

**REPUBLIC OF KENYA**

**COMPETENCY-BASED MODULAR CURRICULUM**

**FOR**

**FARM MACHINERY AND EQUIPMENT OPERATION**

**KNQF LEVEL: LEVEL 4**

**PROGRAMME CODE: 0716 354A**

**©** 2025

All rights reserved. No part of this Curriculum may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods without the prior written permission of …….., except in the case of brief quotations embodied in critical reviews and certain other non-commercial uses permitted by copyright law. For permission requests, write to the Council Secretary/CEO/Chief Principal at the address below:

# FOREWORD

The provision of quality education and training is fundamental to the Government’s overall strategy for social and economic development. Quality education and training contribute to the achievement of Kenya’s development blueprint and sustainable development goals.

Reforms in the education sector are necessary to achieve Kenya Vision 2030 and meet the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution, and this resulted in the formulation of the Policy Framework for Reforming Education and Training in Kenya (Sessional Paper No. 14 of 2012). A key feature of this policy is the radical change in the design and delivery of TVET training. This policy document requires that training in TVET be competency-based, curriculum development be industry-led, certification be based on demonstration of competence, and the mode of delivery allow for multiple entry and exit in TVET programmes.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that this curriculum has been developed. For trainees to build their skills on foundational hands-on activities of the occupation, units of learning are grouped in modules. This has eliminated duplication of content and streamlined exemptions based on skills acquired as a trainee progresses in the up-skilling process, while at the same time allowing trainees to be employable in the shortest time possible through the acquisition of part qualifications.

It is my conviction that this curriculum will play a great role in developing competent human resources for the Agricultural engineering Sector’s growth and development.

**PRINCIPAL SECRETARY**

**STATE DEPARTMENT FOR TVET**

**MINISTRY OF EDUCATION**

# PREFACE

Kenya Vision 2030 aims to transform Kenya into a newly industrializing middle-income country, providing high-quality life to all its citizens by the year 2030. Kenya intends to create globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through lifelong education and training. TVET has a responsibility to facilitate the process of inculcating knowledge, skills, and worker behaviour necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency-Based Education and Training (CBET).

CAP 210A and Sessional Paper No. 1 of 2019 on Reforming Education and Training in Kenya for Sustainable Development emphasized the need to reform curriculum development, assessment, and certification. This called for a shift to CBET to address the mismatch between skills acquired through training and skills needed by industry, as well as increase the global competitiveness of the Kenyan labour force.

This curriculum has been developed in adherence to the Kenya National Qualifications Framework and CBETA standards and guidelines. The curriculum is designed and organized into Units of Learning with Learning Outcomes, suggested delivery methods, learning resources, and methods of assessing the trainee’s achievement. In addition, the units of learning have been grouped in modules to concretize the skills acquisition process and streamline upskilling.

I am grateful to all expert trainers and everyone who played a role in translating the Occupational Standards into this competency-based modular curriculum.

# ACKNOWLEDGEMENT

This curriculum has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support were received from expert trainers, institutions and organizations.

I recognize with appreciation the role of the National Agriculture Sector Skills Committee (NSSC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the Agriculture sector for their valuable input and everyone who participated in developing this curriculum.

I am convinced that this curriculum will go a long way in ensuring that individuals aspiring to work in the Agriculture Sector acquire competencies to perform their work more efficiently and effectively.

**TABLE OF CONTENTS**

Contents

[FOREWORD ii](#_Toc196934381)

[PREFACE iii](#_Toc196934382)

[ACKNOWLEDGEMENT iv](#_Toc196934383)

[ABBREVIATIONS AND ACRONYMS vi](#_Toc196934384)

[COURSE OVERVIEW viii](#_Toc196934385)

[FARM TRACTOR OPERATION 1](#_Toc196934386)

[FARM MACHINERY AND EQUIPMENT OPERATION 6](#_Toc196934387)

[OPERATION OF COMPUTERIZED AGRICULTURAL EQUIPMENT 10](#_Toc196934388)

# ABBREVIATIONS AND ACRONYMS

IAC Industry Advisory Committee

KCSE Kenya Certificate of Secondary Education

KEFEP Kenya Education for Employment

KNQA Kenya National Qualification Authority

KNQF Kenya National Qualification Framework

KEBS Kenya Bureau of Standards

MHE Material handling Equipment

NEMA National Environment Management Authority

OSHA Occupational Safety and Health Act

PPE Personal Protective Equipment

SSAC Sector Skills Advisory Committee

TVET Technical and Vocational Education and Training

TVETA Technical and Vocational Education and Training Authority

AI Artificial Intelligence.

**KEY TO ISCED UNIT CODE**



# COURSE OVERVIEW

Farm Machinery and Equipment operation Level 4 qualification consists of competencies required by an individual to operate farm tractor, operate farm machinery and equipment and operate computerized agricultural equipment

Units of learning comprising Farm Machinery and Equipment Operation Level 4 qualification include the following.

**UNITS OF COMPETENCY.**

|  |  |  |  |
| --- | --- | --- | --- |
| **ISCED UNIT CODE** | **Unit Title** | **Duration in Hours** | **Credit Factor** |
| 0716 351 01A | Farm tractor operation | 250 | 25.0 |
| 0716 351 02A | Farm machinery and equipment Operation | 150 | 15.0 |
| 0716 351 03A | Operation of Computerized agricultural equipment | 120 | 10.0 |
|  | Industrial Training | 320 | 32.0 |
|  | **Sub Total** | **520** | **52.0** |
|  | **Grand Total** | **840.0** | **840.0** |

**Entry Requirements**

An individual entering this course should have any of the following minimum requirements:

1. Kenya Certificate of Secondary Education (KCSE)

**Or**

1. Equivalent KNQF level 3 qualification as determined by relevant regulatory body

**Trainer qualifications**

Qualifications of a trainer for this course include:

1. Possession of a higher qualification than Farm Machinery and Equipment Operator Level 4 or in related trade area; and
2. License by TVETA

**Industry Placement/Training**

An individual enrolled in this course will be required to undergo Industrial attachment for a minimum period of 320 hours in Agricultural farm with a recognized agricultural machinery and equipment facility as a prerequisite for Completion of this training course.

**Assessment**

The course shall be assessed formatively and summatively:

1. During formative assessment all performance criteria shall be assessed based on performance criteria weighting.
2. Number of formative assessments shall minimally be equal to the number of elements in a unit of competency
3. Assessment of basic and common competencies shall be integrated in the core units
4. Theoretical assessment shall be integrated in practical assessment and conducted orally in both formative and summative assessments.
5. Theoretical and practical weight shall be 10:90 respectively for each unit of learning.
6. Formative and summative assessments shall be weighted at 60% and 40% respectively in the overall unit of learning score
7. Assessment performance rating for each unit of competency shall be as follows:

|  |  |
| --- | --- |
| **MARKS** | **COMPETENCE RATING** |
| 80 -100 | Attained Mastery |
| 65 - 79 | Proficient |
| 50 - 64 | Competent |
| 49 and below | Not Yet Competent |
| Y | Assessment Malpractice/irregularities |

1. Assessment for Recognition of Prior Learning (RPL) may lead to award of part and/or full qualification.

**Certification**

A candidate will be issued with a Certificate of Competency upon demonstration of competence in a core Unit of Competency. To be issued with the Kenya National TVET Certificate in Farm Machinery and Equipment Operation Level 4, the candidate must demonstrate competence in all the Units of Competency as given in the qualification pack. Statement of Attainment certificate may be awarded upon demonstration of competence in certifiable element within a unit.

These certificates will be issued by Qualification Awarding Institution

# 

# FARM TRACTOR OPERATION

**UNIT CODE: 0716 351 01A**

**Relationship to Occupational Standards**

This unit addresses the unit of Learning: Operate farm tractor

**Duration of the unit**: 250 hours

**Unit description:**

This unit specifies the competencies required by a Farm Machinery and Equipment Operator Level 4 to operate farm tractor. It involves determining force, work, energy and power, performing bench work, analysing physical properties of engineering materials, carrying out mechanical machining operations, applying geometry and measurements, inspecting farm tractor systems, driving farm tractor, servicing farm tractor systems, maintaining and repairing farm tractor systems.

