

**REPUBLIC OF KENYA**

**COMPETENCY BASED MODULAR CURRICULUM**

**FOR**

**AQUACULTURE**

**KNQF LEVEL 4**

**PROGRAMME ISCED CODE: 0831 354A**

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# **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 Aquaculture 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).

TVET Act, 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 up skilling.

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

# **ACKNOWLEDGMENT**

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 Sector Skills Committee (NSSC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the Fisheries 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 Fisheries Sector acquire competencies to perform their work more efficiently and effectively.

**ABBREVIATIONS AND ACRONYMS**

PPEs Personal Protective Equipment

ISCED International Standard Classification of Education

TVET Technical and Vocational Education and Training

TVETA Technical and Vocational Education and Training Authority

CBET Competency Based Education and Training

**KEY TO ISCED UNIT CODE**



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**COURSE OVERVIEW**

Aquaculture Level 4 qualification consists of competencies that an individual must have to carry out fish production. It involves performing aquaculture housing activities, production of table size Fish, performing hatchery operations and producing Fish feeds.

Units of learning comprising Aquaculture level 4 qualification include the following:

**SUMMARY OF UNITS OF COMPETENCY**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category of Unit** | **Unit code** | **Unit title** | **Unit duration (Hours)** | **Credit factor** |
|  | **MODULE I** | | | |
| Core | 0831 341 01A | Aquaculture housing activities | 150 | 15 |
| Core | 0831 341 02A | Production of table size fish. | 150 | 15 |
|  |  | **TOTAL** | 300 | 30 |
|  | **MODULE II** | | | |
| Core | 0831 341 03A | Fish hatchery operations | 180 | 18 |
| Core | 0831 341 04A | Fish feed production | 180 | 18 |
|  |  | Industry Training | 320 | 32 |
|  | **TOTAL** | | **980** | **98** |

**Entry Requirements**

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

1. Kenya Certificate of Secondary Education (KCSE) with a mean grade D- or E

**Or**

Certificate in aquaculture level 3

**Or**

Equivalent qualifications as determined by relevant regulatory body

**Trainer Qualification**

A trainer for any of the units of competency in this course must:

1. A trainer for this course must have at least a level 5 in aquaculture, or any other related qualification.
2. Licensed by TVETA.

**Industry Training**

An individual enrolled in this course will be required to undergo Industry training for a minimum period of 320 hours in the agriculture sector. The industrial training may be taken after completion of all units for those pursuing the full qualification or be distributed equally in each unit for those pursuing partial qualification. In the case of dual training model, industrial training shall be as guided by the dual training policy.

**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 Unit of Competency. To be issued with the Kenya National TVET Certificate in Aquaculture 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

**MODULE I**

**AQUACULTURE HOUSING ACTIVITIES**

**UNIT CODE: 0831 341 01A**

**UNIT DURATION: 150 HOURS**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Perform Aquaculture housing activities

**UNIT DESCRIPTION**

This unit specifies the competencies required to set up fish rearing unit. It involves applying farm management concepts, constructing fish rearing units, installing inlet and outlet systems, predatory control devices and maintaining fish rearing units.

Performance of products and services.

**Summary of learning outcomes**

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

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Construct a fish-rearing unit | 50 |
| 2. | Install inlet and outlet systems | 40 |
| 3. | Install predatory control devices | 30 |
| 4. | Maintain fish rearing unit | 30 |
| **Total** | | **150** |

