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**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARD**

**FOR**

**AQUACULTURE OPERATOR**

**KNQF LEVEL 4**

**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 economic development. Quality education and training will contribute to achievement of Kenya’s development blueprint, Vision 2030 and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned in the Constitution of Kenya 2010 and this resulted to the formulation of the Policy Framework for Reforming Education and Training. A key feature of this policy is the radical change in the design and delivery of the 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 mode of delivery allows 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 these Occupational Standards were developed for the purpose of developing a competency- based curriculum for Aquaculture Management level 4. These Occupational Standards will also be the basis for assessment of an individual for competence certification.

It is my conviction that these Occupational Standards will play a great role towards development of competent human resource for the Aquaculture sector’s growth and sustainable development.

# PREFACE

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

The Technical and Vocational Education and Training Act No. 29 of 2013 and the sessional paper No. 14 of 2012 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Aquaculture Sector Skills Advisory Committee (SSAC), German International Cooperation and Ministry of Agriculture, Livestock and Fisheries have developed these Occupational Standards for an Aquaculture Technician. TVET CDACC in conjunction with Micro Enterprises Support Programme Trust (MESPT) have reviewed these Occupational Standards and incorporated Food Safety. These standards will be the bases for development of competency-based curriculum for Aquaculture Management level 4.

The Occupational Standards are designed and organized with clear performance criteria for each element of a unit of competency. These standards also outline the required knowledge and skills as well as evidence guide.

I am grateful to the Council Members, Council Secretariat, Aquaculture and Food safety SSAC, expert workers and all those who participated in the development and review of these Occupational Standards.

# ACKNOWLEDGMENT

These Occupational Standards were developed through combined effort of various stakeholders from private and public organizations. I am thankful to the management of these organizations for allowing their staff to participate in this course. I wish to acknowledge the invaluable contribution of industry players who provided inputs towards the development of these Standards.

I thank TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) for providing guidance on the development of these Standards. My gratitude goes to Aquaculture Sector Skills Advisory Committee (SSAC) members for their contribution to the development of these Standards. I thank all the individuals and organizations who participated in the validation of these Standards.

My gratitude also goes to NEPAD Planning and Coordinating Agency (NPCA) of the Africa Union Commission and German Ministry of Economic Cooperation and Development (BMZ) through its implementing agency German International Cooperation (GIZ) GmbH which enabled the development of these Standards through the CAADP ATVET project.

I also appreciate the office of the National Coordinator of GIZ CAADP ATVET Project which was instrumental in the cooperation between the project team, Ministry of Agriculture, Livestock and Fisheries (MoALF) and Ministry of Education.

Much gratitude goes to Micro Enterprises Support Program Trust (MESPT) who initiated the review process and the incorporation of Food Safety in the Occupational Standards. I acknowledge the Danish International Development Agency (DANIDA) and the European Union (EU) who sponsored the review process.

I acknowledge all other institutions which in one way or another contributed to the development of these Standards.

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# ACRONYMS AND ABBREVIATIONS

AQ Aquaculture

AT Aquaculture Technician

ATVET Agricultural Technical and Vocational Education and Training

BC Basic Competency

CR Core Competency

CAADP Comprehensive Africa Agricultural Development Programme

CDACC Curriculum Development, Assessment and Certification Council

DANIDA Danish International Development Agency

GIZ German International Cooperation

MESPT Micro Enterprises Support Programme Trust

OS Occupational Standards

PPE Personal Protective Equipment

SSAC Sector Skills Advisory Committee

**KEY TO ISCED UNIT CODE**



# OVERVIEW

Aquaculture Management qualification level 4 consists of competencies for constructing fish ponds, producing on-farm formulated fish feeds as well as promoting growth of natural foods in ponds and tanks. Other competencies are stocking the ponds and tanks with fingerlings and raising these to market size under optimum conditions; operating a small-scale fish hatchery and fish harvesting, handling and processing.

