

CURRICULUM

For

FARM MANAGER (One-Year Course)

Curricula Templates

1. Introduction Template

2. Summary Template –Curriculum Development for (Trade name)

3. (Trade Name)Curriculum Contents (Teaching and Learning Guide)

- Module One: (Name of Module)

- Objective of the Module

- Duration of the Module / Theory Hours/ Practice Hours

- Learning Unit / Learning Outcomes/ Learning Element/ Duration/ Materials Required/
Learning Place

4. Assessment Template

1. Introduction

Name of course: Farm Manager

The overall objective of course is to enable the learner to gain competencies related to enhancing productivity via soils, field and horticultural crop production packages, operate and understand mechanisms of farm machinery, Irrigation techniques/ packages, crop protection measures, manage to overcome postharvest losses, livestock management packages, farm record maintenance, and determine economics of various crops & proper marketing for gaining maximum profitability

After completing this course, learners will have the opportunity to enter careers relating to Farm Management. Farm Managers will have the technical knowledge and experience which is necessary to efficiently manage agriculture farms for earning maximum returns. This ability will ensure him job opportunities in the farming community of Pakistan and in government created/ announced vacancies. This course will also enable him to earn employment opportunities overseas (especially in the Middle East).

2. Overview about the program – Curriculum for Farm Manager

Module Title and Aim	Learning Units	Theory ¹ Days/hours	Workplace ² Days/hours
Module 1- Soil Management: Introduction of the concept and importance of soil management in agriculture.	LU-1 Have good knowledge of soils and their types	2 hrs	8 hrs
	LU-2 Alter soil properties for keeping soil productive	4 hrs	16 hrs
	LU-3 Managing soil health.	3 hrs	12 hrs
	LU-4 Managing optimum level of essential nutrients and ensure their availability	3 hrs	12 hrs
	LU-5 Soil organic matter (SOM) and its importance/ role in crop production.	3 hrs	12 hrs
	LU-6 Knowledge of various kinds of fertilizers and their nutrient contents.	3 hrs	12 hrs
	LU-7 Know soil water quantity and its availability.	3 hrs	12 hrs
	LU-8 Problem soils (salt-affected, water-logged, heavy metal polluted) and their management.	4 hrs	16 hrs
	LU-9 Soil conservation	2 hrs	8 hrs
Module 2- Field crop production: Understand field crops and their production technologies.	LU-1 Knowing various kinds of field crops.	3 hrs	12 hrs
	LU-2 Crops/ cropping patterns and systems suitable for various kinds of soils and eco-zones.	3 hrs	12 hrs
	LU-3 Knowledge of proper cropping seasons of various	3 hrs	12 hrs

¹ Learning hours in training provider premises

² Training workshop, laboratory and on-the-job workplace

	<p>crops.</p> <p>LU-4 Manage good land preparation using proper tillage techniques for various kinds of soils and crops.</p> <p>LU-5 Arrange proper crop rotations/ inter/ mix cropping.</p> <p>LU-6 Selection of high yielding varieties/ importance of quality seed.</p> <p>LU-7 Know proper fertilizer recommendation, their calculations & application.</p> <p>LU-8 Weed management, disease/ pest control.</p> <p>LU-9 Organic farming.</p> <p>LU-10 Harvesting technologies & storage methods.</p>	<p>3 hrs</p> <p>3 hrs</p> <p>3 hrs</p> <p>3 hrs</p> <p>3 hrs</p> <p>3 hrs</p>	<p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p>
<p>Module 3- Horticulture crop production:</p> <p>Understand field crops and their production technologies.</p>	<p>LU-1 Growing of various kinds of horticulture crops.</p> <p>LU-2 Importance of various crops.</p> <p>LU-3 Raising of nursery, its /transplanting, layout/ or propagation.</p> <p>LU-4 Production of off-season vegetables.</p> <p>LU-5 Application of pruning/ training/ skating.</p> <p>LU-6 Control of weeds and insect/ pest/ diseases.</p> <p>LU-7 Fertilizer/ manure management.</p> <p>LU-8 Growing, harvesting/ handling/ storage.</p>	<p>2 hrs</p> <p>2 hrs</p> <p>4 hrs</p> <p>3 hrs</p> <p>2 hrs</p> <p>4 hrs</p> <p>3 hrs</p> <p>3 hrs</p>	<p>8 hrs</p> <p>8 hrs</p> <p>16 hrs</p> <p>12 hrs</p> <p>2 hrs</p> <p>16 hrs</p> <p>12 hrs</p> <p>12 hrs</p>
Module 4- Managing Farm	LU-1 Manage knowledge of	4 hrs	16 hrs

<p>Mechanization:</p> <p>Understand and familiarize the candidate with various kinds of farm machinery and their operations.</p>	<p>various kinds of farm machinery</p> <p>LU-2 Primary & secondary tillage for proper seedbed preparation</p> <p>LU-3 Direct drilling/ seeding</p> <p>LU-4 Precision leveling</p> <p>LU-5 Raised-bed/ ridging preparation</p> <p>LU-6 Managing fertilizer application/ band placing</p> <p>LU-7 Manage spraying/ dusting other plant protection implementation machinery</p> <p>LU-8 Operations of harvesting and threshing machinery</p> <p>LU-9 Post harvest machinery</p> <p>LU-10 Care/repair/ maintenance and calibration of machinery</p>	<p>4 hrs</p> <p>2 hrs</p> <p>2 hrs</p> <p>2 hrs</p> <p>3 hrs</p> <p>3 hrs</p> <p>3 hrs</p> <p>3 hrs</p> <p>3 hrs</p>	<p>16 hrs</p> <p>8 hrs</p> <p>8 hrs</p> <p>8 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p>
<p>Module 5- Water Management for Crops:</p> <p>Understand importance of water, water requirement for various crops and proper irrigation techniques to get optimum water harvesting/ productivity.</p>	<p>LU-1 Importance of water</p> <p>LU-2 Water requirements for various crops</p> <p>LU-3 Various irrigation types/systems (Furrows/Basin Irrigation)</p> <p>LU-4 Climate/ weather forecasting</p> <p>LU-5 Manage water harvesting/ Watershed management</p> <p>LU-6 Managing high efficiency irrigation systems</p> <p>LU-7 Maintenance of pumps/ tube wells</p>	<p>2 hrs</p> <p>3 hrs</p> <p>3 hrs</p> <p>2 hrs</p> <p>3 hrs</p> <p>4 hrs</p> <p>3 hrs</p>	<p>8 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>8 hrs</p> <p>12 hrs</p> <p>16 hrs</p> <p>12 hrs</p>

	LU-8 water budgeting	2 hrs	8 hrs
	LU-9 Water course management & other water saving techniques/their application	3 hrs	12 hrs
	LU-10 Water use efficiency of crops for optimum water productivity.	3 hrs	12 hrs
Module 6- Plant Protection: Understand livestock production technologies and raising of health livestock at the farm.	LU-1 Major crops diseases and damages caused by various insects/ pests/ microbial diseases, etc.	3 hrs	12 hrs
	LU-2 Scouting/ surveys for disease diagnosis	3 hrs	12 hrs
	LU-3 Damage assessment	2 hrs	8 hrs
	LU-4 Control of insects/ pests/ microbial diseases	3 hrs	12 hrs
	LU-5 Introduction to various pesticides	3 hrs	12 hrs
	LU-6 Selection of suitable pesticides	3 hrs	12 hrs
	LU-7 Safe/ effective use of pesticides	3 hrs	12 hrs
	LU-8 Environment pollution by pesticide use and its effect on human and animal health	3 hrs	12 hrs
	LU-9 Biological pest control	3 hrs	12 hrs
	LU-10 Integrated pest management	3 hrs	12 hrs
	LU-11 Grain storage pest/control	3 hrs	12 hrs
Module 7- Livestock Management: Understand various aspects of raising healthy /profitable livestock for quality milk/ meat production..	LU-1 Promising livestock raising technologies.	3 hrs	12 hrs
	LU-2 Important high yielding breeds of livestock.	3 hrs	12 hrs
	LU-3 Animal nutrition.	3 hrs	12 hrs

	LU-4 Fodder quality and production technologies of fodders & feeds.	3 hrs	12 hrs
	LU-5 Range management/ grazing.	3 hrs	12 hrs
	LU-6 Animal health/ disease control.	3 hrs	12 hrs
	LU-7 Artificial insemination / breed improvement.	3 hrs	12 hrs
	LU-8 Dairy products development.	3 hrs	12 hrs
	LU-9 Poultry Production.	3 hrs	12 hrs
	LU-10 Fish Production.	3 hrs	12 hrs
<p>Module 8- Marketing/ Economic Analysis:</p> <p>Understand economics of the farm and marketing procedures for optimum farm production.</p>	<p>LU-1 Input-cost analysis.</p> <p>LU-2 Cost of production of various crops/ cropping systems.</p> <p>LU-3 Identification of suitable high returning crop commodities.</p> <p>LU-4 Agriculture marketing system of Pakistan.</p> <p>LU-5 Applications of economic principles.</p> <p>LU-6 Problems of agriculture marketing systems and its impact on the economy.</p> <p>LU-7 Functions of wholesale fruits, vegetables and grain markets.</p> <p>LU-8 International marketing vs. local marketing of Pakistan</p> <p>LU-9 Suitable seasons/ times of crops</p>	<p>2 hrs</p> <p>3 hrs</p> <p>3 hrs</p> <p>3 hr</p> <p>3 hrs</p> <p>3 hrs</p> <p>3 hrs</p> <p>3 hrs</p> <p>3 hrs</p>	<p>8 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p> <p>12 hrs</p>

	LU-10 Cost-Benefit analysis sheet	3 hrs	12 hrs
	LU-11 Net returns per unit area.	3 hrs	12 hrs
Module 9 - Post-Harvest Losses Control:	LU-1 Types and causes of post-harvest losses	3 hrs	12 hrs
Understand the post-harvest losses and their management.	LU-2 Assessments of losses for various field crops and their economic values	3 hrs	12 hrs
	LU-3 Assessment of post-harvest losses of various vegetable crop	3 hrs	12 hrs
	LU-4 Assessment of post-harvest losses of various fruit crops	3 hrs	12 hrs
	LU-5 Measures to avoid/ or minimize post-harvest losses of all crops	3 hrs	12 hrs
	LU-6 Concept of proper storage of produce	2 hrs	8 hrs
	LU-7 Losses during storage and their control	3 hrs	12 hrs
	LU-8 Fruit and vegetable preservation methods and their effects on nutritional value	3 hrs	12 hrs
	LU-9 Storage of grains (methods, precautions and stored grain pest control), post harvest losses and shelf life of different fruits	3 hrs	12 hrs
	LU-10 Storage diseases/ insects/ pests and their control	3 hrs	12 hrs
	LU-11 Physiology and biochemistry of fruits and vegetables	2 hrs	8 hrs
	LU-12 Hand/ mechanical harvesting	3 hrs	12 hrs

	LU-13 Post harvest techniques	3 hrs	12 hrs
Module 10- Farm Record Maintenance:	LU-1 Principles of farm layout and design	2 hrs	8 hrs
Impart awareness regarding principles of farm record management.	LU-2 Farm management & maintenance of farm records	3 hrs	12 hrs
	LU-3 Keeping farm record system	3 hrs	12 hrs
	LU-4 Different systems of book keeping	3 hrs	12 hrs
	LU-5 Profit and loss account/income statement Bank Accounts, cheques, discount, interest debts.	3 hrs	12 hrs
	LU-6 Appreciation and depreciation of stocks.	2 hrs	8 hrs
	LU-7 Preparation of trading, profit and loss account and balance sheet.	2 hrs	8 hrs
	Lu-8 Dealing with patwari (Land record holding Govt official) and other govt. revenue officers	2 hrs	8 hrs

3. Farm Manager Curriculum Contents (Teaching and Learning Guide)

Module 1 Title: Soil Management

Objective of the Module: : Introduction of the concept and importance of soil management in agriculture.