**LEARNING OUTCOME, CONTENT AND SUGGESTED METHODS OF ASSESSMENT**

|  |  |  |
| --- | --- | --- |
| **LEARNING OUTCOME** | **CONTENT** | **SUGGESTED METHOD OF ASSEMENT** |
| 1. Construct a fish-rearing unit | * 1. Personal protective equipment      1. Gumboots      2. Helmets      3. Gloves      4. Overalls      5. First aid kits   2. Tools and requirements      1. Tools-tape measure      2. Spirit level      3. Jembes      4. Spades      5. Pangas   3. Factors to consider before constructing a rearing unit   + Availability of extra labor   + Equipment and materials required   + Site related factors   1. Site clearing   + Importance of site clearing   + Types of wetland vegetation   + Site clearing techniques   + Risks associated with site clearing   1. Methods of disposing cleared vegetation   2. Analyzation of water quality and quantity   3. Analyzation of water characteristics   4. Land topography   5. Selection of fish   rearing unit   * + 1. Earthen ponds     2. Lined ponds     3. Concrete ponds     4. Fiberglass tanks     5. Plastic tanks     6. Glass tanks   1. Clearance of fish rearing unit   2. Measurement of fish rearing area   3. Construction of fish rearing unit | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |
| 1. Install inlet and outlet systems | * 1. Personal protective equipment   2. Tools and equipment selection   3. Elevation of inlet and outlet system   4. Excavation of trenches   5. Installation of PVC pipes   6. Fitting of inlets and outlets   7. Backfilling of trenches   8. Inlet and outlet systems   3.8.1. Pipe inlets  3.8.2 Open gutter inlets  3.8.3. Canal inlets  3.8.4 Gate valves  3.8.5 Canfield pipes  3.8.6 Sluices  3.8.7 Monks | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |
| 1. Install predatory control devices | * 1. Measurement of fish rearing unit   2. Pegging of fish rearing unit   3. Mounting of predatory control devices      1. Chain link      2. Scare crow      3. Decoys      4. Deterrents      5. Electric fencing | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |
| 1. Maintain fish rearing unit | * 1. Maintenance required in fish rearing unit      1. Cleaning around net pens and ponds      2. Repairing damaged netting      3. Floatation or moorings      4. fixing the banks of a pond   2. fish rearing unit maintenance procedure   3. Recording of identified issues | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |

**Suggested Methods of Instruction**

* Project
* Demonstration
* Practicals
* Discussions
* Direct instruction

**Recommended Resources for 25 Trainees**

|  |  |  |
| --- | --- | --- |
| **Category/Item** | **Quantity** | **Recommended ratio**  **(item: Trainee)** |
| Desktop computers/laptops | 25 | 1:1 |
| Internet connection |  |  |
| Projector  Printer | 1  1 | 1:25  1:25 |
| Feed mixer | 1 | 1:25 |
| Well-equipped workshop | 1 | 1:25 |
| Flame photometer | 1 | 1:25 |
| Tanks | 1 | 1:25 |
| Feed extruder | 1 | 1:25 |
| Assorted sieve | 1 | 1:25 |
| Spade | 5 | 1:5 |
| Weighing scale | 5 | 1:5 |
| Jembe | 5 | 1:5 |
| PH meter | 5 | 1:5 |
| Wheelbarrow | 5 | 1:5 |
| Measuring tape | 5 | 1:5 |

**PRODUCTION OF TABLE SIZE FISH**

**UNIT CODE:** **0831 341 02A**

**UNIT DURATION: 150 Hours**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: produce table size fish

**Unit Description**

This unit covers the competencies required to produce table-size fish. It entails preparing grow-out rearing units, stocking fingerlings and managing fish health.

**Summary of learning outcomes**

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

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Prepare grow-out rearing units | 50 |
| 2. | Stock fingerlings | 40 |
| 3. | Feed grow out fish | 30 |
| 4. | Manage fish health. | 30 |
| **Total** | | **150** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare grow-out rearing units | **Theory**   * 1. PPEs      1. Safety goggles      2. Gumboots      3. Gloves      4. Dust coats      5. First aid kits      6. Gas mask      7. Waders   2. Selection of tools and equipment      1. Weighing scale      2. Wheelbarrow      3. Water quality test kit      4. Spades      5. Lime      6. Fertilizer      7. Secchi disks      8. Microscope      9. Dissecting kit      10. Buckets and basins      11. Fish harvesting gear   3. Disinfecting grow-out rearing unit   4. Filling if fish rearing unit   5. Carrying out Grow-out rearing unit water conditioning      1. Liming      2. Fertilization      3. Flocculation      4. Flushing | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |
| 1. Stock fingerlings | * 1. PPEs      1. Safety goggles      2. Gumboots      3. Gloves      4. Dust coats      5. First aid kits      6. Gas mask      7. Waders   2. Selection of tools and equipment   3. Fingerlings selection * Care and handling of fingerlings * Fingerling transportation methods * Factors to consider when stocking ponds with fingerlings   + Timing   + Weather   + Water quality   + Fingerling acclimatization   + Stocking procedure      * 1. Fingerlings transfer   2. Carry out fingerlings stocking   3. Post-harvest monitoring of stocked fish   + Handling fingerling mortalities   1. Signs of stress in newly stocked fish | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |
| 1. Feed grow out fish | 3.1 Types of fish feeds  Natural feeds   * 1. Pond liming and fertilization   2. Fish feeding methods      1. Hand feeding (broadcasting)      2. Automatic feeders      3. Demand feeders   3. Weighing feed rations   4. Fish feeds methods   5. Fish feeding behavior | * Oral questioning * Written tests * Practical tests |
| 1. Manage fish health. | * 1. PPEs   2. Selection of tools and equipment   3. Fish health signs and symptoms   4. Administration of disinfectants, drugs, therapeutic substances and antibiotics      1. Iodophores      2. Chlorine      3. Formalin      4. Ozonation      5. Quaternary ammonium compounds      6. Hydrogen Peroxide      7. Potassium permanganate      8. Copper Sulfate      9. Emamectin benzoate      10. Florfenicol      11. Oxolinic acid and flumequine      12. Oxytetracycline   5. Carrying out prevention and control of fish diseases      1. Pathogen-free water      2. Transfer of pathogens      3. Disinfections      4. Optimization of environmental conditions | * Practical * Project * Third party report * Portfolio of evidence * Written tests   + Oral questioning |

**Suggested Methods of Instruction**

* Project
* Demonstration
* Practicals
* Discussions
* Direct instruction

**Recommended resources for 25 trainees.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/NO** | **Category/Item** | **Description/specification** | **Qty** | **Recommended ratio (item: trainee)** |
|  | Projector | EPSOM | 1 | 1:25 |
|  | Whiteboard/smartboard | 2.5 By 1.5.M | 1 | 1:25 |
|  | Desktop/computer |  | 1 | 1:25 |
|  | Classroom | Well-lit with 25 seats | 1 | 1:25 |
|  | Sets of Writing materials |  | 25 | 1:25 |
|  | Video clips |  | 5 | 1:25 |
|  | Human resource | Trainer and Technician | 2 | 1:25 |
|  | Library | Equipped with table fish production books and E- section | 1 | 1:25 |

**MODULE II**

**FISH HATCHERY OPERATIONS**

**UNIT CODE:** **0831 341 03A**

**UNIT DURATION: 180 HOURS**

**Relationship to Occupational Standards**

This unit addresses the unit: Operate fish rearing unit.

**Unit Description**

This unit covers the competencies required to operate fish hatchery. It involves preparing fish hatchery, stocking brood fish, nursing fry and fingerlings and maintaining hatchery unit.

**Summary of learning outcomes**

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

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Prepare fish hatchery | 50 |
| 2. | Stock brood fish | 30 |
| 3. | Nurse fry and fingerlings | 50 |
| 4. | Maintain the hatchery | 50 |
| **Total** | | **180** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare fish hatchery | * 1. PPEs * Safety goggles * Gumboots * Wading suit * Gloves * Dust coats * First aid kits * Life ring * Life jacket   1. Assembling of tools, equipment and materials   **Tools and equipment**   * + 1. pH meters     2. DO meters     3. Multiparameter water test kit     4. Secchi disk     5. Computer     6. Ammonia alarms     7. Automatic titrators   **Materials**   * + 1. Assorted reagents     2. Assorted chemicals     3. Test strips   1. Disinfection of fish hatchery facility   2. Filling of fish rearing unit   3. Carrying out of rearing unit water conditioning * Sedimentation * Filtration * Flocculation * Desalination * Micro-organism control * Heating/cooling * pH Adjustment * Aeration * Degassing | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |
| 1. Stock brood fish | * 1. PPEs are worn   2. Assembling of tools, equipment and materials   3. Grading of brooders   4. Transferring of brood fish   5. Carry out brood fish stocking | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |
| 1. Nurse fry and fingerlings | * 1. PPEs   2. Assembling of tools, equipment and materials   3. Carrying out of fish fry and fingerlings stocking   4. Fish fry and fingerling feeding   5. Fish rearing unit water quality maintenance   6. Fish fry and fingerlings grading based on growth rates   7. Carry out fish fry and fingerlings nursing | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |
| 1. Maintain hatchery rearing units | * 1. Water flow rate regulation   2. Aeration systems regular maintenance   3. Cleaning schedule development   4. Water quality parameter ranges maintenance * Dissolved oxygen * Temperature * pH * Ammonia * Nitrite * Alkalinity * Turbidity   1. Rearing unit repairs   Carry out hatchery rearing unit maintenance | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |

**Suggested Methods of Instruction**

* Project
* Demonstration
* Practicals
* Discussions
* Direct instruction

**Recommended resources for 25 trainees.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/NO** | **Category/Item** | **Description/specification** | **Qty** | **Recommended ratio (item: trainee)** |
|  | Projector | EPSON | 1 | 1:25 |
|  | Whiteboard/smartboard | 2.5 By 1.5.M | 1 | 1:25 |
|  | Desktop/computer |  | 1 | 1:25 |
|  | Classroom | Well-lit with 25 seats | 1 | 1:25 |
|  | Hatchery | operational | 1 | 1:25 |
|  | Feed production manual | Up to date | 5 | 1:5 |
|  | Sets of Writing materials |  | 25 | 1:25 |
|  | Video clips |  | 5 | 1:25 |
|  | Human resource | Trainer and Technician | 2 | 1:25 |
|  | Library | Equipped with fish production books and E- section | 1 | 1:25 |

# **PRODUCTION OF FISH FEEDS**

**UNIT CODE:** **0831 341 04A**

**UNIT DURATION: 150 HOURS**

**RELATIONSHIP TO OCCUPATIONAL STANDARDS**

This unit addresses the unit of competency: produce fish feeds

**UNIT DESCRIPTION**

This unit specifies the competencies required to produce fish feeds. It involves culturing live feed; preparing formulated fish feed; administering live fish feeds and administer formulated fish feeds.

**Summary of learning outcomes**

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

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Culture natural fish feeds | 50 |
| 2. | Produce on-farm formulated fish feeds | 30 |
| 3. | Package and store fish feeds | 20 |
| 4. | Keep records | 50 |
| **Total** | | **150** |

**LEARNING OUTCOMES, CONTENT AND SUGGESTED ASSESSMENT METHODS**

|  |  |  |
| --- | --- | --- |
| **LEARNING OUTCOMES** | **CONTENT** | **SUGGESTED ASSESSMENT METHODS** |
|  |  |  |
| 1. Culture natural fish feeds | * 1. PPEs      1. Gumboots,      2. Helmets,      3. Gloves,      4. Overalls,      5. First aid kits   2. Tools and equipment selection.      1. Feed mixer      2. Feed extruder      3. Tanks      4. Assorted Sieves   3. Cleaning, liming, drying and flooding pond with water   4. Natural productivity of pond   5. Inoculation of live fish feeds      1. Daphnia      2. Rotifera      3. Artemia      4. Moina      5. Copepods | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |
| 1. Produce on-farm formulated fish feeds | * 1. On-farm feed production materials and equipment   2. Formulation of feed composition   3. Treatments of feed ingredients   4. Milling of feed ingredients   5. Adding of Feed additives      1. Feed binders      2. Antioxidants      3. Antibiotics      4. Chemo-attractants      5. Anabolic agents      6. Feed stimulants   Pigments   * 1. Weighing and mixing of formulated feeds   2. Pelleting of feed mixture   3. Carry out preparation of formulated fish feeds | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |
| 1. Package and store fish feeds | * 1. Weighing and packaging of fish feeds   2. Storing of dry fish feeds   3. Refrigeration of moist fish feeds | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |
| 1. Keep records | * 1. Record of feed ingredients      1. Types      2. Date procured      3. Store quantities   2. Preparation of feeds record   3. Records of food safety parameters maintenance   4. Feeding of produced feeds   5. Monitoring of fish growth rate   6. Record keeping of fish growth rate | * Practical * Project * Third party report * Portfolio of evidence * Written tests * Oral questioning |

**Suggested Methods of Instruction**

* Project
* Demonstration
* Practical
* Discussions
* Direct instruction

**Recommended resources for 25 trainees.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/NO** | **Category/Item** | **Description/specification** | **Qty** | **Recommended ratio (item: trainee)** |
|  | Projector | EPSOM | 1 | 1:25 |
|  | Whiteboard/smartboard | 2.5 By 1.5.M | 1 | 1:25 |
|  | Desktop/computer |  | 1 | 1:25 |
|  | Classroom | Well-lit with 25 seats | 1 | 1:25 |
|  | Feed analysis laboratory | Well equipped | 1 | 1:25 |
|  | Feed quality Journals |  | 5 | 1:5 |
|  | Sets of Writing materials |  | 25 | 1:25 |
|  | Video clips |  | 5 | 1:25 |
|  | Human resource | Trainer and Technician | 2 | 1:25 |
|  | Library | Equipped with animal nutrition books and E- section | 1 | 1:25 |