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Ministry of Labor and Skills

Crop Production
LEVEL – III

CURRICULUM
Based on April, 2022Version1Occupational standard (OS)

April, 2022

Addis Ababa, Ethiopia

Preface

The reformed TVET-System is an outcome-based system. It utilizes the needs of the labor market and occupational requirements from the world of work as the benchmark and standard for TVET delivery. The requirements from the world of work are analysed and documented – taking into account international benchmarking – as occupational standards (OS).

In the reformed TVET-System, curricula and curriculum development play an important role with regard to quality driven comparable TVET-Delivery. The Curricula help to facilitate the training process in a way, that trainees acquire the set of occupational competences (skills, knowledge and attitude) required at the working place and defined in the occupational standards (OS).

This curriculum has been developed by a group of professional experts from different Regional TVET Bureaus, colleges, Industries, Institutes and universities based on the occupational standard for crop production Level III**.**

The curriculum development process has been actively supported and facilitated by **Ministry of Labor and Skills**

TVET-Program Design

1.1 TVET-Program Title: for crop production Level III.

1.2 TVET-Program Description

The Program is designed to develop the necessary knowledge, skills and attitude of the trainees to the standard required by the occupation. The contents of this program are in line with the occupational standard. The Trainees who successfully completed the Program will be qualified to work as a **Crop production technician** with competencies elaborated in the respective OS. Graduates of the program will have the required qualification to work in the **agriculture** sector in the field of **Crop production.**

The prime objective of this training program is to equip the Trainees with the identified competences specified in the OS. Graduates are therefore expected to apply field Crops Establishment and Management, Horticultural Crops management and Propagation, Perform Irrigation Schedule and crop water requirement, Perform Soil test and apply integrated soil fertility management, Apply Plant Nutrition Program and Fertigation, Apply crop pest management and Disorders, Perform Post-Harvest management for Field Crops, Perform Post-Harvest management for Horticultural Crops, Apply Chemicals and Biological Agents for the Control of Pests and Apply Digital Technology in Agriculture in accordance with the performance criteria and evidence guide described in the OS.

1.3 TVET-Program Training Outcomes

The expected outputs of this program are the acquisition and implementation of the following units of competences:

AGR CRP3 01 0322 Apply field Crops Establishment and Management
AGR CRP3 02 0322 Horticultural Crops management and Propagation
AGR CRP3 03 0322 Perform Irrigation Schedule and crop water requirement
AGR CRP3 04 0322 Perform Soil test and apply integrated soil fertility management
AGR CRP3 05 0322 Apply Plant Nutrition Program and Fertigation
AGR CRP3 06 0322 Apply crop pest management and Disorders
AGR CRP3 07 0322 Perform Post-Harvest management for Field Crops
AGR CRP3 08 0322 Perform Post-Harvest management for Horticultural Crops
AGR CRP3 09 0322 Apply Chemicals and Biological Agents for the Control of Pests
AGR CRP3 10 0322 Apply Digital Technology in Agriculture

1.4 Duration of the TVET-Program

The Program will have duration of **589 hours** including the on school/ Institution training and on-the-job practice or cooperative training time. Such cooperative training based on realities of the industry, nature of the occupation, location of the TVET institution, and other factors will be considered in the training delivery to ensure that trainees acquire practical and workplace experience.

s.no	Unit competency	TVET Institution training		Cooperative training	Total hours	Remarks
		Theory	Practical			
1.	Apply field Crops Establishment and Management	8	12	42	62	
2.	Horticultural Crops management and Propagation	12	12	49	73	
3.	Perform Irrigation Schedule and crop water requirement	8	12	33	55	
4.	Perform Soil test and apply integrated soil fertility management	12	12	35	59	
5.	Apply Plant Nutrition Program and Fertigation	8	12	35	55	
6.	Apply crop pest management and Disorders	12	12	35	59	
7.	Perform Post-Harvest management for Field Crops	8	12	42	62	
8.	Perform Post-Harvest management for Horticultural Crops	8	12	35	55	
9	Apply Chemicals and Biological Agents for the Control of Pests	12	12	42	66	
10	Apply Digital Technology in Agriculture	8	12	21	43	

1.5 Qualification Level and Certification

Based on the descriptors elaborated on the Ethiopian National TVET Qualification Framework (NTQF) the qualification of this specific TVET Program is **Level III**

The trainee can exit after successfully completing the modules in one level and will be awarded the equivalent institutional certificate on the level completed. However, only institutional certificate of training accomplishment will be awarded.

1.6 Target Groups

Any citizen who meets the entry requirements under items 1.7 and capable of participating in the training activities is entitled to take part in the Program.

1.7 Entry Requirements

The prospective participants of this program are required to possess the requirements or directive of the **Ministry of Labor and Skills**.

1.8 Mode of Delivery

This TVET-Program is characterized as a formal Program on middle level technical skills. The mode of delivery is co-operative training. The time spent by the trainees in the real work place/ industry will give them enough exposure to the actual world of work and enable them to get hands-on experience. The co-operative approach will be supported with school-based lecture-discussion, simulation and actual practice. These modalities will be utilized before the trainees are exposed to the industry environment.

Hence based on the nature of the occupation, location of the TVET institutions, and interest of the industry alternative mode of cooperative training such as apprenticeships, internship and traineeship will be employed. In addition, in the areas where industry is not sufficiently available the established production and service center /learning factories in TVET institutions will be used as cooperative training places. The Training-Institution and identified companies have forged an agreement to co-operate with regard to the implementation of this program.

1.9. TVET-Program Structure

Unit of Competence		Module Code & Title		Training Outcomes	Duration (In Hours)
AGR CRP3 01 0322	Apply field Crops Establishment and Management	**AGR CRP3 M01 0422**	Applying field Crops Establishment and Management	• Prepare basic machinery and equipment • Assess Field crop condition, growth and requirements • Prepare for Field crop establishment Planting/sowing the crop • Apply fertilizer and soil amendments • Monitor crop maturity requirements • Complete cleaning and hygiene operations	62
AGR CRP3 02 0322	Horticultural Crops management and Propagation	**AGR CRP3 M02 0422**	Managing Horticultural Crops and Propagation	• Prepare planting plan • Implement horticultural Crop management • Prepare propagating media • Prepare parent material • Undertake propagation • Complete propagation activities	73
AGR CRP3 03 0322	Perform Irrigation	**AGR CRP3 M03 0422**	Performing irrigation Schedule	• Monitor crop environment • Check water supply and availability	55

	Schedule and crop water requirement		and crop water requirement	• coordinate irrigation shifts and perform irrigation system • Record irrigation information and activities	
AGR CRP3 04 0322	Perform Soil test and apply integrated soil fertility management	**AGR CRP3 M04 0322**	Performing soil test and apply integrated soil fertility management	• Soil sampling and prepare for Integrated soil fertility management • Conduct soil analysis and interpret results • Identify integrated soil fertility management practices • Carry out Integrated soil fertility operations	59
AGR CRP3 05 0322	Apply Plant Nutrition Program and Fertigation	**AGR CRP3 M05 0422**	Applying Plant Nutrition Program and Fertigation	• Prepare for implementation of plant nutrition program • Monitor soil pH • Determine nutritional problems • Prepare materials and equipment to apply fertilizers • Operate the fertigation process • Complete fertigation	55
AGR CRP3 06 0322	Apply crop pest management and	**AGR CRP3 M06 0422**	Applying crop pest management and	• Survey pest infestation • Plan for the implementation of pest	59

	Disorders		Disorders	control measures • Implement control measures • Monitor effectiveness of control measures	
AGR CRP3 07 0322	Perform Post-Harvest management for Field Crops	**AGR CRP3 M 07 0422**	Performing post-harvest management for Field Crops	• Prepare for implementation of post-harvest operations • Plan harvest strategy • Monitor moisture content • Implement harvest schedule • Co-ordinate post-harvest work • Implement post-harvest treatments • Implement packing and storage requirements of produce • Implement hazardous waste disposal guidelines	62
AGR CRP3 08 0322	Perform Post-Harvest management for Horticultural Crops	**AGR CRP3 M 08 0422**	Performing post-harvest management for Horticultural Crops	• Plan and implement horticultural crop harvest • Prepare for implementation of post-harvest operations. • Co-ordinate post-harvest activities Implement post-harvest treatments	55

				• Implement hazardous waste disposal guidelines • Implement packing and appearance requirements of produce • Implement packing and appearance	
AGR CRP3 09 0322	Apply Chemicals and Biological Agents for the Control of Pests	**AGR CRP3 M09 0422**	Applying Chemicals and Biological Agents for the Control of Pests	• Apply instructions and maintenance • Use chemical application equipment • Apply chemicals & bio-agents • Complete application and record keeping • Transport, handle, store chemicals & bio-agents	66
AGR CRP3 10 0322	Apply Digital Technology in Agriculture	**AGR CRP3M 10 0422**	Applying Digital Technology in Agriculture	• Understand the Concept of digital technology • Apply Digital technologies among rural population and farmers • Recording and documentation	43

*The time duration (Hours) indicated for the module should include all activities in and out of the TVET institution.

1.10 Institutional Assessment

Two types of evaluation will be used in determining the extent to which training outcomes are achieved. The specific training outcomes are stated in the modules. In assessing them, verifiable and observable indicators and standards shall be used.

The **formative assessment** is incorporated in the training modules and form part of the training process. Formative evaluation provides the trainee with feedback regarding success or failure in attaining training outcomes. It identifies the specific training errors that need to be corrected, and provides reinforcement for successful performance as well. For the teacher, formative evaluation provides information for making instruction and remedial work more effective.

Summative Evaluation the other form of evaluation is given when all the modules in the program have been accomplished. It determines the extent to which competence have been achieved. And, the result of this assessment decision shall be expressed in the term of institutional Assessment implementation guidelines.

Techniques or tools for obtaining information about trainees' achievement include oral or written test, demonstration and on-site observation.

1.11 TVET Teachers Profile

The teachers conducting this particular TVET Program are A Level and above who have satisfactory practical experiences or equivalent qualifications.

LEARNING MODULE 01

TVET-PROGRAMME TITLE: Crop production Level III

MODULE TITLE: Applying Field Crops Establishment and Management

MODULE CODE: AGR CRP3 M01 04222

NOMINAL DURATION: 62. Hours

MODULE DESCRIPTION: This module covers the knowledge, skills and attitude required to prepare basic machinery and equipment, assess field crop condition, growth and requirements, prepare for field crop establishment, seeding/sowing the crop, apply fertilizer and amendments, monitor crop maturity requirements, and complete cleaning and hygiene operations..