Duration:xy hours Theory:xy hours Practice:.....xy hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Have good knowledge of soils and their types	<ul style="list-style-type: none"> •Know the behavior/ properties of these soils and •Be able to grow crops according to soil types and manage to get optimum crop production. 	<ul style="list-style-type: none"> •Sandy Soils. •Clayey/ heavy soils. •Loam/ Productive soils. •Less productive/Poor soils 	02 hrs Theory 08 hrs practical	Several types and quite reasonable no of soil samples Soil profiles mounted on wooden boards Reference books	Lecture halls Lab and field
2. Alter soil properties for keeping soil productive	<ul style="list-style-type: none"> • Understand nature of these properties and their effect on soil behavior and • Be able to alter these properties to increase per unit area productivity of various crops. 	<ul style="list-style-type: none"> •Bulk density. •pH. •EC. •Organic matter • Water holding capacity 	04 hrs Theory 16 hrs practical	Equipment for soil testing Field area where practices for altering/ improving soil properties Reference books	Lecture halls Lab and field
3. Managing soil health	<ul style="list-style-type: none"> • Be able to do interventions to improve soil health in order to get optimum crop production. 	<ul style="list-style-type: none"> •Aeration. •Good microbial community •Well Drained 	03 hrs Theory 12 hrs practical	Equipment for soil testing Field area where practices for improving soil properties	Lecture halls Lab and field
4. Managing optimum level of essential nutrients and ensure their availability	<ul style="list-style-type: none"> • Understand role of each nutrient in various function in the crop physiology that relates to vegetative, and reproductive growth, diseases control, quality of crop, etc. 	<ul style="list-style-type: none"> •Macronutrients •Secondary nutrients •Micronutrients •Roles of nutrients in biomass and grain production/ disease control and quality of produce 	03 hrs Theory 12 hrs practical	Fertilizers Fertilizers testing facilities Reference books and charts of symptoms of crop nutrient deficiencies	Lecture halls Lab and field

5. Soil organic matter (SOM) and its importance/ role in crop production.	Understand origin/ formation of SOM, distribution in soil, factors affecting its distribution, and its role in various soil properties, nutrient availability and crop production. Be able to do management practices to increase SOM content	<ul style="list-style-type: none"> •Definition and Origin •Quantity/ distribution •Role in nutrient availability •Physical properties •Biological properties •Productivity of soil 	03 hrs Theory 12 hrs practical	Soil organic matter testing facilities (equipment) Field area for experimentation Reference books	Lecture halls Lab and field
6. Knowledge of various kind of fertilizers and their nutrient contents	<ul style="list-style-type: none"> • Know kinds of fertilizers, nutrients present in them, nutrient percentages (calculations), and their roles in crop production. Importance of organic manures/ biofertilizers for soil health and crop production. 	<ul style="list-style-type: none"> •Nitrogen fertilizers •Phosphatic fertilizers •Potash fertilizers •Micronutrient fertilizers •Compound fertilizers •Organic manures 	03 hrs Theory 12 hrs practical	Various kinds of fertilizers (N, P K, and micronutrient) Organic manures Various kinds of biofertilizers Reference books	Lecture halls Lab and field
7. Know soil water quantity and its availability.	<ul style="list-style-type: none"> • Able to determine soil moisture content and calculate/ estimate quantity of water in soil profile available to determine additional quantity of water for certain crop production. 	<ul style="list-style-type: none"> •Role of water in nutrient uptake and transportation •Amount of water in soil profile •Availability of soil water for crops 	03 hrs Theory 12 hrs practical	Soil moisture measuring probes/ equipment Reference books	Lecture halls Lab and field
8. Problem soils (salt-affected, water-logged, heavy metal polluted) and their management	Be able to do practices to; <ul style="list-style-type: none"> • amend adverse soil conditions and • minimize soil pollution of heavy metals their overcome deleterious effects. 	<ul style="list-style-type: none"> •Salt affected/ saline soils •Sodic/ water-logged soils •Saline sodic soils •Calcareous soils •Alkaline soils •Acid soils •Heavy metal (Pb, Cr, Hg polluted) soils 	04 hrs Theory 16 hrs practical	Salinity testing equipment Saline/ water-logged soil fields Heavy metal-polluted soils Reference books	Lecture halls Lab and field

9. Soil conservation (Terracing and across slope cultivation)	<ul style="list-style-type: none"> • Able to do proper conservation practices to avoid/ minimize soil water/ and or wind erosion. 	<ul style="list-style-type: none"> •Water erosion and its control •Wind erosion and its control 	02 hrs Theory 08 hrs practical	Fields prone to i) water and wind erosion Reference books	Lecture halls Lab and field
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Practicals:

i) Soil sampling, preparation and storage, ii) Determination of texture and bulk density of soil, iii) Fertilizer identification and nutrient percentage, iv) Determination of soil EC and pH, v) Soil organic matter determination, vi) Textural analysis; Bulk density by clod, core and excavation method, vii) Analysis of irrigation water and report writing, viii) Measurement of soil water contents, hydraulic conductivity, infiltration rate and soil penetrability, ix) Soil and plant sampling techniques for various stresses, x) Demonstration of plant growth under stressed conditions.

Recommended books:

- Brady, N.C. and R.R. Weil. 2007. Nature and Properties of Soils. 14th Ed. Prentice Hall, Upper Saddle River, NJ, USA.
- Singer, M.J. and D.N. Munns. 2002. Soils – An Introduction. 5th Ed. Prentice Hall, Upper Saddle River, NJ, USA.
- Gupta, P.K. 2006. Soil, Plant, Water and Fertilizer Analysis. Agrobios Publishers, New Delhi, India.

Module 2 Title: Field crop production

Objective of the Module: Understand field crops and their production technologies.

Duration:xy hours Theory:xy hours Practice:.....xy hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Knowing various kinds of field crops	Be able to have good knowledge of <ul style="list-style-type: none"> • Physiologies of these crops. • Productions technologies of these crops • Their economic importance To make decision for kind(s)	<ul style="list-style-type: none"> • Cereal crops. • Legume crops. • Cotton & sugarcane • Other field crops 	03 hrs Theory 12 hrs practical	Sufficient field areas for growing various kinds of crops/ experiments/ practical/demonstration Reference books	Lecture halls Lab and field

	of crops to be grown				
2. Crops/ cropping patterns. systems suitable for various kinds of soils and eco-zones	<ul style="list-style-type: none"> • Understand reasons of their adaptability • Advantages/ disadvantages of these patterns/ systems • Roles of weather/climate in emergence of these systems • Possible changes in these systems 	<ul style="list-style-type: none"> • Suitability of crops/ cropping pattern to kinds of soil • Cropping patterns in various ecological zones • Economics of various cropping patterns/ systems 	03 hrs Theory 12 hrs practical	Sufficient field areas for growing various kinds of crops/ experiments/ practical/demonstration Reference books	Lecture halls Lab and field
3. Knowledge of proper cropping seasons of various crops	<ul style="list-style-type: none"> • Sow crops at proper time to get optimum yield; based on knowledge of roles of temperature, climate and day length on germination, crop development stages, and yield on respective crops. 	<ul style="list-style-type: none"> • Sowing/ harvesting seasons of various crops. • Effects of early/ late planting on crop yields 	03 hrs Theory 12 hrs practical	Sufficient field areas for growing various kinds of crops/ experiments/ practical/demonstration Reference books	Lecture halls Lab and field
4. Manage good land preparation using proper tillage techniques for various kinds of soils and crops	<ul style="list-style-type: none"> • Be able to do proper land preparation according to the type of soil and crop to be grown 	<ul style="list-style-type: none"> • Simple Cultivators • Chisel plow • Mouldboard/ rotavator. • Ridges/ Raised-bed preparation. • Puddling for rice sowing 	03 hrs Theory 12 hrs practical	All implement given in column 03 Sufficient field areas for experiments/ practical/ demonstration Reference books	Lecture halls Lab and field
5. Arrange proper crop rotations/ inter/ mix cropping	<ul style="list-style-type: none"> • Understand reasons of adoption of cropping patterns. Systems • Suitability of inter/ mix cropping • Advantages/ disadvantages of inter/ mix cropping <p>In order to decide type of crop and cropping pattern</p>	<ul style="list-style-type: none"> • Various crop rotations • Cropping patterns • Mix/ inter-cropping 	03 hrs Theory 12 hrs practical	Sufficient field areas for growing various kinds of crops/ experiments/ practical/demonstration Reference books	Lecture halls Lab and field

6. Selection of high yielding varieties/ importance of quality seed	<ul style="list-style-type: none"> • Know high yield varieties of various crops and management to get healthy seed of these varieties • Able to put exact quantity of seed of crops to get optimum number of plant per unit area to get more yield 	<ul style="list-style-type: none"> • High yielding/ disease resisting varieties of various crops. • Healthy seed selection • Seed cleaning to avoid germination of weeds, etc 	03 hrs Theory 12 hrs practical	Seeds of latest improved crop varieties Sufficient field areas for growing various kinds of crops/ experiments/ practical/demonstration Reference books	Lecture halls Lab and field
7. Know proper fertilizer recommendation, their calculations & application	<ul style="list-style-type: none"> • Be able to calculate amount of fertilizer per acre/ ha based on nutrient requirements of crops and nutrient supply of kinds of soil where crop is to be sown 	<ul style="list-style-type: none"> • Fertilizer recommendation for various yield potentials of cereal crops • Recommendation for legume crops • Calculation based on yield potential and soil type 	03 hrs Theory 12 hrs practical	Fertilizer bags Sufficient field areas for growing various kinds of crops/ experiments/ practical/demonstration Reference books	Lecture halls Lab and field
8. Weed management, disease/ pest control,	<ul style="list-style-type: none"> • Be able to have good control of weeds, insects/pests, diseases by applying suitable weedicides, pesticides/, fungicides, etc. and • Be able to apply these chemicals to avoid their deleterious effects on environment 	<ul style="list-style-type: none"> • Weed management techniques (Physical or chemical • Kinds of weedicide/ pesticide for respective weeds/ insect/ pest 	03 hrs Theory 12 hrs practical	Weedicide/ insticides/ pesticides Sufficient field areas for growing various kinds of crops/ experiments/ practical/demonstration Reference books	Lecture halls Lab and field
9. Organic farming	<ul style="list-style-type: none"> • Be able know the concept of OF • Arrange input needed for OF • Mange insect/ pest control for OF • Sell organic produce in proper markets 	<ul style="list-style-type: none"> • Basics of organic farming • Its suitability for certain soils/ crops • Yield/ Quality aspect 	03 hrs Theory 12 hrs practical	Sufficient availability of organic manures Sufficient field areas for growing organiccrops/ experiments/ practical/demonstration Reference books	Lecture halls Lab and field

10. Harvesting technologies & storage methods	<ul style="list-style-type: none"> • Arrange/ use suitable machinery for respective crops for timely harvest with minimum losses • Arrange suitable storage to avoid storage losses 	<ul style="list-style-type: none"> • Machinery for harvesting for various crops • Benefits of machines • Proper storage method/ techniques 	03 hrs Theory 12 hrs practical	Harvesting implements Sufficient field area for experiments/ practical/demonstration Reference books	Lecture halls Lab and field
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Practicals:

i) Identification and plant characteristics of crops, cultivars and seeds, ii) Raising of crop nurseries and their transplanting, iii) Measurement of land; conventional and metric system, iv) Identification and use of hand tools and implements, iv) Selection of crops/ varieties for various kinds of soil, v) Determination of soil moisture contents, saturation percentage, field capacity and wilting point, vi) Demonstration and use of tillage implements, vii) Preparatory tillage, seedbed preparation and intercultural operations, viii) Calculation of nutrient cum fertilizer unit value, ix) Suitable fertilizer application, x) Identification of crops and their seeds xi) Demonstration of improved sowing methods, xii) Inoculation for different legume seeds. xiii) Intercultural practices, xiv) Weed control practices, xv) Demonstration of harvesting & threshing operations and xvi) Visits to different research areas of the region.

Recommended books:

- Bhatti, I. M. and A. H. Soomro. 1996. Agricultural inputs and field crops production Sindh.
- Nazir, M.S. 1994. Crop production, National Book Foundation, Islamabad.
- Martin, J. H., R.P. Waldren and D. L. Stamp. 2006. Principles of field crop production 4th ed. Mc Millan Co. New York.

Module 3: Title: Horticulture crop production

Objective of the Module: Understand field crops and their production technologies.