This qualification consists of the following competencies:

|  |  |
| --- | --- |
| **ISCED Unit Code** | **Unit Title** |
| 0831 351 01A | Perform Aquaculture housing activities |
| 0831 351 02A | Produce of table size fish. |
| 0831 351 03A | Operate Fish hatchery |
| 0831 351 04A | Produce Fish feed |

# PERFORM AQUACULTURE HOUSING ACTIVITIES

**UNIT CODE: 0831 351 01A**

**UNIT DESCRIPTION**

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

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**  These are **assessable** statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Construct a fish-rearing unit | * 1. ***Tools, equipment, materials*** and ***supplies*** are identified and gathered based on job requirements.   2. ***PPEs*** are identified and gathered as per job requirements.   3. Pond site is drained where necessary   4. Pond site is cleared of vegetation, debris and topsoil as instructed by ***immediate supervisor***   5. Cleared vegetation is disposed of as recommended by the supervisor   6. Safety precautions are applied according to site requirements   7. Tools, equipment, materials and supplies are identified and gathered based on job requirements.   8. PPEs are identified and gathered as per job requirements.   9. Fish pond area is measured and pegged following directions from immediate supervisor   10. A perimeter cut-off trench is constructed around the pond area based on the peg marks   11. Pond area is excavated following the peg markings, to a depth recommended by the supervisor   12. Dykes are constructed, shaped and aligned under supervision of a qualified technician   13. Pond leveling and inlet-outlet system are carried out under supervision of a qualified technician |
| 1. Install inlet and outlet systems | * 1. Pond water diversion channel is trenched following peg markings as directed by immediate supervisor.   2. Screening devices for in-coming water are installed under supervision   3. Flood control structures are installed as directed by supervisor   4. Drainage channels are constructed following peg markings as directed by immediate supervisor. |
| 1. Install predatory control devices | * 1. ***Fish predators and intrusive animals*** are identified   2. ***Pond weeds*** are located and removed as per good aquaculture management practices   3. ***Control measures*** for predators and intrusive animals are installed as per identified risks and good aquaculture management practices |
| 1. Maintain fish rearing unit | * 1. ***Maintenance tools, equipment and materials*** are assembled as per the task requirements   2. Grass on pond dykes is cleared periodically as per good aquaculture practices   3. Infringing vegetation is cleared as per good aquaculture practices   4. Pipes and drainage channels are monitored and cleared blockages as per workplace procedures   5. Tools and equipment are cleaned and stored as per workplace procedures |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Hazards may include but not limited to: | * Physical hazards * Chemical hazards   + Heavy metals   + Pesticides   + Industrial chemicals * Biological hazards   + Aquatic animal diseases * Naturally occurring toxins |
| 1. Sources may include but not limited to: | * Agricultural chemicals * Toxic plants * Fecal matter * Soil * Water |
| 1. Preventing may include but not limited to: | * Location, design and layout of farm * Farm waste management * Pond nets |
