g/lit with *Pseudomonas fluorescens* reduces the disease infection.

1:00 pm – 3:00 pm: FARM MECHANIZATION: IMPROVED TOOLS AND MACHINERY FOR HILL AGRICULTURE

IMPROVED TOOLS AND MACHINERY FOR HILL AGRICULTURE

PLOUGING/PUDDLING

Animal Drawn Mould Board Plough

Mould board Plough is used for primary tilling operator and help to dig the soil and invert it for quick decaying of surface trash and stubble. It has less specific draft requirement as compared to the country plough. Draft requirement depends upon its width as well as depth of ploughing and accordingly can be pulled either by a pair of bullock or a single bullock. The 25 cm size plough has been designed for hilly region as an improvement over indigenous plough. The depth of operation varies from 10 to 15 cm depending on soil condition. The ploughing efficiency and soil inversion is 65.O% and 62.2% by MB Plough as compared to

65.6% and 38.7% in case of indigenous plough respectively. The held capacity is 0.25 ha/day and costs Rs. 1200/-

Animal Drawn Light Ridger Plough

It is a light duty, double mould board with reversible share type plough suitable for ploughing and making ridges in light soils and hilly terrains. The implement can be effectively used for upland cultivation. Compared to conventional method of using spade for making ridges, this animal drawn implement has high capacity. It is superior over local plough and can be adopted in light soils and hilly terrains.

Dimension (Ixwxh), m	: 1.95x0.20x0.77
Weight, kg	: 5.6 (without beam)
Power source	: A pair of bullock
Width of cut,, mm	:150
Depth of cut, mm	:140
Field capacity, ha/h	: 0.03
Labour requirement, man-h/hr	:33

Animal Drawn Puddler: It is a rectangular blade type puddler suitable for puddling operation under wetland condition. It consists of 3 rows of plades, each row having blades welded on the shaft. Average depth of operation is about 10 cm having field capacity and field efficiency about 0.90ha/h and 65% respectively. It saves 66% labour and 88% operating time as compare with conventional method of puddling using animal drawn country plough.

Dimension (Ixwxh), m	:0.90x0.65x0.58
Weight,kg	:40
Power	: A pair of bullock
Width of cut, mm,	:A pair of bullock
Cost ,Rs.	:1500/-

<u>SOWING/PLANTING</u>

Metallic Tip Dibbler

Metallic tip dibbler is used for dibbling maize and other bold seeds on hill slopes. It helps in getting better output per unit time as compared to local dibbling stick. Seeds can be sown up to 7 cm depth as compared to 3 - 4 cm by the wooden/non metallic tip dibbler. Its field capacity is about 0.10 ha/day at 40 cm row-to-row spacing and it costs Rs. 120/-.

Adjustable Row Marker

It is suitable for marking rows at different spacing as per the requirement of the crop to be sown. Sowing in rows facilitates intercultural operations like weeding, earthing etc. in easy way. Row spacing can be adjusted between 20 to 60 cm by sliding the tynes on a cross bar. The cost of the equipment is Rs. 480/-.

Bardoli Seed Drill

Bardoli seed drill is manually operated equipment suitable for sowing seeds in line and fertilizer application in terraced land condition. Normal width of furrow is 7.5 cm and hand pressure is used to get the desired depth. The field capacity is 0.4 ha/day at 40 cm spacing and it costs Rs. 400/-.

WHEEL HOE SEED DRILL

It is, manually operator seed drill suitable for sowing mustard, rape seed and Iinseed in rows at desired seed rates. By changing fluted roller, other crop like wheat and green gram can also be sown. It saves 50% on cost of operation.

Dimension (lxwxh), m	: 1.00 x 0.40 xl.05
Weight, kg	: 8
Labour requirement, man-h/ha	: 32
No of row	:One

4- Row Pre germinated Paddy Seeder

It is useful for sowing pre-germinated paddy seeds in puddled fields. It is capable of sowing 4 rows at 20 cm spacing. A lugged wheel is provided for giving drive and agitation in drums to facilitate dropping of seeds.

Overall dimension, mm	: 1700 x 940 x 600
Weight, kg	:15
No. of Seed drums	: 2
Drum size (dia x length)	: 200x 265

Metering orifice size, mm	: 8
Row-to-row spacing, mm	: 200
Effective field capacity, ha/h	: 0.04 — 0.06
Power source	: One person

Manually Operated Paddy Transplanter

It is suitable for transplanting mat type paddy seedlings in rows. The row-to-row spacing is 20 cm and depth of planting varies between 2-3 cm. The average field capacity of 6- row transplanter is 0.04ha/h and field efficiency is 57%. It saves about 65% labour requirement and 45% on cost of operation as compared to manual transplanting method.

WEEDING/INTERCULURE

Long hand1e weeders aIIow performing weeding operation without bending thus reduction drudgery to the operator and increase the capacity. These weeders are namely Circuiar (U) bIade weeder (1) Garden rake, (2), V blade Weeder (3), Grass slasher (4),and hand fork (5) costing Rs. I 50/-, Rs. 160/-, Rs. ‘190/-, Rs.1 20/-, and Rs. 140/- respectively. These weeders are suitable for weeding in paddy and vegetable fields. The uprooted weeds can be collected using garden rake. can be used in standing water and later collection of weeds can be done using garden rake. With these hand tools labour saving to the extent of 60-65 % can be achieved over traditional method.

Wheel Hoe

It is manually operated implement suitable for weeding and interculture in upland row crops. This is suitable for removing weeds among the rows of vegetable crops. It can also be used to bury the weeds around trunk of fruit trees. It saves 70-75 percent on labour and operating time and 80 per cent on cost of operation and it also results in 5-8 per cent increase in yield compared to conventional method of using khurpa. The cost of the equipment is Rs. 900/-.

Rotary Paddy Weeder

Rotary paddy weeder is manually operated equipment with long handle and blades fitted on cones to perform weeding operation in between the paddy rows without bending the posture of the operator thus reducing drudgery of work.

Dimension (lxwxh), mm	: 1740 200 940
Weight, kg	: 6.7
Cost of equipment, Rs:	: 800/-
Number of persons required:	: 1
Width of coverage, mm:	: 140
Field capacity:	: 036 ha/h

HARVESTING

Improved Sickle

It is a serrated blade sickle suitable for cutting of grasses and harvesting of different crops like paddy wheat, maize etc. the wooden handle has a bend for better grip and to avoid hand injury during use. The blade is of self – sharpening type. The average field capacity is 0.018ha/h and saves 26% of labour and operating time compared to harvesting with local sickle.

Self Propelled Vertical Conveyor

Reaper

It is an engine operated, walking type harvester suitable for harvesting and windrowing cereal and oilseed crops like paddy, wheat, soybean etc. it can harvest two to six rows at a time according to size of the cutter bar and row-to-transmitted to cutter bar and conveyor belt through belt-pulleys. The cutter bar length is 1.0 m and its pitch is 75 mm. the machine saves 52% labour requirement, 90% operation time and 52% cost of operation compared to the conventional method of harvesting with sickle.

THRESHING AND WINNOWING

Maize Sheller

It is a manually operated sheller suitable for shelling of maize cobs. It consists of a 198x72 mm size G.l. sheet folded to a round shape. It is provided with four tapered fins, folded at 110 and welded inside the tube. A ring of 3 mm thick wire wrapped around is provided at the inlet edge of the tube as a protection from hand injury. Shelling is done by holding the sheller in one hand and gradually inserting the cob into the sheller by the other hand with backward and forward twist. It is available in tubular and octagonal shape. A person can shell 30kg of grain per hour as compare to 10-12 kg per hour by the tradition method of shelling by hand. It saves 66% labour and operating time and 70% on cost of operation. The cost of maize sheller is Rs. 50/-.

Groundnut Decorticator

The Groundnut decorticator separator kernels from the groundnut pod by rubbing action. It consists of oscillating sectors with rubber shoes and perforated screen. Decorticated pods fall through screen and kernels are separated manually. Clearance to size of pod, moisture content of crop, etc. the breakage of kernels is 1 to 3 % and decortications efficiency is 96-98%.

Decortication Efficiency	: 93 %
Breakage of kernel	: 4 %
Working Efficiency	: 81 %
Feed Rate	: 10.2 kg/h

Pedal Paddy Thresher

It is a manually operated paddy thresher consisting of threshing cylinder, pedal and grain shield. Threshing cylinder is fitted with wire loops perform threshing operation by combing action.

Dimension, (lxwxh)	: 1.25x0.65x063
Output capacity, kg/hr	: 40-50
Threshing efficiency, %	: 98

Motorized Paddy thresher:

It is an improvement over pedal type paddy thresher. It consists of threshing, cylinder, blower, prime mover and grain shield. Its capacity is four times higher than that of pedal type. Blower fitted with the machine helps to throw the broken chaff at some distance away from grain. The machine can be operated either with 1.5 hp electric motor of 2-3 hp engine. Threshing cylinder and prime mover can easily be transportation of thresher in hilly area. There is saving of about 80% labour requirement and 74% on cost of operation against pedal type paddy thresher.

Dimension, m	: 085X0•75X0.75
Weight ,kg	: 50
capacity, kg/h	: 150-200
threshing efficiency, %	: 98
Cleaning efficiency, %	: 90

Hand Winnower

It is a manually operated hand winnower used for cleaning threshed paddy grains and separation of straw, husk, dust and other light weight foreign material from paddy crops. It has a pair of gears for increasing the speed of the fan blades. One person is required for the operation of this equipment while another person release grains from height so as to separate the husk or other unwanted light material from the grain by air flow of the winnower. Its weight is about 29 kg. . .