Duration:xy hours Theory:xy hours Practice:.....xy hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Growing of various kinds of horticulture crops	<ul style="list-style-type: none"> • Be able to arrange seeds/ nurseries good varieties according to soil & ecological zones and their 	<ul style="list-style-type: none"> • Winter vegetables crops. • Summer vegetable crops • Citrus fruit orchards. • Other fruit orchards 	02 hrs Theory 08 hrs	Sufficient orchards and vegetable growing area for experiments/ practical/demonstration	Lecture halls Orchards & vegetable

	<p>sowing at proper times.</p> <ul style="list-style-type: none"> • Be able to know their plant parts and their roles in production 		practical	Reference books	growing fields
2. Importance of various crops	<ul style="list-style-type: none"> • Grow high returning crops through use of improved technologies of weed/ pest management, nutrition/ irrigation, and harvesting of these crops 	<ul style="list-style-type: none"> • Yield potentials of crops • Economic importance of each crop • Suitability of crop to soils 	<p>02 hrs Theory</p> <p>08 hrs practical</p>	<p>Sufficient orchards and vegetable growing area for experiments/ practical/demonstration</p> <p>Reference books</p>	<p>Lecture halls</p> <p>Orchards & vegetable growing fields</p>
3. Raising of nursery, its /transplanting, layout/ or propagation	<ul style="list-style-type: none"> • Arrange/ raise nurseries and properly transplant/ grafting or propagate and achieve good crop stand/ establishment 	<ul style="list-style-type: none"> • Germination of the crops • Transplanting methods • Grafting methods • Other measures for healthy crops/good harvest 	<p>04 hrs Theory</p> <p>16 hrs practical</p>	<p>Sufficient orchards and vegetable growing area for experiments/ practical/demonstration</p> <p>Reference books</p>	<p>Lecture halls</p> <p>Orchards & vegetable growing fields</p>
4. Production of off-season vegetables	<ul style="list-style-type: none"> • Produce off-season vegetable using appropriate methods • Arrange construction of tunnels and be able to grow bumper vegetable crop using proper weed/ insect/pest/ disease control 	<ul style="list-style-type: none"> • Building/ maintenance of tunnels • Temperature control • Insect/ pest control 	<p>03 hrs Theory</p> <p>12 hrs practical</p>	<p>Sufficient number of tunnels</p> <p>Temperature control system</p> <p>Pesticides/ spraying implements for practical/demonstration</p> <p>Reference books</p>	<p>Lecture halls</p> <p>Orchards & vegetable growing fields</p>
5. Application of pruning/ training/ skating	<ul style="list-style-type: none"> • Able to use proper pruning/ skating in order to manage healthy orchards and good harvest 	<ul style="list-style-type: none"> • Techniques of pruning/ skating • Importance of these methods 	<p>01 hrs Theory</p> <p>04 hrs practical</p>	<p>Pruning equipment</p> <p>Orchards/ hedges</p> <p>Reference books</p>	<p>Lecture halls</p> <p>Orchards & vegetable growing fields</p>
6. Control of weeds and insect/ pest/ diseases	<p>Be able to;</p> <ul style="list-style-type: none"> • Use proper physical techniques/ select suitable weedicide • Select suitable insecticide, pesticide/ fungicide and proper application 	<ul style="list-style-type: none"> • Physical weed control, hoeing/ cultivation, etc • Chemical weed control • Identification of insect/ pests or microbial diseases 	<p>04 hrs Theory</p> <p>16 hrs practical</p>	<p>Insecticide/ pesticides and spraying equipment</p> <p>Reference books</p>	<p>Lecture halls</p> <p>Orchards & vegetable growing fields</p>

	techniques for their effective control	• Chemical/ biological insect/ disease control			
7. Fertilizer/ manure management	• Understand/ calculate fertilizer/ manure requirement for horticulture crops and use proper application techniques	• Fertilizer recommendation for various vegetable crops • Fertilizer/ manure recommendation for orchard crops	03 hrs Theory 12 hrs practical	Fertilizers Organic manures Reference books	Lecture halls Orchards & vegetable growing fields
8. Growing, harvesting/ handling/ storage	• Apply suitable growing/ harvesting techniques to get good harvest and minimize harvest/ post-harvest losses	• Growing/ harvesting techniques for vegetables • Growing/ harvesting techniques for orchards • Post harvest losses control	03 hrs Theory 12 hrs practical	Sufficient orchards and vegetable growing area for experiments/ practical/demonstration Reference books	Lecture halls Orchards & vegetable growing fields

Practical:

i) Practice of layout methods. Selection of plants from nursery. Propagation methods; Production techniques, identification and mulching methods of mulching. Visits of nurseries, commercial gardens, and public parks.

Recommended Books:

- Malik, M. N. 1994. Horticulture, National Book Foundation, Islamabad.
- Chadha, K. L. 2006. Hand Book of Horticulture, 6th ed. ICAR, New Delhi, India.
- Sharma, R.R. 2002. Propagation of horticultural crops. Principles and practices of Kalyani Publishers, Ludhiana, India.

Module 4 Title: Managing Farm Mechanization

Objective of the Module: Understand and familiarize the candidate with various kinds of farm machinery and their operations.

Duration:xy hours Theory:xy hours Practice:.....xy hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Manage knowledge of various kinds of farm machinery	Able to know <ul style="list-style-type: none"> • Good models/designs of various kinds of farm machinery, their prices and availability in order to get appropriate machinery on economical rates 	<ul style="list-style-type: none"> • Tractors/Trolleys • Tube-wells/ pumps • Land preparation and sowing/ drilling machines • Threshers • Combined harvesters • Sprayers/ Dusting machines • Seed cleaners/ separators 	04 hrs Theory 16 hrs practical	All equipment/ machines given in column 03 of this row Sufficient field area for practical Reference books	Lecture hall Workshop Field area
2. Primary & secondary tillage for proper seedbed preparation	Able to manage proper land preparation of various kinds of soils for various kinds of field and horticulture crops using proper tilling machines/ tools	<ul style="list-style-type: none"> • Cultivators • Chisel Plow • Moldboard • Rotavator • Disc Plow • Zero-till • Diggers/ Ridgers • Others 	04 hrs Theory 16 hrs practical	All equipment/ machines given in column 03 of this row Sufficient field area for practical Reference books	Lecture hall Workshop Field area
3. Direct drilling/ seeding	<ul style="list-style-type: none"> • Able to sow crops using appropriate direct-drill machinery in order to save time (by early sowing) and energy/cost 	<ul style="list-style-type: none"> • Advantages • Direct drill wheat • Direct Drill Rice 	02 hrs Theory 08 hrs practical	All equipment/ machines given in column 03 of this row Sufficient field area for practical Reference books	Lecture hall Workshop Field area
4. Precision leveling	<ul style="list-style-type: none"> • Able to arrange precision leveling of his fields using precision levelers in order to save irrigation water 	<ul style="list-style-type: none"> • Purpose/Advantage • Various precision levelers • Saving of water/ Uniform distribution of water 	02 hrs Theory 08 hrs practical		Lecture hall Workshop

					Field area
5. Raised-bed/ ridging preparation	Able to prepared raised bed/ ridges and their proper breadth (esp. raised-bed) for various crops and sowing sites of seeds	<ul style="list-style-type: none"> • Importance/ Advantage • Various machines for raised bed preparation • Crops for which in is useful/ suitable 	02 hrs Theory 08 hrs practical	All equipment/ machines given in column 03 of this row Sufficient field area for practical Reference books	Lecture hall Workshop Field area
6. Managing fertilizer application/ band placing	<ul style="list-style-type: none"> • Be able to apply fertilizers band-placement at proper depth and side distance from seed • Be able to calculate doses of fertilizers and calculate/ adjust the implement and • Manage fertigation for orchards 	<ul style="list-style-type: none"> • Purpose/ Advantage • Designing • Fertilizers saving esp. phosphatic • Adjustment of fertilizers dose 	03 hrs Theory 12 hrs practical	All equipment/ machines given in column 03 of this row Sufficient field area for practical Fertilizers Reference books	Lecture hall Workshop Field area
7. Manage spraying/ dusting other plant protection implementation machinery	<ul style="list-style-type: none"> • Able to know/operate/ maintain/ calibrate/repair various machines involved in spraying, dusting and other plant protection measures 	<ul style="list-style-type: none"> • Manual sprayers and their nozzle adjustment • Motor operated small/ man-operated sprayers • Sprayers for fruit trees • Tractor operated large/ mechanical sprayers 	03 hrs Theory 12 hrs practical	All equipment/ machines given in column 03 of this row Sufficient field area for practical Pesticide/ insecticides Reference books	Lecture hall Workshop Field area
8. Operations of harvesting and threshing machinery	<ul style="list-style-type: none"> • Able to know/operate/ maintain various machines involved in threshing/ harvesting/ picking of various field and horticulture crops 	<ul style="list-style-type: none"> • Advantages • Various machines/ models suitable for different cereal crops • Harvester/ threshers for other crops • Fruit harvesters 	03 hrs Theory 12 hrs practical	All equipment/ machines given in column 03 of this row Sufficient field area for practical Reference books	Lecture hall Workshop Field area
9. Post harvest machinery	<ul style="list-style-type: none"> • Able to know/operate/ maintain various machines involved in post harvest (transportation, cleaning, separation, packing, etc.) 	<ul style="list-style-type: none"> • Transportation machines • Driers • Packing machines, esp. for fruits 	03 hrs Theory 12 hrs practical	All equipment/ machines given in column 03 of this row Sufficient field area for practical	Lecture hall Workshop Field area

		<ul style="list-style-type: none"> • Separators/ cleaners 		Reference books	
10. Care/repair/ maintenance and calibration of machinery	<ul style="list-style-type: none"> • Able to understand mechanisms and working of these machines N able to maintain and do minor repair/ calibration of machines and their tools 	<ul style="list-style-type: none"> • Tractors • Tillage machines • Harvesters • Threshers • Seeding/ other drills 	03 hrs Theory 12 hrs practical	All equipment/ machines given in column 03 of this row Sufficient field area for practical Fertilizers Reference books	Lecture hall Workshop Field area

Practical:

i) Study of energy requirements of various farm equipment, Working/ operation of various equipment, iii) Study of farm field operation of selected farm machines, iv) Calibration of seed drills, planters, sprayer, fertilizer distributors, v) Precision land leveling, vi) Minor repair of tractor and other implements, and vii) Determination of farm machinery requirement for various sizes of farms.

Module 5 Title: Water Management for Crops

Objective of the Module: Understand importance of water, water requirement for various crops and proper irrigation techniques to get optimum water harvesting/ productivity.

Duration:xy hours Theory:xy hours Practice:.....xy hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Importance of water	<ul style="list-style-type: none"> • Able to understand importance and functions/ role of water, especially for nutrient uptake/ transport and general development of plant and use available water properly 	Role of water in: <ul style="list-style-type: none"> • Nutrient uptake • Transportation of nutrients/ photosynthate within plant • General plant growth and development 	02 hrs Theory 08 hrs practical	Sufficient field area and irrigation systems for practical/demonstration Reference books	Lecture hall Field area
2. Water requirements for	<ul style="list-style-type: none"> • Able to understand crop physiologies and know 	Water requirement for: <ul style="list-style-type: none"> • Cereals except rice 	03 hrs Theory	Sufficient field area and irrigation systems for	Lecture hall

various crops	<p>water requirement for different crops at different developmental stages</p> <ul style="list-style-type: none"> • And number irrigation needed to grow specific crops 	<ul style="list-style-type: none"> • Rice • Sugarcane • Fodder • Vegetables • Fruits 	12 hrs practical	<p>practical/demonstration</p> <p>Reference books</p>	Field area
3. Various irrigation types/systems (Furrows/Basin Irrigation)	<ul style="list-style-type: none"> • Able to arrange irrigation systems, suitable for his fields for different field and horticultural crops. • Also make economical use of available water for getting more farm yields/ production 	<ul style="list-style-type: none"> • Flood irrigation • Furrow & Basin irrigation • Raised bed irrigation • Sprinkler irrigation • Drip irrigation 	03 hrs Theory 12 hrs practical	<p>Sufficient field area and irrigation systems for practical/demonstration</p> <p>Reference books</p>	Lecture hall Field area
4. Climate/ weather forecasting	<ul style="list-style-type: none"> • Be up-dated about weather forecast and adjust his irrigation schedules accordingly 	<ul style="list-style-type: none"> • Watching/ listening weather forecast on electronic media • Adjustment of irrigation according to forecast 	02 hrs Theory 08 hrs practical	<p>Access to weather stations</p> <p>Sufficient field area and irrigation systems for practical/demonstration</p> <p>Reference books</p>	Lecture hall Field area
5. Manage water harvesting/ Watershed management	<ul style="list-style-type: none"> • Able to store water in properly built stores/ ponds during high rainfall period and use this water to irrigate his crops during dry periods • Arrange cultivation across the slop and stop surface run-off. • Build terraces in high slope hilly areas in order to harvest properly the rain water. 	<ul style="list-style-type: none"> • Cultivation across the slop to catch surface runoff • Terracing in hilly areas • Plowing of fallow land to absorb rain water • Storage (in ponds)/ harvesting of water in sloped hilly areas and (Rodekahi systems) 	03 hrs Theory 12 hrs practical	<p>Sufficient field area and irrigation systems for practical/demonstration</p> <p>Storage ponds</p> <p>Reference books</p>	Lecture hall Field area
6. Managing high efficiency irrigation	<ul style="list-style-type: none"> • Able to arrange set-up of high efficiency irrigation systems especially in 	<ul style="list-style-type: none"> • Sprinkler irrigation • Drip Irrigation • Solar pumps and irrigation 	04 hrs Theory	<p>Sufficient field area</p> <p>Irrigation stems given in column 03 of this</p>	Lecture hall Field area