| 1. Correcting may include but not limited to: | * Pest control * Pond lining * Runoff control |
| 1. Tools, equipment, materials and supplies include but not limited to: | * Tools-tape measure, spirit level, water level, jembes, spades, pangas, * Equipment-plate compactors and rollers, wheelbarrows * Materials and supplies-ropes, liners, pegs, plumbing materials, lime, cement, sand |
| 1. Water fit for aquaculture include but not limited to | * Fish species specific recommended level of chlorine * Fish species specific Recommended pH range * Fish species specific Recommended Ammonia * Fish species specific recommended turbidity level * Free of infective pathogens |
| 1. PPE’s include but not limited to | * Gum boots, helmets, gloves, overalls, first aid kits |
| 1. Immediate supervisor includes but not limited to: | * Fisheries Officer * Assistant Fisheries Officer * Aquaculture technician Level 3, 4, or 5 |
| 1. Soil erosion control measures include but not limited to: | * Planting grass on the dykes, terracing |
| 1. Hazards may include but not limited to: | * Chemical hazards   + Heavy metals   + Pesticides   + Industrial chemicals * Physical hazards * Biological hazards   + Aquatic animal diseases   + Naturally occurring toxins |
| 1. Sources of hazards may include but not limited to: | * Poor feeding * Poor feed quality * Poor water quality * Human carriers * Cleaning agents * Pesticides * Industrial/ agricultural wastes |
| 1. Preventing may include but not limited to: | * Good water quality * Sanitary measures * Proper use of antibiotics * Disease management * Parasite control * Use of quality feed * Good hygienic practices * Biosecurity measures * Probiotics |
| 1. Correcting may include but not limited to: | * Disposal of contaminated fish * Fish treatment * Water flow management * Sterilization of the fish grow-out |
| 1. PPEs include but not limited to | * Safety goggles, gum boots, helmets, gloves, dust coats, first aid kits, industrial mouth piece |
| 1. Tools, equipment and materials include but not limited to: | * Measuring tape, weighing scale, wheelbarrow, pH meter, jembes, spades, rakes * Lime, fertilizer, ropes |
| 1. Grow out culture units includes but not limited to | * Earthen ponds, concrete tanks, plastic tanks, fiberglass, raceways, cages and pens |
| 1. Fisheries technician includes but not limited to: | * Assistant Fisheries Officer, Fisheries Officer, Aquaculture technician levels 4, 5 and 6, Aquaculture extension officer |
| 1. Fish predators and intrusive animals include but not limited to: | * Birds, mammals, reptiles, amphibians, invertebrates, man |
| 1. Control measures include but not limited to: | * Clearing grass, trimming vegetation, traps and scarecrows, net covers, twines, screens, fencing |
| 1. Harvesting tools, equipment and materials include but not limited to: | * Seine net, scoop net, buckets, laundry baskets, weighing scale, perforators |
| 1. Maintenance tools, equipment and materials include but not limited to: | * Slashers, machetes, jembes, spades, wheelbarrow, rakes, gunny bags |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Organizing skills
* Analytical skills
* Negotiation skills
* Interpersonal skills
* Communication skills
* Evaluation skills
* Problem solving
* Critical thinking
* Sanitary food handling practices
* Implementing sustainable waste management
* Applying first aid treatment