Dimension, m	: 1.16X1.1 6x1 .77
Power	: One person
Weight, kg	: 29
No. of vanes	: 4

3:00 pm – 5:00 pm: FARM MECHANIZATION: Practical

DAY 48: FIELD VISIT

DAY 49 10:00 am – 3:00 pm: MUSHROOM: BUTTON MUSHROOM (*AGARICUS BISPORUS*)

Introduction

Mushrooms belong to a separate group of organisms called Fungi. They lack the green matter (chrolophyll) present in plants and grow on dead and decaying organic materials. From these decaying substrates, they absorb their nutrition with the help of very fine thread like structures (mycelium) which penetrate into the substratum and are generally not visible on the surface. After the mycelium has grown profusely and absorbed sufficient food materials, it forms the reproductive structure which generally comes out of the substrate and forms fruiting body, commonly known as mushroom. The mushroom fruiting body may be umbrella like or of various other shapes, size and colour. Commonly, it consists of a cap or pileus and a stalk or stipe but others may have additional structures like a veil or annulus, a cup or volva, performing various functions in the life-cycle of the fungus.

Historical

Mushrooms have been devoured as food by mankind since time immemorial after collecting from the forests. However, mushrooms could not be domesticated due to their complex nature. Though Chinese were the first to do the artificial cultivation of the tropical and subtropical mushrooms about thousand years ago real commercial ventures started when Europeans started cultivation of button mushroom in green houses and caves during 16th and 17th century. The success to isolate pure culture through tissues and spores was the turning point in the process of commercial mushroom production in world. Mushrooms are now getting significant importance due to their nutritive and medicinal values and income generating venture in about 100 countries.

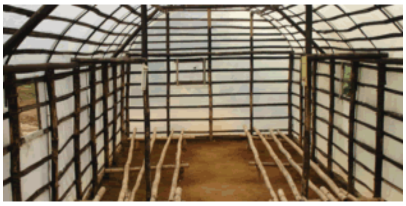
Mushroom being an indoor crop does not require arable land, except for some non-agricultural land to build the infrastructure for preparation of substrate, rising of crop, preparation of spawn and postharvest handling. White button mushrooms in India is grown seasonally and in environment controlled cropping houses and both require building of basic infrastructure. Seasonal growing is done for 5-6 months when outside temperatures are favourable for the crop, i.e., during winter months in N.W. plains and from September to April in the hills.

Components of Mushroom Farm

- Composting Unit
- Outdoor Phase-I composting platform/indoor bunkers or aerated chambers
- Indoor Phase-II in peak heating/bulk past-chamber
- Peak heating chamber
- Bulk pasteurization chamber
- Cooling of compost in summer months a special requirement
- Casing pasteurization chamber
- Spawn unit
- Spawn laboratory
- Cropping unit
- Seasonal cropping rooms
- Environment controlled cropping rooms
- Environment control, air conditioning and forced air circulation
- Ancillary units
- Post harvest handling unit

- Pre-cooling chamber
- Canning hall with canning line
- Packaging room

Low cost Thatched Huts / Mushroom growing Houses

Spawning

For spawn run air temperature of 23° ± 1C is maintained in the room, with corresponding bed temperature of 24-25°C (1-2°C higher than air temperature). The fresh air valve is closed and entire air is re-circulated, allowing the carbon dioxide to accumulate to the level of 15000 ppm, desirable for quick spawn run. Higher concentration of CO2 accelerates the spawn run/vegetative growth of the mushroom fungus. During spawn run above temperature has to be maintained, till entire compost is impregnated with the mushroom mycelium, alongwith other parameters like high CO2 concentration, high RH (will be discussed later). Increase or decrease in temperature effects the CO2 production of the compost and the RH of the room. With increase in temperature, RH will tend to fall, and with decrease in tempt. RH will increase. The properly insulated room will ensure uniform temperature in the cropping room at every stage of crop growth. The air will go into the room at the will of the grower and as per requirement inside, suiting the crop stage. The heat from the cropping room is removed via cooling coils in the AHU.

Casing

The environmental conditions suitable for spawn run, are suitable for case run as well. The same conditions will be provided for 7 days for case run, as for spawn run, i.e., temperature of 23°C in the air and 24°C in the bed. The RH/CO2 will be same as required for spawn run. Within one week the case run will be completed, and case run is completed the moment the mycelium is observed in the valleys. Valleys are areas between the peaks as can be seen on top of casing. Casing is applied uniformly and the material used should not be a finely ground casing soil but in the form of small clods, which form valleys/peaks on surface of casing. The CO2 conc. and RH should also be within the optimum range for effective/quick case run.

Crop Management

After completion of case run, the cooling of the room is enhanced to bring the air tempt down to 15-17°C in the room within 2-3 days time. Simultaneously, the fresh air vent is opened to 30% and rest of the air is re-circulated (70%). This brings down the CO2 conc. in the room to 300 ppm to 1000 ppm, desired for pinhead formation. Likewise, the RH is also reduced to 85% from 95%. This facilitates pinhead formation on the casing within a week's time. The pinheads grow into full button sized mushrooms in another 3-4 days. The environment parameters are maintained as above during entire period of cropping. Temperature has influence on RH and CO2 conc. and hence should be maintained/manipulated, keeping in mind its effect on other two factors. All the three parameters work in synergy with each other to induce pinning on casing surface.

Harvesting

Mushrooms are harvested by gently holding a mushroom body and twisting it. Washing becomes necessary to remove soil particles if non-peat casing soil is used but washed mushrooms generally deteriorate rapidly than mushrooms packed dry, due to the increased water content that results in greater growth rate of spoilage by bacteria. Small growers wash in solution of reducing agents to retard the browning caused by polyphenoloxidase.

Processing

Sun-drying of mushrooms is one of the simplest and oldest methods followed by the growers from the time immemorial. Due to the difficulties in drying of some of the mushrooms, new preservation technologies like cabinet drying, canning, pickling, freeze-drying and irradiation treatment of mushrooms have developed to improve the shelf life and consumption of mushrooms. A variety of products are being prepared from mushrooms. These are mushroom pickle, mushroom powder for preparing mushroom soup, mushroom sauce, mushroom candy etc. Farmers can prepare these products when there is surplus.

3:00 pm – 5:00 pm PRACTICAL

DAY 50: 10:00 am – 12:00 Noon: HORT II: Orchard Management

1. **Selection of Site** – The selection of site is very important and the following criteria should be considered.

a) The climate should be favourable to the fruit crops to be grown.

b) There should be adequate supply of water throughout the year.

c) Nature of soil and its fertility.

d) There should be no water stagnation.

The land selected should be cleared by removing trees without leaving stumps or root. In hill areas the land should be divided into terraces and levelling is done within the terraces. If the soil is poor, green manure crops should be grown to improve its physical and chemical conditions before planting fruit trees. Adequate manure should be applied during ploughing.

2. **Planning of Orchard –** The following points should be remembered during planning of an orchard.

❖ Roads: A well laid out internal network of main, cross roads and paths is essential for efficient movement of men and machinery.

❖ Adequate number of buildings like office, implement shed, godown, pump house etc are establish convenient locations. The area under roads and buildings ahould not exceed 10 % of the total orchard area.

❖ +Fence and wind break: A strong impenetrable fence is one of the pre requisites to successful orcharding.The fencing should be such as to make the orchardfree of both domestic and wild animals and human pilferage.An effective wind break with tall and compacr trees should be established within the orchard along the fence.

❖ Spacing:Adoption of optimum spacing is intended towards harnessing solar energy,avoiding root competition and efficient exploitation of water and nutrients.

❖ Selection of planting materials:The planting materials should be vigorous,true to type derived from healthy mother plants free from diseased and pest infestation.

3. **Layout of Orchard –** In order to accommodate maximum numbers of trees proper layout of the orchard should be followed. There are different types of laying out in orchard.

➢ **Square system -** The fruit plants are planted in each corner of a square with appropriate planting distance. This is the easiest method and most commonly followed. Inter cropping can be done in two directions in this method.

➢ **Rectangular system –** The trees are planted in each corner of a rectangle. Here the distance between any two rows is more than the distance between any

(1)

two trees in a row. The intercultural and mechanical operations can be carried out freely in the wider spaces.

➢ **Hexagonal system** - In this method, the trees are planted in each comer of an equilateral triangle. This way six trees form a hexagon with the seventh tree in the centre. This system provides equal spacing, the limitations of this system are that it is difficult to layout and the cultivation is not so easily done as in the square system.

- **Diagonal system -** This is the square method but with one more plant in the centre of the square. This will accommodate double the number of plants, but does not provide equal spacing. The central (filler) tree chosen may be a short lived one. This system can be followed when the distance between the permanent trees is more than 10 m. As there will be competition between permanent and filler trees, the filler trees should be removed after a few years when main trees come to bearing.

- **Triangular system -** The trees are planted as in square system but the difference being that those in the even numbered rows are midway between those in the odd rows instead of opposite to them. Triangular system is based on the principle of isolateral triangle. The distance between any two adjacent trees in a row is equal to the perpendicular distance between any two adjacent rows.

- **Contour system -** lt is generally followed on the hills where the plants like pineapple, etc. are planted along the contour across the slope. It is particularly suitable for land with undulated topography, where there is greater danger of erosion and irrigation is difficult. The main purpose of this system is to minimize land erosion and to conserve soil moisture so as to make the slope fit for growing fruits and plantation crops. The contour line is so designed and graded in such a way that the flow of water in the irrigation channel becomes slow and thus finds time to penetrate into the, soil without causing erosion.