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

LO1. Prepare basic machinery and equipment

LO2. Assess Field crop condition, growth and requirements

LO3. Prepare for Field crop establishment

LO4. Planting/sowing the crop

LO5. Apply fertilizer and soil amendments

LO6. Monitor crop maturity requirements

LO7. Complete cleaning and hygiene operations

MODULE CONTENTS:

LO1. Preparing basic machinery and equipment

1.1. Selecting, maintaining and confirming basic Machinery and equipment

1.2. Attaching and calibrating equipment securely.

1.3. Identifying existing and potential OHS hazards and their control

1.4. Emergency operating procedures

1.5. Relevant policies, legislation and regulations

LO2. Assessing field crop condition, growth and requirements

2.1 Monitoring crops moisture and their needs

2.2 Identifying pest survey and control alternatives

2.3 Establishing sites for regular soil moisture measurement

2.4 Measuring moisture levels and calculating soil water moisture percentage

2.5 Calculating and applying crop water requirements.

LO3. Preparing for field crop establishment

3.1. Monitoring soil and weather conditions for optimal sowing conditions

3.2. Application of soil and water conservation practices.

3.3. Identification of seed source and quality

3.4. Confirming seeding, fertilizer, and pest control requirements.

3.5. Identifying crop calendar

3.6. Types and methods of irrigation

3.7. Preparing contingency plans.

LO4. Planting or sowing crops

4.1 Selecting, using and maintaining suitable PPE

4.2 Planting and fertilizer applications

4.3 Planting pattern and calculating land equivalent ratio.

4.4 Coordinating pest control, seed treatment and fertilizer applications.

4.5 Identifying, assessing and controlling environmental implications.

LO5. Applying fertilizer and soil amendments

5.1.Soil amendments and fertilizer application

5.2.Economic threshold data and action targets

5.3.Assessing, recording and reporting crop growth stages

5.4.Principles and method of fertilizer application

5.5.Types, time and amount of soil amendments

LO6. Monitoring crop maturity requirements

6.1. Assessing, recording and reporting crop growth stages

6.2. Monitoring crop maturity

6.3. Identifying the crop maturity indicators

6.4. Time and method of harvesting

LO7. Completing cleaning and hygiene operations

7.1. Cleaning equipment

7.2. Disposing off containers, waste and debris

7.3. Completing required records and documentation

LEARNING METHODS:

- Lecture and Discussion
- Demonstration
- Simulation
- Role playing

ASSESSMENT METHODS:

- Written test with Oral questioning
- Practical demonstration

ASSESSMENT CRITERIA:

LO.1 Prepare basic machinery and equipment

- Basic Machinery and equipment are selected and confirmed against the work plan and prepared to manufacturer's specifications.
- Equipment securely attached and calibrated for operation to manufacturer's specific at
- Existing and potential OHS hazards in the workplace are identified, risks assessed and controlled in line with organization requirements.

LO.2 Assess Field crop condition, growth and requirements

- Crops are monitored to assess moisture and their needs and observations are recorded and reported.
- Pest survey and control alternatives are identified in line with crop type and level of infestation present and taking into account expert advice if obtained.
- Sites for regular measurement of soil moisture are established in consultation with survey advice.
- Soil probe is used to measure moisture levels and soil water moisture percentage calculated.
- Water requirements are calculated in line with standing crop and forecast weather conditions.

LO.3Prepare for Field crop establishment

- Soil and weather conditions are monitored for optimal seeding/sowing conditions.
- Soil and water conservation practices are applied before crop establishment.
- Seeding, fertilizer, and pest control requirements are confirmed against the work plan and prepared to manufacturers specifications using safe handling procedures.
- Crop calendar for crops establishment is identified
- Irrigation type and method for crop establishment is identified
- Contingency plans are prepared for unusual seasonal Conditions.

LO.4Planting/sowing the crop

- Suitable personal protective clothing and equipment are selected, used and maintained in seeding/sowing operation in accordance with OHS requirements.
- Planting/sowing and fertilizer applications are carried out in line with the work plan.
- The planting pattern marked and land equivalent ratio is calculated
- Pest and weed control and seed treatment is coordinated with planting and fertilizer applications as required.

- Environmental implications associated with planting/sowing operations are identified, assessed and controlled in line with organization requirements

LO.5 Apply fertilizer and soil amendments

- Fertilizer and soil amendments are selected and applied based on recommendations for growth stages and taking into account expertise advice if obtained.
- Economic threshold data is identified in line with action targets.
- Crop growth stages are assessed, recorded and reported.
- Water is applied according to the identified need and the requirement.
- Fertilizer application principles are recognized and implemented
- The type and amount of soil amendments are applied.
- All fertilizer applications are undertaken in the full consideration of adverse environmental impacts.

LO.6 Monitor crop maturity requirements

- Crop growth stages are assessed, recorded and reported
- Crop maturity is monitored and the need for further applications is determined.
- The crop maturity indicators are identified.
- The timing and method of harvest is determined.

LO.7 Complete cleaning and hygiene operations

- Equipment is cleaned in accordance with manufacturer's specifications, organizational procedures and regulations.
- All containers, leftover fluids, waste and debris from the maintenance and servicing work are disposed of safely and appropriately.
- All required records and documentation are completed accurately and promptly in accordance with organizational requirements.

Annex: Resource Requirements

AGR CRP3 M01 04222Applying Field Crops Establishment and Management				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by the trainer	25	1:1
	Operation sheet	prepared by the trainer	25	1:1
2.	Reference Books			
3.1	Tillage practices for crop production in summer rainfall areas.	Holland JF, Doyle AD and Morley JM (1987)	5pcs	1:P5
3.2	PRACTICALM ANUAL on FIELD CROPS	Dr. L.R. Yadav Dr. O.P. Sharma Dr. N.L.Jat	5pcs	1:5
4.	Journals/Publication/Magazines			
B.	**Learning Facilities & Infrastructure**			
1.	Class room	$1.2m^2$	1	1:25
2.	chair	standard		
3.	Teachers chair	standard	1pcs	1:25
	Teachers table	Standard	1pcs	1:25
	Black /white board	DMWP811VESAMB	1pcs	1:25
	Computer/lap top	Dell desktop	5pcs	1:5
C.	**Consumable Materials**			

1.	Dusterwhite/blac k board)	Standard	1pcs	1:25
2	Chalk		1Packet	1:25
5	Marker	For white board	1packet	1:25
6	Paper	A4 golden	1dasta	1:25
8	Flip chart	23mm*30mm	1 pcs	1:25
9	Pen		1pcs	1:25
10	Stapler	Standard	1pcs	1:25
D.	**Tools and Equipments**			
1.	Seed drills	Single row manually operated seed drill: forl large-size vegetable and grain seeds large grain seed	1pcs	1:25
2	Air seeders	Model Width. 8'6" (2.59 m). 10'6" (3.2 m) Length. 17'10" (5.43 m). 23'6" (7.16 m); Tank Capacity. 115 BSH (4.07 m3). 133 BSH (4.70 m3); Front .	1pcs	1:25
3	Plough	chisel ploughs	1pcs	1:25
4	Harrows	Heavy Grass, 7'-6", 1/2" dia. x 2 1/2", -, 160 ; Chain and Spike, 7'-6", 1/2" dia. x 3 1/2", -, 195 ...	1pcs	1:25
5	Cultivators	tractor mounted spring loaded cultivators	1pcs	1:25
6	Augers and bins	6, 8 and 10” diameter augers fit bins from 18 to 60' in diameter	1pcs	1:25
7	Row planters	Pull-Type Planter, 8-row Rigid, 12-row, 16-row, or 24-row Centerflex ... cylinders and NG Plus 2 row units with seed hopper and lid	1pcs	1:25
8	Row maker	Size, 6 Feet ; Material, High Carbon Steel ; Country of Origin, Made in India ; Weight, 102 Kg ; Height Adjustment, 5-10 Inch ...	1pcs	1:25

9	Ditcher, ridge maker	Standard	1pcs	1:25
10	Sprayer equipment	Tank: HDPE, pressure: 15-25kg/cm², output: 6-8 Ltr/min	1pcs	1:25
11	Fertilizer applicator	Standard	1pcs	1:25
12	Fertilizer spreader	Standard	1pcs	1:25
13	Chipping hoe	Standard	1pcs	1:25
14	Cultivation equipment	Standard	1pcs	1:25
15	irrigation equipment	Standard	1pcs	1:25
16	Broad bed maker (BBM)	Standard	1pcs	1:25
17	Tie Ridger	standard	1n^{o}	1:25
18	Lime spreader	standard	1n^{o}	1:25

LEARNING MODULE 02

TVET-PROGRAMME TITLE: Crop production **Level III**

MODULE TITLE: Managing and propagating horticultural Crops

MODULE CODE: AGR CRP3 M02 04222

NOMINAL DURATION: 73 Hours

MODULE DESCRIPTION: This module covers the knowledge, skills and attitude required to prepare planting plan and implementing horticultural crop management practices. The unit also covers propagation media preparation, parent material selection, understand propagation techniques and undertake propagation.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

LO1. Prepare planting plan

LO2. Implement horticultural Crop management

LO3. Prepare propagating media

LO4. Prepare parent material

LO5. Undertake propagation

LO6. Complete propagation activities

MODULE CONTENTS:

LO1.Preparing planting plan

1.1. Basic plant physiology
1.2. Determining the type and method(s)of horticultural crop planting
1.3. Type of horticultural crop and method(s) of planting
1.4. Assessing and calculatingthe resources required for the planting operations.
1.5. Selecting and organizingthe chemical applications
1.6. preparing production plan and ensuring any potential environmental impacts.
1.7. Ensuring proper disposal of containers, drums and other waste.
1.8. Identifying and assessing occupational health & safety hazards
1.9. Identifying sought and obtained approvals required for the planting operations.
1.10. Determining measurable indicators, specifications and targets

LO2.Implementing horticultural Crop management

2.1. Undertaking measurement of soil moisture to calculate soil water percentage
2.2. Calculating water requirements according to soil analysis data, standing crop, and weather conditions forecast.
2.3. Assessing soil amendments and nutrient requirements for crops and identifying

deficiencies.

2.4. Marking out the planting pattern.

2.5. Factors affecting horticultural crops production

2.6. Implementing sustainable land management.

2.7. Monitoring and planning horticultural crops to maintain water and nutritional requirements for optimal production.

2.8. Monitoring pest levels and modifying the control program.

2.9. Assessing benefits from fertilization methods and documenting analysis for future management programs.

2.10. Monitoring and documenting cropping programs efficiency and effectiveness.

2.11. Documenting relevant data for continual analysis and effective horticulture crop management.

LO3. Preparing propagation media

3. 1Selecting media components based on propagation method and plant needs.

3. 2 Testing and treatingpropagation media is to ensure media specifications

3. 3 Handling of media and components following OHS requirements

3. 4Selection of storage requirements for the unused propagation media.

3. 5 Selecting conditioning and storage requirements for maximum viability of propagating material

3. 6Preparation of growing site is suit species and propagation method

LO4. Preparing parent material

4. 1.Interpreting workplace information and organizing tasks.

4. 2. Selecting tools, equipment and machinery.

4. 3. Identifying and selecting parent plant.

4. 4. Preparing parent plant and employing suitable method of propagation.

4. 5. Collecting propagation material.

4. 6. Maintaining viability of materials by appropriate storage.

4. 7. Implementing hygiene practices.

4. 8Identifying OHS hazards, assessed, controls implemented and reported risks

LO5. Undertaking propagation

5.1. Selecting propagation method.

5.2. Preparing propagation material.

5.3. Preforming propagation techniques (Types of propagation technique)

5.4. Handling of plants to minimizes damage.

5.5. Completing records accurately and at the required time

5.6. Identifying and reporting out-of-specification process and equipment performance.

LO6. Complete propagation activities

6. 1Cleaning equipment.

6. 2Disposing off/storing unused propagation materials.

6. 3Collecting, treating, disposing off or recycling waste.

6. 4Recording workplace information, the appropriate format.

LEARNING METHODS:

- Lecture and Discussion
- Demonstration
- Simulation
- Role playing

ASSESSMENT METHODS:

- Written test with Oral questioning
- Practical demonstration

ASSESSMENT CRITERIA:

LO.1 Prepare planting plan

- The type of horticultural crop and method(s) of planting are determined from the organizations production manual/management plan and availability of planting material
- The resources required for the planting operations areassessed and calculated.
- The chemical applications that are required prior to andpost planting is selected and organized to occur at an appropriate time
- The plan is prepared in line with the overall production plan of the organizations and ensuring any potential environmental impacts, including the proper disposal of containers, drums and other waste
- Occupational health & safety hazards are identified, assessed
- Any approvals that are required for the planting operations are identified, sought and obtained
- Measurable indicators, specifications and targets are determined, based on the production/ management plan and the method, resources, and seed, seedling and cutting to be used.

LO.2 Implement horticultural Crop management

- Measurement and assessment of soil moisture is undertaken to calculate soil water percentage.
- Water requirements are calculated according to soil data analysis, standing crop, and forecast weather conditions.
- Soil amendments and nutrient requirements for crops are assessed and deficiencies identified.
- The planting pattern is marked out according to the production plan.
- Factors affecting horticultural crops production are identified.
- Sustainable land management is implemented according to horticultural crop specification environmental standards.
- Horticultural Crops monitored and planned to maintain water and nutritional requirements for optimal production.
- Pest levels are monitored and the control program modified as required.
- Benefits from fertilization methods are assessed and documented for analysis in future management programs.

- Cropping programs are monitored for efficiency and effectiveness, and documented for future best practice.
- Relevant data is documented for continual analysis and effective horticulture crop management.

LO.3. Prepare propagating media

- Media components are selected according to propagation method and plant needs.
- Propagation media is tested and treated to ensure the product complies with media specifications
- Media and components are handled according to OHS requirements.
- Storage requirements for the unused propagation media are selected.
- Conditioning and storage requirements are selected to ensure maximum viability of propagating material
- Growing site is prepared to suit species and propagation method.

LO.4Prepare parent material

- Workplace information is interpreted and tasks organized to achieve daily work routine within time constraints.
- Tools, equipment and machinery are selected according to propagation method and work procedures.
- Parent plant is identified and selected according to health, vigour and desired characteristics.
- Parent plant is prepared and the method of taking propagation material suitable to the species is employed in accordance with organizational procedures.
- Propagation material is collected according to the species.
- Viability of materials is maintained by appropriate storage in accordance with the requirements of the species.
- Hygiene practices are implemented according to guidelines.
- OHS hazards are identified, risks assessed, controls implemented and reported to the supervisor

LO.5. Undertake propagation

- Propagation method is selected in accordance with crop type
- Propagation material is prepared according to the propagation method and the characteristics of species.
- Propagation techniques are performed according to the selected crop type

- Plants are handled to minimizes damage.
- Records are completed accurately and at the required time in accordance with organizational guidelines.
- Out-of-specification process and equipment performance is identified, rectified and/or reported.

LO.6. Complete propagation activities

- Equipment are cleaned as required.
- Unused propagation material is disposed of/stored
- Waste generated by both the propagation and cleaning procedures is collected, treated, disposed of or recycled.
- Workplace information is recorded in the appropriate format..

Annex: Resource Requirements

AGR CRP3 M02 04222Managing and propagating horticultural Crops				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	prepared by the trainer		
2.	Reference Books			
3.1	vegetable practice	Volume 10	1pcs	1:25
3.2	Fundamental horticulture	Edition 2	1pcs	1:25
4.	Journals/Publication /Magazines			
B.	**Learning Facilities & Infrastructure**			
1.	Class room	1.2m2	1	1:25
2.	Arm chair	standard	25	1:1
3.	Teachers chair	standard	1	1:1
4	Teachers table	Standard	1	1:1
5	Black /white board	Standard	1	1:25
6	Computer/lap top	Standard	1	1:25
C.	**Consumable Materials**			
1.	Duster (white/black board)	Standard	1	1:25
2	Chalk	Standard	1 packet	1:25
5	Marker	Standard	1 packet	1:25
6	Paper	A4	2 Ream	2:25
8	Flip chart	Standard	1set	1:1
9	Pen	Standard	2 Piece	2:25

10	Stapler	Standard	1pices	1:25
D.	**Tools and Equipment**			
1.	Razor blades and other cutting instruments	Standard		
2	shovel,	Pico	1	1:25
3	plastic fencing,	Black 6m*100 roll	1	1:25
	tape,	Plastic	1pcs	1:25
	support structures,	Standard	1pcs	1:25
	labels,	Standard	1pcs	1:25
	irrigation equipment,	Set standard	1pcs	1:25
	heaters,	Standard	1pcs	1:25
	Wheelbarrow	Standard	1pcs	1:25
	fans,	Standard	1pcs	1:25
	vents, f	Standard	1pcs	1:25
	ogging/ misting systems,	Standard	1pcs	1:25
	Screens	Standard	1pcs	1:25
	•Secateurs,	Standard	1pcs	1:25
	propagation knives,	Grafting knive and budding knive	1pcs	1:25

LEARNING MODULE 03
TVET-PROGRAMME TITLE: CROP PRODUCTION LEVEL III
MODULE TITLE : Performing irrigation Schedule and crop water requirement
MODULE CODE : AGR CRP3 M03 0422
NOMINAL DURATION : 55Hours
MODULE DESCRIPTION : This unit covers the knowledge, skills and attitude required to monitor plant or crop environment, check water supply and availability, coordinate irrigation shifts, perform irrigation system process, and record irrigation information and activities perform in watering shifts, assist in monitoring factors that influence water requirements and adjust the irrigation schedule to accommodate changes in those factors.
LEARNING OUTCOMES At the end of the module the trainee will be able to: LO1. Monitor crop environment LO2. Check water supply and availability LO3. coordinate irrigation shifts and irrigation system LO4. Record irrigation information and activities
MODULE CONTENTS: **LO1. Monitoring crop environment** 1.1. Monitoring crop environment and interoperating results 1.2. Crop inspection on signs of stress. 1.3. Recommending changes to irrigation shifts **LO2. Checking water supply and availability** 2.1 Identification and manipulating type of crop and water requirement 2.2 Recognition of external factors affecting irrigation requirements 2.3 Preparing and understanding irrigation schedule 2.4 Giving sufficient notice of water order **LO3. Coordinating irrigation shifts and performing irrigation system** 3.1. Briefing and coordinating resource 3.2. Implementing agreed irrigation schedule 3.3. Recording frequency of irrigation 3.4. Measuring and recording water usage 3.5. Calculating water usage differences between estimated water use and actual water 3.6. Measuring water quality. 3.7. Assessing plant or crop growth and water use efficiency

3.8. Assessing and measuring soil chemical characteristics and moisture 3.9. Selection and use of relevant personal protective clothing and equipment 3.10.Identification and assessing OHS hazards and risk **LO4 Recording irrigation information and activities** 4.2 Recording plant or crop response to environment 4.3 . Recording crop water use irrigation schedule 4.4 Recording irrigation shifts system/data
LEARNING METHODS:
• Lecture and Discussion • Braine storming • Practical demonstration • Practical exercise • Audio visual • Role playing
ASSESSMENT METHODS:
• Written test • Oral questioning • Practical (group work) • Assignment • Presentation

ASSESSMENT CRITERIA:

LO1. Monitor crop environment

- Crop environment are monitored and results interpreted according to organization policy and procedures.
- Crops are inspected for signs of stress.
- Changes to irrigation shifts are recommended according to environmental conditions and crop requirements.

LO2. Check water supply and availability

- Type of crop identified and crop water requirement is manipulated
- External factors affecting irrigation requirements are recognized
- Irrigation schedule is prepared according to water management authority standards and procedures.
- Sufficient notice of water order/schedule is given, if necessary, to ensure water is available when required.

LO3. Coordinate irrigation shifts and perform irrigation system

- Resources are coordinated and personnel briefed to deliver requirements.
- Agreed irrigation schedule is implemented.
- Frequency of irrigation is recorded.
- Water usage is measured and recorded and does not exceed water allocation for a given period.
- Differences between estimated water use and actual water used are calculated.
- Water quality is measured according to Organization occupational health standard (OHS) policy and procedures.
- Plant or crop growth and water use efficiency is assessed.
- Soil chemical characteristics are measured and soil moisture is assessed.

LO4. Record irrigation information and activities

- Plant or crop environment data is recorded.
- Water orders/schedules and water usage is recorded.
- Irrigation shifts are recorded**.**

Annex: Resource Requirements

AGR CRP3 M03 0422 Performing irrigation Schedule and crop water requirement				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
A.	Learning Materials			
1.	TTLM	prepared by the trainer	25	1:1
3	Practical manual/operation sheet	prepared by the trainer	25	1:1
	Reference Books			
2.1	web site/ Internet	Google.com et	1	1:1
2.2	Agronomy text	B.Chandrasekaran K.Annadurai, E.Somasundaram © 2010,	25	1:1
4.	Journals/Publication/Magazines			
B.	Learning Facilities & Infrastructure			
1.	Class room	$1.2m^2$	1	1:25
2.	Arm chair	Standard	25	1:1
3.	Teachers chair	Standard	1	1:1
4.	Teachers table	Standard	1	1:1
5.	Black /white board	Standard	1	1:25
6.	Computer/lap top	Standard	1	1:25
7.	LCD Projector	Standard	1	1:25
8	Teachers uniform	Standard	1	1:25
9	Laptop bag	Standard	1	1:25
C.	Consumable Materials			
1.	Duster (white/black board)	Standard	1	1:25
2	Chalk	Standard	1 packet	1:25

5	Marker	Standard	1 packet	1:25
6	Paper	A4	2 Ream	2:25
	Flip chart	Standard	1set	1:1
8	Pen	Standard	2 Piece	2:25
9	Stapler	Standard	1pices	1:25
10	Steeple	Standard	1packet	1:25
D.	Tools and Equipment			
1.	Rake	Standard	7pcs	1:5
	Machetes	Standard	5 pcs	1:7
	Sickles	Standard	7 pcs	1:5
	Tape meter	Standard	7 pcs	1:5
	Secateurs,	Standard	5 pcs	1:7
	Spades,	Standard	7 pcs	1:5
	Forks,	Standard	5 pcs	1:7
	Hoes	Standard	5 pcs	1:7
	Cart	Standard	25 pcs	1:1
	Water can	Standard	5 pcs	1:7
	Knives	Standard	5 pcs	1:7
	Dust bins	Standard	1 pcs	1:25
	Sprayers	Standard	3 pcs	3:25
	wheelbarrow	Standard	3pcs	3:25
	Soil Augare	Standard	5pcs	1:7
	Soil Tensiometer	Standard	5pcs	1:7
	Oven	Standard	1pcs	1:25
	Sample ring or core	Set	1pcs	1;25
	Rubber boots/shoes	40,42	25pcs	1:1
	safety goggles,	standard	25pcs	1:1
	face mask	standard	5pcs	1:1
	Ear protectors	hearing EN 325 protectors	25pcs	1:1

	Overalls	Apron/Smock.	25pcs	1:1
	Gloves	Latex/Rubber:	25pcs	1:1
	sun hat	Misty Mountain Expedition Nylon Sun Hats Lightweight	25pcs	1:1