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Safety Practices
* Proper waste disposal
* Environmental protection and concerns
* Food safety principles and practices
* Good grooming and personnel hygiene
* Parts and functions of personal protective equipment
* First Aid Kit
* Sanitizing equipment

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Identified and appropriately used Personal Protective Equipment . 2. Identified, controlled and prevented aquaculture hazards 3. Implemented personnel hygiene and sanitation practices in aquaculture. 4. Implemented aquaculture workplaces’ safety measures 5. Implemented sustainable waste management practices in aquaculture. |
| 1. Resource implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place. 2. Access to relevant work environments. 3. Resources relevant to the proposed activities or task. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Written tests   2. Third party reports   3. Oral questioning   4. Interview   5. Observation |
| 1. Context of Assessment | Assessment could be conducted:  4.1 On-the-job  4.2 Off-the–job  4.3 During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with related units in the sector |

# PRODUCE TABLE SIZE FISH

**UNIT CODE:** 0831 351 02A

**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.

**ELEMENTS AND PERFORMANCE CRITERIA**

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| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Prepare grow-out rearing units | * 1. ***PPEs***are identified and gathered as per task requirement   2. Safety precautions are adhered to   3. ***Tools, equipment and materials*** are assembled in line with task requirement   4. Fish culture units are drained to dryness   5. Fish culture tanks are cleaned and disinfected with food grade cleaning agents as per standard sanitary operating procedures   6. Excess pond bottom mud is removed till initial pond depth is attained   7. Fertilization and liming of culture units carried out based on recommended rates |
| 1. Stock fingerlings | * 1. Fry or fingerlings are acclimatized based on culture unit temperatures   2. Fry or fingerlings are gently released in to culture units with minimum stress   3. Stocked ponds are monitored for fingerling stress and mortalities through direct observations |
| 1. Feed grow out fish | * 1. Fish feeds are safely handled to avoid cross-contamination and adulteration as per standard operating procedures   2. Feeds are weighed as per the feeding schedule for the specified fish species and size   3. Weighed feed rations are divided by the frequency of feeding as specified in the feeding schedule   4. Fish are fed using any of the appropriate methods based on labour available, weather conditions, size of the culture units   5. Fish feeding behaviour is monitored during feeding based on normal behaviour and recorded |
| 1. Manage fish health. | * 1. Fish are observed for changes in behaviour and physical appearance using a checklist provided by a ***fisheries technician***   2. Feeding response is monitored following standard farm procedures   3. Management related remedial measures for stressed and diseased fish are undertaken as directed by a fisheries technician as per International Organization for Animal Health (OIE) guidelines   4. Biosecurity measures are put in place to prevent disease outbreaks |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
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| Variables | Range  Includes but not limited to: |
| 1. Personal protective equipment | * Gloves * Arm/Hand guard, gloves * Hair Net/cap/bonnet * Face protection (mask, shield) * Apron/Gown/coverall/jump suit |
| 1. Commonly farmed fish species | * Fresh water fish species e.g. Nile tilapia and African cat fish * Ornamental fish species e.g. American guppy and gold fish * Salty water fish species e.g. milkfish and prawns |
| 1. Feeding behavior | * Carnivorous fish such as African catfish * Herbivorous fish such as tilapia * Omnivorous fish such as gold fish and guppies |
| 1. Reproductive behavior | * Mouthbrooding in tilapia |
| 1. Social behavior | * Shoaling and schooling |
| 1. Defensive behavior | * Flight |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Organizing skills
* Analytical skills
* Negotiation skills
* Interpersonal skills
* Communication skills
* Evaluation skills
* Problem solving
* Critical thinking
* Observation skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Fish biology for commonly farmed fish species
* Fish behavior

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Identified relevant PPEs   2. Identified aquaculture fish species   3. Identified fish parts/external morphology   4. Demonstrated the understanding of fish behavior |
| 1. Resource implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place. 2. Access to relevant work environments. 3. Resources relevant to the proposed activities or task. |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Written tests   2. Third party reports   3. Oral questioning   4. Interview   5. Observation |
| 1. Context of Assessment | Assessment could be conducted  4.1. On-the-job  4.2. Off-the–job  4.3. During industrial attachment |
| 1. Guidance information for assessment | Holistic assessment with related units in the sector |

# OPERATE FISH HATCHERY

**ISCED UNIT CODE: 0831 351 03A**

**UNIT DESCRIPTION**

This unit specifies the competencies required to operate a fish hatchery. It involves preparing hatchery for stocking, stocking and feeding the brood stock, naturally propagating farmed fish and harvesting the fry and fingerlings. It also involves packaging fish sees for transportation, maintaining the hatchery through cleanliness and regulating water flow rates.

