

**Vocational Higher Secondary
Education (VHSE)**

Second Year

**AGRICULTURE SCIENCE AND
PROCESSING TECHNOLOGY**

Reference Book - Teachers' Version



Government of Kerala
Department of Education

State Council of Educational Research and Training (SCERT),
KERALA
2016

Foreword

Dear Teachers

This reference book (**Teachers' Version**) is intended to serve as a transactional aid to facilitate classroom transaction and as a ready reference for teachers of Vocational Higher Secondary Schools. It offers some guidelines for the transaction of the course content and for undertaking the practical work listed in the course content. As the curriculum is activity based, process oriented and rooted in constructivism focusing on the realisation of learning outcomes, it demands higher level proficiency and dedication on the part of teachers for effective transaction.

In the context of the Right- based approach, quality education has to be ensured for all learners. The learner community of Vocational Higher Secondary Education in Kerala should be empowered by providing them with the best education that strengthens their competences to become innovative entrepreneurs who contribute to the knowledge society. The change of course names, modular approach adopted for the organisation of course content, work-based pedagogy and the outcome focused assessment approach paved the way for achieving the vision of Vocational Higher Secondary Education in Kerala. The revised curriculum helps to equip the learners with multiple skills matching technological advancements and to produce skilled workforce for meeting the demands of the emerging industries and service sectors with national and global orientation. The revised curriculum attempts to enhance knowledge, skills and attitudes by giving higher priority and space for the learners to make discussions in small groups, and activities requiring hands-on experience.

The SCERT appreciates the hard work and sincere co-operation of the contributors of this book that includes subject experts, industrialists and the teachers of Vocational Higher Secondary Schools. The development of the teachers' version of reference books has been a joint venture of the State Council of Educational Research and Training (SCERT) and the Directorate of Vocational Higher Secondary Education.

The SCERT welcomes constructive criticism and creative suggestions for the improvement of the book.

With regards,

Dr. J. Prasad
Director
SCERT, Kerala

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ABOUT THE COURSE

In recent times agricultural sector in Kerala confronts an array of issues which is undeniably a matter of contemplation, especially in view of livelihood and sustainability of the sector in the state. The youth moving away from agriculture to comparatively more remunerative fields poses serious threats to the agrarian future of the state. An asymmetric socio-economic regime with excessive stress on consumerism will also prove to be detrimental in the long run. Viewed from this context, a paradigm shift in this regard, especially placing the agricultural sector in the upfront of the present socio-economic structure of the society, requires concerted effort.

Huge post-harvest losses and lack of secondary agriculture are major threats to our economic, social and nutritional security. Even though we have made tremendous improvement in production and productivity of agricultural crops, about 30 to 40% of fruits and vegetables are still lost due to poor post-harvest handling.

‘Secondary agriculture’ is adding value to the basic agro commodities to allow farmers to get better returns from their harvest, create new jobs in rural sector to grow rural economy which is entirely based on agriculture. Thus secondary agriculture provides ample scope for new job opportunities in all steps of value addition throughout the supply chain right from production, harvesting, Post-harvest handling practices, packaging, labelling, marketing, storage, primary processing and product development through secondary processing. This will provide better returns to farmers and creation of employment with off spin benefits of reduction of Post harvest losses and food and nutritional security.

For the prosperity of our nation, a successful transition from primary agriculture to secondary agriculture, creating new jobs and building wealth, is inevitable, and all developed countries have succeeded in this regard. Agro processing industries have the potential to generate directly significant employment in production activities and also indirect employment through its forward and backward linkages.

Kerala’s revised educational curriculum in Agriculture Science and Processing Technology, in its essence, holds this perception. It comprehensively covers the basic agricultural aspects by giving emphasis to Agri-Field Techniques, Crop Production Technology, Applied Agricultural Technology and Post-harvest and processing Technology. The renewed curriculum touches upon all the important aspects of agricultural technologies in a structured and phased manner while giving sharp focus towards the need for organic farming and give emphasis to Post-harvest and Processing Technology. The course is designed in such a way to train the students

in the above aspects to satisfy the new employment opportunities associated with secondary agriculture and also to create successful entrepreneurs.

The current course structure also gives paramount importance to inculcating the entrepreneurship skill in students pursuing vocational education in agriculture. The scope and potential of the agricultural sector in this state lies beyond any quantifiable magnitude. Nevertheless, for the realistic manifestation of the existing potential, we need to revamp the conventional thoughts and practices in accordance with the advances made in agricultural sector. The system envisages a vibrant and sustainable agrarian sector in the state through equipping the youth with advanced technological and entrepreneurial skills.

Objectives

The course has the following objectives:

- To equip the students in starting commercial enterprises in the field of Agriculture.
- To create awareness about environmental hazards due to indiscriminate use of pesticides and the need for organic farming.
- To practice organic farming and to familiarise the learners with organic certification procedures.
- To practise mass production of bio control agents and preparation of bio pesticides
- To develop skills in field level identification of pests and diseases of major crops and to practise their eco-friendly management.
- To develop skilled technicians in the area of post-harvest handling (sorting, grading, pre-treatments, packaging and storage of crop produces).
- To develop skills in preservation of food products and preparation of various value added products.
- To develop the required skills and competencies among the students to be successful entrepreneurs.

JOB ROLES

Government / Semi Government	Private Sector	Self Employment
<ul style="list-style-type: none"> • Assistant Agricultural Officer. • Agriculture Assistant KLDB • Agri Extension Assistant • Supply Chain Field Assistant • Seed processing Worker • Quality seed grower • Green house fitter • Floriculturist (open and protected cultivation) • Gardener • Laboratory Technical Assistant in VHSE • Vocational Instructor in VHSE • Work superintendent in Department of Agriculture • All other posts where basic qualification required is plus two • Field or Farm technician (IISR) • Field Assistant and Farm supervisor (Farming corporation) • Farm Technical Assistant (Plantation corporation Limited) • Field Assistant (LEADS) • Field Assistant (CTCRI) • Field Assistant (FSRS) • Field Assistant (VFPC) • Field Assistant (KAU) • Technical Assistant (KVK) 	<ul style="list-style-type: none"> • Food sample collector • Post harvest technician • Technician in Processing industries • Technician in repair & maintenance of Processing Equipments • Field Representative (Fertiliser and Pesticide companies) • Assistants in Agriculture based media Programmes • Gardeners / Farm supervisors • Assistants in crop health • Agri Extension service provider • Harvesting machine operator • Supply chain field assistant • Micro irrigation technician 	<p>Production sector</p> <ul style="list-style-type: none"> • Private nursery • Mushroom cultivation and spawn production • Vermicomposting • Coir pith composting • Azolla cultivation • Organic manure production • Bio fertilizer production • Seed production and processing unit • Hiring of agricultural implements • Repair of agricultural implements • Apiculture • Protected cultivation <p>Service sector</p> <ul style="list-style-type: none"> • Training on above sectors • Agro-clinics • Agricultural consultancy • Irrigation services • Harvest services • Other farm services • Agro Service Centers

MAJOR SKILLS (WITH SUB SKILLS)

I. Skill in High-tech Agriculture

- Construction of Rain shelter.
- Cultivation of crops in rain shelter and poly houses.
- Seed bed preparation.

II. Skill in organic farming

- Setting up of organic vegetable garden
- Preparation of botanicals and organic nutrient solutions
- Mass multiplication and application of biocontrol agents
- Method of application of biofertilizers (Rhizobium)

III. Skill in pesticide residue elimination through domestic practices

IV. Skill in running successful agri-enterprises

- Mushroom and spawn production.
- Preparation of value added products from mushroom
- Vegetable seed production.
- Apiculture unit.
- Identification of ornamentals
- Landscaping and its maintenance
- Lawn making and its aftercare
- Flower arrangement- Fresh and dry flower.
- Preservation of plant materials

V Skill in identification of pest and diseases of major crops

VI Skill in suggesting ecofriendly management practices for controlling major pest and diseases.

VII. Skill in post harvest handling (Sorting, Grading, Pretreatments, Packaging and storage of crop produces) to enhance shelf life.

VII. Skill in preservation of food products and preparation of various value added products.

LEARNING OUTCOME OF THE COURSE

- The learner identifies the different branches of Agriculture and explains the milestones and importance of it.
- The learner explains the Agri field techniques like tillage, irrigation , propagation methods , crop pest management etc.
- The learner describes and practices the production technology of important crops of Kerala.
- The learner acquires skill in cultivating crops under protected conditions.
- The learner will be able to practice organic farming and will get aware on the certification procedures.
- The learner will have the skill to become a successful entrepreneur in agri enterprises.
- The learner acquires skill in post harvest technology on various crops.
- The learner will be able to practice the preparation of various value added product.

COURSE STRUCTURE

Module No	Name of Module	No of Periods
1	Agri Field Techniques	340
2	Crop Production Technology	340
3	Applied Agricultural Technology	340
4	Post harvestand processing Technology	340

SYLLABUS

MODULE III

APPLIED AGRICULTURAL TECHNOLOGY

Unit 1 Hi-Tech Agriculture

(69 periods)

Protected cultivation - definition - advantages – scope and constraints in Kerala – Green House/ poly house– definition – classification based on shape, structure and cladding material – components of green house - Growing media and bedpreparation- list of crops cultivated commonly in protected cultivation- drip irrigation, fertigation- automated climate regulation in protected cultivation - Mistifiers, foggers-cultivation practices of yard long beans, cucumber and rose- rain shelter cultivation-New trends in high-tech agriculture techniques like aquaponics, aeroponics and other soil less cultivation practices.

Unit 2 Organic farming and certification

(55 periods)

Concept - importance with reference to global scenario – scope in Kerala – organic farming principles and practices - Organic plant nutrient management ,compost,biofertilizers ,Organic plant protection, Biocontrol agents, Botanicals- plant growth promoting preparations- Organic certification procedure – agencies involved.

Unit 3 Food safety measures and Certification

(72 periods)

International scenario on food safety -FSSAI – Good Agricultural Practices -GAP definition, objectives, principles and certification- GLOBALGAP -HACCP—GMP-GHP- Hazards associated with production flow-biological, physical and chemical-residual toxicity - Maximum residue limit – waiting period concepts –Biomagnification hazards. Pesticide residue elimination methods of common food materials with special emphasis to fruits and vegetables.

Unit 4 Agri- Enterprises

(84 periods)

Mushroom cultivation –Spawn production and Cultivation of oyster mushrooms-Value addition in mushroom-Apiculture – Importance and Scope- Honey beespecies- Honey bee castes, General Apiary management Practices- collection of Honey - value added products from Bee keeping- pest and disease.-SericultureTechnology-Vegetable seed Production-Landscaping- Basic principles of landscape design- Lawn making– After care and management-Flower arrangement

Unit 5 Farmer Support Services

(60 periods)

Services from Krishibhavan - agriclincs - Concept of IPDM-Identification of pest – Nature of damage and diseases–symptoms and management – Rice, Coconut, Rubber, Banana, Mango, Cashew, Pepper, Solanaceous vegetables – cucurbits, cowpea, Amaranthus, Bhindi - Agri-input centers – biopharmacy –Various Schemes under Dept of Agri-ICT enabled extension services in Agriculture – Practicing e – crop doctor and other related software for Pest and

disease diagnosis Familiarization of popular agri extension related softwares- crop decision support system – pest, disease and nutrient deficiency diagnosis softwares – Kisan Call Centres – Krishi Vigyan Kendras - NGOs

MODULE IV

POST HARVEST AND PROCESSING TECHNOLOGY

Unit 1 Post harvest Technology (30 periods)

Post harvest Technology-Concept - Importance with reference to agricultural products - Present scenario with reference to World, India and Kerala- Scope-extent of Post harvest losses – causes of Post harvest losses – salient features of Post harvest management

Unit 2 Post harvest Handling (50 periods)

Steps in Post harvest Handling – Harvesting stages – maturity indices of fruits and vegetables - sorting and Grading- Precooling – Pretreatments- Importance of packing– Types of Package used for packing of commercial products - Methods of storage — transportation

Unit 3 Post harvest technology of major crops (114 periods)

Post harvest technology and product diversification aspect of important crops like Cereals – Rice; Fruits – Jack fruit, mango, banana; Spices – Ginger, Pepper, Turmeric; Plantation crops - Coconut, Cashew; Commercial Flowers

Unit 4 Agro-Processing Technology (116 periods)

Concept– steps and Principles - methods of preservation - important commercial methods like - Canning, preparation of Jam, Jelly, Pickles, Squash, Marmalade, etc.

Unit 5 Entrepreneurship Development in Agri-based processing industries (30 periods)

Scope of self-employability – Present scenario - licensing and FSSAI registration aspects -list of machineries used in processing industry- marketing strategies.

LIST OF PRACTICALS

MODULE III

- ❖ Practice drip irrigation and identification of different components.
- ❖ Preparation of nutrient solution and practicing fertigation.
- ❖ Visit a high tech farming unit with automated climate control systems.

- ❖ Farmer interaction: Preparation of questionnaire to interview a farmer practicing protected cultivation.
- ❖ Visit to a model organically certified farm and interaction with the farmer
- ❖ Setting up of organic vegetable school garden
- ❖ Preparation of botanicals- Neem oil garlic emulsion,
- ❖ Preparation of botanicals Tobacco decoction
- ❖ Seed treatment with Rizobium
- ❖ Field level multiplication of Trichoderma
- ❖ Visit to an accredited firm that follows FSSAI/GAP/HACCP
- ❖ Method demonstration of mushroom bed preparation
- ❖ Visit to a spawn production unit
- ❖ Marketing and sale of mushroom products
- ❖ Setting up of lawn through different planting methods
- ❖ Practising different styles of Flower arrangement
- ❖ Visit to a silkworm production unit
- ❖ Preparation of an interview schedule and visit to an apiary unit
- ❖ Conduct Agriclincs in School
- ❖ Visit to KrishiBhavan and Interactions with KrishiBhavan Officials
- ❖ Practising ICT enabled softwares

MODULE IV

- ❖ Identify the maturity indices of the fruits and vegetables and record in a tabular form
- ❖ Exhibition of different packing materials used for fruits and vegetables
- ❖ Preparation of different value added products from rice.
- ❖ Visit to a banana export - packing unit.
- ❖ Preparation of value added products of jack
- ❖ Post harvest handling of banana
- ❖ Curing of turmeric – methods demonstration
- ❖ Preparation of dry ginger
- ❖ Removal of tannin from cashew apple juice.
- ❖ Practising the steps involved in copra making.
- ❖ Post harvest handling and techniques to enhance vase life of Anthurium/ orchid/rose
- ❖ Preparation of value added products viz. jam, jelly, squash,RTS, pickles, tomato sauce
- ❖ Visit a processing unit and familiarize the different machineries and equipments .
- ❖ Visit a retail outlet and conduct a market survey on the marketing strategies adopted by various products.

LEARNING OUTCOME OF THE UNIT

MODULE III

Unit I – Hi Tech Agriculture

The learner :

- 3.1.1. Defines the concepts of protected cultivation and its advantages in the present scenario of Kerala and list out the major problems.
- 3.1.2. Defines green house and classify them based on shape, structure and cladding material and list the components.
- 3.1.3. Lists the crops grown under protected cultivation and acquire skill in preparation of media.
- 3.1.4. Understands the methods of irrigation in Protected cultivation; drip irrigation and fertigation
- 3.1.5. Understands the climate control system of a green house unit and familiarize with foggers, filters and mistifiers in greenhouse.
- 3.1.6. Familiarizes with the cultivation practices of yard long beans, cucumber and rose.
- 3.1.7. Practices rain shelter cultivation.
- 3.1.8. Understands the concept of aeroponics, hydroponics and other soil less cultivation.

Unit II –Organic farming and certification

The learner :

- 3.2.1. Understands the concept of organic farming and its importance in global and Kerala condition.
- 3.2.2. Understands the principles and practices of organic farming.
- 3.2.3. Demonstrates the use of biocontrol agents, botanicals and other plant growth promoting preparations.
- 3.2.4. Gets familiarized with the procedure of organic certification and the agencies involved.

Unit III - Food safety measures and certification

The learner:

- 3.3.1. Analyses the international scenario of food safety and certification with Indian context and understand functions of FSSAI.
- 3.3.2. Defines GAP and enumerate the objectives and principles.
- 3.3.3. Gets an awareness about Global GAP, HACCP, GMP and GHP.
- 3.3.4. Enlist the hazards associated with production flow.
- 3.3.5. Understands the importance of residual toxicit, MRL, waiting period, biomagnification etc.
- 3.3.6. Performs pesticide residue elimination methods in food materials with emphasis to fruits and vegetables.

Unit IV. Agri- Enterprises

The learner :

- 3.4.1. Acquires skill on starting mushroom and spawn production unit and its processing.
- 3.4.2. Gets familiarised with apiculture.
- 3.4.3. Gets familiarized with sericulture.
- 3.4.4. Acquires skills in Vegetable seed production.
- 3.4.5. Acquires skill in landscaping and lawn making.
- 3.4.6. Understands the scope of flower arrangement as an enterprise.

Unit V. Farmer support services

The learner:

- 3.5.1. Gets an awareness on the services rendered by KrishiBhavan especially on the functioning of Agri clinics.
- 3.5.2. Identifies the pests and disease symptoms and practice IPDM practices for Rice, Coconut, Rubber, Banana, Mango, Cashew, Pepper, Solanaceous vegetables, Cucurbits, Cowpea, Amaranthus, Bhindi.
- 3.5.3. Explores the services rendered by Agri input centres and Bio pharmacy.
- 3.5.4. Explores the scope of ICT enabled extension services in Agriculture and the related softwares and various schemes in Dept of Agriculture.

MODULE IV

Unit I. Post harvest technology

The learner:

- 4.1.1. Defines post harvest management and understand its scope and present scenario.
- 4.1.2. Explores the causes of post harvest losses and elaborate the procedure of post harvest handling.

Unit II. Post harvest handling

The learner :

- 4.2.1. Identifies the harvesting stages and maturity indices of fruits and vegetables And practice sorting and grading methods.
- 4.2.2. Familiarizes with the precooling and pretreatments done in post harvest stages and package, storage and transportation methods.

Unit III. Post harvest technology of major crops

The Learner:

- 4.3.1. Practices the post-harvest management and product diversification of rice.
- 4.3.2. Describes the post-harvest management and product diversification of mango, Banana and Jack.
- 4.3.3. Practices the post-harvest management and product diversification of pep per, ginger and turmeric.
- 4.3.4. Practices the post-harvest management and product diversification of coco nut and cashew .
- 4.3.5. Familiarizes the post harvest technology of commercial flowers.

Unit IV. Agro-processing technology

The Learner :

4.4.1. Elaborates the principles and methods of preservation.

4.4.2. Practices the preparation of Jam, Jelly, pickle, squash, RTS etc and elaborate the steps of Canning.

Unit V. Entrepreneurship Development in Agri-based processing industries

The learner :

4.5.1 Analyzes entrepreneurial skills needed for starting agri based processing industries.

4.5.2. States the general protocols for commercial processing Unit, FSSAI, Licensing and Registration.

4.5.3. Familiarizes with machineries and enlist and explain different processing equipment for fruit and vegetable processing.

4.5.4. Understands the marketing strategies in the marketing of fresh and processed products

SCHEME OF WORK

MODULE III		
Month	Unit Name	Periods
June	Hi-Tech Agriculture	69
July	Organic farming and certification	72
	Food Safety measures and Certification	55
August	Agri- Enterprises	84
September	Farmer Support Services	60

MODULE IV		
Month	Unit Name	Periods
October	Post harvest Technology	50
November	Post harvest Handling	30
December	Post harvest technology of major crops	114

January	Agro-Processing Technology	116
February	Entrepreneurship Development in Agri-based processing industries	30

STRUCTURE OF MODULE III

APPLIED AGRICULTURAL TECHNOLOGY (Total periods : 340 hrs)

Unit No.	Name of Units	Period (Hrs)
1	Hi-Tech Agriculture	69
2	Organic farming and certification	72
3	Food safety measures	55
4	Agri- Enterprises	84
5	Farmer Support Services	60
Total		340

STRUCTURE OF MODULE IV

POST HARVEST AND PROCESSING TECHNOLOGY (Total periods : 340 hrs)

Unit No.	Name of Units	Period (Hrs)
1	Post Harvest Technology	30
2	Post Harvest Handling	50
3	Post harvest technology of major crops	114
4	Agro-Processing Technology	116
5	Entrepreneurship Development in Agri-based processing industries	30

	Total	340
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CLASS ROOM ACTIVITIES

- Seminar
- Group discussion
- Quiz
- Preparation of Posters and Charts
- Project and workshops
- Exhibitions
- Multimedia presentation
- Panel discussion
- Interview with invited experts/ farmers in the classroom
- Workshop
- Role play
- General discussion
- Brainstorming
- Debate
- Slide show
- Assignment
- Animated CDs
- Jigsaw grouping
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PRACTICAL ACTIVITIES

- Indoor practical work in labs and outside field
- Field visits
- Production cum training center
- On the job training
- Interaction with successful farmers at the farm site
- Curriculum oriented case studies
- Demonstration

MODULE III

APPLIED AGRICULTURAL TECHNOLOGY

Overview

Technology has played a big role in developing agriculture as industry. This module presents promising technologies that are going to give a new momentum to agriculture and farmer welfare. Among the promising technologies high tech agriculture and organic farming are detailed in the module.

The technology development has necessitated introduction of specific standards and certification to build up consumer confidence in farmer produce and products of agro based industries. Topics on organic certification, food safety measures and food certification are intended to give awareness and knowledge on international and national protocols that assures conformation to the prescribed standards.

The module also attempts to strike a proper balance between the technological needs of farmers and the job opportunities for students in agrobased industries. The unit on Agri enterprises emphasizes the skill development of learners in selected micro enterprises that support farm income in a sustainable way and equip them to give inputs on farm planning.

In the changing era of agriculture, farmers look for more environment-friendly and cost-efficient crop inputs and decision support systems. The module exposes learners to Agri input centers and ICT- enabled farmer support services and equips them how to act as an interface between technology and farmers.

ABOUT THE UNITS

UNIT1: High Tech Agriculture

The unit focuses on technology intensive agriculture, with special emphasis on Kerala. Structures in protected cultivation, greenhouse, polyhouse and rain shelters and the crop management aspects like drip irrigation, fertigation, temperature and humidity management in protected cultivation are included in this unit. Learners also get practical exposure in high tech agriculture in cultivating Yard long bean, Cucumber and Rose. Emerging fields in high tech agriculture like soilless cultivation techniques are also mentioned.

UNIT2- Organic farming and certification

The Unit encompasses the concept, scope and the essentialities of organic farming like organic plant nutrient management, soil and water conservation and biodiversity of farm land. The organic certification procedure and agencies involved are also elaborated. The unit also lists resources for organic nutrient management and organic plant protection, their preparation and method of application.

UNIT 3 - Food safety measures and certification

Food safety is an important component of food quality. Maintaining food quality without compromising economic, social and environmental sustainability is one of the major challenges in world agriculture scenario. This unit also introduces voluntary programmes that a farmer or seller may wish to pursue to ensure quality of his/ her food products like FSSAI, GAP and HACCP. The potential hazards from food that cause adverse health effects and the indicators for defining chemical hazards and pesticide residue elimination methods of fresh agricultural produce are also annexed.

UNIT 4- Agri- Enterprises

Agriculture Technology can be used to generate farm income through different agri –enterprises. This Unit explores the enterprises viz. Mushroom technology, Landscaping, Lawn making, Flower arrangement, Apiculture and Sericulture Technology.

Unit 5 - Farmer support services

The unit deals with the various services implemented by the government as well as semi government and private agencies given to farmers to increase the farm production and productivity. Emphasis is given to agri clinics and input centers in this unit. A guide on pest and disease diagnosis is also detailed. Unit also gives an overview on ICT enabled extension services related to agriculture such as popular agri extension related softwares, decision support systems , pest, disease and nutrient deficiency diagnose softwares, ICT enabled crop health clinics and farmer support schemes.

UNIT GRIDS

UNIT1: High Tech Agriculture

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Protected cultivation - definition, advantages ,scope and constraints in Kerala</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation 	<p><i>The learner will be able to</i></p> <p>define the concepts of protected cultivation and its advantages in the present scenario of Kerala and list out the major problems</p>	<ul style="list-style-type: none"> • General discussion (W) • Animated CDs (W) 	<ul style="list-style-type: none"> • Assignment diary • Presentation
<p>Green House/poly house-definition and classification-components</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Tabulation • Communication 	<p><i>The learner will be able to</i></p> <p>define green house, classify based on shape, structure and cladding material and list the components</p>	<ul style="list-style-type: none"> • Collection of Photos (G) • Chart preparation 	<ul style="list-style-type: none"> • Photo album • Chart of classification
<p>Growing media and Bed preparation -list of crops cultivated commonly in protected cultivation</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Practical Skill • Communication 	<p><i>The learner will be able to</i></p> <p>list the crops grown under protected cultivation acquire skill in media and bed preparation.</p>	<ul style="list-style-type: none"> • General discussion (W) • Flow chart preparation • Brochure preparation • Media and bed preparation 	<ul style="list-style-type: none"> • Flow chart • Brochure • Field book
<p>Irrigation Drip irrigation, Fertigation</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Practical Skill • Identification 	<p><i>The learner will be able to</i></p> <p>understand the methods of irrigation in Protected cultivation ; drip irrigation and fertigation</p>	<ul style="list-style-type: none"> • General discussion (W) • Assignment (I) • Preparation of double entry chart • Practice drip irrigation and identification of different components • Preparation of nutrient solution and practicing fertigation 	<ul style="list-style-type: none"> • Assignment • Double entry chart • Field book

<p>Automated Climate regulation in protected cultivation, mistifiers, foggers</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Observation • Identification 	<p><i>The learner will be able to</i> suggest the methods for automated climate regulation in protected cultivation</p>	<ul style="list-style-type: none"> • Animated CDs • General discussion • Power Point Presentation 	<ul style="list-style-type: none"> • Discussion report • Booklets
<p>Cultivation practices of Yard long bean, cucumber and rose – Bed Preparation, scheduling nutrient management, pest and disease management</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Practical Skill • Identification • Communication 	<p><i>The learner will be able to</i> familiarize with the cultivation practices of cucumber, yard long bean and rose</p>	<ul style="list-style-type: none"> • General discussion (W) • Animated CDs (W) • Power point presentation (W) • Visit to a protected cultivation unit • Leaflet preparation • Collection of news articles. 	<ul style="list-style-type: none"> • Report on field visit • Leaflet. • Collection of news articles
<p>Rain shelter cultivation</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Practical Skill • Identification • Record keeping 	<p><i>The learner will be able to</i> practice rain shelter cultivation</p>	<ul style="list-style-type: none"> • Videos(W) • Setting up of a model rain shelter cultivation • Collection of news articles 	<ul style="list-style-type: none"> • Field book • Model • Collection of news articles
<p>New trends in high-tech agriculture-techniques like hydroponics, aquaponics and aeroponics</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Practical Skill • identification 	<p><i>The learner will be able to</i> understand the concept of hydroponics, aquaponics and aeroponics .</p>	<ul style="list-style-type: none"> • Videos (W) • Seminar (G) 	<ul style="list-style-type: none"> • Seminar report

UNIT 2- Organic farming and certification

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Concept of organic farming importance with reference to global scenario – scope in Kerala</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation 	<p><i>The learner will be able to</i></p> <p>understand the concept of organic farming and its importance in global and Kerala condition</p>	<ul style="list-style-type: none"> • CD shows (W) • Literature collection (G) • Basic data collection of farmer practicing organic farming 	<ul style="list-style-type: none"> • Learners Notes • Collection of success stories • Report
<p>organic farming principles and practices</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Data collection • communication 	<p><i>The learner will be able to</i></p> <p>understand the principles and practices of organic farming</p>	<ul style="list-style-type: none"> • General discussion (W) • Setting up of organic vegetable school garden • Chart preparation 	<ul style="list-style-type: none"> • Field book • Chart
<p>Organic plant nutrient management-compost, biofertilizers Organic plant protection- Botanicals, Biocontrol agents, plant growth promoting preparations</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Practical Skill • Communication • Sample collection 	<p><i>The learner will be able to</i></p> <p>demonstrate the use of biocontrol agents, botanicals and other plant growth promoting preparations</p>	<ul style="list-style-type: none"> • Demonstration of botanical pesticides (G) • Seed treatment with rhizobium • Field level application of trichoderma • Assignment • Leaflet preparation 	<ul style="list-style-type: none"> • Skill Evaluation • Assignment • Leaflet
<p>Organic certification procedure – agencies involved.</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Communication 	<p><i>The learner will be able to</i></p> <p>familiarize with the procedure of organic certification and the agencies involved</p>	<ul style="list-style-type: none"> • General discussion (W) • Power point presentation (W) • Assignment • Visit to an organic farm 	<ul style="list-style-type: none"> • Learning Notes • Assignment • Report on farm visit

UNIT 3 - Food safety measures and certification

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>International scenario of food safety -FSSAI</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Identification 	<p><i>The learner will be able to</i></p> <p>analyse the international scenario of food safety and certification with Indian context and understand functions of FSSAI</p>	<ul style="list-style-type: none"> • Brainstorming (W) 	<ul style="list-style-type: none"> • Chart
<p>The GAP definition , Objectives Principles and certification</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Identification 	<p><i>The learner will be able to</i></p> <p>Define GAP and enumerate the objectives, principles and certification</p>	<ul style="list-style-type: none"> • General discussion (W) • Jigsaw(G) • Chart preparation 	<ul style="list-style-type: none"> • Learners Notes • Discussion report
<p>GlobalGAP, HACCP, GMP,GHP</p> <p>SKILLS</p> <p>Observation.</p>	<p><i>The learner will be able to get awareness about</i></p> <p>Global GAP, HACCP, GMP,GHP</p>	<ul style="list-style-type: none"> • General discussion • Class test • visit 	<ul style="list-style-type: none"> • Discussion report • Assessment diary • Report on visit
<p>Potential Hazards associated with production flow- biological, physical and chemical hazards</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation 	<p><i>The learner will be able to</i></p> <p>enlist the hazards associated with production flow</p>	<ul style="list-style-type: none"> • Brochure to create awareness 	<ul style="list-style-type: none"> • Content of the Brochure
<p>Residual toxicity, biomagnifications, MRL waiting period, Pesticide residue elimination methods of common food materials with special emphasis to fruits and vegetables-</p> <p>SKILLS:</p> <p>Observation</p> <ul style="list-style-type: none"> • Practical Skill 	<p><i>The learner will be able to</i></p> <p>perform pesticide residue elimination methods in food materials with emphasis to fruits and vegetables</p>	<ul style="list-style-type: none"> • Documentary Exhibition • Practice pesticide residue elimination methods(G) • Preparation of Point card (I) 	<ul style="list-style-type: none"> • Brochure • Skill evaluation • Point card

UNIT 4- Agri- Enterprises

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
Mushroom cultivation- Spawn production and Cultivation of oyster mushroom-Value addition in mushroom, SKILLS: <ul style="list-style-type: none"> • Observation • Practical Skill • Identification 	<i>The learner will be able to</i> acquire skill on starting mushroom and spawn production unit and its processing	<ul style="list-style-type: none"> • Discussion (W) • Videos (W) • Visit to spawn and mushroom unit (W) • Demonstration • Project preparation • Marketing and sale of mushroom products • Article collection 	<ul style="list-style-type: none"> • Skill evaluation • Report on visit • Project report • Articles
Apiculture – Importance and Scope- Honey bee species- Honey bee castes,–General Apiary management Practices- collection of honey Products from Bee keeping- Pests and diseases	<i>The learner will be able to</i> familiarize with apiculture	<ul style="list-style-type: none"> • Discussion (W) • Power Point Presentation (W) • Videos (W) • Visit • Seminar • Chart preparation 	<ul style="list-style-type: none"> • Learner notes • Report on visit • Seminar report • Chart
Sericulture Technology- SKILLS: Observation <ul style="list-style-type: none"> • Practical Skill • Identification 	<i>The learner will be able to</i> familiarize with sericulture	<ul style="list-style-type: none"> • Discussion (W) • PowerPoint Presentation (W) • Videos (W) • Visit • Brochure preparation 	<ul style="list-style-type: none"> • Learners Notes • Report on visit • Brochure
Vegetable seed production SKILLS: <ul style="list-style-type: none"> • Observation • Practical Skill 	<i>The learner will be able to</i> develop skill on vegetable seed production	<ul style="list-style-type: none"> • Power Point Presentation (W) • Visit to a seed processing plant 	<ul style="list-style-type: none"> • Vocational Diary • • Report on visit

<ul style="list-style-type: none"> •Landscaping- Basic principles of landscape design- Lawn making– After care and management SKILLS: Observation <ul style="list-style-type: none"> • Practical Skill • Identification 	<i>The learner will be able to</i> acquire skill in land scaping	<ul style="list-style-type: none"> • Land scaping in school premises • Lawn making • Chart preparation 	<ul style="list-style-type: none"> • Skill evaluation • Chart
Flower arrangements SKILLS: Observation <ul style="list-style-type: none"> • Practical Skill Identification	<i>The learner will be able to</i> understand the scope of flower arrangement as an enterprise	<ul style="list-style-type: none"> • Discussion (W) • Videos (W) • Practice different style flower arrangements • Prepare a flower arrangement method 	<ul style="list-style-type: none"> • Skill evaluation • Notes • Report

UNIT 5 - Farmer support services

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
Services from Krishibhavan- Agri clinics SKILLS: <ul style="list-style-type: none"> • Observation 	<i>The learner will be able to</i> get an awareness on the services rendered by KrishiBhavan esp. on the functioning of Agri clinics	<ul style="list-style-type: none"> • Visit to Krishibhavan and participation in Agriclincs 	<ul style="list-style-type: none"> • Evaluation of agroclinic record book
Concept of IPDM- Identification of pest – Nature of Damage and Diseases–symptoms and Management – Rice, Coconut, Rubber, Banana, Mango, Cashew, Pepper, Solanaceous vegetable – cucurbits – cowpea – Amaranthus – Bhindi SKILLS: <ul style="list-style-type: none"> • Observation • Practical Skill • Identification 	<i>The learner will be able to</i> identify the pests and disease symptoms and practice IPDM practices for the given crops	<ul style="list-style-type: none"> • Power point presentation • Field visit (G) • Specimen collection (I) • Herbarium preparation(I) • Videos • Field application of pesticides and botanicals 	<ul style="list-style-type: none"> • Field diary • Evaluation of Insect box and herbarium • Assignment • Skill evaluation

Agri-input centres – biopharmacy SKILLS: <ul style="list-style-type: none"> • Observation • Practical Skill • Identification 	<i>The learner will be able to explore the services rendered by agri input centres and biopharmacy</i>	<ul style="list-style-type: none"> • Visit to nearby input centres 	<ul style="list-style-type: none"> • Report
-ICT enabled extension services in Agriculture – Practicing e – crop doctor and other related software- Various Scemes in Agriculture SKILLS: <ul style="list-style-type: none"> • Observation • Practical Skill • Identification 	<i>The learner will be able to explore scope of ICT enabled extension services in Agriculture and the related softwares and Familiarise with the Various Schemes in Agriculture</i>	<ul style="list-style-type: none"> • Practice the different softwares • Seminar on the schemes various schemes • Visit to krishibhavan 	<ul style="list-style-type: none"> • Assessment of their ability in handling softwares • Seminar report • Report

ADDITIONAL INFORMATION

Unit 3 - Food safety measures and certification

Principles of HACCP

- Conduct a hazard analysis
- Determine the CCPs
- Establish Critical Limits
- Establish a system to monitor Control of the CCPs
- Establish the Corrective Actions to be taken when monitoring indicates that a particular CCP is not in control

Unit 4- Agri- enterprises

Flower Arrangements

Some of the basic differences between eastern and western arrangements are

- * Primarily western style is symmetrical arrangement, but eastern style is asymmetrical one.
- * Western arrangements employ more flowers to create mass effect, but eastern styles impress more by the beauty of individual material.
- * Contrary to western arrangements the materials in Japanese never touch the rim of the vase.
- * Accessories are never used in western arrangements. But in Ikebana interesting branches, drift wood, pieces of bark, shells etc., are used to imitate the nature. Here the more emphasis is given on western arrangements.

Western styles of flower arrangement: Different models

- * The triangular model

- * The Round bowl model
- * The Oval bowl model
- * The L-Shape model
- * The S-Shape model
- * The Crescent shape model

Eastern or Japanese or Ikebana styles

Ikebana arrangement

- Moribana upright style
- Moribana slanting style
- Nageire upright style
- Nageire slanted style
- Nageire cascading style

Unit 5 - Farmer support services

Economic injury Level (EIL): The smallest number of insects (amount of injury) that will cause yield losses equal to the insect management costs. The EIL has been described as the break-even point, the level of pest a plant can tolerate, among other things.

ETL: The economic threshold is the pest density at which control measures should be determined to prevent an increasing pest population from reaching economic injury level.

For example, sometimes the ETL is simply set at 80% of the EIL, as it is with bean leaf eating caterpillars. In this case the ET is relatively close to the EIL. On the other hand, for an insect such as the aphid that has an exponential population growth rate, the ET is well below the EIL and at a level where no damage occurs.

Pest resurgence

Pest resurgence is the rapid reappearance of a pest population in injurious numbers, usually brought about after the application of a broad-spectrum pesticide has killed the natural enemies which normally keep a pest in check. A well-known example in rice cultivation is the resurgence of brown plant hopper (BPH).

ASSESSMENT ACTIVITIES

UNIT 1: High Tech Agriculture

1. Prepare a chart on classification of protected cultivation structures.
2. Prepare a photo album of structures used in protected cultivation.
3. Prepare a flow chart of media and bed preparation in poly house.
4. Prepare a double entry chart that gives the names of individual units of irrigation system and their function.
5. Prepare an assignment on drip irrigation and fertigation in protected cultivation.
6. Prepare a booklet containing pictures along with a small write up of equipments used for climatic control in poly houses.
7. Prepare a leaflet on the cultivation practices of Yard long Beans/Cucumber/ Rose in poly house.

8. Collection of news articles on cultivation practices of crops other than the crops detailed in the unit.
9. Collect the success stories of rain shelter cultivation from popular articles and daily newspaper.
10. Conduct seminar on Aquaponics, hydroponics and other soilless cultivation practices. (Group activities) [Hint-Concept, Scope, Advantages, Limitations].

Unit2- Organic farming and certification

1. Chart preparation on the principles of organic farming
2. Assignment on various biofertilizers and Biopesticides practicing in the fields of the locality.
3. Preparation of leaflet showing steps involved in the preparation of botanicals and fields level multiplication of Biocontrol agents.
4. Reading assignment.

Unit 3 - Food safety measures and certification

1. Brainstorm after providing the background information on international scenario of food safety and record the outputs on common chart.
2. Jigsaw grouping and discussion on the principles of GAP.

Jigsaw grouping -Learners are divided into groups of 5 each and. each member will be asked to study one component in GAP principle. Learners getting the same component discuss together and finally go back to their original group and contribute their ideas to the original group.

3. Class test on definition of Global GAP, HACCP, GMP, GHP
- 4.General Discussions
5. Prepare an assignment on the key terms associated with chemical hazards
6. Preparation of point card showing the domestic practices for the removal of insecticide residues from fruits and vegetables.

Unit 4- Agri- Enterprises

1. Prepare a project on establishing a small scale mushroom unit (No.of beds-30-50beds) .
2. Article collection on new trends in mushroom cultivation.
3. Seminar on Apiary management practices
4. Preparation of chart on honey bee species and castes
5. Preparation of brochures on sericulture.
6. Preparation of chart showing rearing equipments
7. Preparation of chart explaining the extraction and drying of vegetable seeds in a tabular form.
8. Chart preparation of basic principles of landscaping
9. Collect pictures of different types of flower arrangement

Unit 5 - Farmer support services

1. Visit to KrishiBhavan and participate in agriclinics .
2. Class test on pest and disease of crops detailed in the unit.
3. Collection of specimens and preparation of herbarium.

4. Quiz programme on pest and disease symptoms and management
5. Seminar on the schemes implemented by Department of Agriculture.
6. Visit a KrishiBhavan and prepare a report detailing the schemes implemented by KrishiBhavan.

LIST OF ITEMS IN PORTFOLIO

UNIT 1: High Tech Agriculture

1. Assessment diary in which students responses on various aspects of protected cultivation are recorded.
2. Chart on classification of protected cultivation structures.
3. Photo album of structures used in protected cultivation.
4. Flow chart of media and bed preparation.
5. Brochure of different components used in media for protected cultivation.
6. Assignment on drip irrigation, fertigation in protected cultivation.
7. Double entry chart showing the names of individual units of irrigation system and their functions.
8. Field book showing method of preparation of nutrient solution and fertigation.
9. Submission of discussion report on importance of automated climate regulation in protected cultivation.
10. Booklet containing pictures along with a small write up of equipments used for climatic control in poly houses.
11. Leaflet showing cultivation practices of yard long Beans/Cucumber/ Rose in Polyhouse.
12. Report on field visit to a high tech farm.
13. Collection of news articles on cultivation practices of crops other than the crops detailed in the unit.
14. Basic data collection of Hitech farmers in your panchayat.
15. Collection of paper cuttings or articles showing success stories of rainshelter cultivation along with the abstract articles of each.
16. Seminar report on aquaponics, Hydroponics and other soilless cultivation practices

UNIT2- Organic farming and certification

1. Collection of success stories on organic farming along with the abstract of each.
2. Basic data collection of farmers practicing organic farming in your panchayat.
3. Field book in which details of organic vegetable school garden is recorded.
4. Chart showing principles of organic farming.
5. Assignment enlisting the biopesticides and biofertiliser commonly used in the near by farmers field.
6. Leaflet exhibiting the flowchart of the preparation of botanicals and field level multiplication of biocontrol agents.
7. Assignment showing organic certification procedure and organic certification agencies.
8. Report on visit to an organically certified farm

Unit 3 - Food safety measures and certification

1. Chart showing information on food safety
2. Discussion report on principles of GAP
3. Discussion report on certification process

4. Assessment diary containing answers on class test on Global GAP, HACCP, GMP, GHP.
5. Discussion report on potential hazards that cause adverse health effects
6. Report on visit to an accredited institution that follows FSSAI/ GAP/ HACCP and map the flow diagram of production process and steps followed in the certification process.
7. Brochure on chemical and biomagnification hazards
8. Point card showing the domestic practices of pesticide residue removal from fruits and vegetables.

Unit 4- Agri- enterprises

1. Report on visit to a spawn and mushroom production unit.
2. Project report on setting up of small scale mushroom unit.
3. Collection of articles on “new trends in mushroom cultivation“ along with a brief description.
4. Report on visit to an apiary unit.
5. Seminar report on apiary management practices.
6. Chart showing honey bee species and castes.
7. Report on visit to silkworm production unit.
8. Chart showing rearing equipments
9. Chart showing the extraction of seeds from different vegetables.
10. Chart on basic principles of Landscaping.
11. Report on a flower arrangement method prepared by the learner.
12. Collection of pictures of different types of flower arrangement

Unit 5 - Farmer support services

1. Evaluation sheet
2. Collection of specimens and herbarium
3. Seminar report on various schemes implemented by the Department of Agriculture.
4. Report on the visit to KrishiBhavan

EXTENDED ACTIVITIES

1. Awareness programme on rainshelter cultivation to farmer groups/residential colony members to nearby locality.
2. Promotion of organic vegetable garden in the panchayatward area of the school.

i. Prepare a survey schedule detailing the percentage of vegetable consumed produced at home, awareness on Pesticide residues, awareness on the procedure for removing pesticide residues, history of occurrence of cancer in the family, open area available for setting up of a vegetable garden etc.

ii. Organizing Training on the awareness of the Pesticide residues and setting up of an Organic vegetable garden.

iii. Distribution of vegetable cultivation kit comprising of vegetable seeds, growbags, vermicompost, leaflets etc to all the participants of the training.

iv. Selection of 10 families for setting up a vegetable garden- selection to be done based on

the criteria of their interest in farming and the availability of open area.

v. Students split into ten groups and each group sets a vegetable garden in the selected houses.

3. Training to the women groups on Mushroom cultivation.

4. Conducting Agro clinic in the nearby localities.

MODULE IV

POST HARVEST AND PROCESSING TECHNOLOGY

Overview

India is the second largest producer of food next to China. Having achieved near self sufficiency in primary agriculture, the country's attention is now focused on secondary agriculture, which is basically the processing of products of primary agriculture. Government is investing on secondary agriculture at farm level, village level and at national level. The research institutions are also asked to develop proper post harvest technology to support the growth of secondary agriculture. Owing to the importance given to post harvest and processing technology, the module is designed in such a way so that the learner will get equipped in post harvest handling methods. Various stages in post harvest technology has been elaborated in the syllabus which will make the student aware about the minimization of post harvest losses and value addition. The processing technology of various products are included which has good scope in selfemployabilty. The license and registration protocols are also detailed in the module which are necessary for running small as well as large scale processing units.

ABOUT THE UNITS

Unit 1 - Post harvest technology

Post harvest technologies refer to the stabilization and storage of unprocessed or minimally processed foods from the time of harvest until its reaches for human consumption.

As world population has started to relocate among different continents, farm products are getting a global market. Considering the perishable nature and the worldwide demand of farm products post harvest practices are gaining much importance. Although post harvest research and development has advanced significantly in developed countries, many of the post harvest technological innovations are either not used or used inadequately in the developing countries like India, resulted in huge post harvest losses. The unit examines the importance of post harvest technology with

reference to agricultural products and its present scenario. The unit also details the reasons for post harvest losses in India and the steps involved in post harvest management.

Unit 2 - Post harvest handling

Post harvest operations like sorting, grading and packaging make the agricultural products more acceptable irrespective of the country in which it is produced. Sorting and grading help farmers to get better prices and makes the mechanized processing easier in commodities like Cashew. Pretreatments like washing, disinfection, modified atmosphere or controlled atmosphere storage increase shelf life of the produce considerably. Many farmers and food handlers are still totally unaware of proper post harvest management and its advantages which results in considerable loss during post harvest handling. The Unit delineates the different stages in post harvest handling viz. harvesting, sorting, grading and important pretreatments before packaging and storage of agricultural produce.

Unit 3 - Post harvest technology of major crops

Unit is intended to provide specific skills to learners on post harvest technology of a set of crops important to Kerala viz. Rice, Mango, Banana, Jack, Spices, Coconut, Cashew and cut flowers. Application of appropriate post harvest technologies is much more complicated than simply the establishment of adequate research and development programmes. General understanding on agronomic practices and pest and diseases of the above mentioned crops in first year of VHSE programme would help learners to be more sensitive to intricacies of post-harvest technology and product diversification of agricultural commodities

Unit 4 - Agro-processing Technolog

World is passing through a 'second wave' of globalization through rapid growth in processed and high value agricultural and food products through networks retail supermarkets. Apart from local and national markets there is a global market for processed products. The unit deals with principles of preservation and standardised production flow charts in canning and making of jam, jelly, squashes, pickle, sauce and marmalade

Unit 5- Entrepreneurship Development in Agri-based processing industries

Entrepreneurs taking up Agri based processing industries needs skills in selection of location and power source, adoption of quality control measures, procurement of good quality raw material that

does not get out of stock, timely supervision and guidance, proper training of workers, availing finance, proper advertisement, licensing and registration, seeking government support and incentives etc. They also should have high risk taking ability, innovative behavior and high degree of motivation, The Unit intends to give emphasis on scope of self employability, procedure for licensing and registration for initiating small scale enterprises and details the machineries/ equipments needed for starting a small scale unit.

UNIT GRID

UNIT 1 - Post harvest technology

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
Post harvest Technology- Concept - Importance & scope with reference to agricultural products - Present scenario with reference to World, India & Kerala SKILLS: <ul style="list-style-type: none"> • Observation 	<i>The learner will be able to</i> define post-harvest management and understand its scope, importance and its Present scenario.	<ul style="list-style-type: none"> • General discussion (W) • Videos (W) • Paper cuttings (G) 	<ul style="list-style-type: none"> • Learning note • Album of collected articles
Causes of post harvest losses - Steps in Post Harvest Handling SKILLS: <ul style="list-style-type: none"> • Observation • Tabulation • Communication 	<i>The learner will be able to</i> explore the causes of Post Harvest Losses and elaborate the procedure in Post Harvest Handling	<ul style="list-style-type: none"> • Videos (W) • Presentation 	<ul style="list-style-type: none"> • Presentation • Report

UNIT 2 -Post harvest handling

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Harvesting stages – washing, sorting & Grading</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation 	<p><i>The learner will be able to</i></p> <p>Develop skill in identifying the harvesting stages of fruits and vegetables and practice washing, sorting and grading methods.</p>	<ul style="list-style-type: none"> • Video clippings (W) • Practice washing & sorting methods (G) • identification of maturity index (G) • Assignment 	<ul style="list-style-type: none"> • Learning note • Practical record • Assignment report
<p>Precooling Pretreatments Importance of packaging – Types of Package used for packaging of commercial products Methods of storage and transportation</p> <p>SKILLS:</p> <ul style="list-style-type: none"> • Observation • Tabulation • Communication 	<p><i>The learner will be able to</i></p> <p>understand the precooling, pretreatments, packaging storage and transportation methods done in post harvest stages</p>	<ul style="list-style-type: none"> • PPT (W) • Photos (G) • Seminar • Class test • Preparation of chart 	<ul style="list-style-type: none"> • Learning note • Seminar report • Answer script • Chart

UNIT 3 - Post harvest technology of major crops

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
Post harvest technology of Rice SKILLS: <ul style="list-style-type: none"> • Observation • Practical skill 	<i>The learner will be able to</i> practise the postharvest management and product diversification of rice.	<ul style="list-style-type: none"> • Video clipping(W) • Practice few PH methods in rice(G) • Preparation of Rice Products(G) 	<ul style="list-style-type: none"> • Learning evidence • Presentation • Chart on products of rice • Field Book • Practical Record
Post harvest technology & product diversification aspect of Fruits- Mango Banana & Jack SKILLS: <ul style="list-style-type: none"> • Observation • Tabulation • Collection • Communication 	<i>The learner will be able to</i> describe the post-harvest management and product diversification of Banana mango & Jack	<ul style="list-style-type: none"> • PPT of various value added products (G) • Practice post harvest handling in Banana (G) • Practice Processing in Jack(G) • Preparation of flow chart(I) • Visit to Export unit(W) 	<ul style="list-style-type: none"> • Product Quality of Banana • PPT – Slide soft copy • Flow chart <ul style="list-style-type: none"> • Report based on the visit
Post harvest technology & product diversification aspect of spices SKILLS: <ul style="list-style-type: none"> • Observation • Communication 	<i>The learner will be able to</i> describe the post-harvest management and product diversification of spices- Pepper, Turmeric and Ginger	Brain storming(G) <ul style="list-style-type: none"> • Quiz(I) Practice P H in pepper, turmeric & ginger(G) 	<ul style="list-style-type: none"> • Product Quality • Quiz score
Post harvest technology & product diversification aspect of Plantation crops SKILLS: <ul style="list-style-type: none"> • Observation • Communication 	<i>The learner will be able to</i> describe the post-harvest management and product diversification of Plantation crops – Coconut and Cashew	<ul style="list-style-type: none"> • Animated CDs (W) • PhotoAlbum of various products (I) • Practice Processing in coconut 	<ul style="list-style-type: none"> • Product Quality

Post harvest technology of cut flowers SKILLS: <ul style="list-style-type: none"> • Observation • Communication 	<i>The learner will be able to describe the post harvest technology of cutflowers</i>	<ul style="list-style-type: none"> • Animated CDs (W) • PhotoAlbum of various products (I) • Practice PH in Anthurium 	<ul style="list-style-type: none"> • Product Quality
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UNIT 4 - Agro-processing technology

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
Principles & methods of preservation - SKILLS: <ul style="list-style-type: none"> • Observation • Communication 	<i>The learner will be able to elaborate the principles and methods of preservation.</i>	<ul style="list-style-type: none"> • Discussion • Seminar 	<ul style="list-style-type: none"> • Learning note • Presentation
Important commercial methods like - Canning, preparation of RTS, squash, Jam, Jelly, pickles, sauce, marmalade SKILLS: <ul style="list-style-type: none"> • Observation • Practical skill • Communication skill 	<i>The learner will be able to practice preparation of RTS, squash, Jam, Jelly, pickles, sauce, marmalade and familiarize Canning procedure</i>	<ul style="list-style-type: none"> • Flow chart of preparation of various products • products (I) • Demonstration of preparation of Jam, Jelly, Squash 	<ul style="list-style-type: none"> • Flow chart • Product Quality evaluation

Unit 5. Entrepreneurship Development in Agri-based processing industries

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
Scope of self employability – Present scenario –foos parks SKILLS: <ul style="list-style-type: none"> • Observation • Communication 	<i>The learner will be able to identify the scope of self employabilityinagri based processing industries.</i>	<ul style="list-style-type: none"> • Discussion • Collection 	<ul style="list-style-type: none"> • Learning notes • Presentation
licensing and FSSAI registration aspects SKILLS: <ul style="list-style-type: none"> • Observation 	<i>The learner will be able to Understand the procedure for FSSAI,Licensingand registration</i>	<ul style="list-style-type: none"> • Class test 	<ul style="list-style-type: none"> • Answer script
list of machineries used in processing industry SKILLS: <ul style="list-style-type: none"> • Observation • Practical skill 	<i>The learner will be able to familiarize with machineries & enlist different processing equipment for fruit and vegetable processing</i>	<ul style="list-style-type: none"> • Practice simple equipments • Collection of Photos of Machinaries • Visit 	<ul style="list-style-type: none"> • Photo album • Report of visit
Marketing strategies SKILLS <ul style="list-style-type: none"> • Observation 	<i>The learner will be able to understand the marketing strategies in the marketing of fresh and processed products</i>	<ul style="list-style-type: none"> • Visit • Market survey 	<ul style="list-style-type: none"> • Report

ADDITIONAL INFORMATION

Unit 2 - Post harvest handling

SOME NOVEL PACKAGING METHODS:

Biodegradable Packaging : Here “Biodegradable plastic” is used in which the degradation results from the action of naturally occurring microorganisms such as bacteria, fungi and algae.

Active Packaging : Active packaging is an innovative concept in which the package, the product and the internal environment in the packaging interact to extend shelf-life while maintaining the quality and safety of the product. In active packaging oxygen scavengers, CO₂ absorbers, ethylene absorbents are used to control the gases in a package.

Edible Packaging : In edible packaging a thin layer of edible films formed as a coating on the food. A variety of polysaccharides (starch), proteins (soybean proteins and fish proteins) and lipids have been used to produce edible films.

Nano Packaging: Nanotechnology enables designers to alter the structure of packaging materials on the molecular scale, in order to give the material the desired properties.

Intelligent or Smart Packaging: Intelligent, or smart packaging is basically designed software to monitor and communicate information about food quality. It is a packaging which sense and informs the consumer about the quality/safety/usability of the produce.

Zero energy cool chamber (ZECC)

Considering, the acute energy shortage in rural areas, there is better scope for adoption of small capacity, low cost, on-farm scientific storage structure like Zero Energy Cool Chamber (ZECC) developed at IARI, New Delhi based on the principle of evaporative cooling.

The basic structure of the chamber can be built from bricks and river sand, with a cover made from cane or other plant materials and sacks or cloth. There must be a nearby source of water. Construction of the floor is built from a single layer of bricks, and then a cavity wall is constructed with bricks around the outer edge of the floor with a gap of 75 mm between the inner wall and the outer wall. This cavity is then filled with sand. About 400 bricks are needed to build a chamber of the size. A covering for the chamber is made with canes covered in sacking all mounted in a bamboo frame. The whole structure should be protected from sunlight by making a roof to provide shade. After construction of the walls and floor, the sand in the cavity is thoroughly saturated with water. Once the chamber is completely wet, daily sprinkling of water twice daily is done, which is enough to maintain the moisture and temperature of the chamber.

Unit 3 - Post harvest technology of major crops

Parboiling

The most important change during parboiling is the gelatinization of starch and disintegration of protein bodies in the endosperm. Parboiled rice is more nutritious than raw rice because during soaking the nutrients get evenly distributed in the grain.

Unit 4 - Agro-processing technology

Pasteurization

There are three methods of pasteurization.

- (a) **Bottle or 'Holding' pasteurization** :This method is commonly used for the preservation of fruit juices at home.
- (b) **Overflow method** :This method is very suitable for grape juice because it minimizes the adverse effect of air on the quality of the juice.
- (c) **Flash pasteurization** :The method has been developed specially for the canning of natural orange juice, but can also be used for grape and apple juice.

Preservation by Low Temperature

- (i) Cellar storage (about 15°C) : Root crops, potatoes, onions, apples and similar foods can be stored for limited periods during the winter months.
- (ii) Refrigeration or chilling (0 to 5°C) : Fruits, vegetables and their products can be preserved for a few days to many weeks when kept at this temperature.
- (iii) Freezing method (-18 to -40°C): It is the most harmless method of food preservation. The best way of preserving pure fruit juice is by freezing. Properly frozen juice retains its freshness, colour and aroma for a long time. This method is particularly useful in the case of juices whose flavour is adversely affected by heating.

ASSESSMENT ACTIVITIES

Unit 1 - Post harvest technology

1. The students are assigned the task of collecting paper cuttings and e-information on the importance of Post Harvest Technology and its present scenario in India and a report on the same is to be submitted.
2. Seminar on causes of post harvest losses & steps involved in post harvest handling.

Unit 2- Post harvest handling

1. Assignment on the harvesting stages, washing, sorting & grading procedure.
2. Presentation by the learners on the minimization of losses during transport.
3. Preparation of chart on different types of Precooling & Pretreatment in post harvest handling.
4. Class test on Precooling, Pretreatment, Package & storage.