- **Terraces and Half- moon terraces system:** Terrace system refers to planting in flat strip of land formed across a sloping side of a hill, lying level along the contours. Whereas half-moon terraces are made by cutting in half moon shape to create circular level bed having 1-1.5 m diameter. This also provides facilities for retaining moisture and easy application of fertilizers and manures for healthy growth of plants.

Soil Management Practices

a) Clean Culture – This involves regular ploughing and removal of weeds. This type of cultivation causes injury to the feeding roots, which result in stunted growth and reduce the trees life. Frequent cultivation also causes soil erosion which result in loss of humus and depletes Nitrogen. These defects in clean cultivation can be minimized by avoiding deep and frequent cultivation.

b) Clean cultures with cover crops – In this type of soil management, green manuring crops are planted between the trees during rainy season and incorporated into the soil at the end of the rainy season. Crop like French bean, cowpea are most commonly grown as green manuring crops. This also results in extra income to the farmers.

Mulching – Mulching is also very important in soil management. Crop residues like straw, leaves, saw dust and material like polythene films are spread in the inter space of trees. Mulching add humus to the soil and prevent soil erosion. It also conserves moisture and keeps the soil cool in the day, warm at night. Mulching material should not be too dry as it may cause risk of fire. Also thick mulches may act as place for mice and rodents to live and multiply, which may cause damage to the trees.

Intercropping – Intercropping can be practiced in between the fruit trees. The inter crops act as cover crops and benefit the fruit trees through irrigation, manuring given to them. The following points should be considered while growing inter crops.

a) Inter crops should not occupy the area where roots of the fruit trees concentrate.

b) Soil fertility should be maintained or improved when intercrops are grown.

c) Excessive water supply should be avoided.

d) Vegetables are the better intercrops in fruit trees.

Mixed cropping – In this cropping system, perennial crops are grown in between spaces of fruit trees. This helps for utilization of the available area and increase the income of the farm.

Multitier System of Cropping – Some fruit trees take 4-7 years to bear fruits. So, in between the available spaces other fruit plant with lesser root spread (less than 1m in diameter) can be grown.

Organic Farming – To avoid **e**xcessive use of chemical fertilizers and pesticides to boost up our food production which causes considerable damages to our soil health and the environment, organic farming is to be taken up. It is a production system which avoids or largely excludes the use of synthetically compounded inorganic chemicals. This system entirely relies on crop rotation, crop residues, animal manures, legumes, green manures, off-farm organic wastes, biofertilizers, mechanical

cultivation etc. and aspects of biological pest control to maintain soil productivity and tilth to supply nutrients and to control insects, weeds and other pests. This system is often, referred as „biological farming‟ „regenerative farming‟ and „sustainable farming‟ „eco-friendly farming‟ etc.

1:00 pm – 3:00 pm: PRACTICAL

3:00 pm – 5:00 pm: AH & VET: Farm Visit

DAY 51: 10:00 am – 12:00 Noon: COOPERATION: MAINTENANCE OF BOOKS AND RECORDS

The following are the books and records to be maintained by a co-operative society.

1) Cash Book

2) General Ledger

3) Member Register

4) Share Ledger

5) Loan Ledger

6) Sales Day Book

7) Purchase Day Book

8) Proceeding Book

9) Stock Register

10) Receipt Book

11) Assets Register

1:00 pm – 3:00 pm: ZBNF (Zero Budget natural Farming): Home remedies for management of pests & ZBNF

Some Common Insect -Pests in Kitchen Garden

Mixture of cowdung, cow urine, chilli and garlic

1. Dug a pit as required, in which cowdung, cow urine, chilli and garlic are mixed and kept it for decomposition.

2. The decomposed mixture is then spray in the kitchen garden.

3. 2-3 spray is done in each season

Use of silkworm excreta

1. The excreta is allow to dry and make into a fine powder and a pply to the field (paddy and vegetable field)

2. The excreta is insecticidal for some pest while repelling others.

Use of garlic extract

1. Make fine garlic paste and extract the juice from it using muslin cloth.

2. Add 50 ml of water to the extract and immediately spray to the field.

3. Always used fresh mixture for every spray.

Use of tobacco extract

1. Soak tobacco leave in 50 ml of water or crush the leave into fine paste and mixed it well with 50 ml of water.

2. Spray immediately to the vegetable garden

Use of household ash

1. Household ash is sprayed in and around the vegetables crop in the kitchen garden to protect from pests and diseases.

Use of bio-agents

1. Drench on seed beds or spray *Viricon* **-** *L* @ 10 15 spoons in 16 liter of water for management of wilting and rot of the vegetable crop.

2. Spray of Helicon-L @ 10-15 spoon in 16 liter of water for management of leaf eating caterpillar in vegetables plant.

Use of trichocard

1. Use of *Trichogramma brassicae* for management of cabbage butterflies in cole crops.

2. Use of *T. brassiiiensis* for management of fruit and shoot bore in tomato.

Barriers

Barriers are physical structures put in place to prevent a pest from reaching a plant. They keep pests away from a plant but do not kill them.

Crawling insects

1. Cut the top off a transparent plastic bottle and place it firmly into the ground, over a young plant. This stops pests such as slugs from reaching the plant.

Climbing insects

1. To help protect trees from attack by insects, grease bands can be used.

Termites

1. Digging a 70-100cm trench around buildings and nurseries can prevent attack from subterranean species of termites.

Bait traps

Cutworms

Method one

1. Mix equal quantities of hardwood sawdust, bran, molasses and enough water to make the solution sticky.

2. Spread around the base of the plants in the evenings. The molasses attract the cutworms and as they try to pass through it they get stuck. The substance dries out in the sun and the pest dies.

Method two

1. Mix 100 grams (g) of bran, 109 of sugar, 200 ml of water, 5g of pyrethrum powder. Spread around the base of the plants. The cutworms eat the substance and die.

Light traps

1. Light traps are set up at night and attract a variety of flying insects including moths, mosquitoes, chafer beetles, American bollworms, army worms, cutworms, brown rice plant hopper, green rice leaf hopper, rice black bugs, rice gall midges, rice stem borers and tomato hornworms.

Use of pheromone trap

1. Use of luci lure and heli lure for management of fruit and shoot borer in brinjal and tomato respectively.

2. Use of cue lure for management of fruit fly in cucurbits crop.

Use of trap crop

1. Planting of marigold flower along with vegetable crops reduced the incidence of aphids and thrips.

2. Planting of mustard after every 5-10 rows of cabbage or cauliflower.

3. Trap cropping of mustard and radish reduced the incidence of cabbage borer.

4. Intercrop cabbage and tomato reduced infestation of pests in cabbage.

Use of sticky trap

1. Use of yellow sticky trap for management of aphid and white fly.

Use of common salt

1. Distribute or spread common salt around the plant for management of snail and slug.

Use of vinegar

For management of fruit fly

1. Take 1 cup of water, a half a cup of apple cider vinegar, a quarter of a cup of sugar and 1 tablespoon of molasses and mixed together.

2. Take old tin cans without their lids and make two holes in opposite ends for wire handles.

3. Attach the handles and add an inch of the mixture to each can and hang 2 - 3 tins in each tree.

For management of fungal diseases or black spot

1. Take 2 tablespoons of white vinegar and mix it with 4 litres of compost tea and spray to the garden plant.

2. Take 3 tablespoons of cider vinegar, and mix it with 4 litres of water to control those fungal diseases.

For management of powdery mildew

1. Take 2-3 tablespoons of cider vinegar and mix with 4 litres of water and spray your plants.

For management of slug and snail

1. Vinegar acts as a poison to the slugs because, if you spray slugs with it directly, they will die. You can treat snails in exactly the same way.

Fruit fly baits

Baits for fruit fly that can be poured into the traps:

1. Mix 1 teaspoon of pyrethrum powder, 250g of honey, a few drops of vanilla essence, 250g of orange or cucumber peel or pulp and 10 litres of water.

Use of corn meal

1. Put a tablespoon or two of cornmeal in a jar and lay it on its side wherever there is slug activity. The slugs love this stuff and after eating it they die.

Use of baking soda

1. Mixed one spoon of baking soda in 3 liter of water
2. Add one or two drop of liquid soap.
3. Add tea spoon of vegetable oil
4. Spray the solution to the plant.
5. This is effective against powdery mildew in the plants

ZERO BUDGET NATURAL FARMING (ZBNF)

HISTORY

Mr. Subhash Palekar studied natural system and verified natural processes of the forest on his farm for six years, since 1989 to 1995. There were about 154 research projects during these six years of research work. After six years of verified research work, he got the package of technique about Zero Budget Natural Farming; which he is giving to the farmers throughout India.

DEFINITION

ZERO BUDGET NATURAL FARMING (ZBNF) or holistic agriculture is a method of agriculture that counters the commercial expenditure and things required for the growth of plant are present around the root zone.

Palekar's vision

- The model eliminates the cost of fertilizers, pesticides and seed and greatly reduce the incentive borrow, one of the chief causes for farmer suicides in the country. Hence, its evocative title ZERO BUDGET NATURAL FARMING.

- He believes in a method of cultivation which makes the already existing nutrients in the soil such as phosphate, potash, zinc, and calcium available in absorbable form by the plants.

Some unique quality of ZNBF

- In the ZERO BUDGET NATURAL FARMING nothing has to be purchased from the outside. All the things required for the growth of the plants are available around the root zone of the plants.

- 98 to 98.5% nutrients are taken from air, water and solar energy.

- Remaining 1.5% nutrients taken from the soil are also available free of cost as it is taken from the prosperous soil which is enriched with these nutrients.

OBJECTIVES

1. To increase the yield and income of the farmer through ZBNF in cereals, commercial crops, vegetables and other food crops and fruit crops as well
2. Crops can withstand adverse climatic conditions
3. Increase the presence of earthworms, beneficial insects, honey bees and birds.