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| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Prepare fish hatchery | * 1. ***PPE****’s* are identified and gathered as per task requirements   2. ***Tools, equipment and food grade materials*** are assembled as per task requirements   3. Fish pond is filled with water fit for aquaculture to required depth based on pond depth and purpose   4. Fish pond fertilized based on recommended fertilization rates as per identified food safety risks   5. Fish happas are cleaned, disinfected as per cleaning and sanitation procedures and appropriately set in the fish pond   6. Water flow within the fish pond is set at rates suitable for species under culture and evaporation rates. |
| 1. Stock brood fish | * 1. Broodstock are selected based on their state of readiness for breeding by observation of physical features   2. Broodstock is acclimatized based on pond water temperatures   3. Selected broodstock for natural breeding is transferred to culture facilities based on species specific stocking density   4. Broodstock are released into the culture facilities based on fish stocking procedures |
| 1. Nurse fry and fingerlings | * 1. Fish feeds are safely handled to avoid cross-contamination and adulteration.   2. Feeds are weighed as per the feeding schedule for the specified fish species   3. Weighed feed rations are divided by frequency of feeding as specified in the feeding schedule   4. Fish is fed using any of the appropriate methods based on labour available, weather conditions, size of the culture units   5. Fish feeding behavior is monitored during feeding and recorded |
| 1. Maintain the hatchery | * 1. Indoor and outdoor hatchery components are cleaned with food grade cleaning agents   2. Water flow levels rates and levels within the culture units are maintained based on the fish stages reared |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Correcting may include but not limited to: | * Parasite control * Fish treatment * Water flow management * Sterilization of the hatchery |
| 1. Food safety standards | * Codes of practice * Principles of food hygiene |
| 1. Water fit for aquaculture include but not limited to | * Fish species specific recommended level of chlorine * Fish species specific Recommended pH range * Fish species specific Recommended Ammonia * Fish species specific recommended turbidity level * Free of infective pathogens |
| 1. PPE’s include but not limited to: | * Safety goggles, gum boots, wading suit, gloves, dust coats, first aid kits, life ring, life jacket |
| 1. Tools and equipment include but not limited to: | * Weighing balance, measuring cylinders, perforators, basins, harvesting gear, happa nets, buckets, scoop nets, sieves of assorted sizes |
| 1. Harvesting include but not limited to: | * Partial or complete harvesting |
| 1. Materials include but not limited to: | * Salt, towel, warm water, feeds, fertilizers, assorted bowls, cleaning and disinfection agents |
| 1. State of readiness include but not limited to: | * Ready to spawn (swollen abdomen), not yet ready, already spawned |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Trouble shooting
* Use of tools and equipment
* Weighing
* Numeracy
* Fish handling and packaging
* Identification of anatomical features
* Basic first aid
* Hand sexing of brooders
* Identification of signs of healthy fish

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Food safety Standards (codes of practice for fish and fishery products)
* Regulatory bodies/ Competent authorities
* Hazard Analysis Critical Control Point (HACCP)
* Types of tools, equipment and PPEs
* Basic fish anatomy
* Fish feeds and feeding
* Cleaning and disinfection procedures

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Implemented fish hatchery food safety plan   2. Set water flow within hatchery at appropriate rates   3. Reduced stress to the fish during stocking   4. Fed fish as per feeding schedule and prevailing weather conditions   5. Produced high quality health fish seeds   6. Harvested and sorted fish seeds based on market demands   7. Minimized stress and mortalities of fish during transportation by proper packaging |
| 1. Resource Implications for competence certification | The following resources must be provided:  2.1 Access to relevant workplace where assessment can take place  2.2 Appropriately simulated environment where assessment can take place  2.3 Materials relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency may be assessed through:  3.1 Observation  3.2 Oral presentation  3.3 Oral questioning  3.4 Written tests  3.5 Practical tests |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# PRODUCE FISH FEEDS

**ISCED UNIT CODE: 0831 351 04A**

**UNIT DESCRIPTION**

This unit specifies the competencies required to produce fish feeds. It involves the ability to culture natural fish feeds, produce on-farm formulated fish feeds, package and store fish feeds and keep records