Unit 3 - Post harvest technology of major crops

1. Collection of articles and leaflets on value added products from rice
2. Prepare a PPT on various value added products from jack fruit/banana/mango
3. Recording of flow chart for post harvest handling in the learners note.
4. Conduct a quiz programme on the topic- Processing of Ginger, Turmeric and Pepper
5. Collection of articles on value added products of coconut
6. Recording list of products from cashew apple in learners note

7. Prepare a chart showing the techniques to enhance vase life of common cut flower in a tabular form.

Unit 4 - Agro-processing technology

1. Seminar on different methods of preservation with detailed presentation of any one of the preservation methods practiced at home.
2. Class test on “Principles and methods of preservation”
3. Assignment on preparation of flow chart on the preparation of jam, jelly, squash etc

Unit 5- entrepreneurship development in agri-based processing industries

1. Collection of latest reports and statistics on food parks in india.
2. Conduct a class test on FSSAI Licensing & registration
3. Prepare chart on the machineries used in processing industry
4. Collection of photos/articles on machineries/equipments
5. Presentation by leaners on the marketing management process

LIST OF ITEMS IN PORTFOLIO

Unit 1 - Post harvest technology

1. Album of collected articles on the present scenario of Importance of Post Harvest Technology in India with statistical data.
2. Seminar report on the causes of post harvest losses & steps involved in post harvest handling

Unit 2 - Post harvest handling

1. Recordings of washing, sorting and grading procedure in Practical Record.
2. Completed tabular format of fruits and vegetables with maturity indices in Practical Record.
3. Assignment report on harvesting stage, washing, sorting & grading.
4. List of different packaging materials in the practical record.
5. Seminar report on minimization of transport losses in different situations
6. Chart on Pretreatment and Precooling

Unit 3 - post harvest technology of major crops

1. Collection of articles on value added products for rice & coconut.
2. List of prepared value added products of Rice, Jack and cashew apple
3. PPT- soft copy of various value added products of Banana, Mango and Jack
4. Report based on field visit to Export Unit of Banana.
5. Record the flow chart of post harvest handling of fruits in Learner note
6. A chart showing techniques to enhance vase life of flower in tabular form

Unit 4 - Agro-processing technology

1. Seminar report on method of preservation
2. Assignment report on the flowchart on the preparation of jam, jelly, squash, RTS etc
3. Procedure of preparation of value added products viz. jam, jelly, squash, RTS, pickles, tomato sauce
4. Answer scripts of class test on “principles and methods of preservation”.

UNIT 5- Entrepreneurship Development in Agri-based processing industries

1. .Assignment report on statistics of food park
- 2'.Class test evaluation score.
3. Photo album on the machineries and its use
4. Report on the visit to a processing unit
- 5 Report on the visit to a retail outlet

EXTENDED ACTIVITIES

- 1.Organize a training on the importance of value addition and the preparation of value added products of fruits and vegetables for the Kudumbasree units. Prepare a leaflet on the preparation of value added products of Jack/Mango/ banana and distribute to the participants.
- 2.Publish articles in the school magazines on the recipes of various value added products.
- 3.The learners identify a rice/coconut/turmeric/cashew farmer and help in the post harvest processes of the crop.
- 4.Collect traditional or endangered rice varieties, traditionally used post harvest equipments/implements and organize an exhibition in the school on Rice day/ farmer's day.

ON THE JOB TRAINING

OJT refers to that component of vocational curricula which takes place in a real job situation under the supervision of an expert or in- plant supervisor. It provides participation in the actual production of goods and services. It prepares the student psychologically in developing entrepreneurship qualities. It helps in continuous evaluation of the student's work and knowledge. The student is exposed to the latest technology and equipments. The student finds the real feelings in taking instructions from the supervisor. It provides the student overall exposure and the use of material and machinery. It leads to increased production of goods and services to the employers at less cost.

Time : End of each module
Duration : 14 days per year

List of possible OJT Centres

GENERAL

- .. Various institutions under Kerala Agricultural University(Colleges, research stations)
- .. KrishiVigyanKendras (KVKs)
- .. KrishiBhavans
- .. Central Government Institutions like CTCRI, CPCRI, IISR etc.
- .. VFPCCK centres
- .. State Horticulture Mission
- .. Master Farmer's Fields
- .. Various Commodity Boards, Government of Kerala
- .. District Seed Farms
- .. Extension Training Centres
- .. Various NGOs like Thanal, PASSS, MithraNiketan, MSSRF

- Various Private Nurseries (Atmanilayam Nursery Gardenscheruvarakkonam, Kuzhippallam Botanical GardensNellimoodu, Beena Nursery Vithura, Dreamland GardenMukkoodu)
- Regional Agricultural Training and Testing Centres
- Agro service centres
- Soil testing labs
- Safal markets
- HORTICROP
- Private Retail Malls

District wise OJT Centers

1. Thiruvananthapuram

- Jawaharlal Nehru Tropical Botanical Garden and Research Institute (JNTBGRI), Palode
- Biotechnology and Model Floriculture Centre (BMFC),

Kazhakkuttom

- Rubber Board
- Various NGOs like Thanal, PASSS, MithraNiketan,
- Various Private Nurseries (Atmanilayam Nursery GardensCheruvarakkonam, Kuzhippallam Botanical GardensNellimoodu, Beena Nursery Vithura).

2. Kollam

- KVK Sadanandapuram, Kottarakkara
- FSRS Sadanandapuram, Kottarakkara
- District Seed Farm, Kottukkal, Anchal
- State Seed Farm, Kottarakkara
- Cashew Farm, Kottarakkara
- Extension Training Centre (ETC), Kottarakkara
- AgroIndustries, Neduvathoor, Kottarakkara
- Institute of Watershed Development Management Kerala(IWDMK), Chadayamangalam
- Agro Fruits, Elambal, Punalur
- Dreamland Garden, Mukkoodu, Kollam
- Soil Testing Lab, Kureepuzha
- Kripa Mushroom Farm, Kulakkada
- Biogas Training Centre, KNNMVHSSS (AC & ABC), Pavithreswaram, Puthur.

3. Pathanamthitta

- PazhakulamAgroservice Society (PASS), Adoor
- State Seed Farm, Munnalam, Adoor
- Sugarcane Breeding Farm, Kadakkad, Pandalam
- Bodhana Social Service Society, Thiruvalla
- KVK, Thelliyoor, Pathanamathitta
- Seed Farm, Pandalam

4. Alappuzha

- CPCRI, Kayamkulam
- Rice Research Station (RRS), Monkombu
- Seed Farm, Veeyapuram
- Bee keeping and Training Centre, Kottalammude
- KVK, Kayamkulam
- State Seed Farm, Mavelikkara
- RARS, Kayamkulam

5. Kottayam

- District Agriculture Farm, Kozha
- KVK, Kumarakom
- RARS, Kumarakom
- VFPCCK, Ettumanoor
- JEYES Farm, Neendoor
- Chaithanya (NGO), Kottayam

6. Idukki

- Bapuji KVK, Santhanpara
- Cardomom Research Station, Myladumpara
- VFPCCK, Thodupuzha, Adimali, Munnar, Kanthalloor, Vattavada
- Spice Board, Idukki

7. Ernakulam

- Aromatic and Medicinal Plants Research Station (AMPRS), Odakkali.
- Pineapple Research Station, Vazhakkulam
- Coconut Development Board, Neriamangalam
- Spices Board, Kochi
- Nadukkara Agroprocessing Society (NAPC), Nadukkara
- RATTC, Vytilla
- Kinfra Park, Nellad
- Parasite Breeding Station, Vytilla
- Hafi orchids, Kalamassery
- Sevashram (NGO), Ankamaly
- Aiswarya Farm (NGO), Kalady
- Grandma Pickles, Muvattupuzha.

8. Thrissur

- KVK, Mannuthy
- State Biocontrol Lab, Mannuthy
- Cashew Research Station, Madakkathara
- Pineapple Research Station, Madakkathara
- Banana Research Station, Kannara
- Central Training Institute, Mannuthy
- State Seed Farm, Pananchery and Nadavaramba
- National Rose Garden, Vellanikkara
- TEEOSE Gardens, Madakkathara
- RAYIRATH Gardens, Pattikkad

9. Palakkad

- IRTC, Mundur
- Integrated Seed Development Farm, Eruthiampathy
- Precision Farm, Perumatti
- Sugarcane Breeding Research Institute (Sub center), Puthur
- Seed Processing Plants, VFPCCK, Alathoor
- High Tech Dairy Farm, Malampuzha, Dhoni

10. Malappuram

- RARS, Aanakkayam

11. Kozhikode

- Koothali Farm

- IISR Kozhikode
- KVK, Peruvannamoozhy, Kozhikode
- Fruit Processing Center, Balussery

12. Kannur

- KVK Kannur
- Pepper Research Station, Panniyur
- District Agricultural Farm, Thaliparamba
- Private Nurseries
- Coconut Nursery, Polayad
- Kinathy Farms, Kuthiparamba
- Soil Testing Lab, Thaliparamba
- Seed Farm, Vengad
- Germplasm collection center, Kannur
- Agromachinery Center, Chelod
- High Tech Farms, Pinarayi
- RAIDCO, Kannur.

13. Kasaragod

- CPCRI, Kasaragod
- KVK, Kasaragod
- College of Agriculture, Padannakkad
- RARS, Pilicode
- Agricultural Farm, Nileswar
- State Seed Farm, Karanthakad, Kasaragod
- Cashew Progeny Orchard, Gwalimukham
- Private nurseries
- Jenny flowers, Kasaragod
- Mechirath Nursery, Kasaragod

14. Wayanad

- MSSRF, Kalpille
- RARS, Ambalavayal
- KVK, Ambalavayal
- Wayanad Social Service Society, Mananathavady
- Private Nurseries
- Hitech Farms

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