**Summary of Learning Outcomes:**

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

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Determine force, work, energy and power. | 20 |
| 2. | Perform bench work | 40 |
| 3. | Analyse physical properties of engineering materials | 30 |
| 4 | Carry out mechanical machining operations. | 50 |
| 5 | Apply geometry and measurements | 10 |
| 6 | Inspect farm tractor systems | 10 |
| 7 | Drive farm tractor | 20 |
| 8 | Operation Farm tractor system | 20 |
| 9 | Service farm tractor systems | 20 |
| 10 | Maintain and repair farm tractor systems | 30 |
| **Total** | | **250** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Methods of Assessment** |
| 1.Determine force, work, energy and power | * 1. 1.1 Personal protective equipment   2. Define force, work, energy and power   3. Describe forms of energy;      1. Renewable solar, wind water, geothermal, biogas etc.      2. Non-renewable   4. Convert energy from one form to another   5. Solve simple calculations on force, work, energy and power | * Written tests * Oral questioning * Assignments * Supervised exercises. * Practical tests |
| 1. Perform bench work | * 1. Wear personal protective Equipment appropriately.   2. Assemble bench work tools as per work procedure.   3. Perform benchwork operations as per work procedures.   4. Maintain benchwork tools. | * Written tests * Oral questioning * Assignments * Supervised exercises |
| 1. Analyse physical properties of engineering materials | * 1. Wear personal protective Equipment appropriately   2. Identify engineering materials as per physical properties.   3. Test Engineering materials as per work requirements. | * Written tests * Oral questioning * Assignments * Supervised exercises |
| 1. Carry out mechanical machining operations | * 1. Wear personal protective Equipment appropriately   2. Identify mechanical machines according to the work carried out   3. Perform mechanical machining operations as per work requirements.   4. Identify ways of recycling and reusing waste materials in machining operations.   5. Identify use of ecofriendly materials in the workshop.   6. Maintain mechanical machines as per manufacturers specifications and manuals | * Written tests * Oral questioning * Assignments * Supervised exercises |
| 5.Apply geometry and measurements | * 1. Obtain perimeter and areas of regular figures using geometric rules.   2. Obtain Volumes and surface area of Solids using geometric rules   3. Solve engineering problems using Pythagoras theorem as per work requirements | * Written tests * Oral questioning * Assignments * Supervised exercises. |
| 6.Inspect farm tractor systems | * 1. The observance of Kenyan regulations concerned with health, safety and the environment;   2. The use of personal protective equipment and clothing (PPE) used throughout work activities;   3. Potential safety hazards in the work environment   4. Inspection of farm tractor systems as per the operator’s manual.   Prepare farm tractor inspection report. | * Observation * Practical exercises * Oral * Written * Third party report |
| 7.Drive farm tractor | * 1. Wear person protective equipment and clothing (PPE)   2. Farm tractor starting.   3. Carry out safe driving of tractor | * Observation * Practical exercises * Oral * Written * Third party report |
| 8. Operate farm tractor system | * 1. Wear personal protective equipment (PPE) appropriately   2. Identify selected tractor systems      1. Cooling system      2. Electrical system      3. Transmission system      4. Hitches      5. Power Take off (PTO)      6. Hydraulic system      7. Lubrication system      8. Fuel system   3. Carry out farm tractor system and equipment inspection.   4. Mount /attach farm tractor equipment   5. Perform operation of tractor systems   Identify Electric powered tractors. | * Observation * Practical exercises * Oral * Written * Third party report |
| 9. Service farm tractor systems | * 1. Wear personal protective equipment (PPE) appropriately.   2. Prepare service schedule   3. Cary out pre-start checks of the farm tractor   4. Utilize Automated farm tractor servicing i.e. Use of Robots   5. Carry out routine scheduled services.   6. Manage Farm tractor servicing waste by the three 3R principle (Reduce, Reuse, Recycle)   7. Prepare farm tractor system service report. | * Observation * Practical exercises * Oral * Written * Third party report |
| 10.Maintain and repair farm tractor systems | * 1. Wear personal protective equipment (PPE) appropriately.   2. Assemble Farm Tractor system maintenance and repair tools and equipment.   3. Perform basic diagnostics on tractor systems      1. Cooling system      2. Electrical system      3. Transmission system      4. Hydraulic system      5. Power take-off (PTO)      6. Lubrication system      7. Fuel system      8. Steering system      9. Hitches   4. Identify common malfunctions of selected tractor systems   Interpret results of the diagnostic tests of selected tractor systems | * Observation * Practical exercises * Oral * Written * Third party report |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the Agricultural Machinery service and repair sector;
* Industrial visits.

**Recommended Resources**

* A fully equipped agricultural machinery and equipment maintenance workshop;
* Fully operational tractor
* Internet access to manufacturers’ technical information;
* Personal protective equipment (PPE) and suitable coverings to protect vehicles;
* Facilities for the disposal of waste oil and used parts;
* Customer database and systems for recording maintenance records.
* Lubricants
* Fluids
* Replacement parts
* Cleaning materials
* Scientific Calculators

# FARM MACHINERY AND EQUIPMENT OPERATION

**UNIT CODE: 0716 351 02A**

**Relationship to Occupational Standards**

This unit addresses the unit of Learning: operate farm machinery and equipment

**Duration of Unit:** 150 hours

**Unit Description**

This unit specifies the competencies required by a Farm Machinery and Equipment OperatorLevel 4 to operate farm machinery and equipment. It involves operating tillage, planting, crop protection and harvesting equipment and machinery.

**Summary of Learning Outcomes**

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

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Operate tillage equipment and machinery | 40 |
| 2. | Operate planting equipment and machinery | 40 |
| 3. | Operate crop protection equipment and machinery | 40 |
| 4 | Operate crop harvesting equipment and machinery | 50 |
| **Total** | | **150** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Methods of Assessment** |
| 1. Operate tillage equipment and machinery | * 1. Wear personal protective equipment (PPE) appropriately.   2. Assemble farm tillage equipment and machinery      1. Disc plough      2. Mouldboard plough      3. Subsoiler      4. Chisel plough      5. Cultivators      6. Rotavator      7. Power plough      8. Disc harrow   3. Adjust farm tillage and equipment as per work requirements.   4. Operate farm tillage equipment and machinery.   5. Integrate conservation tillage   6. Maintain farm tillage equipment and machinery | * Written tests * Oral presentation * Observation |
| 1. Operate planting equipment and machinery | * 1. Wear personal protective equipment (PPE) appropriately.   2. Assemble planting equipment and machinery.      1. Broadcaster      2. Seed Drills      3. Row crop planter      4. Pneumatic planter      5. Potato planter      6. Drones   3. Calibrate planting equipment and machinery as per work and crop requirement   4. Operate planting equipment and machinery.   5. Identify precision planting methods.   6. Maintain planting equipment and machinery | * Written tests * Oral presentation * Observation * Project |
| 1. Operate crop protection equipment and machinery | * 1. Wear personal protective equipment (PPE) appropriately.   2. Assemble crop protection equipment and machinery.      1. Knapsack sprayer      2. Boom sprayer      3. Dusters      4. Aerial sprayers      5. Motorised sprayers   3. Calibrate crop protection equipment and machinery.   4. Operate crop protection equipment and machinery   5. Maintain crop protection equipment and machinery   6. Use of drones in identifying and controlling pest and diseases. | * Oral questioning * Observation * Project |
| 1. Operate crop harvesting equipment and machinery | * 1. Wear personal protective equipment (PPE) appropriately.   2. Assemble crop harvesting equipment and machinery.      1. Mowers      2. Balers      3. Conditioners      4. Forage harvesters      5. Combine harvesters   3. Calibrate crop harvesting equipment and machinery.   4. Operate crop harvesting equipment and machinery   5. Maintain crop harvesting equipment and machinery | * Oral questioning * Observation * Oral presentation * Written report |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop
* Instructor lead facilitation of theory
* Demonstrations
* Simulation/Role play
* Group Discussion
* Projects
* Presentations
* Case studies
* Assignments

**Recommended Resources**

* Computers
* TV sets
* LCD projectors
* Internet access to manufacturers’ technical information;
* Personal protective equipment (PPE) and suitable coverings to protect vehicles;
* Facilities for the disposal of waste oil and used parts;
* Customer database and systems for recording maintenance records**.**
* Stationery
* Charts
* Video clips
* Audio tapes
* Radio set
* Digital multi-meters
* Test lights
* Laptop diagnostic systems
* On-board diagnostic systems
* Batteries
* Sensors
* Regulators
* Heaters
* LED
* Printed circuit boards
* Communication plugs
* Circuit tests
* Component tests
* Service code diagnostics

# 

# 

# OPERATION OF COMPUTERIZED AGRICULTURAL EQUIPMENT

**UNIT CODE: 0716 351 03A**

**Relationship to Occupational Standards**

This unit addresses the unit of Learning: utilize computerized agricultural equipment

**Duration of Unit:** 120 hours

**Unit Description**

This unit specifies the competencies required by a Farm Machinery and Equipment Operator Level 4 to utilize computerized agricultural equipment. It involves activating, navigating and operating computerized agricultural equipment.

**Summary of Learning Outcomes**

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

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Operate computer devices | 30 |
| 2. | Activate computerized agricultural equipment | 30 |
| 3. | Navigate computerized agricultural equipment | 30 |
| 4 | Operate computerized agricultural equipment | 30 |
| **Total** | | **120** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Methods of Assessment** |
| 1. Operate computer devices | * 1. Meaning and importance of digital literacy   2. Procedure for turning/off a computer   3. Types of computer devices      1. Tablets      2. desktop      3. Laptop computers   4. Components of a computer system   5. Computer Hardware      1. The System Unit E.g. Motherboard, CPU, casing,      2. Input Devices e.g. Pointing, keying, scanning, voice/speech recognition, direct data capture devices.      3. Output Devices e.g. hardcopy output and softcopy output      4. Storage Devices e.g. main memory e.g. RAM, secondary storage (Solid state devices, Hard Drives, CDs & DVDs, Memory cards, Flash drives      5. Computer Ports e.g. HDMI, DVI, VGA, USB type C, etc.   6. Electronic waste recycling   7. Start Menu Commands and Desktop Manipulation   8. Mouse use techniques   9. Keyboard Parts and Use Techniques   10. File and Files Management using an operating system   11. Computer Internet Connection Options       1. Mobile Networks/Data Plans       2. Wireless Hotspots       3. Cabled (Ethernet)   12. Mechanisms for storing files (flash drives, hard drives).   13. Computer external devices management   14. Device connections   15. Device controls (volume controls and display properties) | * Observation * Oral assessment * Portfolio of evidence * Third party report * Written assessment * Practical |
| 1. Activate computerized agricultural equipment | * 1. Wear personal protective Equipment appropriately.   2. Assemble computerized agricultural equipment.      1. OBD      2. Display interfaces      3. Control systems      4. Joystick      5. Sensors      6. GPS receivers      7. Actuators of robotic arms      8. Communication modules   2.3 Activate computerized agricultural equipment. | * Written tests * Oral presentation * Observation |
| 1. Navigate computerized agricultural equipment | * 1. Wear personal protective Equipment appropriately.   2. Access Computerized agricultural equipment menu.      1. Automated steering      2. Precision planting      3. Precision spraying      4. Variable rate application of chemicals      5. Remote monitoring      6. Data collection and analysis      7. Precision harvesting   3. Customize Computerized agricultural equipment. | * Written tests * Oral presentation * Observation * Project |
| 1. Operate computerized agricultural equipment | * 1. Wear personal protective Equipment appropriately.   2. Select computerize agricultural Equipment functions as per work requirement.   3. Operate Computerized agricultural equipment as per operator’s manual.   4. Identify robot driven agricultural equipment and machines. | * Oral questioning * Observation * Project |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop
* Instructor lead facilitation of theory
* Demonstrations
* Simulation/Role play
* Group Discussion
* Projects
* Presentations
* Case studies
* Assignments

**Recommended Resources for 25 Trainees**

* Internet access to manufacturers’ technical information;
* Personal protective equipment (PPE) and suitable coverings to protect vehicles;
* Facilities for the disposal of waste oil and used parts;
* Customer database and systems for recording maintenance records**.**
* Stationery
* Charts
* Video clips
* Audio tapes
* Radio set
* Digital multi-meters
* Test lights
* Laptop diagnostic systems
* On-board diagnostic systems
* Batteries
* Sensors
* Regulators
* Heaters
* LED
* Printed circuit boards
* Communication plugs
* Circuit tests
* Component tests
* Service code diagnostics
* 25 computers with the following software:
  1. Windows/Linux/Macintosh Operating System
  2. Microsoft Office Software
  3. Google Workspace Account
  4. Antivirus Software
* 25 External Storage Media
* 2 Printers
* Printing papers
* 2 Projectors
* 2 Whiteboards
* 2 Smartboards/Smart TV (Where applicable)
  + Assorted white board markers
  + Internet connection
  + 3 samples of CVs
  + 3 samples of job applications