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| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Culture natural fish feeds | * 1. ***PPE***’s are identified and gathered as per task requirements   2. ***Materials and equipment*** for producing natural fish foods are identified and gathered based on task requirements and identified food safety risks   3. Pond is cleaned, limed, dried and flooded with ***water fit for aquaculture***   4. ***Natural productivity*** of pond is determined based on secchi depth   5. Fish pond is fertilized based according to pond’s natural productivity and recommended rates of fertilization while observing food safety |
| 1. Produce on-farm formulated fish feeds | * 1. ***On-farm feed production materials and equipment*** are identified and gathered based on task requirements and identified food safety risks   2. Feed composition is formulated using Pearson’s Square method based on available ingredients and ***nutrient requirements*** of target species   3. Feed ingredients are subjected to specified ***treatments*** to inactivate anti-nutritional factors   4. Feed ingredients are milled to fine particles while observing food hygiene standards   5. Feed additives where required are added as per standard and statutory requirements   6. Formulated feed proportions are weighed and mixed uniformly   7. Feed mixture is pelletized and/or dried to a moisture content of 10% or less |
| 1. Package and store fish feeds | * 1. Fish feed is weighed and packaged in sealed bags with clear ***label details***   2. Dry fish feeds are stored in cool and dry areas   3. Moist fish feeds are properly refrigerated as per the identified food safety risks |
| 1. Keep records | * 1. ***Records of feed ingredients*** are prepared and kept according to site requirements   2. Records of prepared feeds are prepared and kept according to site requirements   3. Records of food safety parameters are maintained   4. Produced feed is fed to target fish at recommended rates   5. Fish growth rate is monitored according to ***sampling plan***   6. Records are kept of fish growth response to feed |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Sources may include but not limited to: | * Ingredients used for formulation of feeds * Poor storage conditions * Pests * Rodents * Agrochemicals |
| 1. Contamination/hazards may include but not limited to: | * Physical hazards * Chemical hazards   + Heavy metals   + Pesticides   + Industrial chemicals * Biological hazards   + Aquatic animal diseases * Naturally occurring toxins |
| 1. Water fit for aquaculture include but not limited to | * Fish species specific recommended level of chlorine * Fish species specific Recommended pH range * Fish species specific Recommended Ammonia * Fish species specific recommended turbidity level * Free of infective pathogens |
| 1. PPE’s include but not limited to | * Safety goggles, gum boots, helmets, gloves, dust coats, first aid kits, mouth piece |
| 1. Materials and equipment include but not limited to: | * Fertilizers, secchi disk, weighing scale * Buckets , gunny bags, sticks, stakes |
| 1. Natural productivity include but not limited to: | * Phytoplanktons * Zooplanktons |
| 1. On-farm feed production materials and equipment include but not limited to: | * Meat mincer, blender/ grinder, weighing scale, dryer, mixer, containers, bag sealer, oven, burner, drying racks * Packaging bags, drying canvas/ polythene |
| 1. Nutrient requirements include but not limited to: | * Proteins, * Lipids/fats * Ash * Carbohydrates * Moisture * Mineral and vitamin |
| 1. Treatments include but not limited to: | * Roasting * Boiling * Fermentation * Sun-drying |
| 1. Label details include but not limited to: | * Date of manufacture * name of manufacturer * date of expiry * storage conditions * protein level * pellet size, * species. |
| 1. Records of feed ingredients include but not limited to: | * Types * Date procured * Store quantities |
| 1. Sampling plan includes but not limited to: | * Sampling frequency * Sample size * Sampling time |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Trouble shooting
* Use of tools and equipment
* Measurement
* Mixing ingredients
* Communication
* Basic first aid
* Numeracy

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Regulatory bodies/ Competent authorities
* Hazard Analysis Critical Control Point (HACCP)
* Types of tools, equipment and PPEs
* On-farm fish feed formulation
* Locally available raw materials
* Nutritional composition of the raw materials and their properties

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Implemented fish feed production food safety plan   2. Used secchi disk accurately   3. Formulated feed composition correctly as per target species   4. Applied the correct fertilizer at right amounts using appropriate method   5. Applied the right treatment to inactivate anti-nutritional factors in selected feed ingredients   6. Weighed accurate amounts of feed ingredients based on feed formulation   7. Mixed feed ingredients uniformly   8. Stored produced feed under recommended storage conditions |
| 1. Resource Implications for competence certification | The following resources must be provided:  2.1 Access to relevant workplace where assessment can take place  2.2 Appropriately simulated environment where assessment can take place  2.3 Materials relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency may be assessed through:  3.1 Observation  3.2 Oral presentation  3.3 Oral questioning  3.4 Projects  3.5 Written tests |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |