REPUBLIC OF KENYA

COMPETENCY-BASED MODULAR CURRICULUM

FOR

AGRICULTURE AND EXTENSION LEVEL 6
(CYCLE 3)

ISCED PROGRAMME CODE: 0811 554 A

TVET CDACC
P.O. BOX 15745-00100 NAIROBI

SOIL SCIENCE PRINCIPLES

UNIT CODE: 0811 551 17 A

TVET CDACC UNIT CODE: AGR/CU/EXT/CC/01/6/MA

UNIT DURATION: 40 HOURS

Relationship to Occupational Standards

This unit addresses the Unit of Competency: **Apply soil science principles**

Unit Description

This unit specifies the competencies required to apply soil science principles. It includes competencies for performing soil sampling, analysis and improving soil fertility.

Summary of Learning Outcomes

By the end of this unit, the learner should be able to:

S/No	Learning Outcomes	Duration (Hours)
1.	Perform soil sampling	20
2.	Perform soil analysis	10
3.	Improve soil fertility.	10
Total		**40**

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcomes	Content	Suggested Assessment Methods
2. Soil sampling	**Theory** 1.1 Soil sampling 1.1.1 Define soil sampling 1.1.2 Importance of soil sampling 1.1.3 Methods of soil sampling	• Practicals • Written tests • Third party report • Reflection papers • Projects

	1.1.4 Procedure of soil sampling 1.2 Personal Protective Equipment 1.2.1 PPE requirements 1.2.2 Importance of PPE 1.2.3 Uses and care 1.3 Soil sampling tools 1.3.1 Machetes 1.3.2 Secateurs 1.3.3 Shovels 1.3.4 Soil augur 1.3.5 Panga 1.3.6 Hammer 1.3.7 Saw 1.3.8 Bucket 1.3.9 Shears 1.3.10 Dibbler 1.4 Soil testing equipment 1.4.1 Digestion block 1.4.2 Kjeldahl apparatus 1.4.3 UV-VIS Spectrophotometer 1.4.4 Atomic absorption spectrophotometer (AAS) 1.4.5 Flame photometer 1.4.6 pH meter 1.4.7 EC meter 1.4.8 TDS meter 1.4.9 Fume chamber 1.4.10 Measuring cylinders 1.4.11 Assorted glassware for routine laboratory procedures 1.4.12 Mechanical stirrer 1.4.13 Electric shaker 1.4.14 Eureka cans	• Interviews/ Oral questions • Workshop reports • Individual/group assignments

	1.4.15 Meteorological equipment 1.4.16 Maintenance of farm tools and equipment 1.5 Sampling procedures 1.5.1 Field layout 1.5.2 Sample collection 1.5.3 Compositing 1.5.4 Packaging 1.5.5 Processing 1.5.6 Storage **Practice** 1.6 Conduct soil sampling using various sampling methods 1.6.1.1 Traverse method 1.6.1.2 Zigzag method 1.7 Conduct soil testing using various testing equipment 1.7.1 pH meter 1.7.2 EC meter	
3. Soil analysis	**Theory** 2.1 Soil analysis 2.1.1 Define soil analysis 2.1.2 Importance of soil analysis 2.2 Soil analysis equipment and materials 2.2.1 Physical Analysis Equipment 2.2.2 Chemical Analysis Equipment 2.2.3 Biological Analysis Equipment 2.2.4 Laboratory Materials 2.2.5 Data Loggers and Sensors 2.3 Types of soil analysis 2.3.1 Physical Analysis 2.3.2 Chemical Analysis 2.3.3 Biological Analysis	• Written tests • Third party report • Reflection papers • Projects • Interviews/ Oral questions • Workshop reports • Individual/group assignments • Case Studies • Practicals

	2.3.4 Soil organic matter **25. Practical** 25.4 Conduct soil analysis using various methods 25.4.1 Physical methods 25.4.2 Chemical methods 25.4.3 Organic matter 25.4.4 Biological 25.5 Conduct soil analysis using various equipment 26. 2.5.1Physical Analysis Equipment 2.5.2Chemical Analysis Equipment	
4. Soil fertility	**Theory** 3.1 Soil fertility 3.1.1 Define soil fertility 3.1.2 Define soil nutrients 3.1.3 Importance of soil fertility 3.1.4 Ways soil losses fertility 3.1.5 Soil fertility improvement and management 3.2 Types of fertilizers 3.2.1 Inorganic fertiliser 3.2.1.1 Simple/ primary /individual fertilisers 3.2.1.2 Compound/complex 3.2.1.3 Calculations involving fertilizer rates 3.2.1.3.1 Fertilizer ration 3.2.1.3.2 Fertilizer grade	• Written tests • Third party report • Reflection papers • Projects • Interviews/ Oral questions • Workshop reports • Individual/group assignments • Case Studies • Practicals

	3.2.1.4 Methods of fertiliser application 3.2.1.4.1 placement method 3.2.1.4.2 broadcasting method 3.2.1.4.3 foliar application 3.2.1.4.4 drip method 3.2.1.4.5 band/ ring method 3.2.2 Organic manure 3.2.2.1 Farmyard manure 3.2.2.2 green manure 3.2.2.3 compost manure 3.3 Soil fertility and plant nutrition 3.3.1 Definition of terms 3.3.2 Macro-Nutrients 3.3.3 Micro-Nutrients 3.4 Personal Protective Equipment 3.4.1 PPE requirements 3.4.2 Importance of PPE 3.4.3 Uses and care 3.5 Tools, equipment and materials used soil fertility testing 3.6 Soil amendments 3.6.1 Fertilizers 3.6.2 Agricultural lime	

	3.6.3 Gypsum 3.7 Soil conservation measures 3.7.1 Cover cropping 3.7.2 Mulching 3.7.3 Strip cropping 3.7.4 Building of terraces 3.7.5 Minimum tillage 3.7.6 Contour ploughing **Practice** 3.8 Perform fertilizer rationing basing on N:P: K ratio	

Suggested Methods of Instruction

- Role playing
- Group discussion
- Direct instruction

Recommended Resources for 25 Trainees

S/No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
A	**Learning Materials**			
13.	Business Journals		5 pcs	1:5
14.	writing materials		50	
15.	Charts			
16.	PowerPoint presentations	For trainer's use		
17.	Whiteboard		1	

18.	Assorted color of whiteboard markers			
19.	Printers		2	
20.	External storage media			
21.	Projector		1	
22.	Whiteboard		1	
23.	Smart board/ Smart TV (where applicable)			
24.	Newspapers and Handouts		5	
B	**Learning Facilities & infrastructure**			
7.	Lecture/theory room	Size??	1	1:25
8.	Projector		1	
9.	Telephone			
10.	samples of CV		5	
11.	Assorted Flash Cards		25	
12.	Site	Size?	1	1:25
C	**Consumable materials**			
	Printing Papers			
	Assorted color of whiteboard marker			
	Nitrogenous fertilizer	50 kg bag	**1**	
	Phosphatic fertilizer	50 kg bag	**1**	
	Potassic fertilizer	50kg bag	**1**	
D	**Tools and Equipment**			
14.	Granulation equipment		1	1: 25
15.	Hummer mill		1	1: 25

16.	Fertilizer mixer		1	1: 25