LEARNING MODULE 04

TVET-PROGRAMME TITLE: CROP PRODUCTION LEVEL III

MODULE TITLE : Preforming Soil test and apply integrated soil fertility management

MODULE CODE : AGR CRP3 M04 0422

NOMINAL DURATION : 59Hours

MODULE DESCRIPTION : This module covers the process of performing soil test and applying integrated soil health and fertility management technologies and practices required for agricultural crop production. This unit specifies the competence required to implement to boost productivity of soils crops while maintaining soil health and fertility. The unit involves Soil sampling, conduct soil analysis and interpret results, preparing for Integrated soil fertility management, identify integrated soil fertility management practices and carry out Integrated soil fertility operations. Besides, it includes operation and quality control application issues

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

LO1. Soil sampling and prepare for Integrated soil fertility management

LO2.Conduct soil analysis and interpret results

LO3 Identify integrated soil fertility management practices

LO4. Carry out Integrated soil fertility operations

MODULE CONTENTS:

LO1. Soil sampling and prepare for Integrated soil fertility management

1.1. Preparing job sheet or work order
1.2. Identification of field Surveying activity and contractors
1.3. Identifying and applying sampling operations and techniques
1.4. Performing and dispatching sample collection,
1.5. preparation and labelling of composite soil
1.6. Undertaking precautions during collection and storage of soil samples
1.7. specifications of integrated soil fertility technologies and practices
1.8. Selecting and preparing tools and equipment
1.9. Selecting and checking integrated soil fertility inputs
1.10. Identifying existing and potential OHS hazards
1.11. Emergency operating procedures
1.12. Selecting, using and maintaining PPE
1.13. Recording sample data

LO2.Conducting soil analysis and interpreting results

2.1 Determining physical, chemical and biological characteristics of soil

2.2 Cleaning and returning sampling and testing tools and equipment

2.3 Recording results

2.4 Classification of the soil types

2.5 Determining the acceptable soil physical and chemical parameters

LO3 Identifying integrated soil fertility management practices

3.1 Identifying and confirming integrated soil fertility technologies and practices

3.2 Measuring and transporting required quantities of integrated soil fertility inputs

3.3 Monitoring and checking inputs

3.4 preparation of integrated soil fertility and equipment

3.5 Selecting application method of integrated soil fertility input

LO4. Carrying out Integrated soil fertility operations

4.1. Handling and transporting integrated soil fertility inputs

4.2. Applying integrated soil fertility inputs

4.3. Cleaning and sterilizing tools and equipment

4.4. Disposing off waste and debris

4.5. Completing workplace records

4.6. Inspecting and checking integrated soil fertility inputs

4.7. Recording and documenting

LEARNING METHODS:

- Lecture and Discussion
- Braine storming
- Practical demonstration
- Practical exercise
- Audio Visual
- Role playing

ASSESSMENT METHODS:

- Written test
- Oral questioning
- Practical (group work)
- Assignment
- Presentation

ASSESSMENT CRITERIA

LO1. Soil sampling and prepare for Integrated soil fertility management

- Job sheet or work order is prepared
- Field Surveying activity and contractors are identified according to site plans and organization work procedures
- Sampling operations and techniques are identified and employed according to the procedures.
- Sample collection, preparation and labelling of composite soil samples are performed and dispatched according to testing agency requirements and organization work procedures
- Precautions during collection and storage of soil samples undertaken according to the guideline
- Specifications for Integrated soil fertility technologies and practices are confirmed according to instructions and Organization procedures.
- Tools, accessories, Machinery and equipment are selected and prepared.
- Integrated soil fertility inputs are selected and checked for serviceability.
- Existing and potential Occupational Health and Safety (OHS)hazards are identified.
- Suitable personal protective equipment (PPE)is selected, used and maintained.
- Data recorded in an established format for soil sample record sheet.

LO2.Conduct soil analysis and interpret results

- The physical, chemical and biological characteristics of the soil are determined using mobile soil test kits or other technologies according to practice guidelines
- Sampling and testing tools and equipment are cleaned and returned to storage.
- Results are recorded in an established format according to organization work procedures
- The soil types of the sample area are classified according to standards for soil classification
- The acceptable soil physical and chemical parameters for a specified crop are determined

LO3 Identify integrated soil fertility management practices

- Integrated soil fertility technologies and practices are clearly identified and confirmed.
- Required quantities of integrated soil fertility inputs are measured and transported to

preparation area.

- Inputs required for integrated soil fertility are regularly monitored and checked against specifications and remedial action is taken according to Organization procedures and product specifications.
- Integrated soil fertility input Preparation methods and equipment to be used are confirmed.
- Operation of integrated soil fertility input application method is selected based on the guidelines and principles

LO4. Carry out Integrated soil fertility operations

- Integrated soil fertility inputs are handled and transported.
- Integrated soil fertility inputs are applied according to agro ecology, soil type, cropping system and crop type
- Input application time is carried out according to the planting plan.
- Tools and equipment are cleaned and sterilized.
- All containers, leftover fluids, waste and debris are disposed of safely and appropriately.
- All required workplace records are completed accurately and promptly in accordance with Organization requirements.
- Integrated soil fertility inputs are inspected and checked for their quality, quantity and compliance with job sheet and product requirements.
- Integrated soil fertility application methods and results are documented accurately and promptly according to organization procedures

Annex: Resource Requirements

AGR CRP3 M04 0422 Performing Soil test and apply integrated soil fertility management				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
A.	Learning Materials			
1.	TTLM	prepared by the trainer	25pcs	1:1
2	Practical manual/operation sheet	prepared by the trainer	25pcs	1:1
2.	Reference Books			
2.1	web site/ Internet	Google.com et	1pcs	1:1
2.2	Agronomy text	B.Chandrasekaran K.Annadurai, E.Somasundaram 2010	5pcs	1:7
4.	Journals/Publication/ Magazines			
B.	Learning Facilities & Infrastructure			
1.	Class room	$1.2m^2$	1	1:35
2.	Arm chair	Standard	25pcs	1:1
3.	Teachers chair	Standard	1pcs	1:1
4.	Teachers table	Standard	1pcs	1:1
5.	Black /white board	Standard	1pcs	1:25
6.	Computer	Standard	1pcs	1:25
7.	LCD Projector	Standard	1pcs	1:25
C.	Consumable Materials			
1.	Duster (white/black board)	Standard	1pcs	1:25
2	Chalk	Standard	1 packet	1:25
5	Marker	Standard	1 packet	1:25
6	Paper	A4	2 Ream	2:25

8	Pen	Standard	2 Piece	2:25
9	Stapler	Standard	1pices	1:25
10	Steeple	Standard	1packet	1:25
11	Teachers uniform	Standard	1pices	1:25
12	Teachers bag	Standard	1pices	1:25
D.	Tools and Equipment			
1.	Rake	Standard	5pcs	1:5
2	Machetes	Standard	5pcs	1:5
3	Sickles	Standard	5pcs	1:5
4	Tape meter	Standard	5pcs	1:5
5	Secateurs	Standard	5pcs	1:7
6	Spades	Standard	5pcs	1:7
7	Forks	Standard	5pcs	1:7
8	Plastic bag	Standard	7pcs	1:5
10	Water can	Standard	5pcs	1:7
11	Knives/spatula	Standard	5pcs	1:7
12	Dust bins	Standard	2pcs	2:35
13	buckets,	Standard	5pcs	1:7
14	Canvas	Standard	1pcs	1:35
15	Hoe	Standard	5pcs	1:7
16	Wheel barrows,	Standard	3pcs	3:35
17	Trolleys,	Standard	3pcs	3:35
19	nylon rope	Standard	5 (rol)	1:7
20	pegs	Standard	25	1:1
22	Soil sample recoding sheet	Standard	35	1:1
23	GPS	Gps 720	5pcs	1:7
24	pH test kit or electronic pH testing device,	The GroLine HI98118 pH/temperature tester	1 set	1:25
25	hand held salinity or	C270 Intelligent On-line	2pcs	1:25

	EC meter,	Conductivity Monitor 0~18 M Ω · cm or 0~19.99uS/cm, 0~999.9uS/cm, 0~9999uS/cm, 0~100mS/cm,0~10000ppm		
26	sample bags	Standard	5roll	5:7
27	plastic overlays,	Standard	2 roll	2:35
28	Charts and tables of soil characteristics	Standard	5pcs	1:7
29	Hammer	Standard	2pcs	2:35
30	boots/shoes	Standard	25pcs	1:1
31	safety goggles	Standard	25pcs	1:1
32	face mask	Standard	25pcs	1:1
33	Ear protectors	Standard	25pcs	1:1
34	Overalls	Standard	25pcs	1:1
35	Gloves	Standard	25pcs	1:1
36	sun hat	Standard	25pcs	1:1

LEARNING MODULE 05

TVET-PROGRAMME TITLE: Crop Production Level III

MODULE TITLE : Applying Plant Nutrition Program and Fertigation

MODULE CODE : AGR CRP3 M05 0422

NOMINAL DURATION 55 Hours

MODULE DESCRIPTION : This module covers the skills, knowledge and attitude required to Prepare for implementation of plant nutrition program, Monitor soil pH, Determine nutritional problems in plants, Prepare materials and equipment to apply fertilizers, Operate the fertigation process and Complete fertigation

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

LO1. Prepare for implementation of plant nutrition program

LO2. Monitor soil pH

LO3. Determine nutritional problems in plants

LO4. Prepare materials and equipment to apply fertilizers

Lo5. Operate the fertigation process

LO6. Complete fertigation

MODULE CONTENTS:

LO1. Preparing for implementation of plant nutrition program

1.1. Identification of goals and targets site of soil fertility status

1.2. Soil and plant treatments materials

1.3. Locating services using site plans

1.4.OHS hazards and control their risks

1.5. Material safety data sheets (MSDS)

1.6. Selecting, using and maintaining suitable PPE

LO2. Monitoring soil pH

2.1. Monitoring soil pHin site

2.2.Soil acidity, alkalinity and salinity

2.3.Identifying, comparing, selecting and sourcing products useful in changing soil pH

2.4.Product application methods and environmental implications

LO3. Determining nutritional problems in plants

3.1. Plant nutrient deficiency and toxicity problems

3.2. Causes of nutritional problems and toxicity

3.3. Nutrient cycling and nutrient uptake

3.4. Soil amelioration

LO4. Preparing materials and equipment to apply fertilizers

4.1. Consideration for fertilizer application

4.2. Selecting and using fertilizer

4.3.Methods of fertilizer application

4.4. Selecting tools, equipment and machinery

4.5. Pre-operational and safety checks on tools, equipment and machinery

4.6. Calibrating and adjusting tools, equipment and machinery

4.7. Handling and storing fertilizers safely

LO5. Operating the fertigation process

5.1. Preparing fertigation materials

5.2. Connecting, directing and calibrating injection or fertigation equipment

5.3. Implementing startup sequence

5.4. Calculating fertilizer concentration and mixed solution

5.5. Operating, maintaining and monitoring fertigation process

5.6. Application of fertigation

5.7. Monitoring fertigation equipment

5.8. Correcting, adjusting and implementing process and equipment

LO6. Completing fertigation

6.1. Flushing out injection equipment

6.2. Cleaning equipment

6.3. Managing waste

6.4. Reporting and recording fertigation activities

LEARNING METHODS:

- Lecture and discussion
- Braine storming
- Practical demonstration
- Practical exercise
- Audio visual
- Role playing

ASSESSMENT METHODS:
• Written test • Oral questioning • Practical • Assignment • Presentation

ASSESSMENT CRITERIA:

LO1. Prepare for implementation of plant nutrition program

- Goals and target site for implementation of the plant nutrition program including soil fertility status, plant species and varieties are identified according to organization work procedures.
- Materials for soil and plant treatments available to the organizations are identified and the storage site or supplier details located.
- Services are located using site plans and in consultation with the supervisor.
- OHS hazards are identified, risks assessed, controls implemented and reported to the supervisor.
- Suitable personal protective equipment (PPE) is selected, used and maintained

LO2. Monitor soil pH

- Soil pH in the implementation site is monitored in relation to plant nutrition and according to organization work procedures.
- Products useful in changing soil pH are identified, compared, selected and sourced according to organization work procedures
- Product application methods are assessed according to product type, soils, organization work procedures, and in due consideration of the environmental implications

LO3. Determine Nutritional Problems in Plants

- Common plant nutrient deficiency and toxicity problems in plants are identified using visual inspection.
- The supervisor and/or nutritional specialist are consulted, as required, to determine causes of nutritional or toxicity problems.
- Soil ameliorants to improve soil fertility are identified, compared, selected and sourced according to organization work procedures

LO4. Prepare materials and equipment to apply fertilizers

- The right sources of specific products are identified, right rate, time and placement of fertilizer implemented according to the product type and analysis, manufacturers specifications, organization work procedures, and in due consideration of the environmental implications.
- The fertilizer to be used is selected according to fertilizer type, soils, organization work procedures, and in due consideration of the environmental implications.
- Fertilizer application methods are assessed according to fertilizer type, soils, organization work procedures, and in due consideration of the environmental implications.

- Tools, equipment and machinery are selected according to organization work procedures.
- Pre-operational and safety checks are carried out on tools, equipment and machinery according to manufacturer's specifications and organization work procedures.
- Tools, equipment and machinery are calibrated and adjusted according to manufacturers' guidelines and organization work procedures
- Fertilizers are handled and stored safely in a manner that minimizes detrimental environmental impact, and according to organization work procedures

LO5. Operate the fertigation process

- Materials are prepared to meet fertigation requirements.
- Injection or fertigation equipment is connected, as directed, and calibrated according to manufacturers' specifications
- Startup sequence is implemented according to operations manual and Organization procedures
- Fertilizer concentration is calculated and the solution thoroughly mixed according to enterprise, OHS and environmental requirements
- Fertigation process is operated and monitored to ensure delivery is maintained according to organization specifications and procedures
- Fertigation are applied according to the plant growing cycle and the organizations fertilizer calendar
- Fertigation equipment is monitored to ensure no adverse environmental impact is caused by faulty operation
- Corrections to the process and equipment adjustments are implemented as necessary

LO6. Complete fertigation

- Injection equipment is flushed out according to organization standards prior to shut down.
- Equipment is cleaned according to organization procedures.
- Waste generated by both the fertigation process and cleaning procedures is managed according to environmental protection requirements and organization OHS procedures.
- Fertigation activities are reported and recorded according to regulatory requirements and organization procedures

Annex: Resource Requirements

AGR CRP2 M05 0422 Applying Plant Nutrition Program and Fertigation				
Ite	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended**

m No.				Ratio (Item: Trainee)
A.	**Learning Materials**			
1.	TTLM	prepared by the trainers	25 no.	1:1
2	Operation sheet	Prepared by teachers	25 no.	1:1
3.	Reference Books			
3.1	Nutrient Management Handbook	IFA, WFO and GACSA, 1st ed., 2016	5 pcs	1:5
4.	Journals/Publication/Magazines			
4.1	Fertigation: Fertilization through Irrigation	IPI No. 23, 2003	5 pcs	1:5
B.	**Learning Facilities & Infrastructure**			
1.	Class room	1.2 m^2	1	1:25
2.	Workshop	6	1	1:25
3.	Library	1.7 m^2	1	1:25
4.	Arm chair		25pcs	1:1
5.	Teachers chair	Standard	1pc	1:1
6.	Teachers table	Standard	1pcs	1:1
7.	Black /white board	Standard	1pcs	1:25
8.	Computer	Standard	5pcs	1:5

9.	LCD Projector	Standard	1pcs	1:25
C.	**Consumable Materials**			
1.	Duster (white/black board)	Standard	1pcs	1:25
2	Chalk	Standard	1 packet	1:25
3	Marker	Standard	1 packet	1:25
4	Paper	A4	2 Ream	2:25
5	Flip chart	23”32”	25pcs	1:1
6	Pen	Ball point	2 Pcs	2:25
7	Fertilizers	Urea DAP NPS	5 kg 5kg 5 kg	1:5 1:5 1:5
D.	**Tools and Equipment**			
1.	Water tanker	Stainless steel >1000lts	1pcs	1:25
2	pH test kit	pH meter Litmus paper	1pcs 5 packt	1:25 1:5
3	Pumps pump fittings	2 inch Pvc	1 pcs 1 set	1:25 1:25
4	Salinity or EC meter		1pcs	1:25
5	Field tool box		1pcs	1:25
6	Backpack spray/Knapsack sprayer	Diaphragm Piston	1 pcs 1pcs	1:25 1:25
7	Sample bags		1set	10:25
8	Munsell soil color chart	40 Munsell Color Standards; color provide value, hue, chroma,	5pcs	1:5
9	Charts and illustrations of the symptoms of plant	Standard	5pcs	1:5

	nutrient deficiencies and toxicities			
10	Measuring tape	50meter length	5pcs	1:5
10	Aerial photographs	Standard	1pcs	1:25
13	Sensitive balance	capacity2100 g, Resolution 0.001g, Repeatibility 0.001 g, linearity ± 0.005 g, response time ≤ 3sec	1pcs	1:25
14	Soil map	1:15000scale	1pcs	1:25
15	Fertigation set		1pcs	1:25
16	Hat		25	1:1
17	Boots	size: extra small (xS) for children, small (S), medium (M), large (L), extra large (XL) • Quantity: 10 xS, 15 S, 15 M, 15 L, 15 XL	25	1:1
18	Gloves	Standard Vented Gloves	25pcs	1:1
19	Overalls		25pcs	1;1
20	Goggles	Black	25pcs	1:1
21	respirator/face mask	Standard	25pcs	1;1
22	Sunscreen lotion	Standard	25pcs	1;1
23	First aid Kits	Standard	5pcs	5:25

LEARNING MODULE 06
TVET-PROGRAMME TITLE: Crop Production Level III
MODULE TITLE : Applying crop pest management and disorders
MODULE CODE : AGR CRP3 M06 0422
NOMINAL DURATION : 59 Hours
MODULE DESCRIPTION : This module covers the knowledge, skills and attitude to assess/survey pest infestation, plan for the implementation of pest control measures, implement

control measures and monitor effectiveness of control measures.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

LO1. Survey pest infestation

LO2. Plan for the implementation of pest control measures

LO3. Implement control measures

LO4. Monitor effectiveness of control measures

MODULE CONTENTS:

LO1. Surveying pest infestation

1.1.Preparing survey equipment

1.2.Assessing scope and size for infestation and level of damage

1.3.Recording and reporting plants pests, disorders, beneficial organisms and natural enemies

1.4.Determination of economic threshold level

1.5.Integrated pest management (IPM) strategy

LO2. Planning for the implementation of pest control measures

2.1.Pest control measures

2.2.Selecting tools, equipment and machinery

2.3.OHS hazard, risks assessment and control

2.4.Selecting, using, maintaining and storing PPE

2.5.Selecting control measures based on social and environmental implications

2.6.Risk associated to pesticide for horticultural crop

LO3. Implementing control measures

3.1. Integrated pest management (IPM) activities

3.2. Deciding pest control methods

3.3. Maintaining clean and safe work area

LO4. Monitoring effectiveness of control measures

4.1 Monitoring control operations efficiency

4.2 Identifying and monitoring control methods

4.3 Assess effectiveness of control methods

4.4 Implementing adjustments to IPM measures

4.5 Maintaining records

LEARNING METHODS:

- Lecture and discussion

- Braine storming
- Practical demonstration
- Practical exercise
- Audio visual
- Role playing

ASSESSMENT METHODS:

- Written test
- Oral questioning
- Practical
- Assignment
- Presentation

ASSESSMENT CRITERIA:

LO1. Survey Pest Infestation

- Prepare survey equipment (quadrant and GPS)
- Assess scope and size of the infestation and level of damage
- Identify plants pests, disorders, beneficial organisms and natural enemies are reported/recorded in field notes
- Levels of pest infestations tolerated by the market or environment are identified from the Integrated Pest Management (IPM) strategy Economic threshold level of the pests are determined
- Infestation levels, about which plant health or growth objectives are identified and professional advice is obtained according to guidelines

LO2. Plan For the Implementation of Pest Control Measures

- Control measures suitable for the pest infestation and level of damage are selected from Integrated Pest Management (IPM) strategy
- Tools, equipment and machinery are selected from Integrated Pest Management (IPM) strategy
- Occupational Health and Safety hazards are identified, risks assessed, controls implemented and reported
- Suitable personal protective equipment (PPE)are selected, used, maintained and stored
- Control measures selected need to be in full consideration of social and environmental implications

LO3. Implement Control Measures

- Control measures are implemented according to the Integrated Pest Management (IPM) standards and requirements
- Implement Integrated Pest Management (IPM) activities according to Occupational Health and Safety (OHS) requirements
- Depending on the size of infestation, control methods are decided
- A clean and safe work area is maintained throughout and on completion of each work activity

LO4. Monitor Effectiveness of Control Measures

- Control operations are monitored to check the control efficiency
- Control methods are monitored to identify side effects to other plants, animals or external environment

- Assess effectiveness of control methods in reference to specified standards
- Implement adjustments to Integrated Pest Management measures, where necessary.
- Records are maintained as required.

Annex: Resource Requirements

AGR CRP2 M06 0422 Apply crop pest management and disorders				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	prepared by the trainer	25pcs	1:1
2	Operation sheet	Prepared by teachers	25pcs	1:1
3.	Reference Books			
3.1	Handbook on Important Insect Pests and diseases of major crops in	India 2018	5 pcs	1:5
3.2	Identification and control of agricultural plant pests and diseases	No. 8, 2004	5 pcs	1:5
4.	Journals/Publication/Magazines			
B.	**Learning Facilities & Infrastructure**			
1.	Class room		1pcs	1:35
2.	Arm chair	Standard	25pcs	1:1
3.	Teachers chair	Standard	1pcs	1:1
4.	Teachers table	Waterproof	1pcs	1:1
5.	Black /white board		1pcs	1:25
6.	Computer	Dell	1pcs	1:25
7.	LCD Projector		1pcs	1:25
C.	**Consumable Materials**			
1.	Duster (white/black board)		1pcs	1:25
2	Chalk	White	1 packet	1:25
5	Marker	1.5 mm.,7 mm., 15 mm. (0.059", 0.275",	1 packet	1:25

		0.590"). • Dimensions: 5.88" L x 1.13" Ø (150 x ...		
6	Paper	A4	2 Ream	2:35
7	Pen		2 Piece	2:35
8	Pesticide	Fungicide ,insecticide	10lit	10:35
D.	**Tools and Equipments**			
1.	manually operated sprayers (ULV, Knapsack)	Standard	2 each	2:35
2	Boom sprayer tractor mounted/trailed	Standard	1pcs	1:35
3	insect traps	Blue sticky traps and yellow	5pcs	5:35
4	Pitfall trap	sticky traps	5pcs	5:35
5	plant tissue test kits	Standard	5pcs	5:35
6	Phermone trap	Standard	5pcs	10:35
7	Light trap	Standard	10pcs	10:35
8	Measuring tape	Standard	10ps	10:35
9	Sensitive balance	Standard	1pcs	10:35
10	Graduated cylinder	Standard	5pcs	5:35
11	Bucket	Standard	5pcs	5:35
16	Hat	Standard	25pcs	1:1
17	Boots	Standard	25pcs	1:1
18	Gloves	Standard	25pcs	1:1
19	Overalls	Standard	25pcs	1;1
20	Goggles	Standard	25pcs	1;1
21	Respirator/face mask	Standard	25pcs	1;1
22	Sunscreen lotion	Standard	25pcs	1;1
23	First aid Kits	Standard	5pcs	5:35

LEARNING MODULE 07

TVET-PROGRAMME TITLE: Crop Production Level – III

MODULE TITLE : Performing post-harvest management for Field corps

MODULE CODE : AGR CRP3 M07 0422

NOMINAL DURATION : 62 Hours

Module Description : This module covers the knowledge, skills and attitude required to implementation of post-harvest operations, plan harvest strategy, monitor moisture content, implement harvest schedule, co-ordinate and implement post-harvest treatments, implement hazardous waste disposal guidelines, implement packing and storage requirements of produce.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

LO1. Prepare for implementation of post-harvest operations

LO2. Plan harvest strategy

LO3. Monitor moisture content

LO4 Implement harvest schedule

LO5 Co-ordinate post-harvest work

LO6 Implement post-harvest treatments

LO7 Implement packing and storage requirements of produce

LO8 Implement hazardous waste disposal guidelines

MODULE CONTENTS:

LO1.Preparing for implementation of post-harvest operations

1.1 Post-harvest operations and post-harvest work procedures

1.2 Selecting materials, tools, equipment and machinery

1.3 Pre-operational and safety checks

1.4 Identifying, risks assessing, controlling, implementing and reporting OHS hazards

1.5 Selecting, using and maintaining suitable safety PPE

LO2. Planning harvest strategy

2.1Estimation of commencement date and the time span

2.2 Determining, planning, and describing order of harvesting

2.3 Calculating the equipment and labour resources required

2.4 Applying pre-harvest pest control treatments

2.5 Applying IPM principles and organization policy

LO3. Monitoring moisture content

3.1 Monitoring crop moisture content

3.2 Monitoring and determining weather patterns and forecasts

3.3 Adjusting harvesting operations

3.4. Planning for drying and storage.

LO4 Implementing harvest schedule

4.1 Reviewing harvest schedules

4.2 Managing operating hours and collecting operator diaries

4.3 Co-ordination of equipment operation for maximum efficiency

4.4 Noting and reporting initial plan change to harvest

LO5 Co-ordination post-harvest work

51. Coordinating post-harvest works

5.2 Undertaking post-harvest operations and environmental implications.

5.3 Maintaining a clean, safe and hygienic work area

LO6 Implementing post-harvest treatments

6.1Threshing, drying, transporting and storing harvested crop produce

6.2 Grading and labelling

6.3. Identifying and disposing produce that not meet specification

6.4. Selecting post-harvest treatments

6.5 conforming timing, rate, application method and environmental requirements

6.6 . Implementing post-harvest practices

6.7 Bushfire prevention, control strategies and equipment (EG)

6.8 Cleaning and maintaining tools, equipment and machinery

LO7 Implementation of packing and storage requirements of produce

7.1 Specifying package and storage requirement

7.2 Marketing plan and production best practice

7.3Anticipating and prevent or control the possibility of emergencies

7.4. Monitoring and remedial action packing and storage processes

7.5 Recording packing and storage processes

LO8 Implementing hazardous waste disposal guidelines

8.1Reviewing principle of waste disposal

8.2 Monitoring, collection and disposal of waste

8.3 Reporting conditions impact on business viability

LEARNING METHODS:

- Lecture and discussion
- Braine storming
- Practical Demonstration
- Practical exercice

• Audio Visual
ASSESSMENT METHODS:
• Written test • Oral questioning • Practical • Assignment • Presentation

ASSESSMENT CRITERIA:

LO1. Prepare for implementation of post-harvest operations

- Post-harvest operations to be performed are identified according to post harvest work procedures, the marketing plan.
- Materials, tools, equipment and machinery are selected according to work procedures.
- pre-operational and safety checks are carried out on tools, equipment and machinery according to manufacturers
- Specifications.
- 1OHS hazards are identified, risks assessed, controls Implemented and reported.
- Suitable safety and personal protective equipment (PPE)are selected, used and maintained

LO2. Plan harvest strategy

- The commencement date and the time span for harvest are estimated, so that the crop will be maintained in optimum condition.
- The equipment and labour resources required for harvest are calculated from the size of the land, amount of labour, equipment availability and the time limitations on the harvest.
- Prost-harvest pest control treatments are to be applied, according to the recommendations of the manufacturer and the legislative requirements.
- **Order of harvesting** is determined, planned, and described in the plan.

LO3. Monitor moisture content

- Crops are monitored for moisture content against classification standards.
- Weather patterns and forecasts are monitored to determine impact on moisture content.
- Harvesting operations are adjusted, as required to control moisture in stored crop.
- When the ambient conditions cannot bring moisture to market standard, the crop is dried according to the prepared plans for drying and storage

LO4 Implement harvest schedule

- The schedules for harvest are reviewed in light of the weather and other conditions immediately before and during the harvest.
- Operating hours are managed to suit the resources available throughout the harvest.
- Equipment operation is co-ordinated for maximum efficiency, including allowances for downtime, maintenance and servicing requirements.

- Operator diaries are collected regularly throughout the harvest to identify any actual or potential maintenance or operator issues.
- Any changes that are made to the initial plan are noted and a report made for input to subsequent harvest review and planning

LO5 Co-ordinate post-harvest work

- Post- harvest works identified and tasks are coordinated in a sequential, timely and effective manner.
- Post- harvest operations are undertaken according to OHS requirements and with due consideration of the environmental implications.
- A clean, safe and hygienic work area is maintained throughout and on completion of work.

LO6 Implement post-harvest treatments

- Harvested crop produce is threshed, dried, and transported and stored.
- Harvested produce is graded and labelled according to the marketing plan.
- Produce that does not meet specifications and produce standards is identified and disposed of according to sector environmental procedures.
- Post-harvest treatments are selected according to harvested produce requirements, the integrated pest management strategy and the marketing plan.
- Timing, rate, application method, environmental requirements and handling techniques conform to the requirements of the harvested produce.
- Post-harvest practices are implemented based on economical, methodological, perspectives to meet established work schedules and minimize damage to produce.
- Tools, equipment and machinery are cleaned and maintained

LO7 Implement packing and storage requirements of produce

- Packing and storage requirements specified in the marketing plan and production procedures are reviewed and operational tasks determined.
- Packing and storage of produce conform to the requirements of the harvested produce, the marketing plan and production best practice.
- Packing and storage processes are monitored and remedial action taken where necessary.
- Packing and storage processes are recorded according to the production work procedures

LO8 Implement hazardous waste disposal guidelines

- Waste disposal requirements of the crop production and principles are reviewed and operational tasks determined.
- Collection of waste and disposal are monitored with variation from sector environmental procedures addressed promptly.
- Conditions likely to impact on business viability are reported.

Annex: Resource Requirements

AGR CRP3 M07 0422 Performing post-Harvest management for Field Crops				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by the trainer		
2.	Reference Books			
2.1	Advanced in agronomy	Academic press volume 83 or 84	25	1:1
2.2	Agronomic Hand book	CRC Press	25	1:1
2.3				
3.	Journals/Publication/Magazines			
B.	**Learning Facilities & Infrastructure**			
1.	Lecture room / work shop	Standard	1	1:25
2.	Library	Standard	1	1:25
3.	Electricity	Standard	1	
C.	**Consumable Materials**			
1.	Copy paper	A4 size	5 rim	1:5
2	Flip chart	Rim	5 rim	1:5
3	White board	Standard	1	1:25
4	White board marker	Standard	25	1:1
5	Marker	Permanent	25	1:1
D.	**Tools and Equipment**			
1.	threshing machines	cutting and binding sheaves	1	1:25
1	Gases	Ethely	1	1:25
2	Cleaning agents	Fungus and bacteria agents	1	1:25
3	labelling devices		1	1:25
4	packaging materials		1	1:25

5	Tools, equipment and machinery	No	1	1:25
6	moisture tester	Digital Seed Grain Moisture Meter	1	1:25
7	sickle,	Heavy duty		1:25
8	Combine harvester	Class 130 112 kW/152 hp Displacement (cm2) max: 650;	1	1:25
9	Tractors	Fm world 704f Agricultural Farm Mini Wheel Tractor 70HP		
10	Trailers	Length: 48 - 53 feet (576 - 636 inches) Width: 8.5 feet (102 inches) Height: 13.5 feet (162 inches)	1	1:25
11	Silos	typically 10 to 90 ft (3 to 27 m) in diameter and 30 to 275 ft (10 to 90 m) in height	1	1:25
12	hermetic bags	bureau of standards (kebs)	1	1:25
13	threshing machines	Schuco 450898900 1:32 Scale Lanz Bulldog Model Tractor Set with Threshing Machine	1	1:25
14	Trucks	No	1	1:25
15	Forklifts	Toyota 3 ton Electric Forklift (4-Wheel model)	1	1:25
16	snips	**Sheet metal**	1	1:25
17	Knives	Standard	1	1:25
18	Gloves	Waterprof	1	1:25
19	Washers	Standard	1	1:25

20	Grading machinery,	Standard	1	1:25
21	Brushes	Standard	1	1:25
22	Dryers	Standard	1	1:25
23	Chemical applicators,	Standard	1	1:25
24	packing tools	Standard	1	1:25
25	Scales	Standard	1	1:25
26	Pallets	Standard	1	1:25
27	gassing chambers	Standard	1	1:25

LEARNING MODULE 08

TVET-PROGRAMME TITLE: Crop Production Level III

MODULE TITLE : Performing post-Harvest management for Horticultural Crop

MODULE CODE : AGR CRP3 M08 0422

NOMINAL DURATION : 55Hours

Module Description : This module covers the knowledge, skills and attitude to prepare for implementation of horticultural crop harvest, post-harvest operations, co-ordinate post-harvest activities, implement post-harvest treatments, implement hazardous waste disposal guidelines, implement packing and appearance requirements of produce and Implement storage requirements of produce.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

LO1. Plan and implement horticultural crop harvest

LO2. Prepare for implementation of post-harvest operations

LO3. Co-ordinate post-harvest activities

LO4. Implement post-harvest treatments

LO5.Implement hazardous waste disposal guidelines

LO6.Implement packing and appearance requirements of produce

LO7. Implement storage requirements of produce

MODULE CONTENTS:

LO1. Planning and implement horticultural crop harvest

1.1 Estimation of the commencement date and the time span

1.2 Calculating the equipment and labour resources required

1.3 Planning harvest on the maturity indexes for horticultural crops

1.4 Determining, planning, and describing method and order of harvesting

LO2. Preparing for implementation of post-harvest operations

2.1 Performing post-harvest operations

2.2 Selecting materials, tools, equipment and machinery

2.3 pre-operational and safety checks

2.4 Identifying, risks assessing, controls implementing and reporting OHS hazards

2.5 selecting, using and maintaining suitable safety and PPE

LO3. Co-ordinate post-harvest activities

3.1 Identifying and tasks work team

3.2 undertaking post-harvest operations to OHS requirements and environmental implications

3.3 Maintaining a clean, safe and hygienic work area

LO4. Implementing post-harvest treatments

4.1 Grading and labelling harvested produce

4.2 Identifying and disposing produce that not meet specification.

4.3Selecting post-harvest treatments

4.4 Integrating pest management strategy and marketing plan

4.5 Conforming timing, rate, application method and environmental requirements

4.6 Establishing post-harvest practices that meet economical and methodical

4.7 cleaning and maintaining tools, equipment and machinery

LO5.Implementing hazardous waste disposal guidelines

5.1 Reviewing principle of waste disposal

5.2 Monitoring, collection and disposal of waste

5.3 Reporting conditions impact on business viability

LO6.Implementing packing and appearance requirements of produce

6.1Specifying package and presentation requirement

6.2 Conforming packing and presentation of produce

6.3 Monitoring and remedial action for package and presentation processes

6.4. Recording packing and presentation processes

LO7. Implement storage requirements of produce

7.1 Specifying and reviewing storage requirements

7.2 Conforming storage and handling of produce

7.3 Monitoring storage processes and facilities

7.4 Recording storage processes and conditions

LEARNING METHODS:

- Lecture and Discussion
- Demonstration
- Role playing

ASSESSMENT METHODS:

- Written test with Oral questioning
- Practical demonstration

ASSESSMENT CRITERIA:

LO1. Plan and implement horticultural crop harvest

- The commencement date and the time span for harvest are estimated, so that the crop will be maintained in optimum condition.
- The equipment and labour resources required for harvest are calculated from the size of the land, amount of labour, equipment availability and the time limitations on the harvest.
- Harvest is planned based on the maturity indexes for horticultural crops.
- The method and order of harvesting is determined, planned, and described in the plan.

LO2. Prepare for implementation of post-harvest operations

- post-harvest operations to be performed are identified
- according to work procedures, the marketing plan and guidelines
- Materials, tools, equipment and machinery are Selected according to work procedures.
- Pre-operational and safety checks are carried out on tools, equipment and machinery according to manufacturer's Specifications.
- OHS hazards are identified, risks assessed, controls Implemented and reported.
- Suitable safety and personal protective equipment (PPE) are

LO3. Co-ordinate post-harvest activities

- Work team is identified and tasks are co-ordinated in a sequential, timely and effective manner.
- Post-harvest operations are undertaken according to OHS requirements and with due consideration of the environmental implications.
- A clean, safe and hygienic work area is maintained throughout and on completion of work.

LO4. Implement post-harvest treatments

- Harvested produce is graded and labelled according to the marketing plan and work procedures.
- Produce that does not meet specifications and standards is identified and disposed of according to environmental procedures.
- Post-harvest treatments are selected according to harvested produce requirements, integrated pest management strategy and the marketing plan.
- Timing, rate, application method, environmental requirements and handling techniques conform to the requirements of the harvested produce and work

procedures.

- Post-harvest practices are economical, methodical, meet established work schedules and minimise damage to produce.
- Tools, equipment and machinery are cleaned and maintained according to work procedures

LO5.Implement hazardous waste disposal guidelines

- Waste disposal requirements are reviewed and operational tasks determined.
- Collection of waste and disposal are monitored with variation from environmental procedures.
- Conditions likely to impact on business viability are reported

LO6.Implement packing and appearance requirements of produce

- Packing and presentation requirements specified in the marketing plan and work procedures are reviewed and operational tasks determined.
- Packing and presentation of produce conform to the requirements of the harvested produce, the marketing plan and best practices.
- Packing and presentation processes are monitored and remedial action taken where necessary.
- Packing and presentation processes are recorded according to work procedures.

LO7. Implement storage requirements of produce.

- Storage requirements specified in the marketing plan and work procedures are reviewed and operational tasks determined.
- Storage and handling of produce conform to the requirements of the harvested produce, the marketing plan and best practice.
- Storage processes and facilities are monitored and remedial action taken where necessary.
- Storage processes and conditions are recorded according to work procedures.

Annex: Resource Requirements

AGR CRP2 M08 0422: Performing post-harvest handling of stimulants and spices crops				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by the trainer	25	1:1
2	**Reference Books**			
2.1.				
2.2	Post-harvest management and processing of fruits and vegetables:	New India publishing agency instant notes	25	1:1
2.3	Postharvest physiology and pathology of vegetables,	Marcel Dekker Inc. 2nd	25	1:1
2.4	The Fundamentals of Horticulture		25	1:1
2.5	Postharvest Management of Horticultural Crop		25	1:1
2.6	Principles of Horticulture	Routl edge Level 2 (7th edition	25	1:1
2.7	Postharvest and Handling Technology for horticulture		25	1:1
3	Journals/Publication/Magazines			
B.	**Learning Facilities & Infrastructure**			
1.	Lecture room / work shop	Standard	1	
2.	Library	Standard	1	
3.	Electricity	Standard	1	
C.	**Consumable Materials**			
1.	Copy paper	A4 size	5 rim	1:5

2	Flip chart	Rim	5 rim	1:5
3	White board	Standard	1	1:25
4	White board marker	No	25	1:1
5	Marker	permanent	25	1:1
D.	**Tools and Equipment**			
1.	Tractors	John Deere	1pcs	1:25
2	Trailers	Axle. 3x13,000kg, BPW brand. Tire. 12.00R20, radial model tire, 12 pcs.	1pcs	1:25
3	Light trucks	Standard	1pcs	1:25
4	Forklifts	Standard	1pcs	1:25
5	Snips	Standard	1pcs	1:25
6	Knives	Standard	1pcs	1:25
7	Gloves	Standard	25	1:25
8	Containers	Standard	1pcs	1:25
9	Grading machinery	Standard	1pcs	1:25
10	Washers	Standard	1pcs	1:25
11	Brushes	Standard	25	1:25
12	Dryers	Standard	1pcs	1:25
13	Chemical applicators	Standard	1pcs	1:25
14	Gassing chambers	Standard	1pcs	1:25
15	Labelling devices	Standard	1pcs	1:25
16	Packing tools	Standard	1pcs	1:25
17	Scales,	Standard	1pcs	1:25
18	Pallets,	Standard	1	1:25
19	Hand trolleys and lifting aids	Standard	1	1:25

LEARNING MODULE 09
TVET-PROGRAMME TITLE: Crop Production Level III
MODULE TITLE : Applying Chemicals and Biological Agents for the Control of pests
MODULE CODE : AGR CRP3 M0 90422
NOMINAL DURATION : 66 Hours
MODULE DESCRIPTION : This module covers knowledge, skills and attitude to apply chemicals and biological agents for the control of weeds, pests and diseases using workplace specific application equipment. The work functions in this standard will be carried out under supervision.
LEARNING OUTCOMES At the end of the module the trainee will be able to: LO1**.**Apply instructions and maintenance LO2. Use chemical application equipment. LO3. Apply chemicals & bio-agents LO4.Complete application and record keeping LO5. Transport, handle, store chemicals & bio-agents
MODULE CONTENTS: **LO1.Applying instructions and maintenance** 1.1. Carrying out pre and post operational checks 1.2. Interpreting chemical labels 1.3. Measuring and decanting of substances 1.4. Following safe working practices 1.5. Identifying and following procedures 1.6. Preparing and adjusting application and Personnel Protective Equipment (PPE) 1.7. Following instructions to identify and maintain damaged 1.8. Identifying and reporting OHS hazards **LO2.Using chemical application equipment** 2.1 Identification and minimization of hazards 2.2 Selecting, using and maintaining workplace industry standard and appropriate step 2.3 Observing safe working practices regulations and legislation 2.4 Using application equipment accurately and effectively 2.5 Recording details organization policy, legislative requirements and industry practice. 2.6 Assessing weather conditions for chemical application

2.7 Respond to emergencies and apply first aid in the event of pesticide poisoning

LO3. Applying chemicals & bio-agents

3.1 Interpretation of chemical labels

3.2 Recognizing and identifying hazards

3.3 Following requirements for application equipment and calibration.

3.4 Assessing suitable weather conditions.

3.5 Following safe working practices

3.6 classification of pesticides

3.7 Paths of entry of poisons into the body and methods of limiting exposure

3.8 Following equipment, cleanup methods and instructions

LO4.Completing application and record keeping

4.1 Identification of instructions

4.2 Recording chemical inventory

4.3 Reporting chemical application

LO5. Transporting, handling, storing chemicals & bio-agents

5.1 Recognizing and following transport, handle and storage requirements

5.2 Recognizing and following requirements for storage of chemicals &bio-agents

LEARNING METHODS:

- Braine storming
- Lecture
- Discussion
- Practical demonstration

ASSESSMENT METHODS:

- Written test
- Move exam
- Practical demonstration
- Assignment

ASSESSMENT CRITERIA:

LO1. Apply instructions and maintenance

- Pre and post operational checks and maintenance on application equipment are carried out according to manufacturer's specifications and procedures
- Chemical label is interpreted
- Measurement and decanting of substances comply with directions
- Safe working practices relevant to the situation are followed
- Procedures in the event of a chemical spill are identified and followed
- Application and Personnel Protective Equipment (PPE)are prepared and adjusted for use appropriate to the situation and in accordance with Occupational Health and Safety (OHS)requirements
- Instructions are followed to identify and maintain damaged, non-functioning or worn equipment
- OHS hazards are identified and reported to the supervisor.

LO2.Use chemical application equipment

- Potential and existing hazards are identified and minimized safely in a manner consistent with accepted industry practices and/or reported to supervisor or an appropriate authority.
- The workplace is maintained to an accepted industry standard and appropriate step to ensure public safety are selected and used.
- Safe working practices determined by industry or organization are employed and regulations and legislation relevant to the situation are observed.
- Application Equipment are used to accurately and effectively apply the required dose to the target.
- Application details are recorded in accordance with Organization policy, legislative requirements and industry practice.
- Weather conditions are assessed as suitable for the application of selected chemical.

LO3. Apply chemicals & bio-agents

- Chemical labels are interpreted
- Hazards are identified and associated risks recognized-
- Requirements for application equipment to accurately and effectively apply the required dose of the chemical to the target are followed according to correct calibration result.

- Suitable Weather conditions are assessed for the application of selected chemical.
- Safe working practices relevant to the situation are followed
- Classification of pesticides is realized
- Equipment and clean-up methods and Instructions are followed using appropriate tools

LO4. Complete application and record keeping

- Instructions for disposal of containers and unused chemicals or biological agents are identified
- Chemical inventory is recorded as instructed and as required by regulations
- Chemical application details are reported as instructed and as required by regulations

LO5. Transport, handle, store chemicals & bio-agents

- Transport, handling and storage requirements for chemicals &bio-agents are recognized and followed
- Requirements for storage of chemicals &bio-agents at the workplace are recognized and followed

Annex: Resource Requirements

AGR CRP3 M09 0422Applying Chemicals and Biological Agents for the Control of pests				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A. Learning Materials				
1.	TTLM	Trainer guide	1 pcs	1:25
		Assessment packet	1 pcs	1:25
		Learning guide	25 pcs	1:1
2.	Poster	Up to date	5 pcs	1:5
3.	Reference books			
3.1	Biological Control of Insect Pest	Alha Nazir, Sehroon Khan and Dewen Qiu 2019	5 pcs	1:5
3.2	Integrated pest management in tree fruit crops	J.F.Brunner, in Encyclopedia of agriculture and food system,2014	5 pcs	1:5
3.3	Agriculture and Related Biotechnologies	Peter G. Kevan, Losshipp, in comprehensive biotechnology(3rd edition 2019)	5 pcs	1:5
B. Learning Facilities and Infrastructure				
1	Lecture room	standard	1	1:25
2	Laboratory	standard	1	1:25
3	Standard farm (plots)	standard	1 plot	1:25
4	Class room	standard	1	1:25
5	Library	standard	1	1:25
C. Consumable Materials				
1	Printing paper	A4	2rim	2:25
2	log book	standard	25	1:1
3	Pencil	HB	25 pcs	1:1
4	Marker	Colored	25 pcs	1:1

5	Duster (white/black board)	standard	1	1:25
6	Chalk	standard	1 packet	1:25
D. Tools, Equipment and Materials				
1	• Sprayer	Diaphragm type	1 pcs	1:25
2	• Pesticides	Based on labels	1L	1:25
3	• Knapsacks	Standard	1pcs	1:25
4	• hand-held pneumatic sprayers	Standard	5	1:5
5	• drench	Standard	5	1:5
6	• Guns	Standard	5	1:5
7	• spot on applicators	Standard	2	1:25
8	• syringes	Standard	5	1:5
9	• vehicle mounted sprayers	Standard	5	1:5
10	• ULV sprayer	Standard	2	2:25
11	• Hand lenses	Standard	5	1:5
E. Personal protective equipment (PPEs)				
1	Boots	Rubber	25 pcs	1:1
2	Overalls	Cotton – long sleeve	25 pcs	1:1
3	Gloves	Plastic	25 pcs	1:1
4	Respirator	Standard	25 pcs	1:1
5	Face mask (guard)	Standard	25 pcs	1:1
6	Sunscreen lotion	Standard	25 pcs	1:1
7	Hat	Standard	25 pcs	1:1
8	Goggles	Standard	25pcs	1:1

LEARNING MODULE 10

TVET-PROGRAMME TITLE: Crop Production **Level III**

MODULE TITLE : **Applying Digital Technology in Agriculture.**

MODULE CODE : **AGR CRP3M100422**

NOMINAL DURATION : 43Hours

MODULE DESCRIPTION : This module covers the knowledge, skills and attitude required to Understand the Concept of digital technology, apply Digital technologies among rural population and recording and documentation system.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

LO1. Understand the Concept of digital technology

LO2. Apply Digital technologies among rural population and farmers

LO3. Recording and documentation

MODULE CONTENTS:

LO1.Understanding the Concept of digital technology

1.1. Understanding digital technologies

1.2. Understanding importance of digital technologies

1.3. Identification the role of digital technologies in agriculture

1.4. Identification principles of agricultural technology

1.5. Understanding smart phones and template functions

LO2. Applying digital technologies among rural population and farmers

2.1 Identification and coordination require tools and equipment

2.2 Identification of digital technology infrastructures

2.3 Developing digital technology skills

2.4 Developing digital agri-preneurial skill

2.5 Using digital technology communication tools

2.6 Using digital technologies, tools and techniques

2.7 Promoting implementation of digital technologies

LO3. Recording and documenting

3.1. Developing data collecting formats

3.2. Identification and selection of data collection methodologies

3.3. Literacy skills for data analysis and interpretation

3.4. Use software applications (word processing, spread sheets, data base management

3.5. Organizing, analyzing, interpreting, documenting and reporting collected data

3.6. Organized, analyzed and interpreted data are documented and reported 3.7. Collection of feedbacks
LEARNING METHODS:
• Braine storming • Lecture • Discussion • Practical demonstration
ASSESSMENT METHODS:
• Written test • Assignment • Practical demonstration

ASSESSMENT CRITERIA:

LO1. Understand the Concept of digital technology

- Digital technologies are understood to apply digital technology.
- Importance of digital technologies are understood in agricultural sector
- Role of digital technologies in agriculture is identified to enhance agricultural development.
- Principles of Agricultural technology are identified to apply in the agricultural sector
- Mobile/Smart phones and template functions are understood to collect data

LO2.Apply Digital technologies among rural population and farmers

- Require tools and equipment are identified and coordinated to apply digital technologies
- Digital technology infrastructures are identified to implement in agricultural development
- Digital technology skills are developed among the rural population
- Digital Agri-preneurial skill is developed for agricultural transformation.
- Digital technology communication tools are used to collect data and reporting system
- Digital technologies, tools and techniques are used to deliver digital education
- Implementation of digital technologies is promoted to enhance productivity

LO3. Recording and documentation

- Data collecting formats are developed based on the needs
- Data collection methodologies are identified and selected based on the intended objectives
- Collected data are organized, analyzed and interpreted based on the intended objectives
- Organized, analyzed and interpreted data are documented and reported
- Feedbacks are collected from the relevant stakeholders

Annex: Resource Requirements

AGR CRP3 M10 0422Applying Digital Technology in Agriculture.				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A. Learning Materials				
1.	TTLM	Trainer guide	1 pcs	1:25
		Assessment packet	1 pcs	1:25
		Learning guide	25 pcs	1:1
2	Operation sheet	Prepared by trainer	25	1:1
3	Reference books			
3.1	Digital Technology-and-Services-Driven Sustainable Transformation of Agriculture Cases of China and the EU	Gaoming Jiang, Tianyu Qin, Lei Zhang New Trends in Agri-Food sector; Environmental, Economic and Social Perspectives 2022.	5 pcs	1:5
3.2	How Are Smallholder Farmers Involved in Digital Agriculture in Developing Countries: A Case Study from China.	Xie, L.; Luo, B.; Zhong, W. Land 2021, 10, 245.	5 pcs	1:5
	Digital Technology and Services for Sustainable Agriculture in Tanzania	Mushi, G.E.; Di Marzo Serugendo, G.; Burgi, P.-Y. Digital A Literature Review. Sustainability 2022,14,2415 2022, 14, 2415	5 pcs	1:5
B. Learning Facilities and Infrastructure				
1	Lecture room	Standard	1	1:25
2	Laboratory	Standard	1	1:25
3	Standard farm (plots)	Standard	1 plot	1:25
4	Class room	Standard	1	1:25
5	Library	Standard	1	1:25
C. Consumable Materials				
1	• Printing paper	A4	2rim	2:25

2	• log book	Standard	25	1:1
3	• Pencil	HB	25 pcs	1:1
4	• Marker	Colored	25 pcs	1:1
5	• Duster (white/black board)	Standard	1	1:25
6	• Chalk	Standard	1 packet	1:25
D. Tools, Equipment and Materials				
1	• Chargers	Standard	25	1:1
2	• Computer	Standard	5	1:5
3	• Smart phone	Standard	25	1:1
4	• Tablet	Standard	25	1:1
5	• I pad	Standard	5	1:5
6	• GIS	Standard	5	1:5
7	• Website	Standard	1	1:25
8	• Online resources	Standard	5	1: 5
9	• Digital programs	Standard	1	1:25
• **E. Personal protective equipment (PPEs)**				
1	• Boots	Rubber	25 pcs	1:1
2	• Overalls	Cotton – long sleeve	25 pcs	1:1
3	• Gloves	Plastic	25 pcs	1:1
4	• Respirator	Standard	25 pcs	1:1
5	• Face mask (guard)	Standard	25 pcs	1:1
6	• Sunscreen lotion	Standard	25 pcs	1:1
7	• Hat	Standard	25 pcs	1:1
8	• Goggles	Standard	25pcs	1:1

APPENDEX-1

Learning Methods:				
For none impaired trainees	**Reasonable Adjustment for Trainees with Disability (TWD)**			
	Low Vision	**Deaf**	**Hard of hearing**	**Physical impairment**
Lecture-discussion	❖ Provide large print text ❖ Prepare the lecture in **Audio/video** ❖ Organize the class room seating arrangement to be accessible to trainees ❖ Write short notes on the black/white board using large text ❖ Make sure the luminosity of the light of class room is kept ❖ Use normal tone of voice ❖ Encourage trainees to record the lecture in audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	❖ Assign sign language interpreter ❖ Arrange the class room seating to be conducive for eye to eye contact ❖ Make sure the luminosity of the light of class room is kept ❖ Introduce new and relevant vocabularies ❖ Use short and clear sentences ❖ Give emphasis on visual lecture and ensure the attention of the trainees ❖ Avoid movement during lecture time	❖ Organize the class room seating arrangement to be accessible to trainees ❖ Speak loudly ❖ Ensure the attention of the trainees ❖ Present the lecture in video format ❖ Ensure the attention of the trainees	❖ Organize the class room seating arrangement to be accessible for wheelchairs users. ❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note ❖ Provide Orientation on the physical feature of the work shop

		❖ Present the lecture in video format ❖ Summarize main points		
Demonstration	❖ Conduct close follow up ❖ Use verbal description ❖ Provide special attention in the process of guidance ❖ facilitate the support of peer trainees ❖ Prepare & use simulation	❖ use Sign language interpreter ❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training ❖ Show clear and short method ❖ Use gesture ❖ Provide tutorial support (if necessary)	❖ Illustrate in clear & short method ❖ Use Video recorded material ❖ Ensure the attention of the trainees ❖ Provide tutorial support (if necessary)	❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipments/ machines ❖ Assign peer trainees to assist ❖ Conduct close follow up ❖ Provide tutorial support (if necessary
Group discussion	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other	❖ Introduce the trainees with their peers

			group member ❖ Inform the group members to speak loudly	
Exercise	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/practical training ❖ Introduce new and relevant vocabularies	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/ practical training	❖ Assign peer trainees ❖ Use additional nominal hours if necessary
Individual assignment	❖ prepare the assignment questions in large text ❖ Encourage the trainees to prepare and submit the assignment in large texts ❖ Make available recorded assignment questions ❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy	❖ Use sign language interpreter ❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges
Written test	❖ Prepare the exam in large texts ❖ Use interview as an option if necessary ❖ Prepare the exam in audio format ❖ Assign human reader ❖ (if necessary) ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment ❖ Time extension for trainees having severe upper limb impairment
Demonstration /Observation	❖ Brief the instruction or provide them in large text ❖ Time extension	❖ Use sign language interpreter ❖ Brief on the instruction of the exam	❖ Provide activity based assessment ❖ Brief on the instruction of	❖ Provide activity based assessment ❖ Conduct close

		❖ Provide activity-based/ practical assessment method ❖ Time extension	the exam ❖ Use loud voice ❖ Time extension	follow up ❖ Time extension

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