

**Vocational Higher Secondary
Education (VHSE)**

Second Year

**AGRI -BUSINESS AND
FARM SERVICES**

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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PART -A

About the course

Agribusiness tends to be a large-scale business operation and may dabble in farming, processing and manufacturing and/or the packaging and distribution of products. In recent times agricultural sector in Kerala confronts an array of issues which is indubitably a matter to contemplate especially in view of the livelihood and sustainability of the sector in the State. The youth moving away from agriculture to other comparatively more remunerative fields poses a serious threat on the agrarian future of the State. An asymmetric socio-economic regime with undue importance on consumerism is detrimental to the State in long run. 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. The revised educational curriculum in its essence holds this perception. As a matter of fact there is a need to restructure and realign the subsegments of agriculture sector like production sphere, marketing arena, value chain and educational spectrum. Keeping view of this the Vocational Higher Secondary Course curriculum has assumed a new shape culminating from a series of brainstorming sessions.

The revised course structure comprehensively covers the basic agricultural aspects by giving emphasis to Crop Health Management, Agricultural Science & Processing Technology and Agri-business and Farm Services. A shift from agriculture to agri-business is viewed as an essential pathway to revitalize the agrarian sector of the State. There is a tremendous untapped potential in the downstream end of the agricultural value chain which is at present languishing in darkness. The purposeful emphasis on agricultural processing and agri-business in the revised curriculum assumes importance in this context. The renewed curriculum touches upon all the important aspects of agricultural technologies in a structured and phased manner while giving sharp focus towards the downstream end of the value chain on value addition and business opportunities. Such a reorientation is essential for the value chain up gradation of the candidates

choosing agriculture as a vocation both in academic and practical levels. Moreover, the current course structure places paramount importance to inculcate the entrepreneurship to the student pursuing vocational education in agriculture. The up gradation in structural value chain is the manifestation of entrepreneurship and this is only possible through imbibing the courage to climb up the ladder by breaking away from the conventional pathways in agricultural sector. Farm services segment is an emerging and imperative field in the agrarian sector. The evolving importance of organic farming, certification and labeling, environmental sustainability on the effective utilization of natural resources categorically indicated the inevitability of this segment. The revised curriculum therefore provides adequate weightage on this segment. 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 to advances made in agricultural sector. For the youth of this State agriculture is essentially a sunrise sector and therefore they should be equipped to face the challenges and hurdles on their pathway to success. The system envisages a vibrant and sustainable agrarian sector in the state through equipping the youth with advanced technological and entrepreneurial skills.

Objectives

- To create awareness on Agri business and farm services in the community.
- To develop skills for different agri enterprises and their management.
- To develop skills for different aspects of farm machinery and its services.
- To make them aware of custom hiring centers and agro-clinics.
- To develop skilled technicians in the area of supply chain management.
- To equip the students to set up agro-clinics and agri-business centers.
- To enhance self-support capabilities.
- To assist in landscape designing and maintenance.
- To equip the students in starting commercial enterprises in the field of Agriculture.
- To develop skills and competencies among the students to be successful entrepreneur.

JOB ROLES

Government/Semi Government	Private Sector	Self-Employment
Assistant Agricultural Officer	Food sample collector	<u>Production sector</u>
Agri Extension Assistant	Post harvest technician	Private nursery
Supply Chain Field Assistant	Technician in Processing Industries	Mushroom cultivation and spawn production
Seed processing Worker	Field Representative (Fertiliser and Pesticide companies)	Vermicomposting
Quality seed grower	Assistants in Agriculture based media programmes	Coir pith composting
Floriculturist (open and protected cultivation)	Gardeners / Farm supervisors	Azolla cultivation
Laboratory Technical Assistant in VHSE	Assistants in crop health Clinics	Organic manure Production
Vocational Instructor in VHSE	Agri Extension service provider	Seed production and processing unit
Work superintendent in Dept. of Agriculture	Harvesting machine operator	Hiring of agricultural Implements
All other posts where basic qualification required is plus two	Supply chain field assistant	Repair of agricultural Implements
Field or Farm technician (IISR)	Micro irrigation technician	Apiculture
Field Assistant and Farm supervisor (Farming corporation)	Agripreneur	Protected cultivation
Farm Technical Assistant (Plantation corporation Limited)	Bonsai cultivator	<u>Service sector</u>
Field Assistant (LEADS)	Landscaping supervisor/ Landscapist	Training on above sectors
Field Assistant (CTCRI)	Custom hiring centre Operator	Agro-clinics
Field Assistant (FSRS)	Hi-tech farm technician	Agricultural consultancy
Field Assistant (VFPCK)		Irrigation services
Field Assistant (KAU)		Harvest services
Technical Assistant(KVK)		Other farm services
Gardner		Agro Service Centers

Major skills (with sub-skills)

1. Setting up an agribusiness
 - a. Identifying entrepreneurial opportunities for agri business
 - b. Identifying risks and making proper decisions in agri business.
2. Skill in landscaping
 - a. Identification of ornamental plants.
 - b. Construction of garden components like water pool,rockery,lawn
 - c. Maintenance of garden-lawn mowing, pruning, plant protection.
 - d. Preparing a landscape plan/ garden layout and maintenance.
3. Skills in various agro techniques in protected cultivation
 - a. Construction of rain shelter, polyhouse.
 - b. Cultivation of crops in rain shelters and polyhouse.
 - c. Seed bed preparation
 - d. Plant protection in poly houses
4. Skill in running a commercial nursery
 - a. Preparation of different types of planting material for various ornamental plants
 - b. Skills in various propagation techniques-budding, grafting , layering
 - c. Preparing the layout of a commercial nursery
5. Skill in post harvest handling and value addition of flowers.
 - a. Skill in flower arrangement-fresh flower and dry flower arrangements.
 - b. Skill in preservation of plant material.
 - c. Skill in preparation of bouquet.
6. Skill in post harvest handling and value addition of fruits.
 - a. Skill in post harvest handling of fruits to increase shelf life.
 - b. Skill in preparation of jam,jelly and squash.
7. Skill in post harvest handling and value addition of vegetables.
 - a. Skill in post harvest handling of vegetables to increase shelf life.
 - b. Skill in preparation of pickles, sauce.
8. Skill in tissue culture-Primary and secondary hardening of tissue culture plantlets.
9. Skill in mushroom production
 - a. Skill in cultivation of mushroom
 - b. Skill in spawn production.
10. Skill in vermicomposting
11. Skill in apiculture
12. Skill in sericulture.
 - a. Skill in mulberry cultivation
 - b. Skill in rearing silk worms and producing cocoons.
13. Skill in vegetable seedling production in portrays.
14. Skill in setting up an indoor garden
 - a. Selecting plants for indoor garden
 - b. Maintenance of indoor plants.
15. Skill in identifying pest and diseases symptoms in crop plants
16. Skill in applying pest and disease management measures
17. Skill in setting up an agri input centres
18. Skill in operation of farm machinery and plant protection equipments

Learning outcomes of the course

After completing the course, the learner is able to

- To generate general as well as specific awareness about the various agricultural sectors and activities.
- To create a pool of efficient and well self-empowered personals in agro machinery operations and service.
- To create well trained technicians with supervisory and management skills in handling supply chains.
- To support operationalise custom hiring centers, catering to the needs of the farming community.
- To supply efficient personals in establishing and maintaining agriclincs for the farming community.
- To create skilled technicians in the area of Green House technology.
- To create skilled personals in the area of landscaping and garden management.
- To create efficient and skilled technicians in the field of specialized techniques.
- To create a dedicated work force in subsidiary enterprises like nursery business, mushroom technology, Apiculture and Sericulture.
- To train personals to implement projects for maximizing agricultural production.

Course Structure

The course consists of 4 modules

MODULE No.	MODULE NAME	No. of Periods
1	AGRI FIELD TECHNIQUES	340
2	CROP PRODUCTION TECHNOLOGY	340
3	AGRI-BUSINESS ENTERPRISES	340
4	FARM SERVICES	340

SYLLABUS

MODULE 3

AGRI-BUSINESS ENTERPRISES

UNIT-1 INTRODUCTION TO AGRI-BUSINESS (10Hrs)

Definition of agri-business, importance, basic concepts, scope of agri-business, entrepreneurial opportunities in agri-business, decision making in Agri-business , steps in farm planning.

UNIT 2 MAJOR ENTERPRISES (210 Hrs.)

a) Landscaping (65 Hrs.)

Importance and scope, basic principles of landscaping, classification of ornamental plants, garden types, garden components, principles of garden design and layout, maintenance of garden.

b) Commercial nursery (35 Hrs.)

Basic concepts of commercial nursery, scope, types, establishment of nursery, layout, records, major activities.

c) Protected cultivation practices (70Hrs.)

Definition of protected cultivation, importance, types-polyhouse, rain shelter, greenhouse, establishment of protected cultivation structures, agro techniques, emerging trends-Good Agriculture Practices (GAP), organic certification.

d) Post-harvest handling and value addition (40Hrs.)

Post-harvest handling of flowers, improvement of vase life, post-harvest handling of fruits, post-harvest handling of vegetable, value addition of flowers - flower arrangement, dry flower making, value addition of fruits- preparation of jam/jelly/squash, value addition of vegetables- preparation of pickles/sauce

UNIT 3 OTHER ENTERPRISES (120 Hrs.)

a) Tissue culture- basic principles, media, equipment, steps, tissue culture techniques of banana

b) Mushroom cultivation

c) Vermicomposting

d) Indoor gardening- suitable plants, care and maintenance

e) Bonsai- basics of bonsai making, styles

f) Apiculture

g) Sericulture

h) Vegetable seedling production

i) Vertical gardening, Aquaponics

MODULE 4
FARM SERVICES

UNIT 1. AGRI CLINICS (140 Hrs)

Definition - concept and necessity of agri clinics - objectives of agri clinic - functioning of agri clinic - infrastructure required - procedure of pest and disease diagnosis - diagnosis and management of major pest and diseases of rice, coconut, rubber, pepper, ginger, cassava, banana, tomato, brinjal, chilli, cucurbitaceous vegetables, cowpea, amaranthus, bhindi, cabbage, rose, anthurium, orchid, jasmine - plant protection in polyhouse.

UNIT 2. AGRI INPUT CENTRES (70 Hrs)

Concept and scope of agri input centres - formalities for starting an agri input centre - types of inputs in agriculture - consumable inputs and capital inputs - supply chain management - marketing strategies.

UNIT 3.FARMMACHINERYANDPLANTPROTECTIONEQUIPMENTS(80Hrs)

Scope of farm mechanization - farm machineries used for cultivation, harvesting, intercultural operations, harvesting and post harvest operations, plant protection equipments, homestead farming – maintenance of plant protection equipments.

UNIT 4. FARMER SUPPORT SERVICES (50 Hrs)

Government agencies and major NGOs supporting farmers - important schemes - ICT - enabled support.

LIST OF PRACTICALS

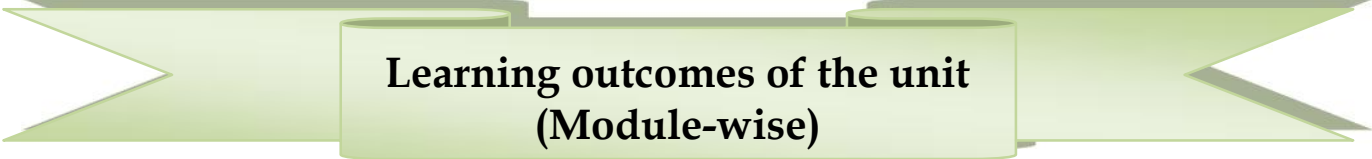
MODULE III

1. Survey of scope of agri-business in the locality around the school.
2. Case study of successful agribusiness enterprises- including IFS models, ornamental gardening/floriculture, commercial nursery management.
3. Field visit to farm business centers nearby the school.
4. Case study of risks while running an agri business.
5. Landscaping -planning and layout.
6. Identification, familiarization and classification of ornamental plants
7. Raising of seedlings of ornamental plants
8. Establishment of rockery, lawn, lily pool, flowerbed, carpet bed, trophy, topiary, edge, hedge, arches.
9. Propagation Techniques - air layering - T- budding - Patch budding - approach grafting, epicotyl grafting - vegetable grafting.
10. Field visit to a commercial nursery and prepare a Layout of commercial nursery
11. Visit to protected cultivation farm and prepare layout/design
12. Different styles of Flower arrangement.
13. Bouquet making.
14. Preservation of fruits and vegetables (jam, jelly, squash, Preparation of pickle, sauce/ketchup)
15. Visit to tissue culture lab and layout of tissue culture lab.
16. Hardening of tissue culture seedlings.
17. Mushroom cultivation.
18. Vermicomposting.
19. Visit to apiculture/sericulture unit.

20. Vegetable seedling production in portraits.

MODULE IV

1. Visit to Krishibhavan to study Infrastructure and functioning of agri clinic.
2. Identification and management of pests of Rice, coconut, banana, pepper, ginger, rubbersolanaceous vegetables - tomato, brinjal, chilli, cucurbitaceous vegetables, Cowpea, bhindi, Amaranthus, cabbage, cassava. Anthurium, orchid, rose and jasmine.
3. Identification and management of diseases of Rice, coconut, rubber, pepper, ginger, cassava, banana, solanaceous vegetables - tomato, brinjal, chilli, cucurbitaceous vegetables, Cowpea, bhindi, Amaranthus, cabbage, cassava. Anthurium, orchid, rose and jasmine.
4. Collection of pest and disease specimen and preparation of insect box of pests and herbarium of disease specimen. (Minimum 5)
5. Visit to agri input centre and list out the inputs available there.
6. Visit to a super market. Find out the supply chains for different agricultural commodities.
7. Conduct a market survey and list out the marketing strategies involved.
8. Marketing of PTC products applying various marketing strategies.
9. Visit to an agro - machinery unit. Identify the various implements and understand their operation.
10. Operation of brush cutter/coconut climber/sprayers/tractor/tiller/ other available implements.
11. Visit to the local Krishibhavan and list out the various ongoing farmer support schemes.
12. Prepare a list of ICT enabled farmer support systems and explain their salient features.



Learning outcomes of the unit (Module-wise)



Module 3

Unit 1

The learner

- 3.1.1. defines agri-business, its importance and basic concepts.
- 3.1.2. identifies the scope of agri-business and enlists the entrepreneurial opportunities in agri-business.
- 3.1.3. selects suitable farm business and identifies the steps in farm planning.
- 3.1.4. identifies the risk factors in agri business

Unit 2

- 3.2.1.1. explains the importance and scope of landscaping and its basic principles
- 3.2.1.2. identifies and classifies various ornamental plants.
- 3.2.1.3. identifies different garden types and garden components.
- 3.2.1.4. designs and prepares layout of garden.
- 3.2.1.5. practices maintenance of garden.
- 3.2.2.1. identifies and explains the basics of commercial nursery, scope and types.
- 3.2.2.2. identifies and explains the establishment of different types of nursery with emphasis to layout, components, records and major activities.
- 3.2.3.1. defines protected cultivation and understands its importance.
- 3.2.3.2. identifies different types of protected cultivation.
- 3.2.3.3. explains the establishment of different protected cultivation structures.
- 3.2.3.4. practices the agro techniques in protected cultivation.
- 3.2.3.5. defines and explains Good Agricultural Practices (GAP) and organic certification.
- 3.2.4.1. practices the steps in post-harvest handling of flowers and the techniques to improve vase life of flowers.
- 3.2.4.2. practices the steps in post-harvest handling of fruits and vegetables
- 3.2.4.3. practices value addition of flowers
- 3.2.4.4. practices value addition of fruits
- 3.2.4.5. practices value addition of vegetables

UNIT 3.

- 3.3.1. defines and explains the basic principles of tissue culture, equipment, steps and familiarises tissue culture techniques of banana.
- 3.3.2. practise mushroom cultivation.

- 3.3.3. practise vermicomposting.
- 3.3.4. defines and explains the concept of indoor gardening and familiarises with suitable plants, care and maintenance.
- 3.3.5. defines and explains the basics and techniques of bonsai making – identifies different styles of bonsai.
- 3.3.6. practise apiculture
- 3.3.7. practise sericulture
- 3.3.8. defines and describes aquaponics and vertical gardening

Module 4

Unit 1

The learner

- 4.1.1 defines and explains the concept, necessity and objectives of agri clinic.
- 4.1.2 explains the functioning of agri clinic
- 4.1.3 enlists the various infrastructure required to set up agri clinic.
- 4.1.4 explains the procedure of pest and disease diagnosis
- 4.1.5 recognizes and explains symptoms of major pests and diseases of rice and suggest remedial measures.
- 4.1.6 recognizes and explainssymptoms of major pests and diseases of coconut and suggest remedial measures.
- 4.1.7 recognizes and explainssymptoms of major pests and diseases of Banana and suggest remedial measures.
- 4.1.8 recognizes and explainssymptoms of major pests and diseases of pepper and suggest remedial measures.
- 4.1.9 recognizes and explainssymptoms of major pests and diseases of ginger and suggest remedial measures.
- 4.1.10 recognizes and explainssymptoms of major pests and diseases of Rubber and suggest remedial measures.
- 4.1.11 recognizes and explainssymptoms of major pests and diseases of Brinjal, Tomato, chilli and suggest remedial measures.
- 4.1.12 recognizes and explainssymptoms of major pests and diseases of Cucurbitaceous vegetables and suggest remedial measures.
- 4.1.13 recognizes and explainssymptoms of major pests and diseases of Cowpea and suggest remedial measures.
- 4.1.14 recognizes and explains symptoms of major pests and diseases of Bhindiand suggest remedial measures.
- 4.1.15 recognizes and explainssymptoms of major pests and diseases of Amaranthus and suggest remedial measures.
- 4.1.16 recognizes and explainssymptoms of major pests and diseases of Cabbage and suggest remedial measures.

- 4.1.17 recognizes and explains symptoms of major pests and diseases of Cassava and suggest remedial measures.
- 4.1.18 recognizes and explains symptoms of major pests and diseases of Ornamental plants - Anthurium, Orchid, Rose, Jasmine and suggest remedial measures..
- 4.1.19 recognizes and explains symptoms of major pests and diseases in polyhouse crops.
- 4.1.20 recognizes and explains symptoms of nutritional disorders and suggest remedial measures.

UNIT 2

- 4.2.1 defines and explains the concept and scope of agri input centres.
- 4.2.2 enlists the formalities for starting an agri input centre
- 4.2.3 enlists and explains the two types of agricultural inputs - consumable inputs and capital inputs.
- 4.2.4 defines and explains supply chain management in agricultural inputs
- 4.2.5 enlists various marketing strategies for agricultural inputs.

UNIT 3

- 4.3.1 defines and explains the scope of farm mechanization
- 4.3.2 identifies farm machineries used for cultivation - for harvest and post harvest-for plant protection - Machinery suitable for homestead farming
- 4.3.3 practises maintenance of plant protection equipments

UNIT 4

- 4.4.1 enlists Government agencies and major NGOs supporting farmers.
- 4.4.2 practises with ICT enabled supports for farmers.



Scheme of work

Module 3

Month	Name of unit	Periods
June	Introduction to agri-business	10
June	Major enterprises	65
July	Major enterprises	75
August	Major enterprises	70
August	Other enterprises	5
September	Other enterprises	75
October	Other enterprises	40

Module 4

Month	Name of unit	Periods
October	Agriclinics	35
November	Agriclinics	75
December	Agriclinics	30
December	Agri input centres	45
January	Agri input centres	25
January	Farm machinery and plant protection equipment	50
February	Farm machinery and plant protection equipment	30
February	Farmer support services	50

Structure of Modules

Structure of Module 3

Unit no.	Unit name	Periods
1	Introduction to agri-business	10
2	Major enterprises	210
3	Other enterprises	120

Structure of Module 4

Unit no.	Unit name	Periods
1	Agri clinics	140
2	Agri input centres	70
3	Farm machinery and plant protection equipment	80
4	Farmer support services	50

Classroom activities (General)

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

Practical activities (General)

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

PART B

MODULE 3

Overview

Agriculture is the principal source of livelihood for more than 55% of the population of India. But, the share of agriculture and allied sectors in gross domestic product (GDP) is only about 15%. Today, India is the world's largest producer of many fresh fruits and vegetables, milk, major spices, select fibrous crops such as jute, staples such as millets and castor oil seed. India is the second largest producer of wheat and rice, the world's major food staples. India has shown a steady average nationwide annual increase in the productivity for some agricultural items, over the last 60 years. These gains have come mainly from the Green Revolution, improving road and power generation infrastructure, knowledge of gains and reforms. Despite these recent accomplishments, agriculture still has the potential for major improvement, because crop yields in India are still just 30% to 60% of the best sustainable crop yields achievable in the farms of developed and other developing countries. Additionally, losses after harvest due to poor infrastructure and unorganised retail cause India to experience some of the highest food losses in the world.

Slow agricultural growth is a serious concern as some two-thirds of India's people depend on rural employment for a living. Current agricultural practices are neither economically nor environmentally sustainable and our yields for many agricultural commodities are low. Therefore, it is essential for India to build a productive, competitive, and diversified agricultural sector and facilitate rural, non-farm entrepreneurship and employment. Encouraging policies that promote competition in agricultural marketing will ensure that farmers receive better prices.

Entrepreneurship opportunities to do business with Indian Agriculture are enormous. Some of them are food grains, fruits and vegetables, processed fruits and vegetables, mushroom, dairy products, spices, medicinal and aromatic plants, essential oils, poultry and meat products, aqua products and organic products. In developing countries like India, the agribusiness sector encompasses four distinct sub-sectors, viz. agricultural inputs; agricultural production; agro-processing; and marketing and trade. All these add value or utility to the goods. Agribusiness is emerging as a specialized branch of knowledge in the field of management sciences. In this context, agribusiness can be defined as science and practice of activities, with backward and forward linkages, related to production, processing, marketing, trade, and distribution of raw and processed food, feed and fibre, including supply of inputs and services for these activities.

This module deals with the familiarisation of the learners with different agri-business enterprises. The module gives an insight into the concept of agri-business, entrepreneurial opportunities and its scope. The major enterprises like landscaping, commercial nursery,

protected cultivation and post-harvest handling are explained in this module. Tissue culture, mushroom cultivation, vermicomposting, indoor gardening, bonsai, apiculture and sericulture along with recent trends like aquaponics and vertical gardening are outlined in the module.

ABOUT THE UNITS

Unit 3.1 Introduction to Agri-business

This unit defines agri-business, explains its importance, basic concepts, scope and various entrepreneurial opportunities in agriculture. The learner also gets an insight into the decision making process in agri-business and farm planning. The learners also are made aware of the risk factors in agri business and methods to manage them.

Unit 3.2 Major enterprises

This unit deals with major agribusiness enterprises like landscaping, commercial nursery, protected cultivation and post harvest handling and value addition. In landscaping, its basic principles are explained. The learner gets acquainted with the classification of ornamental plants, different types of gardens, garden components and will be able to design and prepare layout of garden. The basic concepts of commercial nursery, its scope, types, establishment of nursery, layout, components, records and major activities like propagation, hardening and sales are explained to the learner in this unit. Protected cultivation deals with the definition, importance and types of protected cultivation including green house, poly house, shade house and rain shelter. The learner gets familiarised with the establishment of protected cultivation structures, agro-techniques and emerging trends. The post-harvest handling and value addition of agricultural produce like flowers, fruits and vegetables are detailed.

Unit 3.2.2 Commercial Nursery

This unit deals with the various aspects of a commercial nursery. It explains the different types of nurseries based on their method of sale. The important factors to be considered while establishing a nursery, the different documents that should be maintained in a nursery and the major activities carried out in a nursery like propagation, hardening etc are discussed in detail in this chapter.

Unit 3.2.3. Protected cultivation

This unit deals with the definition, importance and types of protected cultivation including green house, poly house, shade house and rain shelter. The learner gets acquainted with the establishment of protected cultivation structures, agro-techniques and emerging trends.

Unit 3.2.4. Post-harvest handling and value addition

The post-harvest handling and value addition of agricultural produce like flowers, fruits and vegetables are detailed in this unit. The learner acquires knowledge about various post-harvest handling techniques of flowers, fruits and vegetables. The learner practices preparation of value added products like flower arrangement, dry flowers, vegetable and fruit carving, jam, jelly, pickles, sauce and dried products.

Unit 3.3 Other Enterprises

This unit gives the learner an insight into the principles of tissue culture, equipment and steps in tissue culture, tissue culture technique of banana, mushroom cultivation, vermicomposting, indoor gardening, various plants suitable for indoor gardening and their care and maintenance, accessories used in indoor gardening, basics of bonsai making and various bonsai styles, apiculture, sericulture and recent trends like aquaponics and vertical gardening.

UNIT GRID

Unit 3.1 Introduction to Agri-business

Ideas/concept/skills	Learning outcomes	Suggested activities	Assessment
Definition of agri-business, importance, basic concepts SKILLS Observation Analysis	<i>The learner</i> defines agri-business, its importance and basic concepts.	General discussion(W) Notes	Notes
Scope of agri-business, Entrepreneurial opportunities in agri-business. SKILLS Observation Identification Analysis	<i>The learner</i> Identifies the scope of agri-business and enlist the entrepreneurial opportunities in agri-business.	Brainstorming (W) Collection of paper cuttings on successful agri-business enterprises in Kerala.(G) Survey	Survey report Presentation
Decision making in Agri-business , Steps in farm planning. SKILLS Analysis Communication	<i>The learner</i> selects suitable farm business and identify the steps in farm planning.	Group discussion Chart preparation	Notes Chart
Identify the risk factors in agri business SKILLS Observation Identification Analysis	<i>The learner</i> identifies the risk factors while running an agri business	Survey Discussion	Survey Report

Unit 3.2 Major enterprises

Ideas/concept/skills	Learning outcomes	Suggested activities	Assessment
Landscaping- Importance and scope, basic principles of landscaping. SKILLS Observation Identification	<i>The learner</i> explains the importance and scope of landscaping and its basic principles	Powerpoint presentation Videos Collection of articles and pictures on landscaping Landscaping of the school campus	Notes work diary Audio-Visual report
Classification of ornamental plants. SKILLS Observation Identification Collection Classification	<i>The learner</i> identifies and classifies various ornamental plants.	Slide show of different ornamental plants Collection live specimen of ornamental plants. Identification of ornamental plants.	PTC record Herbarium Notes Quiz
Types of garden, garden components. SKILLS Observation Identification Classification	<i>The learner</i> identifies different garden types and garden components.	Videos Collection of pictures of different garden types and garden components	Album Notes
Principles of garden design and layout. SKILLS Observation Practical skills	<i>The learner</i> designs and prepare layout of garden.	Design and layout a garden in school Garden visit	School garden Garden layout
Maintenance of garden	<i>The Learner</i> Practices	Garden maintenance,	Work diary

SKILLS Observation Identification Practical skills	maintenance of a garden	Pruning and Training	
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Unit 3.2.2 Commercial Nursery

Ideas/concept/skills	Learning outcomes	Suggested activities	Assessment
Basic concepts of commercial nursery, scope, types of nursery. SKILLS Observation Analysis Classification	<i>The learner</i> Identifies and explains the basics of commercial nursery, scope and types.	General discussion Collection of paper cuttings on nursery business in Kerala	Album Notes
Establishment of nursery, layout, records, major activities. SKILLS Practical skill Observation Identification	<i>The learner</i> Identifies and explains the establishment of different types of nursery with emphasis to layout, components, records and major activities.	Visit to commercial nursery Preparation of layout Model of nursery	Field diary Report

Unit 3.2.3. Protected cultivation

Ideas/concept/skills	Learning outcomes	Suggested activities	Assessment
Definition of protected cultivation, importance. SKILLS Observation Analysis Communication	<i>The learner</i> defines protected cultivation and understand its importance.	General discussion Seminar Collection of paper cuttings about protected cultivation. Videos	AV material Album Notes

Different types of protected cultivation- Polyhouse, rain shelter, greenhouse, shadehouse, Polytunnel SKILLS Observation Communication Analysis Inference	<i>The learner</i> Identifies different types of protected cultivation.	Videos about green houses, poly houses etc. Visit to greenhouse/poly house	Field diary AV material
Establishment of protected cultivation structures. SKILLS Observation Communication Analysis Inference	<i>The learner</i> explains the establishment of different protected cultivation structures.	Models of different protected cultivation structures Setting up of poly house in school	Models Record Field diary
Agrotechniques in protected cultivation. SKILLS Observation Communication Analysis Inference Practical skill	<i>The learner</i> practices the agro techniques in protected cultivation.	Discussion Seminar on agrotechniques of specific crops Interaction with greenhouse farmers Visit to greenhouse/poly house. Videos	Report AV material Notes
-Good Agriculture Practices (GAP), Organic certification. SKILLS Reference skill	<i>The learner</i> Defines and explains Good Agricultural Practices(GAP), organic certification.	Collection of data on GAP and Organic certification Notes	Notes Report

Unit 3.2.4. Post-harvest handling and value addition

Ideas/concept/skills	Learning outcomes	Suggested activities	Assessment
Post-harvest	<i>The learner</i>	Flow chart of post	Notes

handling of flowers- improvement of vase life. SKILLS Observation Practical skills Reference skill	Practices the steps in post-harvest handling of flowers and the techniques to improve vase life of flowers.	harvest handling process videos. Literature collection	Chart
Post-harvest handling of fruits and vegetables steps followed. SKILLS Observation Practical skills Reference skills	<i>The learner</i> practices the steps in post-harvest handling of fruits.	Flow chart of post harvest handling process Videos Literature collection	Notes Chart
Value addition of flowers- flower arrangement, dry flower making. SKILLS Observation Analysis Inference Practical skill	<i>The learner</i> practices value addition of flowers.	Paper cuttings about value addition flowers Demonstration of flower Arrangement Videos Photos	Album Flower arrangements, Bouquet Record Notes
Value addition of fruits- preparation of jam/jelly/squash SKILLS Observation Analysis Inference Practical skill	<i>The learner</i> practices value addition of fruits	Demonstration Videos	Value added products Notes Reports
Value addition of vegetables- preparation of pickles/sauce SKILLS Observation Analysis Inference Practical skill	<i>The learner</i> practices value addition of vegetables	Demonstration Videos	Value added products Notes Reports

Unit 3.3 Other Enterprises

Ideas/concept/skills	Learning outcomes	Suggested activities	Assessment
Tissue culture- basic principles, media, equipment, steps, TC techniques of banana SKILLS Observation Inference Application	<i>The learner</i> Defines and explains the basic principles of tissue culture , equipment, steps and familiarise tissue culture techniques of banana.	Establishment of primary and secondary hardening units Lab visit Assignment Project Interview Discussion	Field diary Primary hardening unit Secondary hardening unit Project report
Mushroom cultivation SKILLS Observation Inference Application Practical skill	<i>The learner</i> practice mushroom cultivation.	Demonstration Mushroom cultivation in school Marketing of mushroom and products	PTC report Field diary
Vermicomposting SKILLS Observation Inference Application Practical skill	<i>The learner</i> practice vermicomposting.	Demonstration Vermicomposting of school waste and mushroom waste Marketing of vermicompost and worms	PTC report Field diary
Indoor gardening- plants, care and maintenance SKILLS Observation Identification Classification Analysis Inference Practical skill	<i>The learner</i> defines and explains the concept of indoor gardening and familiarises with suitable plants, accessories, care and maintenance.	Setting of indoor garden Assignment Videos Collection of indoor plants and garden accessories	Collections Notes
Bonsai- basics of bonsai making, styles SKILLS Observation Identification	<i>The learner</i> defines and explains the basics and techniques of bonsai making and identify different	Collection of photos Discussion Presentation Pre-Bonsai preparation	Field diary Collection Notes Record

Classification Analysis Inference Practical skill	styles of bonsai.		
Apiculture SKILLS Observation Communication Analysis Identification	<i>The learner</i> practice of apiculture.	Collection of articles on apiculture Videos Visit to apiary	Notes Collection Report
Sericulture SKILLS Observation Communication Analysis Identification	<i>The learner</i> practice of sericulture	Collection of articles and photos on sericulture Videos	Notes Collection
Aquaponics, vertical gardening SKILLS Observation Reference Analysis Practical skill	<i>The learner</i> defines and explains aquaponics, vertical gardening and other recent trends.	Collection of data on aquaponics, vertical gardening Model of aquaponics system Setting up of vertical garden	Notes Collection Vertical garden Model

ADDITIONAL INFORMATION

Colour Combinations

The basic arrangement of colours in annual beds may be classified as follows, but no rigid formula can be provided for all the places for all times and may vary according to situation and convenience.

Monochromatic:

It is arranging different tones of the same colour either of the same species or in combination with different species.

Analogous:

Using closely related or harmonious colours such as violet with blue and light blue with green, and yellow with green, or yellow with yellow-orange.

Complementary or contrasting: Two opposite or contrasting colours –blue and orange, red and

green, violet and yellow-are called complementary. The red salvias grown against a lush green hedge form a beautiful contrast.

Nutrient Film Technique (NFT)

In the Nutrient Film Technique (NFT)-system, a thin film of water and nutrients are flowed through a horizontal pipe or gutter and the plants are suspended above the water. The roots touch the "thin film" of water and nutrients, this taking in their nutritional requirements.

Hydroponics

Hydroponics is a subset of hydroculture and is a method of growing plants using mineral nutrient solutions, in water, without soil. Terrestrial plants may be grown with their roots in the mineral solution only, or in an inert medium, such as perlite or gravel.

Aeroponics

Aeroponics is the process of growing plants in an air or mist environment without the use of soil or an aggregate medium. The basic principle of aeroponic growing is to grow plants suspended in a closed or semi-closed environment by spraying the plant's dangling roots and lower stem with an atomized or sprayed, nutrient-rich water solution

Benefits of GAP

- Appropriate adoption and monitoring of GAP helps improve the safety and quality of food and other agricultural products.
- It may help reduce the risk of non-compliance with national and international regulations, standards and guidelines regarding permitted pesticides, maximum levels of contaminants in food and non-food agricultural products, as well as other chemical, microbiological and physical contamination hazards.
- Adoption of GAP helps to promote sustainable agriculture.

Currently, there are numerous systems that growers can adopt to ensure safe food production other than GAP, which include Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Points (HACCP), Good Hygiene Practices(GHP) etc. Hazard Analysis and Critical Control Point (HACCP) is an internationally recognized system for reducing the risk of safety hazards in food.

A HACCP System requires that potential hazards are identified and controlled at specific points in the process. This includes biological, chemical or physical hazards. Any company involved in the manufacturing, processing or handling of food products can use HACCP to minimize or eliminate food safety hazards in their product.

It is to be recognized that animals are a part of organic farming system since they contribute to nutrient cycles, soil fertility and higher yields. There are many organic standards on national as well as international levels. Generally standards vary with the country and to sell the products in a particular country, the standards of the importing country are to be followed. Certification is the key to the national organic program.

Inspection Certification bodies

APEDA has recognized the following Inspection Certification bodies, all of these are able to certify based on the NPOP

1. BVQ1 (India) Pvt. Ltd (Mumbai)

2. E cocert (Aurangabad)
3. IMO control private limited (Bangalore)
4. Indian organic certification agency (Indocert, Aluva)
5. International Resources for farmer trade members
6. Lacon quality certification Pvt. Ltd (Theepany, Kerala)
7. National organic certification Association Pvt. Ltd (Pune)
8. One Cert Asia Agri Certification Pvt. Ltd (Jaipur)
 2. SGS India Pvt. Ltd (Gurgaon)
 3. Skal International (Bangalore)
 4. Uttaranchal State Organic Certification Agency (Uttaranchal).

Many of the Indian farmers are small scale, poor farmers who may not be able to afford the cost of certification. Private certification bodies are creating International control systems and participatory guarantee system as alternative means of certification to reduce the cost of certification.

OPTIMUM STAGES OF HARVESTING FOR IMPORTANT FLOWERS:

Sl. No.	Flowers	Purpose	Stage of Harvest
1	Rose	Cut flower	1-2 petals beginning to unfold. At tight bud stage.
2	Jasmine	Loose flower	Matured, unopened bud stage
		Oil extraction	Fully opened flowers
3	Anthurium	Cut flower	Spadix almost fully developed 1/3 rd of flowers on spadix mature. Change of colour from base to top.
4	Chrysanthemum	Standard	When outer florets fully expanded
		Spray	Flowers open but before shedding of pollens
		Pompons and decorative	Centre of the oldest flower fully open
		Anemones	Open but before central disc florets begin to elongate.
5	Carnation	Standard	Paint brush stage when flowers are half open
		Spray	At least two flowers fully open
6	Gerbera	Cut flower	Flowers open but outer two rows show shedding of pollens (fully mature)
7	Gladiolus	Cut flower	1-5 florets show colour
8	China Aster	Cut flower	Fully opened flower with long stalk
		Loose flower and oil extraction	Fully opened with short or no stem
9	Tuberose	Cut flower	When few flowers open at the base
		Loose flower and oil extraction	When all the flowers are fully opened

Home remedies for prolonging vases life

The vase containing flowers should not be placed near a fire or under an electric fan circulating hot air. To improve relative humidity the blooms may be misted with clean and cool water. After harvesting the cut end of the flowers should be immediately immersed in clean water. Every day a portion of the cut stem end should be cut again under water and replaced without exposing this to air. A little amount of sugar added to the vase water may improve

keeping quality. A very dilute solution of copper sulphate added to the water may check rot due to fungi.

ASSESSMENT ACTIVITIES

1. Identification of the agri business enterprises in your locality by data collection and report submission.

Sl. No.	Name and address of farmer	Type of agri business	Remarks

2. The students are shown pictures of English garden, French garden, Japanese garden and Mughal garden. They are asked to bring out the salient features of each garden and how they differ from each other.
3. Students are given a project of beautifying the school campus/ selected area near school.
4. Prepare a layout of a commercial nursery. What are the plants that you will select for this nursery? (Find out the market demand before selecting the plants.)
5. The students are asked to conduct a debate on the pros and cons of protected cultivation – whether it is suitable for our conditions, what are the problems that may arise in protected cultivation in Kerala, etc.
6. Collect data on the common techniques of drying fruits and vegetables, dry preservation of fruit juices etc.
7. Prepare dried leaves/flowers.
8. Prepare jam/jelly using locally available fruits.
9. Prepare pickles/ sauces using locally available vegetables.
10. Project preparation for starting a mushroom cultivation unit
11. Setting up and running a mushroom unit.
12. Preparation of vermicompost from domestic waste.
13. Preparation of a project proposal to start a sericulture unit.
14. Project on vegetable seedling production and sales.

LIST OF ITEMS IN PORTFOLIO

1. Class notes on definition, concept and importance of agribusiness, various entrepreneurial opportunities and decision making.

2. Report of data collection on local agri business enterprises.
3. Report of case studies of successful agri business enterprises- power point presentations/ videos.
4. Field diary
5. Class note, Field diary of constructing lawn/rockery/lily pool, collected pictures of gardens and garden components, Report on school landscaping project.
6. Class notes, charts of diagrammatic representation of propagation techniques, field visit report, submission of established layers, vegetable seedling in portray.
7. Class notes, Seminar report on agro techniques of rose/gerbera/cucumber/capsicum in protected cultivation, models of protected cultivation structures
8. Class notes, flow charts of preparation of jam/jelly/pickles/sauce, submit dried leaves/flowers.
9. Class notes, Report of field visit to apiary/sericulture unit, work diary of mushroom cultivation as part of PTC, work diary of vegetable seedling production project.

EXTENDED ACTIVITIES

1. Conduct campaigning of safe disposal of domestic waste by establishing vermicomposting unit in the Panchayath.
2. Conduct demonstration classes to villagers on Mushroom cultivation.
3. Conduct an awareness programme to Kudumbasree units about Agribusiness opportunities.
4. Start up group on Agricultural enterprises

MODULE 4

Overview

Module 4 deals with the various support services implemented by government as well as private agencies to help farmers improve farm productivity and increase farm income. The Agri clinic and Agri Business Centres scheme was launched by Govt. of India to instill better methods

of farming to the farming community across the country through educated and unemployed Agri graduates. The objectives of the scheme are to supplement the efforts of the government system and to make available sources of input supply and services to needy farmers. Agri input centres are aimed at supplying good quality inputs to farmers at the right time. Farm mechanization is an underdeveloped sector in India. But in Kerala as the shortage of labour poses a threat to agriculture community itself forcing a great many number of farmers to abandon farming altogether, mechanization has become vital. This module introduces the various farm machines to students. The final chapter deals with various schemes implemented by government and NGOs to support farmers and also ICT enabled farmer support services. The Crop Insurance Scheme, Farmers pension scheme etc are envisaged to support poor and marginal farmers in facing the vagaries of our agriculture system. In the modern world farmers are also benefiting from the greater coverage and capabilities of the internet and communication systems.

ABOUT THE UNITS

Unit 4.1 Agri Clinic

This unit gives the definition of agri clinic and explains the concept, necessity and objectives of agri clinics. The learner gets an insight into the functioning of agri clinic and the procedure for diagnosis of pests and diseases of crops. The infrastructure required for setting up an agri clinic is elaborated and the main registers to be kept in the agri clinic is listed. After finishing the unit the learner will be able to diagnose the symptoms of major pests and diseases of Rice, Coconut, Rubber, Pepper, Ginger, Cassava, Banana, Tomato, Brinjal, Chilli, Cucurbitaceous vegetables - Bittergourd, Snakegourd, Cowpea, Amaranthus, Bhindi, Cabbage, Rose,

Anthurium, Orchid, Jasmine and suggest suitable management practices. The learner will also get acquainted with pests and diseases of polyhouse crops and their management measures.

Unit 4.2 Agri Input Centres

This unit deals with the concept and scope of agri input centres. The formalities for starting an agri input centre are discussed and the two types of agri inputs namely consumable inputs and capital inputs are elaborated. The learner also gets an idea about supply chain management in agri input centres as well as the marketing strategies adopted.

Unit 4.3 Farm Machinery And Plant Protection Equipments

Mechanization of agriculture is an essential input to the modern agriculture. It enhances productivity, besides reducing human drudgery and cost of cultivation. Mechanization also helps in improving utilization efficiencies of other inputs.

This unit discusses the scope of farm mechanization in India and Kerala. The learner gets acquainted with the various farm machines used in major crops in our country. The learner also understands the usage of various plant protection equipment like sprayers and duster.

Unit 4.4 Farmer Support Services

Agriculture continues to be the engine of economic growth in most developing countries like India. Indian agriculture is characterized by predominance of small and marginal farmers. The success of green revolution resulted in dramatic gains in productivity. However, despite significant achievements in food production, problems of food and nutrition security, poverty alleviation and regional imbalances still persist. Small farmers in India have several common features like, (1) seasonal producers, (2). fragmented buyers and suppliers unable to exploit economies of scale and (3) dominated by household economics. To enable small farmers to reap the fruits of liberalization and globalization governments must play a proactive role in empowering them to take advantage of opening up of market opportunities. Government-provided agricultural support services need to be reformed to enable small farmers to take up commercial farming through sustainable practices. Private service providers will need to be encouraged by creating an enabling environment. The farm support services mainly include Government Schemes and programmes like Agriclincs, Agri input centers, ICT enabled services etc.

This unit deals with various farmer support services including schemes implemented by Government agencies and NGOs, Agriclincs and ICT enabled farmer support services.

UNIT GRID

Unit 4.1 Agri Clinic

Ideas/concept/skills	Learning outcomes	Suggested activities	Assessment
Definition, concept, necessity and objectives of agri clinic SKILL	<i>The learner</i> defines and explains the concept, necessity and	Discussion Notes	Notes

Observation Analysis	objectives of agro clinic.		
Functioning of agriclinic. SKILL Observation Identification Analysis	<i>The learner</i> explains the functioning of agro clinic.	Visit to agri clinic General discussion	Presentation
Infrastructure required to set up agri clinic. SKILL Observation Identification Analysis	<i>The learner</i> enlists the various infrastructure required to set up agro clinic.	Videos Visit to agri clinic Notes	Notes
Procedure of pest and disease diagnosis SKILL Observation Identification Analysis Practical skill	<i>The learner</i> explains the procedure of pest and disease diagnosis	General discussion Collection of paper cuttings Pictures	Notes
Diagnosis and management of major pests and diseases of rice. SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of rice and suggest remedial measures.	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary
Diagnosis and management of major pests and diseases of coconut. SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of coconut and suggest remedial measures.	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary
Diagnosis and	<i>The learner</i>	Videos	Insect box

management of major pests and diseases of Banana. SKILL Observation Identification Collection Classification Practical skill	recognizes and explains symptoms of major pests and diseases of Banana and suggest remedial measures.	slides Field visit Pictures	Herbarium of disease specimen Notes Field diary
Diagnosis and management of major pests and diseases of pepper. SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of pepper and suggest remedial measures.	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary
Diagnosis and management of major pests and diseases of ginger. SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of ginger and suggest remedial measures.	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary
Diagnosis and management of major pests and diseases of Rubber. SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of Rubber and suggest remedial measures.	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary
Diagnosis and management of major pests and diseases of Brinjal, Tomato, Chilli	<i>The learner</i> recognizes and explains symptoms of major pests and	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes

SKILL Observation Identification Collection Classification Practical skill	diseases of Brinjal, Tomato, Chilli and suggest remedial measures		Field diary
Diagnosis and management of major pests and diseases of Cucurbitaceous vegetables. SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of Cucurbitaceous vegetables and suggest remedial measures.	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary
Diagnosis and management of major pests and diseases of Cowpea SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of Cowpea and suggest remedial measures.	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary
Diagnosis and management of major pests and diseases of Bhindi. SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of Bhindi and suggest remedial measures.	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary
Diagnosis and management of major pests and diseases of Amaranthus SKILL Observation	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of Amaranthus and	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary

Identification Collection Classification Practical skill	suggest remedial measures.		
Diagnosis and management of major pests and diseases of Cabbage SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of Cabbage and suggest remedial measures.	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary
Diagnosis and management of major pests and diseases of Cassava SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of Cassava and suggest remedial measures.	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary
Diagnosis and management of major pests and diseases of Ornamental Plants - Anthurium, Orchid, Rose, Jasmine SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes and explains symptoms of major pests and diseases of Ornamental Plants - Anthurium, Orchid, Rose, Jasmine and suggest remedial measures.	Videos slides Field visit Pictures	Insect box Herbarium of disease specimen Notes Field diary
Plant protection in polyhouses - common pests and diseases in polyhouses and their management. SKILL Observation	<i>The learner</i> recognizes and explains the plant protection in polyhouses - common pests and diseases in	Videos Slides pictures	Notes Field diary

Identification Collection Classification Practical skill	polyhouse crops and their management		
Diagnosis and management of Nutritional disorders of crops SKILL Observation Identification Collection Classification Practical skill	<i>The learner</i> recognizes nutritional disorders symptoms and suggest remedial measures.	Videos slides Field visit Pictures	Notes Field diary Herbarium

Unit 4.2 Agri Input Centres

Ideas/concept/skills	Learning outcomes	Suggested activities	Assessment
Concept and scope of agri input centres SKILL Observation Analysis	<i>The learner</i> defines and explains the concept and scope of agri input centres.	General discussion Brainstorming Collection of data on agri input centres	Notes
Formalities of starting an agri input centre SKILL Observation Analysis	<i>The learner</i> enlists the formalities for starting an agri input centre	General discussion Visit to agri input centre	Report Notes
Types of agricultural inputs SKILL Observation Identification Analysis Classification	<i>The learner</i> enlists and explains the two types of agricultural inputs - consumable inputs and capital inputs.	Brainstorming Notes	Notes

Supply chain management in agricultural inputs SKILL Observation Identification Analysis Communication skill	<i>The learner</i> defines and explains supply chain management in agricultural inputs	Group discussion Brainstorming Notes	Presentation of supply chain management relating to any agri commodity
Marketing strategies for agricultural inputs. SKILL Observation Analysis Identification	<i>The learner</i> enlists various marketing strategies for agricultural inputs.	Group discussion Audio visual presentation Visit to agri marketing firms	Presentation of marketing strategy for any agri commodity

Unit 4.3 Farm Machinery And Plant Protection Equipments

Ideas/concept/skills	Learning outcomes	Suggested activities	Assessment
Scope of farm mechanization SKILL Observation Analysis	<i>The learner</i> Defines and explains scope of farm mechanization	General discussion Notes	Notes
Familiarisation with farm machineries used for cultivation, harvest and post harvest, plant protection and homestead farming SKILL Observation Practical skill	<i>The learner</i> identifies with farm machineries used for cultivation - for harvest and post harvest - for plant protection - machinery suitable for homestead farming	Videos Slides Visit agro machinery unit Collection of pictures	Presentation of machinery used in rice Notes
maintenance of plant protection equipments SKILL Observation	<i>The learner</i> Practices maintenance of plant protection	Videos Slides Visit agro machinery unit	Presentation of machinery used in coconut Notes

Practical skill	equipments	Collection of pictures Operation of farm implements	
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Unit 4.4 Farmer Support Services

Ideas/concept/skills	Learning outcomes	Suggested activities	Assessment
Government agencies and major NGOs working to support farmers. SKILL Observation Identification communication	<i>The learner</i> enlists Government agencies and major NGOs working to support farmers.	General discussion Visit to KrishiBhavan to study various schemes implemented.	Notes Presentation
ICT enabled supports for farmers. SKILL Observation Identification Communication Practical skill	<i>The learners</i> practice with ICT enabled supports for farmers.	General discussion Demonstration of various ICT enables services	Notes Presentation

ADDITIONAL INFORMATION

Against rodents

Place wax blocks of 0.005 % bromadiolone in coconut crown of the infested palms at 3 - 4 days interval till the bait is no more consumed. Boil 10kg wheat and two large pieces of glyricidia bark and broadcast in field as bait. Mix gypsum and sugar and keep in places as bait where rats are frequent. Take one part nerium seed powder + nine parts rice + one part coconut pulp + a little

oil. Mix well and use as a bait. Mix shrimp powder and cement (dry) and keep as bait. Pre baiting with shrimp powder alone will be more effective. Use tin barrier around tree trunk to prevent rat damage.

Marketing strategies

Marketing as defined as "the total of activities involved in the transfer of goods from the producer or seller to the consumer or buyer, including advertising, shipping, storing, and selling."

Marketing seeks to satisfy the needs of people (customers or the **market**) (creating a sense of usefulness or **utility**) through the **exchange** process. Marketing refers to channeling the gap

between service and product providers to service and product seekers. also known as a way of satisfying needs.

4 ps of Marketing are

1. Product
2. Place
3. Promotion
4. Price

"7 p's" of marketing are,

1. product
2. price
3. place
4. promotion
5. people
6. positioning
7. packaging

11 P s of Marketing are

1. Price
2. Place
3. Product
4. Promotion
5. People
6. Process
7. Physical environment
8. Public commentry
9. Privacy
10. Personalisation/Personal interest

11. Partnerships/Personal networks

Marketing strategies for Inputs

Product Strategy

- The products should be able to satisfy the expected needs rural farmers and provide them value for money they spent.
- The product information on the cover packaging and in the user manuals should be expressed in simple and easy to understand local language.
- The rural farmers likes simple and easy to use products.

Pricing Strategy

- The rural customer is Quality conscious and price sensitive and expects value for money and therefore, the pricing has to be in accordance with their expectation.
- The technique value analysis involves replacing costly raw materials with inexpensive ones, without sacrificing quality and functionality

Place Strategy

- The channel plays the role of both pulling as well as pushing function and acts as a dispenser of agricultural inputs.
- Make the products available near the target audience.
- Cooperative societies, public distribution system, feeder markets, village weekly markets fairs and festivals can be utilized to ensure adequate distribution of agri-inputs products.

Promotion Strategy

The promotional activities should be undertaken through media that are comfortable and appropriate for the rural areas. (For e.g.,traditional art forms such as puppet shows and street plays or creating awareness through village panchayat members, distribution of pamphlets, use of mobile vans for publicity and advertising through wall posters

Factors influencing agri input marketing

1. Socio-cultural factors that influence the purchase decision adoption of modern farming practices and equipment
2. Migration of rural population to urban areas which shows less dependence on agriculture for livelihood or/and increase farm mechanization that require less dependence on laborers.
3. Occupational pattern with higher education
4. Literacy is required to understand the modern farming practice and products
5. Land distribution and use also increases or decreases the input consumption
6. Development Programmes carried out by govt. and semi-govt. agencies
7. Communication Media which has been spreading it's network gives newer opportunity for agri-input industries
8. Credit availability through banks and co-operative system has made easier for the farmers to modernize their farming

Custom hiring centres

Mechanization is a major tool for improving productivity and production in agriculture sector. But the mechanization activities face certain constraints in Kerala such as small farm holdings and inability of individual farmers to make huge investment on machinery. The idea of Custom Hiring Centres for agricultural machinery has been accepted as a solution to this problem.

Custom Hiring Centres maintain a number of agricultural machineries and provide the machines to the farmers at a nominal rent basis. The centres are also having the facilities for the proper upkeep and maintenance of the machine.

Objectives of Custom Hiring Centre

- To make available various farm machinery / equipment to small and marginal farmers
- To improve mechanization in places with low farm power availability
- To provide hiring services for various agricultural machinery/implements applied for different operations.
- To expand mechanized activities during cropping seasons in large areas especially in small and marginal holdings.
- To provide hiring services for various high value crop specific machines applied for different operations.

ASSESSMENT ACTIVITIES

1. Visit to farmers fields and identify the symptoms of pest and disease attack. Collection of live specimen.
2. The student is given the task of cultivating poison - free vegetables in 25 grow bags. The student lists out all the inputs he/she uses during the cultivation process. He/she conducts a market survey to find out demand of vegetables among customers. He/she also prepares the marketing strategies to obtain maximum profit for his produce.
3. The student is asked to operate brush cutter for weedcontrol in the school campus.
4. Audio - visual presentation of farmer support systems.
5. Collection of paper cuttings on farmer support systems.
6. Conduct a campaign to create awareness among local farmers about ICT enabled farmer support systems.

LIST OF ITEMS IN PORTFOLIO

1. Notes, Herbarium of disease specimen, Insect box of pests, Field visit report, Album of pictures, Paper cuttings about pests, diseases and new trends in pest management.
2. Notes, Presentation reports, Survey reports in Practical log book
3. Notes, Reports of visit to agro machinery unit, Album of pictures of farm machinery
4. Class Notes, Reports of field visit, Presentation reports.

EXTENDED ACTIVITIES

1. Set up an agri clinic at school
2. Conduct a campaign for pest/disease control in the panchayath. Prepare leaflets on pest and disease control and distribute to the local farmers to create awareness.

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.

List of possible OJT Centres

GENERAL

- Various institutions under Kerala Agricultural University (Colleges, research stations)
- Krishi Vigyan Kendras (KVKs)
- Krishi Bhavans
- 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, Mithra Niketan, MSSRF

- Various Private Nurseries (Atmanilayam Nursery Gardens ,Cheruvarakkonam) ,(Kuzhippallam Botanical Gardens,Nellimoodu), (Beena Nursery,Vithura) , (Dreamland Garden ,Mukkoodu)
- 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 Gardens ,Cheruvarakkonam), (Kuzhippallam Botanical Gardens,Nellimoodu) , (Beena Nursery,Vithura.)

2. Kollam

- KVK Sadanandapuram, Kottarakkara
- FSRS Sadanandapuram, Kottarakkara
- District Seed Farm, Kottukkal, Anchal
- State Seed Fram, Kottarakkara
- Cashew Farm, Kottrakkara
- 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, KNNMVHSS (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, Pathanamthitta
- Seed Farm, Pandalam

3. 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

4. Kottayam

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

5. Idukki

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

6. 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
- RATTTC, Vytilla
- Kinfra Park, Nellad
- Parasite Breeding Station, Vytilla
- Hafi orchids, Kalamassery
- Sevashram (NGO), Angamaly
- Aiswarya Farm (NGO), Kalady
- Grandma Pickles, Muvattupuzha.

7. 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

8. Palakkad

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

9. Malappuram

- RARS, Anakkayam

10. Kozhikode

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

11. Kannur

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

12. Kasaragod

- CPCRI, Kasaragod
- KVK, Kasaragod
- College of Agriculture, Padannakkad
- RARS, Pilicode
- Agricultural Farm, Nileshtar
- State Seed Farm, Karanthakad, Kasaragod
- Cashew Progeny Orchard, Gwalimukham
- Private nurseries

- Jenny flowers, Kasaragod
- Mechirath Nursery, Kasaragod

13. Wayanad

- MSSRF, Kalpetta
- RARS, Ambalavayal
- KVK, Ambalavayal
- Wayanad Social Service Society, Mananthavady
- Private Nurseries
- Hitech Farms

References

1. Practical manual. State level training programme to plant health clinics. Compiled by Kerala centre for pest management Moncombu, Dept of Agriculture, 2015-16.
2. Amarnath, V.(2007) Nursery and landscaping,AgrobiosIndia,Jodhpur
3. Drollete, S.A. (2009) Understanding Agricultural Risk. Department of Agricultural Economics. Utah State University. extension.usu.edu.
4. Farm Guide-2015. Farm Information Bureau.Department of Agriculture, Govt of Kerala. Thiruvananthapuram.
5. Food preservation techniques,Practical manual for class XI-Paper III,(2002) NCERT.
6. Hakim, A.V.M., Pathrose, B. and Nair, H.M. (2014) Green House-Management and Operations,Farm Information Bureau(FIB),Dept of Agriculture.
7. Handbook of Horticulture. (2013) ICAR,New Delhi.
8. Home-scale processing and preservation of fruits and vegetables. (1990)CFTRI,Mysore.
9. Jain,R.andJanakiram, T. (2013) Value addition in Ornamentals. *Keralakarshakan e-Journal*.1(7)6-11
10. Joseph, P.J. and Marykutty,A (2012)Bonsai:DhanathinumAanandathinum DC Books,Kottayam.
11. Manorama Year Book(2015) MalayalaManorama,Kottayam
12. Nair, G.M. (2015) Chemical and Biopesticides for crop protection-A Handbook for Technical Officers,Department of Agriculture,Thiruvananthapuram
13. Package of Practices Recommendations (Adhoc) for Organic Farming: Crops, KAU 2009. Kerala Agricultural University, Thrissur.
14. Package of Practices recommendations.Crops-2011. Kerala Agricultural University.Thrissur.
15. Peethambaran, C.K. and Reghunath, P (2014) Surveillance Based Pest and Disease Management In Crop Plants ,Department of Agriculture,Thiruvananthapuram.
16. Randhawa,G.S and Mukhopadhyaya, A.(1986) Floriculture in India Allied Publishers Limited,New Delhi.
17. Sahai, J. (2015) Elements of Agricultural Engineering,StandardPublishers,NewDelhi.
18. Sairaj, K.P. (2002)Bonsai,State Institute of Languages Kerala,Thiruvananthapuram.
19. Sheela, V.L. (2011). Horticulture,MJPPublishers,New Delhi.

20. Srivastava,R.P and Sanjeev Kumar. (2001) Fruit and Vegetable Preservation- Principles and Practices,CBS Publishers and Distributers Private Ltd,New Delhi.
21. Subhagan, S. R. and Dhalin,D. (2013) Elements of Plant protection, FOLIO publishers,Thiruvananthapuram.
22. Sunil, V.G. and Pathrose, B. (2015) Application of ICT in Agriculture- A Handbook. ICAR KVK Malappuram. Kerala Agricultural University. Thrissur.
23. Suseela,P. (2013) Hi-tech krishi-orumargadarssi,Kerala Agricultural University,Thrissur.
24. www.tnau.ac.in