



Republic of Rwanda
Ministry of Education



RTB | RWANDA
TVET BOARD

AGRRT302

ROOTS AND TUBERS GROWING

Grow roots and tubers crops

Competence

RQF Level: 3

Learning Hours



70

Credits: 7

Sector: Agriculture and food processing

Trade: Agriculture

Module Type: Specific

Curriculum: AFPAGR3001 - TVET Certificate 3 in Agriculture

Copyright: © Rwanda TVET Board, 2022

Issue Date: May 2022

Purpose statement	This module describes the skills, knowledge and attitude required to grow roots and tubers. It is designed for learners who have successfully completed nine years’ basic education or its equivalent and pursuing TVET level III in Agriculture. At the end of this module, learners will be able to select the site for roots and tubers crops growing, conduct roots and tubers crops plantation, and handle harvested produce of roots and tubers crops. Qualified learners deemed competent may work with others in open fields and greenhouses with others under supervision.					
Learning assumed to be in place	Applied biology, applied chemistry, soil erosion control, topographic data collection					
Delivery modality	Training delivery		100%	Assessment		Total 100%
	Theoretical content		30%	Formative assessment	30%	50%
	Practical work:		70%		70%	
	• Group project and presentation	20%				
	• Individual project /Work	50%				
			Summative Assessment			50%

Elements of Competency and Performance Criteria

Elements of competency	Performance criteria	
1. Prepare for roots and tubers crop establishment operations	1.1.	Tools and equipment are adequately selected referring on roots and tubers crop species
	1.2.	Risks, occupational health and safety (OHS) hazards are Properly assessed referring to Food and environmental standards.
	1.3.	PPE are properly selected according to the desired operation.
	1.4.	Environmental implication of roots and tubers crop are properly identified according to regulations
2. Prepare the site for roots and tubers crop growing	2.1.	Roots and tubers crop species are properly selected in terms of ecological requirements and according to quality standards.
	2.2.	Field is properly identified according crop requirements
	2.3.	Land is adequately cleaned depending on the selected site
	2.4.	Tillage for roots and tubers crop growing is adequately performed according to their requirements.
	2.5.	Soil amendments are properly applied complying with roots and tubers crops requirements.
	2.6.	Planting patterns are appropriately made out according to the roots and tubers crop production plan.

	2.7. Records are properly kept as required by the supervisor
3. Conduct roots and tubers crops plantation	3.1. Root and tubers planting materials are effectively prepared specific to each species and according to enterprise quality standards
	3.2. Planting is appropriately performed according to roots and tubers crop species and according to the plan
	3.3. roots and tubers crops are properly maintained for specific to each crop species and according to market quality standards.
	3.4. Records are proper kept as required by the supervisor
4. Harvest roots and tubers crops	4.1. Maturity stages are correctly identified according to the market requirements
	4.2. Roots and tubers are properly harvested following specific techniques of each crop species and requirements of the market
	4.3. Harvested roots and tubers are appropriately handled according to specific roots and tubers crop requirements
	4.4. Records are properly kept as required by the supervisor

Course content

Learning outcome 1: Prepare for root and tubers crop establishment operations		Learning hours: 5
Indicative content		
• Selection of tools and equipment ✓ Types of tools used in roots and tubers growing ✓ Tools and equipment selection Criteria • Assessment of Risks, occupational Health and Safety (OHS) hazards to the supervisor ✓ Types of hazards associated with roots and tubers growing ✓ Hazards risks • Selection of PPE ✓ Types/categories of PPE used in roots and tubers crops growing ✓ PPE Selection criteria • Identification of environmental implications of roots and tubers growing ✓ Definition of environmental impact assessment ✓ Impacts on roots and tubers crop growing on environment		
Resources required for the learning outcome		
Equipment	Projector and Computer	
Materials	Seeds/cuttings, Pesticides, Fertilizers, Internet connection, Related books, Reports, Scientific papers and PPE	
Tools	Hoe, Panga, Hammer, Rake, Spade, Wheelbarrow and Sprayers	

Facilitation techniques	Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided and Group discussion
Formative assessment methods	Written assessment, Oral presentation, Performance assessment, Product based assessment and Project based assessment

Learning outcome 2: Prepare the site for roots and tubers crop growing		Learning hours: 15
Indicative content		
• Selection of roots and tubers crop species ✓ Priority roots and tubers crop species grown in Rwanda ✓ Selection criteria of roots and tubers crop species • Identification of field. ✓ Ecological requirements ✓ Field background ✓ Field accessibility • Cleaning of land ✓ Definition of land clearing ✓ Importance of land clearing ✓ Site obstacles ✓ Tools and equipment used in land clearing ✓ Methods/ways of land clearing • Tilling of land roots and tubers crop growing. ✓ Tillage types ✓ Cultivation methods ✓ Objectives of primary tillage and secondary tillage • Applications of soil amendment ✓ Objectives of soil amendment application ✓ Types of soil amendment ✓ Factors/criteria of soil amendments selection ✓ Sources of soil amendment • Making out planting pattern. ✓ Importance of planting pattern ✓ Different planting patterns for roots and tubers growing: ✓ Criteria of field lay out • Keeping records ✓ Importance of farm records keeping ✓ Content of record form ✓ Method of recording		
Resources required for the indicative content		

Equipment	Clinometer, DVD players, Projector, Rain gauge, Thermometers and pH meters,
Materials	Internet connection, Lime, Newspapers, Organic fertilizer, Records keeping forms, Related books, Reports and Planting material of roots and tubers, and PPE
Tools	Hand hoe, Panga, Flip chart and Field notebook
Facilitation techniques	Lectures, Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided and Group discussion
Formative assessment methods	Written assessment, Oral presentation, Performance assessment, Product based assessment and Project based assessment

Learning outcome 3: Carry out planting and post planting operations		Learning hours: 30
Indicative content		
• Preparation of roots and tubers crop planting materials ✓ Sources of roots and tubers Planting materials ✓ Seed preparation ✓ Characteristic of good quality of roots and tubers seeds ✓ Health ✓ Physical quality ✓ Physiological quality (vigour, viability and germination rate) ✓ Genetic purity • Planting of roots and tubers planting materials ✓ Spacing of potatoes, cassava, taro and yam /planting density ✓ Methods of planting • Maintaining roots and tubers plantation ✓ Different plant maintenance practices ✓ Control of main pests and disease • Keeping records. ✓ Types of records ✓ Template content		
Resources required for the indicative content		
Equipment	DVD players, computer and projector, power tiller and motorised sprayer	
Materials	Demonstration plot, Internet connection, field, Records keeping forms, Sand, plant materials Related books, Reports and Scientific paper and PPE	
Tools	Field notebook, Fire source, Flip chart, Pens and Watering can	
Facilitation techniques	Lectures, Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided and Group discussion	
Formative assessment methods	Written assessment, Oral presentation, Performance assessment, Product based assessment and Project based assessment	

Indicative content

- **Identification of maturity stages.**
 - ✓ Types of maturity
 - ✓ Physiological signs of maturity for roots and tubers crops
 - ✓ Crop periods
 - ✓ Methods of maturity indices determination
- **Application of harvesting techniques.**
 - ✓ Different part to be harvested on roots and tubers crops.
 - ✓ Harvesting techniques on roots and tubers crops.
 - ✓ Harvesting methods
- **Application of handling techniques.**
 - ✓ Techniques of products handling
 - ✓ Packaging
 - ✓ Characteristic of label
 - ✓ Types of labels
 - ✓ Storage roots and tubers
- **Keeping of records**
 - ✓ Importance of farm records keeping
 - ✓ Content of template
 - ✓ Method of recording

Resources required for the indicative content

Equipment	DVD players, computer and projector, harvesters, cleaning machines,
Materials	Records keeping forms, Related books, Reports and scientific paper, Roots and tubers crops field, Pesticides, Internet connection, Fumigants, Flip chart, Field notebook and PPE
Tools	Ropes, Sacs, Sorting screen/sieve, Stick, Wheelbarrow, Winnower Knives, Labels, Pang, Bags, Balance, Basket, Hoe, whipping towels
Facilitation techniques	Lectures, Demonstration and simulation, Individual and group work, Practical exercise, Individualized, Trainer guided and Group discussion
Formative assessment methods	Written assessment, Oral presentation, Performance assessment, Product based assessment and Project based assessment

Integrated/Summative assessment (For specific module)

Integrated situation

Mr. NYIRIDANDI is a farmer of Nyabihu district in Rugera sector, he possesses one hectare of land where he grows Irish potato. He aims at producing ware potatoes for Kigali market. However, he is not achieving his goal because his potato yield is decreasing progressively due to the use of inappropriate farming practices. As a skilled agricultural worker, you are requested to perform a demonstration on farming practices (planting materials preparation, planting at spacing of 75x30cm, plant maintenance activities and harvesting) on 'KINIGI' variety of Potato. These activities must be performed on plot of 4.5m²(3 m long and 1.5m wide). You must perform this task and later present it in 3 hours.

This integrated situation is an example, however the check lists for evaluating the quality of process were developed to fit any other integrated situation .

1. TVET schools should install demonstration plots, this will allow trainees to demonstrate activities at various stages.
2. Trainees can be evaluated in form of project whereby they carry out growing activities on small piece of land from land preparation.
3. Trainers can design another integration situation adapted to the context.

Resources

Tools	Hoe, Machete, forked hoe, Spade, Watering can, Balance, Pots, Measuring tape, Pegs, Collection bags and Baskets
Equipment	PPE, Sprayer and Wheelbarrow and harvester
Materials/ Consumables	Planting materials of Irish potato, Mineral fertilizers, Organic fertilizers, and Pesticides

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
Learning outcome 1: Prepare for root and tubers crop establishment operations (20%)	1.1. Tools and equipment are adequately selected referring on roots and tubers crop species	Tools and equipment selected.			3
		correct selection Criteria are respected			2
	1.2. Risks, occupational health and safety (OHS) hazards are Properly assessed for reporting the supervisor	Hazards associated with roots and tubers growing described			2
		Hazards risks assessed			3

	1.3. PPE are properly selected according to the desired operation	Types/categories of PPE used in roots and tubers crops growing.			2
		Criteria for PPE selected.			3
	1.4. Environmental implication of roots and tubers crop are properly identified for discussing with supervisor	Negative environmental impacts assessed			2.5
		Positive environmental impacts assessed			2.5
Learning outcome 2: Prepare the site for roots and tubers crop growing (20%)	2.1. Roots and tubers crop species are properly selected in terms of ecological requirements and according to quality standards	Priority roots and tubers crop species selected			1
		Criteria for roots and tubers species selected			1
	2.2. Field is properly identified according to crop requirements	Status of field identified			1
		Field background described			1
		Criteria for field accessibility considered			1
	2.3. Land is adequately cleaned depending on the selected site	Site obstacles identified			1
		Tools and equipment used in land clearing			1.5
		Status of land cleared			1.5
	2.4. Tillage for roots and tubers crop growing are adequately performed according to their requirements	Status of land tilled			1.5
		Cultivation methods applied			1.5
	2.5. Soil amendments are properly applied complying with roots and tubers crops requirements	soil amendments applied			1.5
		Factors/criteria for soil amendments selected			1

		Sources of soil amendment identified			1
	2.6. Planting pattern are appropriately made out according to the roots and tubers crop production plan	planting patterns for roots and tubers growing made out			1.5
		Criteria for field lay out made out			1
	2.7. Records are properly kept as required by the supervisor	Record template elaborated			1
		Data collected			1
Learning outcome 3: Conduct roots and tubers crops plantation (30%)	3.1. Root and tubers planting materials are effectively prepared specific to each species and according to enterprise quality standards	Sources of roots and tubers Planting materials identified			3
		Quality parameters of good roots and tubers seeds			4
	3.2. Planting are appropriately perform according to roots and tubers crop species and according to the plan	Spacing of potatoes, cassava, taro and yam /planting used			4
		Methods of planting applied			5
	3.3. Roots and tubers crops are properly maintained for specific to each crop species and according to market quality standards	Plant maintenance practices applied			5
		Control methods of main pests and disease applied			5
	3.4. Records are proper kept as required by the supervisor	Records template elaborated			2
		data collected			2
Learning outcome 4: Harvest roots and tubers crops (30%)	4.1. Maturity stages correctly identified according to the market requirements	Types of maturity identified			2
		Crop periods for maturity assessed			2
		Maturity indices determined			3
	4.2. Roots and tubers are	Part harvested on roots			2

	properly harvested following specific techniques of each crop species and requirements of the market	and tubers crops			
		Harvesting techniques applied			3
		Harvesting methods described			2
	4.3. Harvested roots and tubers are appropriately handling according to specific roots and tubers crop requirements	Handling practices applied			3
		Packaging materials selected			3
		Characteristic of label used			2
		Types of label used			3
		Storage roots and tubers perfumed			3
	4.4. Records are properly kept as required by the supervisor	Recording template elaborated			1
		data collected			1
Total marks		100			
Percentage Weightage		100%			
Minimum Passing line % (Aggregate): 70%					

References:

1. Smith C. D., Optimal Cultural Practices for Processed Sweetpotato Products. A thesis submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College: (2012).
2. Adeyemi P.O. A. and Salaam A. R. B., Effect of Processing Conditions on the Quality of Fried Sweetpotato Chips. The International Journal of Science & Technology. ISSN 2321 – 919X: 3: 2: (2015).
3. Maynard, D.H. and G.J. Hochmuth. 1997. *Knott's Handbook for Vegetable Growers*. 4th ed. John Wiley and Sons, New York.