IMPLEMENTATION OF ZBNF

1. In all districts of the state (11) in all agro climatic zones of the state probably in all farming village of the state.
2. Focus on small and mostly marginal farmers of the state to motivate the practice.
3. All farming villages to come under ZBNF in 5 years.
4. Coverage to be 50 % by the 3rd year as each farmers takes at least 3 years to convert the entire holding ½ of his/her area.
5. With 5 years it becomes a Bio Village.

FUNDING:-

1. Training of ATMA functionaries during October 2018 who will be master Trainers.
2. Master trainers will in turn train progressive farmers and Farmer Friends.
3. One Farmer Friend for every two villages.
4. Farmer friend will convince farmers to adopt ZBNF through intensive persuasion, hands on training, Farm School/Farm Field School, video dissemination (pico projector), troubleshooting etc.
5. They will also identify promising farmers in the village and groom them to become future Farmer Friend through intensive training.
6. 1 lead farmer per 10 men/women farmers

PRINCIPLES of ZBNF

1. NATURAL INPUT

Natural farming does not require chemicals inputs or organic compost like vermi culture but promotes a natural catalyst of biological activity in the soil and natural protection from diseases

2. LOW INPUT FARMING

The production cost for the farmer is zero as no input needs to be purchased. As 1.5 to 2.0% of the nutrients are taken from the soil by the plants, there is no need to add fertilizers.

3. MULCHING

- It is necessary to create the micro-climate under which micro-organisms can well develop, that is 25 to 32°C temperature, 65 to 72 % moisture.
- It conserves humidity of the soil, cools it and protects its micro-organisms.
- It promotes humus formation, suppresses weeds and maintain the water requirement of crops.

4. MULTI-CROPPING

Multi-cropping is a good way to minimize the risk for the farmer who is able to enjoy continuity of yield throughout the year. In case of a crop's failure he can also rely on the other crops. It has expanded farmers' income sources.

Importance of desi cow in zbnf

- One gram of desi cow dung contains 300 to 50 crores of beneficial effective microbes.
- All Indian cow breeds are suitable for ZBNF.
- Dung and urine from one desi cow is sufficient to cultivate 30 acres of land in ZBNF

Cross Bred Jersey & Holstein Friesian cows are not suitable for ZBNF, it contain less beneficial microbes and more pathogens in their dung and urine.

ZBNF & AGRO ECOLOGY

In international classification ZBNF comes under climate change resilient, Agro-ecology and more specifically under Regenerative Agriculture.

Other terms are 'Carbon farming,' 'liquid carbon pathway' etc.

WHY IS IT CALLED ZERO BUDGET?

1. Investment for the main crop- field crop of trees crop recovered through income from short duration water crops and hence the term Zero budget.

2. Other benefits from intercropping is that Soil humus production is enhanced, more nutritious food, pest management, risk management, optional sunlight utilization, and water conservation.

IS ZBNF ‘ORGANIC OF TRADITIONAL?’

1. ZBNF is not “organic input Agriculture” There are no external inputs such as bio-fertilizers, composts, Vermi compost or exotic and expensive ‘bio’ products etc. Organic input based Agriculture is expensive.

2. The output of ZBNF meets the requirement of ‘organic’ certification.

ZBNF is nor traditional agriculture. Cow dung formulation in ZBNF is not a bio-fertilizer, it is an inoculum.

FOUR WHEELS OF ZNBF

1. **jeevamrit/jeevamrutha** is a fermented microbial culture. It provides nutrients, but most importantly, acts as a catalytic agent that promotes the activity of microorganisms in the soil, as well as increases earthworm activity; During the 48 hour fermentation process, the aerobic and anaerobic bacteria present in the cow dung and urine multiply as they eat up organic ingredients (like pulse flour). A handful of undisturbed soil is also added to the preparation, as inoculate of native species of microbes and organisms. Jeevamrutha also helps to prevent fungal and bacterial plant diseases. Palekar suggests that Jeevamrutha is only needed for the first 3 years of the transition, after which the system becomes self-sustaining.

How to prepare jeevamrutha: Put 200 liters of water in a barrel; Add 10 Kg fresh local cow dung and 5 to 10 liters aged cow urine; Add 2 Kg of Jaggery (a local type of brown sugar), 2 Kg of pulse flour and a handful of soil from the bund of the farm. Stir the solution well and let it ferment for 48 hours in the shade. Now jeevamrutha is ready for application. 200 liters of jeevamruta is sufficient for one acre of land.

Jeevamrutha Application: Apply the jeevamrutha to the crops twice a month in the irrigation water or as a 10% foliar spray.(Ensuring soil fertility through cowdung and cow urine based concoction)

2. **bijamrita/beejamrutha** is a treatment used for seeds, seedlings or any planting material. Bijamrita is effective in protecting young roots from fungus as well as from soil-borne and seedborne diseases that commonly affect plants after the monsoon period. It is composed of similar ingredients as jeevamrutha - local cow dung, a powerful natural fungicide, and cow urine, a strong anti-bacterial liquid, lime, soil.

Bijamrita Application as a seed treatment: Add Bijamrita to the seeds of any crop: coat them, mixing by hand; dry them well and use them for sowing. For leguminous seeds, just dip them quickly and let them dry. Seeds treatment with cowdung and urine based formulation

3. Acchadana - Mulching. According to Palekar, there are three types of mulching:

a. Soil Mulch:

This protects topsoil during cultivation and does not destroy it by tilling. It promotes aeration and water retention in the soil. Palekar suggests avoiding deep ploughing.

b. Straw Mulch:

Straw material usually refers to the dried biomass waste of previous crops, but as Palekar suggests, it can be composed of the dead material of any living being (plants, animals, etc). Palekar's approach to soil fertility is very simple – provide dry organic material which will decompose and form humus through the activity of the soil biota which is activated by microbial cultures. (Tree covers, crops and crop residues)

c. Live Mulch (symbiotic intercrops and mixed crops):

According to Palekar, it is essential to develop multiple cropping patterns of monocotyledons (monocots; Monocotyledons seedlings have one seed leaf) and dicotyledons (dicots; Dicotyledons seedlings have two seed leaves) grown in the same field, to supply all essential elements to the soil and crops. For instance, legumes are of the dicot group and are nitrogen-fixing plants. Monocots such as rice and wheat supply other elements like potash, phosphate and sulphur.

4. WHAPASA - MOISTURE: Palekar challenges the idea that plant roots need a lot of water, thus countering the over reliance on irrigation in green revolution farming. According to him, what roots need is water vapour. Whapasa is the condition where there are both air molecules and water molecules present in the soil, and he encourages reducing irrigation, irrigating only at noon, in alternate furrows ZBNF farmers report a significant decline in need for irrigation in ZBNF. Water vapour condensation for better soil moisture.


JEEVAMRITA
Preparation of Jeevamrita
Water 200 L
10kg Cow dung + 10L Cow urine
+ 2kg Jaggery + 2kg Pulse flour
+ 30gm farm soil
Mix in a heap
Allow to ferment for 5-6days
Spray along with irrigation


BRAMHASTRA
Preparation of Bramhastra
Take a pot
Add 10L Cow, Crush 3Kg Neem
Leaves & add this neem pulp in this
water
Boil solution
5 times
Filter using cloth,
fermented for 24 Hrs
Ready to spray on trees to control sucking
pests, pod borer, fruit borer etc.

Core philosophy of ZBNF:

1. The exudates are the food for soil microbes and they multiply, their predators multiply and the entire soil food web gets activated.

2. This triggers the 'exchange 'process between plants soil microbes and soil nutrients. The plentiful locked minerals are made bio available to plants.

3. ZBNF practices stimulate this process and build soil fertility on a continuous basis.

Other important principles of ZBNF and points to note

- **Intercropping** makes the ZBNF system budget less. The minimum costs that are involved in this system are sourced by the income from intercrops.

- **Countour and bunds** have to be made for preserving rain water and to attain maximum produce from different crops.

- **Earthworm species** are revived from the deep soil by the use of organic matter rather than using vermi compost.

- **Cow dung** from the humped cow is expected to have high concentration of microorganism and proves beneficial for farm.

- Pest management through sound agronomy and only where necessary use of botanical extract (Agni asthram and Brahma asthram).

- Indigenous seeds are essential. They have Co-evolve for thousands of year.

- They are more resilient, more productive and respond better to ZBNF.

- None of the inputs should be purchased from the market. All inputs required for ZBNF farming should be made by the farmer at home of in the field or in the village. Nothing to be purchased from the market.

IMPACT OF THE ZBNF SYSTEM

- The ZBNF benefits the agriculture as well as other social and economic zones. A survey has clearly outlined the improvements in yield, soil, seed quality, income, health and autonomy at household level.

- ZBNF recognises farmers with less farmland area and introduces them a specific crop model.

- The system of farming improves the nutritional value and yield of the produce thereby contributing to the food security in the country.

- ZBNF helps the country progress on the Sustainable Development Goals (SDG)by reducing the carbon dioxide emissions at different stages in the agriculture sector.

HOW CAN ZBNF ADDRESS THE AGRARIAN CRISIS

- The yield in this method goes up over a period of time and also crop productivity and farmers' income have doubled.

- Additionally, using ZBNF techniques, one can convert even most infertile land into fertile one.

- Our country has 235 crores acre of farmland and in 2015, our food production was 25 crore metric tonnes. The area of cultivation is not going to increases, but India's population is estimates to hit 162 crore by 2050 and we want 50mt grains to feed the people. S, if we want to increases the food grain production; we have to opt for ZBNF.

HOW MUCH LAND IS REQUIRED TO START ZBNF?

- Anyone who is having half an acre of land can start ZBNF.

But what we have to ensure is to select crop based on what farmers in our area had been practicing. Local varieties of rice and other crops give better yield.

ADVANTAGES OF ZBNF:-

A. Farmers Welfare

1. Reducing cost and risk.
2. Increasing yield both short and long term.
3. Regular stream of income throughout the year.
4. Climate change resilience (tolerant to drought and heavy rain).

B. Freedom From Hunger And Improve Health.

1. More safe and nutritious health.
2. Protect environment health enhance soil micro biota, soil fauna, earthworms, bees butterfly birds, etc.

C. For Government

1. Accelerate achievement of SDG.
2. Compete better in agriculture of SDG.
3. Saving in fertilizers subsidies.
4. Saving in health expenditure.

D. Safeguarding On Collective Future

Survival and prosperity of future generations.

CONCLUSION

- Savings on cost of seeds, fertilizers and plant protection chemicals have been substantial.
- Because of continuous incorporate of organic residues and replenishment of soil fertility. Helps to maintain the soil health.
- The new system of farming has freed the farmers from the debt trap and it has instilled in them a renewed sense of confidence to make farming an economically viable venture.

3:00 pm – 5:00 pm: HORT I: Practical

DAY 52: 10:00 am – 12:00 Noon: HORT III: Anthurium cultivation

Scientific Name: *Anthurium spp.*

Family: Araceae

Chromosome no.: 2n=30,32,45

Origin: Columbia, Peru, Central and South America, Brazil and Venezuela

Species and varieties:

Anthurium andreanum, A. scherzerianum, A. Magnificium, A. digitatium,A.crystallinum, A. Watermaliense, A. Clarinervium, A. hookeri

Important varieties: Acropolis, Red Tropical, Midori, Choco, Fantasia, Cheers, Champagne,Casino, Terra

Types of Anthurium:

- Standard: Most common heart shaped spathe with overlapping lobes
- Obake: Popular for their bi-coloured pattern of green and a major spathe colour
- Tulip: Upright cupped spathe, with a straight and erect spadix

A good Anthurium variety should have:

- Compact flowers with short internodes, prolific sucker producers
- Bright clear colour, showy, heart shaped spathe
- An erect, long flower stem, about five times the length of spathe
- Spathe size of 10 cm
- Vaselife :10-15 days

Propagation: Seeds, stem cuttings, suckers, Leaf axillary buds, root stock cutting, Tissue culture

- Stem cuttings: Top portion of the stem with a few roots is removed and planted
- Suckers: Suckers at 4-5 leaf stage having 2-3 good roots can be separated and planted
- Leaf axillary buds: Single leaf with a dormant axillary bud and root is separated and planted
- Root stock cutting: rootstock is cut into small pieces each containing a single node
- Tissue culture: Explants – Leaf segments, vegetative buds, spadix, embryos etc.

Growing environment: Diurnal temperature, light and humidity play an important role in the growth and flowering.

Commercial scale anthurium production should be done in protected condition.

Growing media: Sugar bagasse, wood shavings, leaf mould, coarse sand, small brick pieces, coir pith, compost, charcoal, coconut husk and cocopeat are generally used.

Planting: Small scale planting in pots. Commercial scale in ground.

Nutrition: 1:2:2 NPK mixtures 2-3g/l in a week.

Irrigation: Twice daily during summer months.

Harvesting

After unfolding of the spathe is complete (1/3 or 2/3 of the true flower on the spadix is open)

Pests and Diseases:

Mites, Thrips, Whitefly.

Management: Boauveria bassiana (5ml/l), Multineem, yellow sticky trap etc

Diseases:

- Wilt

Management: Bacteria free planting material.

- Bacterial blight

Management: Use tissue cultured plants, Phyto-sanitation

1:00 pm – 3:00 pm: HORT IV: Cultivation of Cardamom (*Elearia cardamomum*)

Local Name: Elaichi

English Name: Cardamon

Scienific Name:*Elearia cardamomum*

Family: Zigniberaceae

INTRODUCTION OF CARDAMON:-

Cardamon popularly known as 'ILAICHI' or 'ELAICHI' in India and referred as ' Queen of Spices'. It is actually a dried fruit of a tall perennial plant. It is a part of the 'Zigniberaceae' family. In India, Cardamon is cultivated in Karnataka, Kerala, and Tamilnadu. Because of its aroma and flavour, Cardamon is one of the most expensive spices in the world. India is one of the biggest producers of cardamom in the world. The useful part of cardamom is the dried mature fruit. It is usually termed as capsule. Cardamom is used for flavouring cakes, curries, and bread for other culinary purposes. It is also used as masticatory and for flavouring coffee and confectionery.

HEALTH BENEFITS OF CARDAMON:-

Some of the health benefits of Cardamon are listed below.

- Cardamon relieves acidity.
- Cardamon beats bad breath.
- Cardamon improves digestion.
- Cardamon fights anaemia.
- Cardamon helps in lowering Blood Pressure.
- Cardamon helps in preventing blood cloths.

VARIETIES

Malabar : Mudigree 1, Mudigree 2, PV 1, ICRI 1, ICRI 3, TKD 4,IISR Suvarna, IISR Vijetha, IISR Avinash, Mysore : ICRI 2, Vazhukka : PV2, Njallani (Green gold).

SOURCES OF PLANTING MATERIAL:-

Initially the seeds can be collected from any elite plantation even if they are not grown organically. However, the methods followed for raising seedlings should conform to the organic standards. If rhizomes are to be used as planting material, the plantation should have been following organic methods of production at least one year prior to collection. Tissue culture plantlets should not be used as planting materials in order to keep integrity with the natural methods of propagation. Acid treatment of seeds should be avoided; treatment of seeds with *Trichoderma* culture (50 ml spore suspension for 100 g of seed) is desirable as a prophylactic measure for managing nursery rot diseases. At the time of preparation of beds, incorporation of VAM multiplied in recommended organic medium may be done. For raising poly bag seedlings (preferably bio-degradable polybags), potting mixture may be prepared by using 3: 1: 1 soil rich in organic matter, well rotten cow dung or vermin compost and sand. To this VAM and *Trichoderma* can also be added (250 g of mass multiple media mixed with 25 kg of well rotten cow dung). If growth of the seedlings is not adequate, spraying vermin wash once in a month is desirable (20 ml per plant). The diseases in the nurseries may be managed by regular surveillance and adopting phyto sanitary measures. Restricted application of Bordeaux mixture 1 % may be done to control rot disease at the initial stage itself. Changing the nursery site is benefited to ward off pests and diseases and for vigorous growth of seedlings.

CLIMATE REQUIRED FOR CARDAMON FARMING:-

Cardamon plants are naturally seen in the Western Ghats hilly tracts. Commercial farming of Cardamon is found in Western Ghats as this area is more suitable for its cultivation. Ideal temperature range for this crop is 10^o to 35^oC. Small cardamom is well grown in areas where annual rainfall of 1,500 mm to 4,000 mm is received. This crop can be grown about 600. To 1,500 m above sea level.

SOIL REQUIREMENTS IN CARDAMON FARMING:-

Small Cardamon is usually thrives well in soil with rich in organic matter. The best suited soils for small Cardamon commercial cultivation is loamy soils rich in humus. Ideal soil pH range of 4.5 to 7.0 is best suited for Cardamon plants growth.

PROPAGATION:-

Small Cardamon is mainly propagated by seeds and vegetative propogation. Vegetative propogation is best compared to seed propogation. In vegetative propogation, the suckers free from diseases and pest are normally used. In commercial cultivation of small Cardamon, micro-propogation using tissue culture technique can also be practiced. Small cardamon seedlings are raised in nursery beds for 10 to 18 months and they should be moved to main field plantation.

LAND PREPARATION:-

Main field is prepared by supplementing with organic matter and clearing all under growth. Dig pits of 45 × 45 × 30 cm in size in April to May season and fill with a mixture of top soil and well rotten Farm Yard Manure or any compost. If the field is sloppy, contour terraces should be made and pits should be taken along the contour. Preferred spacing for contour Cardamon planting is 2 × 1 while for Malabar type, spacing recommended in rows in Karnataka is 2 × 2 m between plants. In Kerela, a spacing of 2 m to 3 m from row-to-row and plant-to-plant is adopted.

PLANTATION IN CARDAMON FARMING:-

Best time for planting Cardamon is in monsoons i.e, from June to July. Light drizzles and cloudy days best suited for its planting. One mature sucker along with a young growing shoot should be planted in a prepared pit. After planting Cardamon, pits are filled with soil and base is covered with mulch. Care should be taken while planting seedlings, to avoid deep planting. Seedlings can be planted up to collar region in the pit. The Cardamon seedlings can be by stakes and mulched. If you are considering tissue culture seedlings, hardened plants should be planted in the main land.

PLANT PROTECTION:-
DISEASES:-

The major fungal diseases affecting cardamom are azhukal *(Phytophthora medii)* and clump rot *(Pythium vexans, Rhizoctonia solani* and *Fusarium sp.)*. Incorporation of *Trichoderma* multiplied in suitable organic medium in the plant base (1 kg per clump) prior to the onset of monsoon season (May) is a prophylactic operation for clump rot disease. Use of Bordeaux mixture 1 % when found necessary may be resorted to. Regular rouging of virus affected plants should be made to reduce the spread. Rouged plants should be destroyed by burning.

PESTS:-

Removal of drooping dry leaves, dry leaf sheath, old panicles and other dry plant parts is an important sanitation method recommended for reducing the pest inoculum in the plantation. Mechanical collection and destruction of egg masses of pests, larvae of hairy caterpillar *(Eupterote* sp) and beetles of root grub *(Balepta fuliscorna)*are other approaches in reducing the pest damage. As soon as bore holes of stem borer *(Conogethes punctiferalis)* are noticed, injection of *Bacillus thuringiensis*preparation into the bore hole (0.5 ml in 10 ml water) will kill the larva so that subsequent resurgence can be reduced. Wherever organic methods of cultivation are adopted outbreak of white flies *(Dialeurodes cardamomi)* is seldom observed. However in the event of such outbreak, collection of adults using yellow sticky trap and control of nymphs by spraying neem oil with soft soap made out of minimum caustic soda (500 ml neem and 500 g soft soap in 100 litres of water) is to be followed. In areas prone for nematodes, *(Meloidogine* sp.) application of crushed neem seed can take care of the problems. Application of fish oil rosin soap may be made for managing thrips *(Sciothrips cardamomi)*. Malabar varieties are found to be tolerant to thrips to a certain extent. Regular surveillance is absolutely essential for timely detection and adoption of remedial measures against the pests affecting cardamom.

MANURES AND FERTILIZERS:-

Organic matter like compost or cattle manure (cowdung) may be given at 5 kg per clump. Neem oil cake may be supplemented at 1 kg per clump.

Recommended fertilizer NPK dose is 75:75:150 kg/ha. Application of lime enhances nitrification and corrects soil acidity, resulting in good plant growth. A fertilizer NPK dose is 120:120:240kg/ha to the high density Cardamon planting of (about 5,000 plants/ha) is recommended for Karnataka, whereas a NPK dose of 30:60:30kg/ha is usually recommended in Kerala. For split application of fertilizer, Under rain fed condition, fertilizer can be applied in 2 split. The first application of fertilizer helps in capsules development and in production of suckers, whereas the second application helps in suckers and initiation of panicles. In irrigated conditions of plantation, fertilizer application in four split doses at a quarterly interval is beneficial. Avoid applying fertilizer in heavy rains.

WEED CONTROL/INTERCULTURAL OPERATIONS:-

3 to 4 rounds of weeding is required in May to June , Aug to Sept & Dec to Jan. Plants shade should be regulated when needed. Cardamon plants base should be mulched on regular basis. Panicles exposing over the mulch would be beneficial for bee pollination. Removal of old and drying shoots should be carried out once in a year with monsoon under rain fed conditions and 2 to 3 times in high density Cardamon plantation provided with alternative irrigation facilities.

Before planting of Cardamon, fast growing shade trees like balangi, cedar, and elangi should be planted in the main field. To provide sufficient light during monsoon, shade should be regulated in May before the monsoon arrives. 2-tier canopy is beneficial with a height max of 3 meter between the lower and higher canopy.

IRRIGATOIN IN CARDAMON FARMING:-

Frequent watering 1 week to 2 weeks interval is required during the hot summer months. Regular watering (25mm to 38 mm/irrigation) helps in panicles initiation, flowering of plant and fruit set. Make sure the soil has enough moisture level all the time (at least 45-

50%). Overhead irrigation process/method is best suited to Cardamon plantations. Drip irrigation also found beneficial in the Cardamon crop.

HARVESTING:-

Cardomon plants start bearing the fruit in 2nd or 3rd year or plantation. The fruits would mature @35 to 45 days intervals, with 5 to 6 pickings. Normally harvesting season for Cardamon is from October to November. In Tamil Nadu and Kerela, harvesting starts from Aug to Sept and continues till Feb to March. In Karnataka, it starts in July to Aug and continues up to Dec to Jan. When fruits are in ripped stage,capsules should be harvested. Over mature Cardamon fruits split on drying floor, whereas the unripe Cardamon fruits shrivel on drying

YIELD:-

An average yield of dry Cardamon capsules from a well-grown plantation would be around 450 to 500 kg/ha. Yield may vary from soil to soil and type of variety.

POST HARVEST IN CARDAMON FARMING:-

Both machine drying and sun drying methods are practiced. After harvesting, Cardamon capsules are dried either in the sun or electrical or fuel kiln. Soak harvested green Cardamon capsules with 2% washing soda solution for 10 minutes to retain original green colour. Sorting and grading is done based on the size and colour of the dried Cardamon capsules. Graded capsules should be stored in black polythene lined gunny bags to maintain the green colour during storage. These bags should be kept in wooden chambers.

After harvesting, the freshly harvested capsules need to be cleaned from dirt. Curing of cardamom capsules is done by reducing the moisture from 80% to 8-12% at an optimum temperature by retaining green colour to the maximum extent. Cardamom can be cured by two methods.

SUN DRYING:-

Cardamom is directly dried under the sunlight. Sun drying generally requires 5-6 days. It is not dependable during rainy season. This practice is followed only in some parts of Karnataka. By this method, it is not possible to obtain good green colour.

CONVENTIONAL CURING:-

This is the most commonly adopted method for curing cardamom. It requires a structure fitted with furnace, flue pipes, chimney, ventilators etc. It is a masonry structure consisting of two apartments, a curing room and a furnace room. Curing room is a tall one provided with ceiling at the roof and fitted with wire gauge on the beams at the middle of the room parallel to the ground floor, making the room into two compartments. Flue pipes having a radius of about 25 cms made of galvanized iron sheets are provided in the ground floor from one end to the other from the furnace to chimney pipe to expel the smoke through the roof. Racks holding rectangular trays are also fitted to the side walls for accommodating larger quantities of cardamom.

Capsules are spread in a single layer on the racks and trays. After spreading, the curing room is closed and heating is done by burning firewood in the furnace and the heat produced is conducted. Only fallen trees and lopped branches should be used as fuel. The hot smoke passes through the pipes bringing the room temperature to 45 to 50°C. This temperature is maintained for 3 to 4 hours. At this stage capsules sweat and give off moisture. Ventilators are then opened for sudden cooling and sweeping out vapour from the drying capsules. Ventilators are closed after vapour is escaped completely and temperature is maintained at 40°C for about 24 to 30 hours. Temperature is raised again to 45°C for one hour. The whole process of curing takes about 28 to 36 hours. In general, quality of capsules cured by this method is very good. Community curing is cheap and less polluting.

3:00 pm – 5:00 pm: PROJECT MANAGEMENT: INTRODUCTION TO PROJECT MANAGEMENT

Project management is a methodical approach to planning and guiding project processes from start to finish. It is the method of planning the plan. It starts from project definitions and ends with goal achievement.

Project Management Body of Knowledge (PMBOK) defines project management as the application of knowledge, skills, tool and techniques to project activities in order to meet stakeholder's needs and expectations from a project.

What Is a Project?

- A project is "a temporary endeavor undertaken to create a unique product, service, or result."
- Operations is work done to sustain the business.
- A project ends when its objectives have been reached, or the project has been terminated.
- Projects can be large or small and take a short or long time to complete.

Project Attributes

A project has a unique purpose, Is temporary and Is developed using progressive elaboration. It also requires resources, often from various areas and should have a primary customer or sponsor. The project sponsor usually provides the direction and funding for the project involves uncertainty.

Project and Program Managers

- Project managers work with project sponsors, project teams, and other people involved in projects to meet project goals.
- Program: "A group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually."*
- Program managers oversee programs and often act as bosses for project managers.

What is Project Management?

Project management is "the application of knowledge, skills, tools and techniques to project activities to meet project requirements."

Project Stakeholders

Stakeholders are the people involved in or affected by project activities. It encompasses

- Project sponsor
- Project manager
- Project team

- Support staff
- Customers
- Users
- Suppliers
- Opponents to the project

Project Success Factors

1. Executive support
2. User involvement
3. Experienced project manager
4. Clear business objectives
5. Minimized scope
6. Standard software infrastructure
7. Firm basic requirements
8. Formal methodology
9. Reliable estimates
10. Other criteria, such as small milestones, proper planning, competent staff, and ownership.

The Role of the Project Manager

- Job descriptions vary, but most include responsibilities such as planning, scheduling, coordinating, and working with people to achieve project goals.
- Remember that 97 percent of successful projects were led by experienced project managers.

Skills for Project Managers

- Project managers need a wide variety of skills.
- They should:
  - Be comfortable with change.
  - Understand the organizations they work in and with.
  - Lead teams to accomplish project goals.
- Project managers need both "hard" and "soft" skills.
  - **Hard skills** include product knowledge and knowing how to use various project management tools and techniques.
  - **Soft skills** include being able to work with various types of people.

- **Communication skills**: Listens, persuades.
- **Organizational skills**: Plans, sets goals, analyzes.
- **Team-building skills**: Shows empathy, motivates, promotes esprit de corps.
- **Leadership skills**: Sets examples, provides vision (big picture), delegates, positive, energetic.
- **Coping skills**: Flexible, creative, patient, persistent.
- **Technology skills**: Experience, project knowledge.

DAY 53: 10:00 am – 12:00 Noon: FARM MECHANIZATION: Maintenance of LOG Book

This is a record of the use of your Power Tiller. Proper and regular entries in this book will

(1) help you get the Power Tiller serviced at the right time.

(2) help your mechanics to know the condition of your Power Tiller better and thus take timely action to prevent costly break-downs and

(3) thus help you to get much longer life for the Power Tiller.

The next two sheets will be sufficient to keep the record for the first year of use. The first column shows the name of the month and first rows the dates of the month.

At the end of each day, the number of hours the Power Tiller has been used should be entered in the space provided against thise corresponding date. On a day the Power Tiller has not been used, leave this space blank against that date.

At the end of the day, after cleaning the Tiller for storage, the fuel Tank should be filled up to the top. The quantity of fuel (in liters) required to fill the tank, plus any fuel added during the day should be entered in the space provided for the purpose.

The total number of hours the Power Tiller has been used and the fuel consumed should be added and noted at tile end of each month

.

MONTH	DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
JANUARY	NO.OFHOURS WORKED														
	DISEL IN LTR.														
FEBRUARY	NO.OFHOURS WORKED														
	DIESEL IN LTR.														
MARCH	NO.OFHOURS WORKED														
	DIESEL IN LTR.														
APRIL	NO.OFHOURS WORKED														
	DIESEL IN LTR.														
MAY	NO.OFHOURS WORKED														
	DIESELIN LTR.														
JUNE	NO. OF HOURS WORKED														
	DIESEL IN LTR.														

MONTH	DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Julv	NO.OFHOURS WORKED														
	DISEL IN LTR.														
August	NO.OFHOURS WORKED														
	DIESEL IN LTR.														
September	NO.OFHOURS WORKED														
	DIESEL IN LTR.														
October	NO.OFHOURS WORKED														
	DIESEL IN LTR.														
November	NO.OFHOURS WORKED														
	DIESELIN LTR.														
December	NO. OF HOURS WORKED														
	DIESEL IN LTR.														

1:00 pm – 3:00 pm: AGONOMY: PACKAGE OF PRACTICES OF PULSES

A. LENTIL (*Lens esculenta* L.)

Introduction

Lentil is one of the most important and most nutritious rabi pulses. It has that potential to cover the risk of rainfed dry land agriculture due to its better adaptability under moisture and temperature extremes. This can also be use as a cover crop against soil and water erosion. Lentil is mostly eaten as "dal". The nutritious value of the seeds of the plant is quite high as it is rich in carbohydrates, fibres and proteins. It is extremely good in fixing nitrogen from the atmosphere and forming nitrogen nodules in the soil that rejuvenates the nutrients and keep the soil productive for a long time. Lentil can be grown successfully both in upland and lowland condition of this region after harvest of the kharif crop. In upland, it can be grown with minimum tillage after harvesting of maize or upland rice. In late harvested lowland paddy field, zero tillage can be adopted with Lentil for avoiding any further delay in its sowing.

Improved Cultivation Practices

Climatic and Soil Requirements

Lentil requires a cold climate. It is a very hardy crop and can tolerate frost and severe winter to a great extent. It can be grown to conserve moisture in the soil during the rainy season. It requires cold temperature for vegetative growth and warm temperature during maturity. Light loam soils are suitable for lentil. This crop can also be grown in less fertile soils and lowland rice fallows.

Seed and Sowing

Good quality seeds of any of the short to medium duration variety (120 to 140 days duration) can be chosen. Small seeded varieties are more suitable for this region.

Varieties:

Following varieties have been found suitable for the state of Meghalaya as recommended by the ICAR NEH, Umiam: HUL-57, T-36, PL-6, PL-8, NDL-1, DPL-62, Moitree.

Sowing time

For high Altitude**:** 15th October to 15th November

For Low Altitude : 15th November to 15th December

Soil and its preparation

Application of lime in soil approximating 2 tons per ha 15-20 days before its sowing especially in upland is required. Being a legume it requires good aeration for nodule development and that can be achieved by one deep ploughing followed by one cross harrowing. Application of Panchagavya 15 days before sowing is advantageous.

In lowland after paddy harvest

Seed rate and crop spacing

Small seeded timely sown		= 30-40 kg/ha
Bold seeded timely sown		= 50-60 kg/ha
Row spacing	(Normal sowing)	= 30cm
	(Delayed sowing)	= 25cm
Depth of sowing		= 4-5cm
Plant to plant spacing		= 5cm

Seed treatment

Lentil is susceptible to wilt, root rot and other fungal diseases during establishment hence, seed should be treated with Beefamrut and seed should be inoculated with dual culture of Rhizobium and PSB. About 3-4 packets of both the culture is sufficient for treating the seeds for one hectare area.

Plant nutrient management

FYM@ 5t/ha to be applied in soil about 15 days before sowing of seed and application of Rock Phosphate in furrows method @ 250kg/ha.

Weed management

Hand weeding, one at 35-40 days after sowing and another at 55-60 days after sowing depending on the crop growth and intensity of weed infestation

Water Management

It can tolerate drought to a greater extent but under conditions assured irrigation is required. In lowland rice fallow, usually irrigation is not required. Irrigation may be given to the crop, if water is available, at flowering and pod filling.

Plant protection measures

Minor incidence of pod borer can be controlled with 5% Neem seed kernel extract (NSKE). Disease can be controlled by applying Bio- fungicide like *Bacilluss sp.* Application of Jeevamrut in 15 days interval is also advisable.

Harvesting storage and yield

Crop becomes ready for harvest when leaves begin to fall, stem and pod turn brown or straw in colour.

Threshing and winnowing

The crop should be allowed to dry for 4-7 days on threshing floor and threshed by beating with sticks or trampled under the feet of bullocks.

Storage

The clean seed should be sun dried for 3-4 days to bring their moisture content at 9-10%

Yield

- 8-10q/ha grain
- 15-20q/ha straw

ZERO TILLAGE PRACTICES OF LENTIL IN RICE FALLOW

Opportunity of zero tillage for lowland rice fallow

Rice is the main staple food of the region occupying an area of 3.37 million hectare which is more than 80% of net cultivated area in North East India. The cropping intensity in the region is hardly about 120%. Conventionally, after kharif rice, field remain fallow in lowland, mainly due to excess moisture owing to seepage from surrounding hillocks in mid altitude. Draining water from rice field completely at physiological maturity (about 10days before harvest) creates favourable condition for successful cultivation of rabi pulses like lentil. A simple drainage channel of 30 cm width and 20 cm depth of 5 m interval creates the desirable soil moisture situations.

Characteristics of lowland rice ecosystem in hill.

Lowland rice is cultivated during April to November in hills depending upon the altitudes. At mid hills (950m MSL), rice is transplanted during first fortnight of July and harvested during November. After rice harvest, the moisture level remains high owing to release of moisture from surrounding hillocks. Cultivation of second rice is not possible due to early onset of winter that results spikelet sterility. Under such situation, cultivation of lentil is possible following zero tillage after rice harvest for enhancing cropping intensity, farm income and livelihood.

Pea can be grown in lowland rice follow in Rabi Season

Zero tillage in lowland at as glance

- Transplant rice in line with at least 20cm spacing between row to row.
- Apply FYM or any other organic manure 5 t/ha for better soil health.
- Avoid excessive tillage. Only one or two ploughing followed by levelling in sufficient for a

good crop of rice.

- Follow all other cultural operations as followed for conventional cultivation of rice.
- Provide a narrow drainage channel (30 cm width x 20 cm depth) around the standing rice crop at an interval of 5 m during physiological maturity of the rice crop. This will ensure a fairly dried field for sowing of lentil within 15-20 days of rice harvest.
- Harvest rice by leaving at least 20 cm standing stubble above the ground uniformly.
- Sow lentil by opening a narrow furrow using manual furrow opener in between two rows of previous rice crop as shown in mechanical/animal drawn furrow opener could also be used if feasible/available.
- Plant to plant spacing in a row should be maintained at 1-2 cm for lentil
- Organic Manure and seed are placed in the narrow furrows created by a ‘V’ shave furrow opener.
- Cover the seed with the soil after placing fertilizer and seeds.
- Alternatively, the lentil seed can be broadcasted in the field just one week before rice harvest if soil moisture condition is good (only moist field and no standing water).
- The lentil seeds get germinated before rice harvesting.
- Rest of the cultural operations are done as recommended.

Opportunity of zero tillage for upland rice fallow

In upland, after rice harvest no crop is cultivated due to severe moisture stress. The conventional tillage for sowing of rabi crop further aggravates the soil moisture problem by completely exposing the soil. With the help of zero tillage, the rabi crop can be grown directly in standing rice stubbles soon after the harvest of the rice crop. As the soil is not tilled, the rate of soil moisture loss is reduced and rabi crop can be grown successfully with conserved soil moisture and life saving irrigation

Zero tillage in upland – at glance

- Line sowing of rice crop with 25 cm spacing between row to row
- Apply compost of FYM at 5t/ha for better soil health.
- Avoid excessive tillage. Only one or two ploughing followed by levelling is sufficient for a good crop of rice.
- Follow all other cultural operations as followed for conventional rice cultivation.
- Harvest rice by leaving at least 30cm standing stubble above the ground uniformly.
- Soon after the rice crop harvest, sow lentil crop by opening a narrow using manual furrow opener in between two rows of previous rice crop mechanical/ animal drawn furrow opener could also be used if feasible / available.
- Plant to plant spacing in a row should be maintained at 1-2cm for lentil.
- Organic manure and seeds are placed in the narrow furrows created by a ‘V’ shape furrow opener.
- Cover the seeds with the soil.
- Mulching can also be done with available biomass (rice straw, weed, etc) at 5t/ha
- Rests of the cultural operation are done as followed in conventional agriculture.

LENTIL CULTIVATION UNDER ZERO TILLAGE OPERATION IN THE VILLAGE OF LAKROH, WEST JAINTIA HILLS

B. RAJMA (*Phaseolus vulgaris* L)

Rajma (*Phaseolus vulgaris L.*) is also known as kidney bean, common bean, navy bean, haricot bean or snap bean. Rajma is consumed as green vegetable as well as grain pulse. For vegetable purpose round podded type with more flesh and less string is preferred. Flat podded types are mainly grown for whole seed. Rajma called Raja in Hindi is a rich source of protein and its protein is rich in many essential amino acids.

Traditionally, Rajma is cultivated in the hills during Kharif. However, with development of new varieties its cultivation in the plains is also increasing day by day. Among all pulses it fetches the highest price, almost double the price of other pulses. Thus, from economic point of view, this is a very profitable crop. Rajma is therefore gaining popularity as cash crop. In the hills, Rajma is mainly grown in Kharif. If irrigation is available it can be cultivated during rabi season too. Cultivation of Rajma under rain-fed conditions in rabi is not recommended.

Varieties:

Improved varieties like Arka Anoop, Contender, Pusa Parvati, Arka Komal, Arka Sunidhi are recommended by ICAR NEH, Umiam.

Soil and Land Preparation:

In general, Rajma can be cultivated on almost all types of soil, however, deep light textured soil with 6.5-7.5 pH range are ideally suited. Drainage should be very good Land should be well prepared with one deep ploughing followed by 2-3 harrowing. Beds must be levelled, weed free and free from clods. Soil moisture is very critical at the time of sowing. If adequate moisture is not available at sowing time germination may be very uneven and poor. In such a case seed should be sown only with a pre sowing irrigation. Application of Panchagavya 15 days before transplanting is advisable for better growth.

Seed and Sowing

A seed rate of 120-125 kg/ha is essential for ensuring adequate plant stand. Optimum plant stand for a good crop is 3-3.5 lakhs plants/ha. Row to row spacing should be 40-45 cm and plant to plant distance should be 10 cm. Seeds should be places at 8-10 cm depth for good establishment of the plants.

Sowing time:-

High Altitude (Kharif season): April to May

Low Altitude (Kharif Season): March to June

Low Altitude (Rabi Season) : October.

Organic Manure Management:

Rajma requires a dose 15-20 mt/ha organic manure/ rock phosphate @ 250kg/ha be applied to realize the full potential of high yielding varieties.

Water Management:

Rajma cannot withstand water stress. Sufficient soil moisture should be present during entire crop season. For good yield 3-4 irrigations are essential. Most critical stage for irrigation is 25 days after sowing. Subsequent critical stage is 75 days after sowing. For upland conditions the required frequency of irrigation is much more.

Weed Control:

Weeds are a serious problem in Rajma cultivation. Yield reduction of 25-30% has been reported due to uncontrolled weed growth. Hand weeding at 30-35 days after sowing reduces weeds infestations effectively.

Diseases and insect pests:

In general Rajma is affected by lesser number of insect pests and diseases in comparison to other pulses. However, main pests and diseases are described below.

Insect Pests:

Cutworm: In general this insect damages the crop at early vegetative stage. Sometimes it may damage grown-up plants also. Insect cuts the plant near the soil and drag away the cut portion.

Stem fly: This also damages the crop at early vegetative stage. The fly enter stem near the soil and pupate inside.

Leaf hopper: Damage the crop by sucking cell saps from leaf. Leaves become dry and wrinkled. In severe cases this reduces bearing drastically. Its attack increases with increase in temperature.

Aphid: This insect also damages the crop by sucking cell sap. Moreover, controlling aphids is important due to the fact that it acts as carrier for virus.

3:00 pm – 5:00 pm PRACTICAL

DAY 54-58: EXPOSURE VISIT OUTSIDE THE STATE

DAY 59: 10:00 am – 12:00 Noon: PROJECT MANAGEMENT: Project Cycle Management (PCM)

- Project identification
- Project formation
- Appraisal
- Implementation
- Monitoring
- Plan revision
- Evaluation
- Feedback

8 Steps for PDM in PCM

1. Stakeholder Analysis: Stakeholder is any individual, group or organization, community, with an interest in the outcome of a programme/project.

2. SWOT Analysis: SWOT analysis is a tool for institutional appraisal and a brainstorming exercise in which the representatives of the organization participate fully.This is to Assess the performance and capacity of the units or divisions of a organization

3. Problem Analysis: Problems Analysis visually shows the causes and effects of existing problems in the project area, in the form of a Problem Tree. It clarifies the relationships among the identified problems.

4. Objective Analysis: Objective Analysis clarifies the means-ends relationship between the desirable situation that would be attained and the solution for attaining it. This stage also requires an Objective Tree.

5. Project Selection: Project Selection is a process in which specific project strategies are selected from among the objectives and means raised in Objectives Analysis, based upon selection criteria.

6. Project Design Matrix (PDM): The project design Matrix (PDM) is formed through elaborating the major project components and plans based on the approach selected. The

format of PDM is similar to that of the Logical Framework, and therefore can be commonly used worldwide.

7. Workplan: The Plan of Operation is prepared by the project implementers, based on the PDM and other information. It is an effective tool for project implementation and management, and provides important data for monitoring and evaluation of the project.

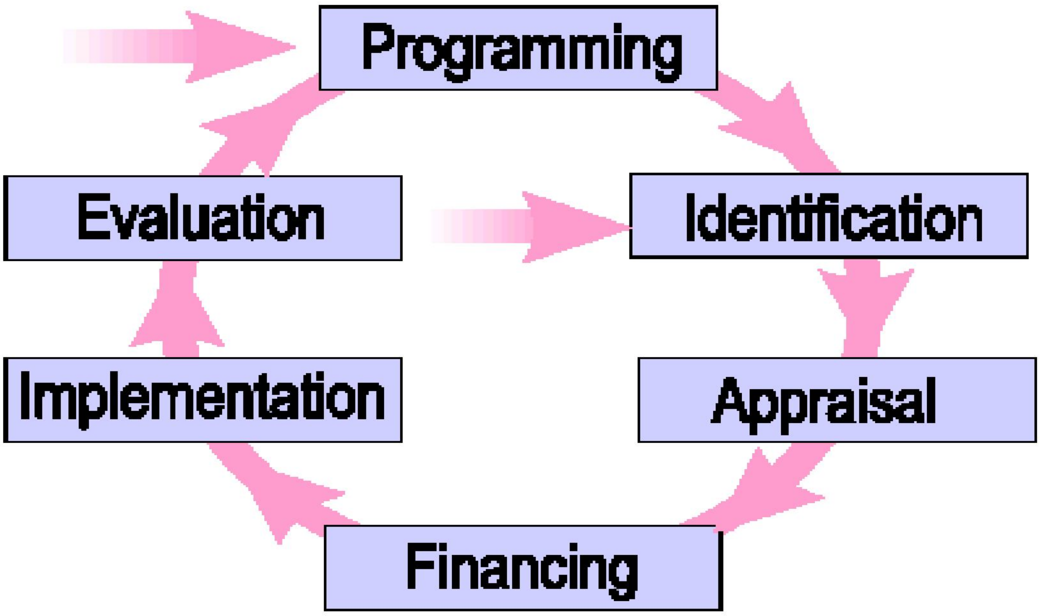
8. Monitoring and Evaluation: Strengthens accountability and transparency. Provides information for effective management.Helps determine what works well and what requires improvement.Builds knowledge

Why Project Cycle Management?

- Results-oriented – not activity driven
- Consistency
- Logically sets objectives and actions
- Participatory stakeholder involvement
- Transparency
- Shows whether objectives have been achieved: Indicators (for M&E)
- Framework for assessing relevance, feasibility and sustainability.
- Describes external factors that influence the project's success assumptions and risks.

Project Cycle Management (PCM) : A Method of managing the 6 phases of the Project Cycle using the Integrated Approach and Logical Framework. It is an Integrated Approach which

- Ensures that projects are adjusted during the 6 phases in order to become more effective, efficient and sustainable
- Specify the documents to be produced in each phase to provide the basis for necessary decisions
- Uses a set of docs having the same basic format



1:00 pm – 3:00 pm: PROJECT MANAGEMENT: Key Activities in Project cycle management

Key activities in Project Cycle Management (PCM)

1. Programming

- Review of socio-economic indicators
- Review of partners countries and donor priorities
- Agreement on sectoral and thematic focus for co-operation through an agreed strategy formulation

2. Identification

- initial formulation of project idea
- screening for further studies (= pre-feasibility)

3. Appraisal (formulation)

- Conduct of feasibility study
- Detailed specification of project ideas
- Decision on whether to draw up financing proposal

4. Financing

- Drafting and negotiating a Fin. Prop.
- Examination by competent Member States committee

- Financing decision and agreement

5. Implementation

- Tendering and contract award
- Mobilisation and project execution

6. Evaluation

- Analysis of project effects and impact
- Recommendations on remedial action or guidance for future projects
- No common perception

Role of PCM

PCM provide structure to ensure that:

▪ Projects are relevant to the real needs of beneficiaries because:

✓ Beneficiaries are actively involved in the planning, implementation and M&E processes since the outset

✓ Problem analysis is thorough

✓ Goals are clearly stated

▪ Projects are feasible & sustainable; efforts are made to ensure that:

✓ Outputs & objectives are logical

✓ Risks and assumptions are taken into account

✓ Monitoring helps adjusting implementation

✓ Benefits will continue afetr the project

✓ Results from evaluation are used to learn from experience and adapt the content of the project as well as reshape the new programming phase

The PCM Toolkit

LFA Tools:

- Stakeholder analysis
- Problem analysis
- Analysis of objectives
- Strategy analysis
- Logframe
- Activity planning

- Resource scheduling

Complementary Tools:

- Participatory workshops
- Environmental assessment
- Gender analysis
- Institutional appraisal
- Economic & financial analysis

Advantages of Project Management

- Better control of financial, physical, and human resources.
- Improved customer relations.
- Shorter development times.
- Lower costs.
- Higher quality and increased reliability.
- Higher profit margins.
- Improved productivity.
- Better internal coordination.
- Higher worker morale (less stress).

3:00 pm – 5:00 pm PRACTICAL -

DAY 60: EXPOSURE VISIT INSIDE THE STYATE