systems	areas of low water availability and grow high value crops		16 hrs practical	row for practical/demonstration Reference books	
7. Maintenance of pumps/ tube wells	<ul style="list-style-type: none"> • Able to maintain these machines to achieve their maximum efficiency and get water at lower expenses 	Tuning/ maintenance of <ul style="list-style-type: none"> • Pumps and • Tube wells to save energy and get maximum water 	03 hrs Theory 12 hrs practical	Sufficient field area Equipment given in column 03 of this row for practical/ demonstration Reference books	Lecture hall Field area
8. Water budgeting	<ul style="list-style-type: none"> • Able to understand total availability of water over a season and plan quantity and types of crops accordingly 	<ul style="list-style-type: none"> • Estimation of total water availability per year • Growing type and number of crops according to water availability 	02 hrs Theory 08 hrs practical	Sufficient field area for practical/ demonstration Reference books	Lecture hall Field area
9. Water course management & other water saving techniques/their application	<ul style="list-style-type: none"> • Able to adjust standard length and breadth of field for getting maximum irrigation (area-wise) with same quantity of water • Use other water saving techniques/ equipment i.e., do precision leveling , drip/ sprinkler irrigation 	<ul style="list-style-type: none"> • Cleaning of water courses • Precision land leveling • Dividing land into standard/ small pieces • Drip/ sprinkler systems 	03 hrs Theory 12 hrs practical	Sufficient field area Irrigation stems given in column 03 of this row for practical/ demonstration Reference books	Lecture hall Field area
10. Water use efficiency of crops for optimum water productivity.	<ul style="list-style-type: none"> • Able to apply water saving techniques and manage irrigation and right times and get maximum yield per unit available water. 	<ul style="list-style-type: none"> • Applying water at right times • Growing crops with less water requirement • Water productivity i.e., quantity of grain/ biomass production per unit quantity water 	03 hrs Theory 12 hrs practical	Sufficient field area Irrigation stems given in column 03 of this row for practical/ demonstration Reference books	Lecture hall Field area

Practical:

i) Measurement of soil moisture content in profile wise, ii) Calculation of water productivity, iii) Selection of appropriate irrigation techniques for respective crops, iv) Water quality (especially with respect of (pH and EC), v) Calculate water use efficiency, and vi) Visits of drip and sprinkler irrigation system.

Recommended Books:

- Khan, S. R. A. 2001. Crop Management with focus on soil and water Lahore,
- Misra, R.D. and M. Ahmed. 1990. Manual of Irrigation Agronomy. Oxford and IBH, Publishing India.
- GOP. 1997. Irrigation Agronomy Manual Islamabad

Module 6 Title: Plant Protection

Objective of the Module: Understand livestock production technologies and raising of health livestock at the farm.

Duration:xy hours Theory:xy hours Practice:.....xy hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Major crops diseases and damages caused by various insects/ pests/ microbial diseases, etc.	<ul style="list-style-type: none"> • Must have good knowledge of major crop diseases, insect/ pests/ microbial pathogens causing damages to various field and horticulture crops and be able to control them. 	<ul style="list-style-type: none"> • Different disease-causing agents insects/ pests • Disease causing micro-organisms (bacteria, fungi) • Types of damages caused • Life cycles of insects • Mode of actions of all disease causing agents 	03 hrs Theory 12 hrs practical	Sufficient field area for practical/demonstration Insectory Reference books	Lecture hall Lab (insectory) and field
2. Scouting/ surveys for disease diagnosis	<ul style="list-style-type: none"> • Able to survey the insect attacks and diagnose major crop diseases 	<ul style="list-style-type: none"> • Types and no. of insects • Samples collection and identification of Bacterial or fungal species 	03 hrs Theory 12 hrs practical	Sufficient field area for practical/demonstration Insectory Reference books	Lecture hall Lab (insectory) and field
3. Damage assessment	<ul style="list-style-type: none"> • Able to assess various kinds of damages to various aerial and 	<ul style="list-style-type: none"> • # of leaves damaged • Braches and stem damages 	02 hrs Theory	Sufficient field area for practical/demonstration	Lecture hall Lab

	underground/ vegetable and reproductive plant parts	<ul style="list-style-type: none"> • Roots damages • Grains damage in crops • Fruits damage in orchards 	08 hrs practical	Insectory Reference books	(insectory) and field
4. Control of insects/ pests/ microbial diseases	<ul style="list-style-type: none"> • Able to control various insect/ pest/ disease using appropriate measures 	<ul style="list-style-type: none"> • Identification of insects/ pests/ fungus • Use of suitable poisons chemicals • Application of chemicals at right time in right quantity. concentration 	03 hrs Theory 12 hrs practical	Sufficient field area for practical/demonstration Insectory Reference books	Lecture hall Lab (insectory) and field
5. Introduction to various pesticides	<ul style="list-style-type: none"> • Have a good knowledge of various Types/ brands of pesticide chemicals, their mode of actions and proper application methods 	<ul style="list-style-type: none"> • Various types/classes of pesticide chemicals • Mode of action of these chemicals • Right application method/ time of these chemicals 	03 hrs Theory 12 hrs practical	Sufficient field area for practical/demonstration Pesticides/ spray machines Reference books	Lecture hall Lab and field
6. Selection of suitable pesticides	<ul style="list-style-type: none"> • Able to select suitable pesticide chemical for certain diseases and for types of crops (especially based on their half life) 	According to: <ul style="list-style-type: none"> • types of insects • type of crop • Vegetables/ fruits 	03 hrs Theory 12 hrs practical	Sufficient field area for practical/demonstration Reference books	Lecture hall Lab and field
7. Safe/ effective use of pesticides	<ul style="list-style-type: none"> • Able to apply pesticides safely to avoid their side effects/ minimize their effects on environment 	<ul style="list-style-type: none"> • Types of insecticides • Types of crops • Dozes/ quantities • Application methods • Time of application 	03 hrs Theory 12 hrs practical	Sufficient field area for practical/demonstration Reference books	Lecture hall Lab and field
8. Environment pollution by pesticide use and its effect on human and animal health	<ul style="list-style-type: none"> • Able to use pesticide chemicals properly at proper time to minimize/ avoid various kind of environmental pollution (air, water, foods, etc. 	<ul style="list-style-type: none"> • Sources of pollution • Types of pollution • Dangerous pesticides • Flaws in application procedures • Effects on humans, animals birds and other wild life 	03 hrs Theory 12 hrs practical	Sufficient field area for practical/demonstration Reference books	Lecture hall Lab and field
	<ul style="list-style-type: none"> • Able to use proper 	<ul style="list-style-type: none"> • Concept and importance 	03 hrs	Sufficient field area for	Lecture hall

9. Biological pest control	biological control/various biological agents controlling insect/pests and their use in order to safe control of diseases	<ul style="list-style-type: none"> • Use of predator birds • Use of predator insects (trichograma) • Use of pathogens controlling bacteria 	Theory 12 hrs practical	practical/demonstration Reference books	Lab and field
10. Integrated pest management	<ul style="list-style-type: none"> • Able to use these integrated pest management methods according to his situation i.e., kind of crop, cropping pattern, environment. 	<ul style="list-style-type: none"> • Crop rotations • Inter/mix cropping • Use of insect traps • Biological agents 	03 hrs Theory 12 hrs practical	Sufficient field area for practical/demonstration Reference books	Lecture hall Lab and field
11. Grain storage pest/control	<ul style="list-style-type: none"> • Able to build proper storage and apply proper techniques to save his produce from storage pests/ diseases. 	<ul style="list-style-type: none"> • Moisture control • Fumigation • Sealing for entry of insects • Proper aeration 	03 hrs Theory 12 hrs practical	Sufficient field area for practical/demonstration Reference books	Lecture hall Lab and field

Practical:

i) Collection, preservation and identification of pests and diseases of field crops, fruits and vegetables, ii) Field survey for identification of common crop diseases, iii) Field/lab demonstration of damages and losses caused by major pests, iv) Use of plant protection equipments, v) Preparation of album of disease samples and insect collection boxes, vi) Study of representative specimens of viral, bacterial, fungal, and nematode diseases, vii) Identification of fruiting bodies/spores of fungal plant pathogens, viii) Study of symptoms and identification of important abiotic plant diseases by visual inspection methods and their management, ix) Proper application of pesticides, and x) Use of predator insects for controlling disease pests.

Recommended Books:

- Agrios, G. N. 2005. Plant Pathology, 5th edition. Academic Press, New York.
- Hafiz, A.1986. Plant Diseases. PARC, Islamabad, Pakistan.
- Wahid, A; M.A. Khan, 2006. Viruses, Bacteria and Thalloid Organisms. Higher Education Commission Pakistan. PP.240
- Manual of Introductory Entomology by Dr. Muhammad Yousaf
- Applied Entomology by Dr. M. A. Saleem and A.H. Shah.
- Insects pests of India and South Asia by A.S. Atwal

Module 7 Title: Livestock Management

Objective of the Module: Understand various aspects of raising healthy /profitable livestock for quality milk/ meat production.

Duration:xy hours Theory:xy hours Practice:.....xy hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Promising livestock raising technologies	<ul style="list-style-type: none"> • Able to understand the importance of livestock and be aware of promising livestock raising / technologies/ packages suitable for his farm size and environment 	<ul style="list-style-type: none"> • Importance • Herd sizes • Proper feeds/ fodders • Rearing packages • Health maintaining procedures 	03 hrs Theory 12 hrs practical	Sufficient livestock Livestock farm Fodder growing area Reference books	Lecture hall Lab and livestock farm
2. Important high yielding breeds of livestock	<ul style="list-style-type: none"> • Able to arrange high yielding breeds of these various animals suitable to his environment or ecologies for these. 	<ul style="list-style-type: none"> • High yielding (milk & meat Producing) breeds of: • Cattle • Buffalo • Sheep/ goats • Horses • Poultry 	03 hrs Theory 12 hrs practical	Sufficient livestock Livestock farm Fodder growing area Reference books	Lecture hall Lab and livestock farm
3. Animal nutrition	<ul style="list-style-type: none"> • Able to understand functions of various nutrients in animal health and production and • Be able to calculate nutrition needs of various animals suitable for milk and meat production 	<ul style="list-style-type: none"> • Nutrition needs of all animals, both for milk and meat production • Times/ numbers of feedings 	03 hrs Theory 12 hrs practical	Sufficient livestock Livestock farm Fodder growing area Reference books	Lecture hall Lab and livestock farm
4. Fodder quality and production technologies of fodders & feeds	<ul style="list-style-type: none"> • Able to grow various types of fodder, prepare silage with high protein value for animal feed • Able to prepare/ arrange various kind of animal feeds/ “wandas” rich in animal nutrition 	<ul style="list-style-type: none"> • High nutritious (esp. high protein) fodders • Mix cropping of cereals and legumes • Silage preparation • Preparation of enriched (high protein) animal feeds 	03 hrs Theory 12 hrs practical	Sufficient livestock Livestock farm Fodder growing area Reference books	Lecture hall Lab, field and livestock farm

5. Range management/ grazing	<ul style="list-style-type: none"> • Able to establish good ranges with suitable grass-legume combinations and plan grazing schedules and regular feedings 	<ul style="list-style-type: none"> • Establishment of range with proper mix of grasses and legumes. • Fertilizer calculation & application for ranges • Grazing schedules 	03 hrs Theory 12 hrs practical	Sufficient livestock Livestock farm Fodder growing area Reference books	Lecture hall Lab, field/ range and livestock farm
6. Animal health/ disease control	<ul style="list-style-type: none"> • Able to maintain good healthy environment for his livestock, adopt proper measures for defense against disease-attack/ outbreaks • Able to make disease diagnosis and arrange vaccinations or proper medications for effective disease control 	<ul style="list-style-type: none"> • Proper aeration and maintenance of animal/ poultry sheds • Occasional vaccination and against contagious diseases • Proper diagnosis of diseases of sick animals • Proper care and medication of sick animals 	03 hrs Theory 12 hrs practical	Sufficient poultry birds Poultry sheds Fodder growing area Vaccines of diseases Reference books	Lecture hall Lab, poultry farms/ sheds
7. Artificial insemination / breed improvement	<ul style="list-style-type: none"> • Able to arrange semen of good/ desired breed of various animals and manage breed improvement his farm animals through artificial insemination 	<ul style="list-style-type: none"> • Importance • Selection/ acquisition of semen of quality breeds. • Applying good artificial insemination practices • Observation/ follow up of complete program of new breeds 	03 hrs Theory 12 hrs practical	Sufficient livestock Livestock farm Semen gene-bank Fodder growing area Reference books	Lecture hall Lab, and livestock farm
8. Dairy products development	<ul style="list-style-type: none"> • Be able to produce/ prepare these dairy products with good quality on sustainable basis 	Preparation of; <ul style="list-style-type: none"> • Pasteurization of milk • Butter • Yogurt • Cheese 	03 hrs Theory 12 hrs practical	Sufficient equipment for pasteurization and making various dairy products Reference books	Lecture hall Lab, and livestock farm
9. Poultry Production	<ul style="list-style-type: none"> • Be able to run a small scale poultry farm/ set-up having quality breeds of poultry for eggs/ meat production at his farm 	<ul style="list-style-type: none"> • Good poultry breeds • Healthy poultry feeds • Disease control and vaccination 	03 hrs Theory 12 hrs practical	Sufficient poultry birds Poultry sheds Fodder growing area Vaccines of diseases Reference books	Lecture hall Lab, poultry farms/ sheds

10. Fish Production	<ul style="list-style-type: none"> • Able to make and maintain suitable sized fish pond, type/ breeds of easily grown fish, find suitable feed/ feeding schedules and harvesting times/ periods 	<ul style="list-style-type: none"> • Preparation of ponds • Good quality fish • Suitable fish feed and its availability • Harvesting ages of various kinds of fish 	03 hrs Theory 12 hrs practical	Sufficient pond for fish farming Various breed of fish Reference books	Lecture hall Lab, fish ponds/ hatcheries
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Practical:

i) Equipment used on dairy farm, ii) Fattening animals in buildings, iii) General farm practices (grooming, bedding, washing, and feeding), iv) Aging, handling and care of suckling staff, v) Building and housing of animals, vi) Record keeping of dairy farm, and vii) Visits to dairy farms.

Recommended Books:

- Bath, D.L., F.N. Tucker and R.D. Appleman. 1985. Dairy Cattle: Principles, Practices, Problems Profits. Lea and Febiger, Philadelphia, USA.
- Bilal, M.Q. and A. Ahmad. 2004. Dairy Hysience and Disease Prevention: Bilal and Usman printers, Faisalabad, Pakistan.
- Ensminger, M.E. 1993. Dairy Cattle Science. The Interstate Printers, Danville, Illinois, USA.
- Khan.B.B., (Ed.) 2008. Health and Husbandry of Dairy Animals. Pak.TM. Printers, Faisalabad.
- Van Horn, H.H. and C.J. Wilcox. 1992. Large Dairy Herd Management. American Dairy Sci. Assoc., Savoy, II, USA.
- Khan, B.B., A. Iqbal and M.I. Mustafa. 2003. Sheep and Goat Production. Department of Livestock Management, University of Agriculture, Faisalabad, Pakistan

Module 8 Title: Marketing/economic analysis

Objective of the Module: Understand economics of the farm and marketing procedures for optimum farm production.

Duration:xy hours Theory:xy hours Practice:.....xy hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Input-cost analysis	<ul style="list-style-type: none"> • Able to calculate/ keep record of all kinds of inputs and their benefits vs. their cost 	<ul style="list-style-type: none"> • Calculation/ estimation of input and • Their costs 	02 hrs Theory 08 hrs practical	Calculators, computers/ computer programs Reference books	Lecture hall Computer lab Field area
2. Cost of production of various crops/ cropping systems	<ul style="list-style-type: none"> • Able to calculate cost of production bearing in mind all kinds of inputs and their cost/ availability, labor and wear & tear of machinery involved 	Calculation of per unit cost of production considering all inputs and labor cost of <ul style="list-style-type: none"> • Single crops (field or horticultural crops) • Various cropping systems 	03 hrs Theory 12 hrs practical	Calculators, computers/ computer programs Field area Reference books	Lecture hall Computer lab Field area
3. Identification of suitable high returning crop commodities	<ul style="list-style-type: none"> • Able to grow various field and horticulture crops with ensured high returns but easy/ accessible production technologies. 	High returning <ul style="list-style-type: none"> • Field crops • Vegetable • Fruits Having easy production technologies	03 hrs Theory 12 hrs practical	Calculators, computers/ computer programs Field area Reference books	Lecture hall Computer lab Field area
4. Agriculture marketing system of Pakistan	<ul style="list-style-type: none"> • Have knowledge of easily accessible markets with suitable prices and ensured sale of commodities to get maximum return of his farm produce. 	<ul style="list-style-type: none"> • Identification of good reliable easy access markets • Understand marketing/ prices trends of markets in order to get ensured/ high returns 	03 hrs Theory 12 hrs practical	Calculators, computers/ computer programs Vehicles for timely access to market Reference books	Lecture hall Computer lab Field area Markets
5. Applications of economic principles	<ul style="list-style-type: none"> • Able to adopt appropriate economic principles in order to get inputs at minimum prices/ cost and sell the farm produce at reasonably high prices 	<ul style="list-style-type: none"> • Joining proper agribusiness organizations • Establishing suitable cooperative agribusiness organizations/ systems 	03 hrs Theory 12 hrs practical	Calculators, computers/ computer programs Access to agri-business organizations Reference books	Lecture hall Computer lab Field area Markets
6. Problems of agriculture marketing	<ul style="list-style-type: none"> • Able to manage the problems of transportation of input & produce and getting credit/ loans at 	<ul style="list-style-type: none"> • Problems and cost of transportation • Distances/approach/ access to markets 	03 hrs Theory 12 hrs	Calculators, computers/ computer programs Vehicles for timely	Lecture hall Computer lab

systems and its impact on the economy	minimum interest	<ul style="list-style-type: none"> Loans/payment procedures Demands for certain types/ quality of products 	practical	access to market Reference books	Field area Markets
7. Functions of wholesale fruits, vegetables and grain markets	<ul style="list-style-type: none"> Able to manipulate the wholesale marketing systems and art of dealing with the brokers in order to get good prices of his produce 	<ul style="list-style-type: none"> Understanding systems of wholesale marketing systems Dealing with brokers/ buyers 	03 hrs Theory 12 hrs practical	System for access to brokers of markets Vehicles for timely access to market Reference books	Lecture hall Computer lab Field area Markets
8. International marketing vs. local marketing of Pakistan	<ul style="list-style-type: none"> Able to have access to local/ and or international markets and capture maximum return/ prices of his farm-produce 	<ul style="list-style-type: none"> Prices/ returns of conventional local markets Prices/ returns of international markets Ensuring access to international markets 	03 hrs Theory 12 hrs practical	System for access to international markets Vehicles for timely access to market Reference books	Lecture hall Computer lab Field area Markets
9. Suitable seasons/ times of crops	<ul style="list-style-type: none"> Able to manage sowing of crops at right season/ dates to get good yields/ good prices and Grow off-season vegetables to fetch good prices 	<ul style="list-style-type: none"> Identification of suitable growing/ harvesting seasons Growing off-season vegetable 	03 hrs Theory 12 hrs practical	Calculators, computers/ computer programs Access to good crop growing models Reference books	Lecture hall Computer lab Field area Markets
10. Benefit: Cost analysis sheet	<ul style="list-style-type: none"> Able to get larger benefit: cost (based on output: input cost) ratios of to get maximum return per unit of investment 	<ul style="list-style-type: none"> Cost of inputs Profits/ returns Calculation of good benefit: cost ratios for various crops. 	03 hrs Theory 12 hrs practical	Calculators, computers/ good computing programs Reference books	Lecture hall Computer lab Markets
11. Net return per unit area.	<ul style="list-style-type: none"> Be able to get minimize input cost and maximize income in order to get maximum return per unit farm area 	<ul style="list-style-type: none"> Records of all inputs + labor Cost of transportation/ marketing Records of all sale proceeds 	03 hrs Theory 12 hrs practical	Calculators, computers/ good computing programs Stock registers/ record books Reference books	Lecture hall Computer lab Markets

		<ul style="list-style-type: none"> • Net profit/ return calculation for various crop commodities/ cropping systems 			
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Practical:

i) Calculation of production cost and profit, ii) Survey of wholesale fruits, vegetables and grain markets, iii) Calculation of cost-benefit ratio, iv) Visits to Agri-business industries (fertilizer industry, seed industry, farm machinery industry).

Recommended Books:

- Erickson, P.S., Akridge, J.T., Barnaid, F.L. and Downey, W.D. 2002. Agri. Business Management. 3rd edition. McGraw Hill New York.
- Beierlein, J.G., Scheeberger, K.C. and Osburn, D.D. 2007. Principles of Agri. Business Management. Waveland Press Inc.
- Mohy-ud-Din, Q. 1998. Agricultural Marketing. A Publisher, Al-Fazal Market, Urdu Bazar, Lahore. Faisalabad, Pakistan

Module 9 Title: Post-Harvest Losses Control

Objective of the Module: Understand the post-harvest losses and their management.

Duration:xy hours Theory:xy hours Practice:.....xy hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Types and causes of post-harvest losses	<ul style="list-style-type: none"> • Have knowledge of various kinds of post-harvest losses and ways to avoid these 	<ul style="list-style-type: none"> • Losses of field crops • Losses of vegetable crops • Losses of fruits 	03 hrs Theory 12 hrs practical	Vegetable field area Orchards Storage facility Reference books	Lecture hall Field area/ orchards
2. Assessments of losses for various field crops and their economic values	<ul style="list-style-type: none"> • Able to assess various kinds of losses of various field crops and calculate their monetary values. 	Losses of various: <ul style="list-style-type: none"> • Cereal field crops • Legumes field crops • Cotton • sugarcane • Forages/ fodders 	03 hrs Theory 12 hrs practical	Vegetable field area Storage facility Reference books	Lecture hall Field area/
3. Assessment of post-harvest losses of various	<ul style="list-style-type: none"> • Able to assess various kinds of losses of various field vegetable crops and calculate their monetary 	Losses of various: <ul style="list-style-type: none"> • Winter vegetable • Summer vegetables • Losses during collection/ 	03 hrs Theory 12 hrs	Vegetable field area Reference books	Lecture hall Field area/ orchards

vegetable crop	values.	transportation	practical		
4. Assessment of post-harvest losses of various fruit crops	<ul style="list-style-type: none"> • Able to assess various kinds of losses of various fruit crops and calculate their monetary values. 	Losses of various: <ul style="list-style-type: none"> • Citrus fruits • Mangoes • Dates • Other fruits • Losses during collection/ picking or transportation 	03 hrs Theory 12 hrs practical	Various kind of orchards Fruit collection harvesting equipment Reference books	Lecture hall Lab and orchards
5. Measures to avoid/ or minimize post-harvest losses of all crops	Able to take proper measures/ steps to avoid/ minimize post-harvest losses	<ul style="list-style-type: none"> • Timely harvest • Proper harvesting/ threshing procedure/ implements • Proper harvesting/ picking of vegetables and transportation to markets • Proper collection/ packing of fruits • Proper processing ways 	03 hrs Theory 12 hrs practical	Vegetable field area Vehicles for easy access to markets Fruit collection harvesting equipment Reference books	Lecture hall Lab and orchards Stores
6. Concept of proper storage of produce	<ul style="list-style-type: none"> • Able to arrange proper storage facility to keep the surplus produce in good shape for longer period to get good prices at right times 	<ul style="list-style-type: none"> • Building proper storage according to harvest times of harvest and marketing trends/ prices • Advantages of storage 	02 hrs Theory 08 hrs practical	Proper storages facilities for storing vegetable and fruit Reference books	Lecture hall Lab and orchards Stores
7. Losses during storage and their control	<ul style="list-style-type: none"> • Know types of various kind of potential losses during storage and be able to control them 	<ul style="list-style-type: none"> • Insect pests losses and their control • Fungal and bacterial losses and their control 	03 hrs Theory 12 hrs practical	Proper storages facilities for storing/ disease control equipment Reference books	Lecture hall Lab and field area
8. Fruit and vegetable preservation methods and their effects on nutritional value	<ul style="list-style-type: none"> • Able to apply proper preservation methods of especially for vegetables and fruits to conserve their nutrition value and avoid their spoilage 	<ul style="list-style-type: none"> • Proper harvest/ collection • Proper packing techniques • Proper processing methods/ techniques to conserve nutrition 	03 hrs Theory 12 hrs practical	Proper storages facilities for storing vegetable and fruit Equipment fruit processing and value addition	Lecture hall Lab and field area

		<ul style="list-style-type: none"> • Adding proper preservatives 		Reference books	
9. Storage of grains (methods, precautions and stored grain pest control), post harvest losses and shelf life of different fruits	<ul style="list-style-type: none"> • Able to build proper stores or arrange proper storage of grains and fruits in order to have achieve their reasonable shelf life period and to have effective insect/ pest control 	<ul style="list-style-type: none"> • Proper storage • Proper aeration • Moisture control • Fumigation • Sealing entries of insects/ pests • Occasional checkups/ observations for insects/ microbial disease attacks 	<p>03 hrs Theory</p> <p>12 hrs practical</p>	<p>Proper storages facilities for storing vegetable and fruit</p> <p>Fumigation/ insect, pest control equipment</p> <p>Reference books</p>	<p>Lecture hall</p> <p>Storages</p> <p>Lab and field area</p>
10. Storage diseases/ insects/ pests and their control	<ul style="list-style-type: none"> • Be able take proper measures to control various kinds of storage insects/ pests, rodents and microbes diseases. 	<ul style="list-style-type: none"> • Insects/pests • Bacterial diseases • Fungal diseases • Proper control measures for all these diseases/ problems 	<p>03 hrs Theory</p> <p>12 hrs practical</p>	<p>Proper storages facilities for storing vegetable and fruit</p> <p>Fumigation/ insect, pest control equipment</p> <p>Reference books</p>	<p>Lecture hall</p> <p>Lab and field area</p>
11. Physiology and biochemistry of fruits and vegetables	<ul style="list-style-type: none"> • Know physiology/ biochemistry of various fruit/ vegetable species and be able to manage their harvest at proper times in proper way to avoid/ minimize harvest/ post-harvest losses 	<ul style="list-style-type: none"> • Fruit/ grains bearing times • Stages of maximum nutrition/ water requirement • Ripening • Harvesting 	<p>03 hrs Theory</p> <p>12 hrs practical</p>	<p>Various kind of orchards</p> <p>Harvesting equipment</p> <p>Reference books</p>	<p>Lecture hall</p> <p>orchards</p> <p>Lab and field area</p>
12. Hand/ mechanical harvesting	<ul style="list-style-type: none"> • Able to apply proper harvest/collection/picking techniques for reduction of losses during harvest 	<ul style="list-style-type: none"> • Proper hand picking • Proper mechanical method • Advantages/ economics of hand picking and mechanical harvesting 	<p>03 hrs Theory</p> <p>12 hrs practical</p>	<p>Proper fruit collecting/ harvesting equipment/ machines</p> <p>Reference books</p>	<p>Lecture hall</p> <p>orchards</p> <p>Lab and field area</p>
13. Post harvest techniques	<ul style="list-style-type: none"> • Have knowledge of proper application of these treatments/ measures to protect the produce from 	<ul style="list-style-type: none"> • Curing • Gamma radiation • Wax coating 	<p>03 hrs Theory</p> <p>12 hrs</p>	<p>Proper storages facilities for storing vegetable and fruit</p> <p>Equipment fruit</p>	<p>Lecture hall</p> <p>orchards</p> <p>Storages</p>

	these storage insect/ pest/ diseases	• Applying anti-fungal or anti-bacterial agents	practical	processing and value addition Reference books	Lab and field area
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Practical:

i) Indications of ripening of fruits and vegetables, ii) Post harvest methods, iii) Packing materials and methods, iv) Ripening chemicals, v) Principles of preservation, vii) Visits to post harvest facilities and grain stores.

Recommended Books:

- Saraswathy, S. 2008. Post harvest management of Horticultural Crops. Agrobios Publishers, India.
- Morris, T.N. 2007. Principles of Fruit Preservation: Jam making, canning and drying. Agrobios Publishers, India.
- Awan, J.A. and Rehman, S.U. 2004. Food Preservation Manual. Unitech Communications, Faisalabad.

Module 10 Title: Farm Record Maintenance

Objective of the Module: Impart awareness regarding principles of farm record management.

Duration:xy hours Theory:xy hours Practice:.....xy hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Principles of farm layout and design	• Be able to Layout/ design the fields/ and or animal sheds properly	• Importance • Proper layout of fields for managing sowing, irrigation and harvesting • Designing of sheds for all kind of livestock	02 hrs Theory	Field area	Lecture hall
			08 hrs practical	Livestock farms/ sheds Reference books	Livestock farm Field area
2. Farm management & maintenance of farm records	• Be able to 1) arrange the input at economical rates, 2) keep records of input and yields and 3) calculate profits/ losses in order to do profitable farming	• Concept and importance • Arrangements of inputs • Arrangements of labor, etc • Output and their returns • Profits/ loss records	03 hrs Theory	Computers/ calculators Computer programs Record registers	Lecture hall
			12 hrs practical	Reference books	Computer labs
	• Able to keep records of 1)	• Cropping history	03 hrs	Computers/ calculators	Lecture hall

3. Keeping farm record system	all cropping histories & livestock, and weather/ rainfall and their effects on farm productivity to be a good manager	<ul style="list-style-type: none"> • Production records of crops • Livestock/ herd records • Weather/ rainfall records and their impacts on production/ losses 	Theory 12 hrs practical	Computer programs Record registers Reference books	Computer labs
4. Different systems of book keeping	<ul style="list-style-type: none"> • Be a good book-keeper for maintaining records and all kinds of information required for profitable farming 	Maintaining records of all <ul style="list-style-type: none"> • Inputs • Labor • Output/ production 	03 hrs Theory 12 hrs practical	Computers/ calculators Computer programs Record registers Reference books	Lecture hall Computer labs
5. Profit and loss account/income statement Bank Accounts, cheques, discount, interest debts.	<ul style="list-style-type: none"> • Be able to do business with bank based on a good knowledge of banking system and different kinds of accounts/ interests/ and understand bank statements 	Keeping records of all: <ul style="list-style-type: none"> • Inputs and their cost • Profits • Bank deposits/ with drawls statements • Knowledge of good returning (interest) accounts. 	03 hrs Theory 12 hrs practical	Computers/ calculators Computer programs Record registers Reference books	Lecture hall Banks Computer labs
6. Appreciation and depreciation of stocks.	<ul style="list-style-type: none"> • Have good knowledge of current prices/ values of his farm stocks (land, livestock, building, machinery, etc) and appreciation/ depreciation of these stocks and • Be able to sell & buy his stocks at proper times 	Appreciation of: <ul style="list-style-type: none"> • Live and dead stocks • Land • Buildings • Machinery & plants • Selling/ buying of stock according to market trends 	02 hrs Theory 08 hrs practical	Computers/ calculators Computer programs Record registers Stores/ buildings Reference books	Lecture hall Livestock farm Computer labs
7. Preparation of trading, profit and loss account and balance sheet.	<ul style="list-style-type: none"> • Be able to analyze the situation and device strategies to get maximum returns/ profits with minimum inputs/ investments 	Records of all: <ul style="list-style-type: none"> • Purchases • Sales • Profits • Losses • Situation analysis 	02 hrs Theory 08 hrs practical	Computers/ calculators Computer programs Record registers Reference books	Lecture hall Computer labs
8. Dealing with	<ul style="list-style-type: none"> • Be able to calculate 	<ul style="list-style-type: none"> • A good knowledge of: 	02 hrs	Computers/ calculators	Lecture hall

Patwari (Land record holding Govt official) and other govt. revenue officers	different govt revenues/ taxes and their payment schedules • Deal with Patwari and other govt revenue officials	<ul style="list-style-type: none"> • Land record keeping • Land revenue calculation • Water charges (Aabiana) calculation • Other revenue calculation • Land purchasing and transfer procedures 	Theory 08 hrs practical	Computer programs Record registers Reference books	Computer labs Courts/ kachehries
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Practical:

i) Layout of farm, ii) Training in maintenance of crop, livestock and dead stock registers, iii) Preparation of a balance sheet and different types of accounts, iv) Calculation of appreciation and depreciation of different farm articles crop yield estimation, and v) Working out cost of production of major crops grown in irrigated and rainfed areas.

Recommended Books:

- Byerlee, D. and T. Hussain. 1992. Farming systems of Pakistan. Vanguard Books. Lahore.
- Ghani, M. A. 1992. Principles of Counting. Pak Imperial Book Dept Chowk Urdu Bazar, Lahore.
- Shreshther, A. 2003. Cropping system. Food Products Press. An Imprint of the Haworth Press, Inc. Vendermeer, J. 1989. The ecology of Intercropping. Cambridge University Press.

2. Assessment

Module 1 Soil Management (* Scheduled Dates column will be filled after project launching & initiation of the course)

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	*Scheduled Dates
1. Have good knowledge of soils and their types	02 hrs	08 hrs	<ul style="list-style-type: none"> • Sandy Soils. • Clayey/ heavy soils. • Loam/ Productive soils. • Less productive/Poor soils. 	Lecture and Soil texture by feel method and by physical analysis	
2. Alter soil properties for keeping soil productive	04 hrs	16 hrs	<ul style="list-style-type: none"> • Bulk density. • pH. • EC. • Organic matter • Water holding capacity 	Lectures and Physical and chemical analyses in the lab using standard procedures	
3. Managing soil health	03 hrs	12 hrs	<ul style="list-style-type: none"> • Aeration. • Good microbial community • Well Drained 	Lectures and Microbial analysis by standard procedure	
4. Managing optimum level of essential nutrients and ensure their availability	03 hrs	12 hrs	<ul style="list-style-type: none"> • Macronutrients • Secondary nutrients • Micronutrients • Roles of nutrients in biomass and grain production/ disease control and quality of produce 	Lectures and Observation of healthy and nutrient deficient plant tissues and soil nutrient analysis by standard procedures	
5. Soil organic matter (SOM) and its importance/ role in crop production.	03 hrs	12 hrs	<ul style="list-style-type: none"> • Definition and Origin • Quantity/ distribution • Role in nutrient availability • Physical properties • Biological properties • Productivity of soil 	Lectures and Analysis of soil organic matter by standard procedure (Walkley & Black)	
6. Knowledge of various kind of fertilizers and their nutrient contents	03 hrs	12 hrs	<ul style="list-style-type: none"> • Nitrogen fertilizers • Phosphatic fertilizers • Potash fertilizers 	Lectures and Fertilizers sample observations and	

			<ul style="list-style-type: none"> • Micronutrient fertilizers • Compound fertilizers • Organic manures 	nutrient analyses of various fertilizers by standard procedures	
7. Know soil water quantity and its availability.	03 hrs	12 hrs	<ul style="list-style-type: none"> • Role of water in nutrient uptake and transportation • Amount of water in soil profile • Availability of soil water for crops 	Lectures and Measurement of soil water/ moisture using moisture-probes and calculating total water availability in soil	
8. Problem soils (salt-affected, water-logged, heavy metal polluted) and their management	04 hrs	16 hrs	<ul style="list-style-type: none"> • Salt affected/ saline soils • Sodic/ water-logged soils • Saline sodic soils • Calcareous soils • Alkaline soils • Acid soils • Heavy metal (Pb, Cr, Hg polluted) soils 	Lectures and Observation of salt/ salt-affected soil. Analyses of soil salinity Analyses of heavy metals in sewerage affected soils	
9. Soil conservation (Terracing in hilly areas and across slope cultivation in slight slope areas)	02 hrs	08 hrs	<ul style="list-style-type: none"> • Water erosion and its control • Wind erosion and its control 	Lectures and On-farm observation and making of terracing/ across slope cultivation	

Module 2: Field Crop Production

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	+Scheduled Dates
1. Knowing various kinds of field crops	03 hrs	12 hrs	<ul style="list-style-type: none"> • Cereal crops. • Legume crops. • Cotton & sugarcane • Other field crops 	Lectures and On-farm observations of various cereal/ legume & other crops	
2. Crops/ cropping patterns. systems suitable for various kinds of soils and	03 hrs	12 hrs	<ul style="list-style-type: none"> • Suitability of crops/ cropping pattern to kinds of soil • Cropping patterns in various ecological zones 	Lectures and On-farm observation of cropping patterns and of zones suitable	

eco-zones			<ul style="list-style-type: none"> • Economics of various cropping patterns/ systems 	for specific cropping patterns	
3. Knowledge of proper cropping seasons of various crops	03 hrs	12 hrs	<ul style="list-style-type: none"> • Sowing/ harvesting seasons of various crops. • Effects of early/ late planting on crop yields 	Lectures and Field observations of crops/ their seasons/ sowing/ harvesting times	
4. Manage good land preparation using proper tillage techniques for various kinds of soils and crops	03 hrs	12 hrs	<ul style="list-style-type: none"> • Simple Cultivators • Chisel plow • Mouldboard/ rotavator. • Ridges/ Raised-bed preparation. • Puddling for rice sowing 	Lectures and Use of proper land preparing implements for respective crops	
5. Arrange proper crop rotations/ inter/ mix cropping	03 hrs	12 hrs	<ul style="list-style-type: none"> • Various crop rotations • Cropping patterns • Mix/ inter-cropping 	Lectures and Field observations of cropping patterns	
6. Selection of high yielding varieties/ importance of quality seed	03 hrs	12 hrs	<ul style="list-style-type: none"> • High yielding/ disease resisting varieties of various crops. • Healthy seed selection • Seed cleaning to avoid germination of weeds, etc 	Lectures and Acquisition of healthy seed of good varieties and use of proper seed cleaning procedures	
7. Know proper fertilizer recommendation, their calculations & application	03 hrs	12 hrs	<ul style="list-style-type: none"> • Fertilizer recommendation for various yield potentials of cereal crops • Recommendation for legume crops • Calculation based on yield potential and soil type 	Lectures and Demonstration of fertilizer recommendation based on crop nutrient requirement and fertilizer nutrients	
8. Weed management, disease/ pest control,	03 hrs	12 hrs	<ul style="list-style-type: none"> • Weed management techniques (Physical or chemical) • Kinds of weedicide/ pesticide for respective 	Lectures and Demonstration of proper weed management and selection/ proper use	

			weeds/ insect/ pest	of pesticides	
9. Organic farming	03 hrs	12 hrs	<ul style="list-style-type: none"> Basics of organic farming Its suitability for certain soils/ crops Yield/ Quality aspect 	Lectures and Demonstration of organic crops	
10. Harvesting technologies & storage methods	03 hrs	12 hrs	<ul style="list-style-type: none"> Machinery for harvesting for various crops Benefits of machines Proper storage method/ techniques 	Lectures and Demonstration of proper harvesting methods and storages	

Module 3: Horticulture crop production

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	*Scheduled Dates
1. Growing of various kinds of horticulture crops	02 hrs	08 hrs	<ul style="list-style-type: none"> Winter vegetables crops. Summer vegetable crops Citrus fruit orchards. Other fruit orchards 	Lectures and Visits to vegetables fields and different orchards	
2. Importance of various crops	02 hrs	08 hrs	<ul style="list-style-type: none"> Yield potentials of crops Economic importance of each crop Suitability of crop to soils 	Lectures and Calculations of input cost, sale return and profit for diff. crops	
3. Raising of nursery, its /transplanting, layout/ or propagation	04 hrs	16 hrs	<ul style="list-style-type: none"> Germination of the crops Transplanting methods Grafting methods Other measures for healthy crops/good harvest 	Lectures and Field demonstration of germination, transplanting/ grafting, etc	
4. Production of off-season vegetables	03 hrs	12 hrs	<ul style="list-style-type: none"> Building/ maintenance of tunnels Temperature control Insect/ pest control 	Lectures and Visits to tunnels, demonstration of tunnel construction	
5. Application of pruning/ training/ skating	01 hrs	04 hrs	<ul style="list-style-type: none"> Techniques of pruning/ skating Importance of these 	Lectures and Demonstration of	

			methods	pruning, etc	
6. Control of weeds and insect/ pest/ diseases	04 hrs	16 hrs	<ul style="list-style-type: none"> Physical weed control, hoeing/ cultivation, etc Chemical weed control Identification of insect/ pests or microbial diseases Chemical/ biological insect/ disease control 	Lectures and On-farm physical and chemical weed control, and use of pesticide/ and or predator insects	
7. Fertilizer/ manure management	03 hrs	12 hrs	<ul style="list-style-type: none"> Fertilizer recommendation for various vegetable crops Fertilizer/ manure recommendation for orchard crops 	Lectures and Calculating chemical organic fertilizer dose and proper procedure of their applications	
8. Growing, harvesting/ handling/ storage	03 hrs	12 hrs	<ul style="list-style-type: none"> Growing/ harvesting techniques for vegetables Growing/ harvesting techniques for orchards Post harvest losses control 	Lectures and On-farm training of vegetable/ fruit cultivation and harvesting	

Module 4: Managing Farm Mechanization

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	*Scheduled Dates
1. Manage knowledge of various kinds of farm machinery	04 hrs	16 hrs	<ul style="list-style-type: none"> Tractors/Trolleys Tube-wells/ pumps Land preparation and sowing/ drilling machines Threshers Combined harvesters Sprayers/ Dusting machines Seed cleaners/ separators 	Lectures and Practical demonstration and training of use/ operation of these all these machines/ tools	
2. Primary & secondary tillage for proper seedbed preparation	04 hrs	16 hrs	<ul style="list-style-type: none"> Cultivators Chisel Plow Moldboard Rotavator 	Lectures and Practical operations of these machines/ tools	

			<ul style="list-style-type: none"> • Disc Plow • Zero-till • Diggers/ Ridgers • Others 		
3. Direct drilling/ seeding	02 hrs	08 hrs	<ul style="list-style-type: none"> • Advantages • Direct drill wheat • Direct drill Rice 	Lectures and Demonstration of benefits of direct drill crops	
4. Precision leveling	02 hrs	08 hrs	<ul style="list-style-type: none"> • Purpose/Advantage • Various precision levelers • Saving of water/ Uniform distribution of water 	Lectures and Practical demonstration of precision leveler & its benefits	
5. Raised-bed/ ridging preparation	02 hrs	08 hrs	<ul style="list-style-type: none"> • Importance/ Advantage • Various machines for raised bed preparation • Crops for which in is useful/ suitable 	Lectures and Practical demonstration of raised=bed preparation and its advantages	
6. Managing fertilizer application/ band placing	03 hrs	12 hrs	<ul style="list-style-type: none"> • Purpose/ Advantage • Designing • Fertilizers saving esp. phosphatic • Adjustment of fertilizers dose 	Lectures and Practical demonstration of proper fertilizer application methods, including band-placing	
7. Manage spraying/ dusting other plant protection implementation machinery	03 hrs	12 hrs	<ul style="list-style-type: none"> • Manual sprayers and their nozzle adjustment • Motor operated small/ man-operated sprayers • Sprayers for fruit trees • Tractor operated large/ mechanical sprayers 	Lectures and On-farm training of different methods/ tools of pesticide applications	
8. Operations of harvesting and threshing machinery	03 hrs	12 hrs	<ul style="list-style-type: none"> • Advantages • Various machines/ models suitable for different cereal crops • Harvester/ threshers for 	Lectures and On-farm training of proper use of crop/ fruit harvesting/picking	

			other crops • Fruit harvesters	machines/ tools	
9. Post harvest machinery	03 hrs	12 hrs	<ul style="list-style-type: none"> • Transportation machines • Driers • Packing machines, esp. for fruits • Separators/ cleaners 	Lectures and Practical use of driers, separators, cleaners and packing machines/ tools	
10. Care/repair/ maintenance and calibration of machinery	03 hrs	12 hrs	<ul style="list-style-type: none"> • Tractors • Tillage machines • Harvesters • Threshers • Seeding/ other drills 	Lectures and Practical demonstration repair/ maintenance of agriculture machinery	

Module 5: Water Management for Crops

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	*Scheduled Dates
1. Importance of water	02 hrs	08 hrs	Role of water in: <ul style="list-style-type: none"> • Nutrient uptake • Transportation of nutrients/ photosynthate within plant • General plant growth and development 	Lectures and Field observations of timely irrigated vs crops under water-stress	
2. Water requirements for various crops	03 hrs	12 hrs	Water requirement for: <ul style="list-style-type: none"> • Cereals except rice • Rice • Sugarcane • Fodder • Vegetables • Fruits 	Lectures and Calculation of water requirement for these crops Field based on their biomass and root systems	
3. Various irrigation types/systems (Furrows/Basin Irrigation)	03 hrs	12 hrs	<ul style="list-style-type: none"> • Flood irrigation • Furrow & Basin irrigation • Raised bed irrigation • Sprinkler irrigation • Drip irrigation 	Lectures and On-farm demonstration of these irrigation systems	

4. Climate/ weather forecasting	02 hrs	08 hrs	<ul style="list-style-type: none"> • Watching/ listening weather forecast on electronic media • Adjustment of irrigation according to forecast 	Lectures and Calculation of irrigation adjustment based on rain fall	
5. Manage water harvesting/ Watershed management	03 hrs	12 hrs	<ul style="list-style-type: none"> • Cultivation across the slop to catch surface runoff • Terracing in hilly areas • Plowing of fallow land to absorb rain water • Storage (in ponds)/ harvesting of water in sloped hilly areas and (Rodekahi systems) 	Lectures and Field visits of terraces, across slope cultivation, water storages in Rodekahi areas	
6. Managing high efficiency irrigation systems	04 hrs	16 hrs	<ul style="list-style-type: none"> • Sprinkler irrigation • Drip Irrigation • Solar pumps and irrigation 	Lectures and Demonstrations of these systems	
7. Maintenance of pumps/ tube wells	03 hrs	12 hrs	<p>Tuning/ maintenance of</p> <ul style="list-style-type: none"> • Pumps and • Tube wells to save energy and get maximum water 	Lectures and Training of repair maintenance of pumps & tube wells	
8. Water budgeting	02 hrs	08 hrs	<ul style="list-style-type: none"> • Estimation of total water availability per year • Growing type and number of crops according to water availability 	Lectures and Decision making process for growing crops according to water availability	
9. Water course management & other water saving techniques/their application	03 hrs	12 hrs	<ul style="list-style-type: none"> • Cleaning of water courses • Precision land leveling • Dividing land into standard/ small pieces • Drip/ sprinkler systems 	Lectures and Practical of water channel cleaning, division of land in proper sized plots	
10. Water use efficiency of crops for optimum water productivity.	03 hrs	12 hrs	<ul style="list-style-type: none"> • Applying water at right times • Growing crops with less water requirement • Water productivity i.e., 	Lectures and Learning ways to increase water use efficiency	

			quantity of grain/ biomass production per unit quantity water		
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Module 6: Plant Protection

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	*Scheduled Dates
1. Major crops diseases and damages caused by various insects/ pests/ microbial diseases, etc.	03 hrs	12 hrs	<ul style="list-style-type: none"> • Different disease-causing agents insects/ pests • Disease causing micro-organisms (bacteria, fungi) • Types of damages caused • Life cycles of insects • Mode of actions of all disease causing agents 	Lectures and Field surveys of major crop diseases Visits of Insectory	
2. Scouting/ surveys for disease diagnosis	03 hrs	12 hrs	<ul style="list-style-type: none"> • Types and no. of insects • Samples collection and identification of Bacterial or fungal species 	Lectures and Field surveys; insect sample collections Microbial diseases affected plant tissues	
3. Damage assessment	02 hrs	08 hrs	<ul style="list-style-type: none"> • # of leaves damaged • Braches and stem damages • Roots damages • Grains damage in crops • Fruits damage in orchards 	Lectures and Field surveys; & samples collection and demonstration of diseased/ damaged plant parts	
4. Control of insects/ pests/ microbial diseases	03 hrs	12 hrs	<ul style="list-style-type: none"> • Identification of insects/ pests/ fungus • Use of suitable poisons chemicals • Application of chemicals at right time in right quantity. concentration 	Lectures and Field surveys for disease identification and practical application of insecticides/ fungicides	
5. Introduction to	03 hrs	12 hrs	<ul style="list-style-type: none"> • Various types/classes of 	Lectures and	

various pesticides			pesticide chemicals <ul style="list-style-type: none"> • Mode of action of these chemicals • Right application method/ time of these chemicals 	Lab and Pesticides stores visit	
6. Selection of suitable pesticides	03 hrs	12 hrs	According to: <ul style="list-style-type: none"> • types of insects • type of crop • Vegetables/ fruits 	Lecture and Pesticides handbooks study	
7. Safe/ effective use of pesticides	03 hrs	12 hrs	<ul style="list-style-type: none"> • Types of insecticides • Types of crops • Dozes/ quantities • Application methods • Time of application 	Lectures and Practical (in the field) of safe application of pesticides	
8. Environment pollution by pesticide use and its effect on human and animal health	03 hrs	12 hrs	<ul style="list-style-type: none"> • Sources of pollution • Types of pollution • Dangerous pesticides • Flaws in application procedures • Effects on humans, animals birds and other wild life 	Lectures and Field survey of bio-remediation sites	
9. Biological pest control	03 hrs	12 hrs	<ul style="list-style-type: none"> • Concept and importance • Use of predator birds • Use of predator insects (trichograma) • Use of pathogens controlling bacteria 	Lectures and Visit of insect raising lab and practical demonstration of insect control by trichograma	
10. Integrated pest management	03 hrs	12 hrs	<ul style="list-style-type: none"> • Crop rotations • Inter/mix cropping • Use of insect traps • Biological agents 	Lectures and Visit of crop rotation fields	
11. Grain storage pest/control	03 hrs	12 hrs	<ul style="list-style-type: none"> • Moisture control • Fumigation • Sealing for entry of insects • Proper aeration 	Lectures and Visit to grain storages	

Module 7: Livestock Management

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	*Scheduled Dates
1. Promising livestock raising technologies	03 hrs	12 hrs	<ul style="list-style-type: none"> • Importance • Herd sizes • Proper feeds/ fodders • Rearing packages • Health maintaining procedures 	Lectures and Visit of Livestock station/ herd and fodder fields	
2. Important high yielding breeds of livestock	03 hrs	12 hrs	<ul style="list-style-type: none"> • High yielding (milk & meet Producing) breeds of: • Cattle • Buffalo • Sheep/ goats • Horses • Poultry 	Lectures and Visits/ discussions at; <ul style="list-style-type: none"> - livestock station - Sheep/ goat herd - Poultry sheds 	
3. Animal nutrition	03 hrs	12 hrs	<ul style="list-style-type: none"> • Nutrition needs of all animals, both for milk and meat production • Times/ numbers of feedings 	Lectures and Visits to Livestock station and feed mills	
4. Fodder quality and production technologies of fodders & feeds	03 hrs	12 hrs	<ul style="list-style-type: none"> • High nutritious (esp. high protein) fodders • Mix cropping of cereals and legumes • Silage preparation • Preparation of enriched (high protein) animal feeds 	Lectures and Visit to fodder fields and feed stocks; also practical of silage production at the farm	
5. Range management/ grazing	03 hrs	12 hrs	<ul style="list-style-type: none"> • Establishment of range with proper mix of grasses and legumes. • Fertilizer calculation & application for ranges • Grazing schedules 	Lectures and Visit to range and discussions for fertility management of range and prepare grazing scedules	

6. Animal health/ disease control	03 hrs	12 hrs	<ul style="list-style-type: none"> • Proper aeration and maintenance of animal/ poultry sheds • Occasional vaccination and against contagious diseases • Proper diagnosis of diseases of sick animals • Proper care and medication of sick animals 	Lectures and Visits to livestock farm, disease surveillance and identification Vaccine applications and medication of sick animals	
7. Artificial insemination / breed improvement	03 hrs	12 hrs	<ul style="list-style-type: none"> • Importance • Selection/ acquisition of semen of quality breeds. • Applying good artificial insemination practices • Observation/ follow up of complete program of new breeds 	Lectures and At livestock farm; - Semen collect practical - Demonstration of artificial insemination technique	
8. Dairy products development	03 hrs	12 hrs	Preparation of; <ul style="list-style-type: none"> • Pasteurization of milk • Butter • Yogurt • Cheese 	Lectures and Practical in lab for pasteurization and milk products preparation	
9. Poultry Production	03 hrs	12 hrs	<ul style="list-style-type: none"> • Good poultry breeds • Healthy poultry feeds • Disease control and vaccination 	Lectures and Visit to poultry feed plants and poultry vaccine applications	
10. Fish Production	03 hrs	12 hrs	<ul style="list-style-type: none"> • Preparation of ponds • Good quality fish • Suitable fish feed and its availability • Harvesting ages of various kinds of fish 	Lectures and Visits to hatcheries and fish ponds and hold Lectures and discussion	

Module 8: Marketing/ Economic Analysis

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	*Scheduled Dates
1. Input-cost analysis	02 hrs	08 hrs	<ul style="list-style-type: none"> • Calculation/ estimation of input and • Their costs 	Lectures and Calculations and cost analyses in computer lab	
2. Cost of production of various crops/ cropping systems	03 hrs	12 hrs	Calculation of per unit cost of production considering all inputs and labor cost of <ul style="list-style-type: none"> • Single crops (field or horticultural crops) • Various cropping systems 	Lectures and Visits to fields and Calculations/ cost analyses in computer lab	
3. Identification of suitable high returning crop commodities	03 hrs	12 hrs	High returning <ul style="list-style-type: none"> • Field crops • Vegetable • Fruits Having easy production technologies	Lectures and Visit to crop fields and discussions with progressive farmers	
4. Agriculture marketing system of Pakistan	03 hrs	12 hrs	<ul style="list-style-type: none"> • Identification of good reliable easy access markets • Understand marketing/ prices trends of markets in order to get ensured/ high returns 	Lectures and Survey and visits of good markets and discussions with sales agents/ brokers	
5. Applications of economic principles	03 hrs	12 hrs	<ul style="list-style-type: none"> • Joining proper agribusiness organizations • Establishing suitable cooperative agribusiness organizations/ systems 	Lectures and Visits/ discussion with agribusiness organizations	
6. Problems of	03 hrs	12 hrs	<ul style="list-style-type: none"> • Problems and cost of 	Lectures and	

agriculture marketing systems and its impact on the economy			transportation <ul style="list-style-type: none"> • Distances/approach/ access to markets • Loans/payment procedures • Demands for certain types/ quality of products 	Surveys for market access and find out market demands	
7. Functions of wholesale fruits, vegetables and grain markets	03 hrs	12 hrs	<ul style="list-style-type: none"> • Understanding systems of wholesale marketing systems • Dealing with brokers/ buyers 	Lectures and Visits of whole-sale markets Have discussions with brokers, sale agents & customers	
8. International marketing vs. local marketing of Pakistan	03 hrs	12 hrs	<ul style="list-style-type: none"> • Prices/ returns of conventional local markets • Prices/ returns of international markets • Ensuring access to international markets 	Lectures and Visits of local markets Internet approach for finds international demands of produce	
9. Suitable seasons/ times of crops	03 hrs	12 hrs	<ul style="list-style-type: none"> • Identification of suitable growing/ harvesting seasons • Growing off-season vegetable 	Lectures and Field visits and finding Visits of off-season produce growing farms	
10. Benefit: Cost analysis sheet	03 hrs	12 hrs	<ul style="list-style-type: none"> • Cost of inputs • Profits/ returns • Calculation of good benefit: cost ratios for various crops. 	Lectures and Calculations using computer programs	
11. Net return per unit area.	03 hrs	12 hrs	<ul style="list-style-type: none"> • Records of all inputs + labor • Cost of transportation/ marketing • Records of all sale proceeds • Net profit/ return calculation for various crop 	Lectures and Survey of market route/ access Calculation/ cost analysis in the computer lab	

			commodities/ cropping systems		
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Module 9: Post-Harvest Losses Control

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	*Scheduled Dates
1. Types and causes of post-harvest losses	03 hrs	12 hrs	<ul style="list-style-type: none"> • Losses of field crops • Losses of vegetable crops • Losses of fruits 	Lectures and Field visits esp. during harvest time	
2. Assessments of losses for various field crops and their economic values	03 hrs	12 hrs	Losses of various: <ul style="list-style-type: none"> • Cereal field crops • Legumes field crops • Cotton • sugarcane • Forages/ fodders 	Lectures and Field visits especially at harvest of these crops	
3. Assessment of post-harvest losses of various vegetable crop	03 hrs	12 hrs	Losses of various: <ul style="list-style-type: none"> • Winter vegetable • Summer vegetables • Losses during collection/ transportation 	Lectures and Vegetable field visits and discussions about losses	
4. Assessment of post-harvest losses of various fruit crops	03 hrs	12 hrs	Losses of various: <ul style="list-style-type: none"> • Citrus fruits • Mangoes • Dates • Other fruits • Losses during collection/ picking or transportation 	Lectures and Visits of various orchards and discussions about losses of these fruits during pick/ harvest and transport	
5. Measures to avoid/ or minimize post-harvest losses of all crops	03 hrs	12 hrs	<ul style="list-style-type: none"> • Timely harvest • Proper harvesting/ threshing procedure/ implements • Proper harvesting/ picking of vegetables and transportation to markets • Proper collection/ packing of 	Lectures and Field/ orchard visits and discussions to avoid/ minimize these losses	

			<ul style="list-style-type: none"> fruits • Proper processing ways 		
6. Concept of proper storage of produce	02 hrs	08 hrs	<ul style="list-style-type: none"> • Building proper storage according to harvest times of harvest and marketing trends/ prices • Advantages of storage 	Lectures and Visits of good storage/ discussions	
7. Losses during storage and their control	03 hrs	12 hrs	<ul style="list-style-type: none"> • Insect pests losses and their control • Fungal and bacterial losses and their control 	Lectures and Visits of storages Surveys of insect/ disease problems and discussions for their solution	
8. Fruit and vegetable preservation methods and their effects on nutritional value	03 hrs	12 hrs	<ul style="list-style-type: none"> • Proper harvest/ collection • Proper packing techniques • Proper processing methods/ techniques to conserve nutrition • Adding proper preservatives 	Lectures and Visits of vegetable field and orchards. Practical demonstration of good harvest techniques	
9. Storage of grains (methods, precautions and stored grain pest control), post harvest losses and shelf life of different fruits	03 hrs	12 hrs	<ul style="list-style-type: none"> • Proper storage • Proper aeration • Moisture control • Fumigation • Sealing entries of insects/ pests • Occasional checkups/ observations for insects/ microbial disease attacks 	Lectures and Visits of storages Demonstrations for fumigation and other measures to block access of insects to the store	
10. Storage diseases/ insects/ pests and their control	03 hrs	12 hrs	<ul style="list-style-type: none"> • Insects/pests • Bacterial diseases • Fungal diseases • Proper control measures for all these diseases/ problems 	Lectures and Surveys for insect/ disease attacks Taking proper measures to check these	

11. Physiology and biochemistry of fruits and vegetables	03 hrs	12 hrs	<ul style="list-style-type: none"> • Fruit/ grains bearing times • Stages of maximum nutrition/ water requirement • Ripening • Harvesting 	Lectures and Visits of orchards and discussion with growers/ caretakers	
12. Hand/ mechanical harvesting	03 hrs	12 hrs	<ul style="list-style-type: none"> • Proper hand picking • Proper mechanical method • Advantages/ economics of hand picking and mechanical harvesting 	Lectures and On-farm demonstration of differences in hand picking and mechanical harvesting	
13. Post harvest techniques	03 hrs	12 hrs	<ul style="list-style-type: none"> • Curing • Gamma radiation • Wax coating • Applying anti-fungal or anti-bacterial agents 	Lectures and Visits of fruit processing plants	

Module 10: Farm Record Maintenance

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	*Scheduled Dates
1. Principles of farm layout and design	02 hrs	08 hrs	<ul style="list-style-type: none"> • Importance • Proper layout of fields for managing sowing, irrigation and harvesting • Designing of sheds for all kind of livestock 	Lectures and Visits of model farms and livestock stations	
2. Farm management & maintenance of farm records	03 hrs	12 hrs	<ul style="list-style-type: none"> • Concept and importance • Arrangements of inputs • Arrangements of labor, etc • Output and their returns • Profits/ loss records 	Lectures and Visits of model farms discussion with farm managers/ owners	
3. Keeping farm record system	03 hrs	12 hrs	<ul style="list-style-type: none"> • Cropping history • Production records of crops • Livestock/ herd records • Weather/ rainfall records 	Lectures and Visits of agri- farms and discussions with their managers/	

			and their impacts on production/ losses	Munshies (caretakers)	
4. Different systems of book keeping	03 hrs	12 hrs	Maintaining records of all <ul style="list-style-type: none"> • Inputs • Labor • Output/ production 	Lectures and Visits of agri- farms and discussions with their Munshies	
5. Profit and loss account/income statement Bank Accounts, cheques, discount, interest debts.	03 hrs	12 hrs	Keeping records of all: <ul style="list-style-type: none"> • Inputs and their cost • Profits • Bank deposits/ with drawls statements • Knowledge of good returning (interest) accounts. 	Lectures and Visits to bank and introduction to banking procedures/ and good returning accounts	
6. Appreciation and depreciation of stocks.	02 hrs	08 hrs	Appreciation of: <ul style="list-style-type: none"> • Live and dead stocks • Land • Buildings • Machinery & plants • Selling/ buying of stock according to market trends 	Lectures and Discussions and computations/ calculations in the computer lab	
7. Preparation of trading, profit and loss account and balance sheet.	02 hrs	08 hrs	<ul style="list-style-type: none"> • Records of all: • Purchases • Sales • Profits • Losses • Situation analysis 	Lectures and Discussions and computations/ calculations in the computer lab	
8. Dealing with Patwari (Land record holding Govt official) and other govt. revenue officers	02 hrs	08 hrs	<ul style="list-style-type: none"> • A good knowledge of: • Land record keeping • Land revenue calculation • Water charges (Aabiana) calculation • Other revenue calculation • Land purchasing and transfer procedures 	Lectures and Visits and discussions with Patwari Visits to Dewani courts and revenue collection departments	

Supportive notes

- Assessment context
- Critical aspects
- Assessment condition
- Resources required for assessment