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Ministry of Labor and Skills

FISHERY AND AQUACULTURE Level – III

ATVT Curriculum Version-I

Based on July 2022, Version- I Occupational Standard

November, 2022

Addis Ababa, Ethiopia

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Preface

The reformed ATVT-System is an outcome-based system. It utilizes the needs of the labor market and occupational requirements from the world of work as the benchmark and standard for ATVT delivery. The requirements from the world of work are analyzed and documented – taking into account international benchmarking – as occupational standards (OS).

In the reformed ATVT -System, curricula and curriculum development play an important role with regard to quality driven comparable ATVT-Delivery. The Curricula help to facilitate the training process in a way, that trainees acquire the set of occupational competences (skills, knowledge and attitude) required at the working place and defined in the occupational standards (OS).

This curriculum has been developed by a group of professional experts from different Regional ATVT Bureaus, colleges, Industries, Institutes and universities based on the occupational standard for **Fishery and Aquaculture Level III.** The curriculum development process has been actively supported and facilitated by **Ministry of Labor and Skills.**

1 ATVT-Program Design

1.1 ATVT-Program Title*:* Fishery and Aquaculture -Level III

1.2 ATVT-Program Description

The Program is designed to develop the necessary knowledge, skills and attitude of the trainees to the standard required by the occupation. The contents of this program are in line with the occupational standard. The Trainees who successfully completed the Program will be qualified to work as **Fishery and Aquaculture technician** with competencies elaborated in the respective OS. Graduates of the program will have the required qualification to work in the **Agriculture Sector** in the field of **Fishery and Aquaculture**

The prime objective of this training program is to equip the Trainees with the identified competences specified in the OS. Graduates are therefore expected to Maintain water quality, Establish fish farm, Process and utilize fish by- products, Apply aquaculture bio security measure, Perform post-harvest handling, Produce algal and live feed cultures, Apply Agricultural Extension service for rural development, Apply Digital Technology in Agriculture and Prevent and Eliminate MUDA in accordance with the performance criteria and evidence guide described in the OS.

1.3 Training Program Structure

Unit of Competence	Module Code & Title	Learning Outcomes	Duration (In Hours)
AGR FAQ3 09 0322 Prevent and Eliminate MUDA	AGR FAQ3M01 1122 Preventing and Eliminating MUDA	• Prepare for work • Identify MUDA and problem • Analyze causes of a problem • Eliminate MUDA and Assess effectiveness of the solution. • Prevent occurrence of wastes and sustain operation	35
AGR FAQ3 02 0722 Establish fish farm	AGR FAQ3 M02 1122 Establishing fish farm	• Select site for fish farm establishment • Prepare for construction work • Construct fish farm • Complete construction work	60
AGR FAQ3 04 0722 Apply aquaculture biosecurity measures	AGR FAQ3 M03 1122 Applying aquaculture biosecurity measures	• Identify biosecurity control measures • Apply biosecurity control measures • Maintain records and monitor biosecurity procedures	40
AGR FAQ3 01 0722 Maintain water quality	AGR FAQ3 M04 1122 Maintaining water quality	• Prepare for water quality maintaining • Carry out sampling • Test and maintain water quality • Complete water quality maintaining activities	50

AGRFAQ3 06 0722	Produce algal and live feed cultures	AGR FAQ3 M05 1122	Producing algal and live feed cultures	• Prepare for algae and live-feed production • Undertake algal and live-feed cultures • Harvest culture • Complete culture production activities	60
AGR FAQ3 05 0722	Perform post-harvest handling	AGR FAQ3 M06 1122	Performing post-harvest handling	• prepare for fish postharvest handling • Perform fish postharvest handling on boat • Handle during landing and transportation	40
AGR FAQ3 03 0722	Process and utilize fish byproducts	AGR FAQ3 M07 1122	Processing and utilizing fish byproducts	• Prepare work area for processing and utilizing • Process fish byproduct • Complete fish by product processing activities	40
AGR FAQ3 08 0322	Apply Digital Technology in Agriculture	AGR FAQ3 M09 1122	Applying Digital Technology in Agriculture	• Understand the Concept of digital technology • Apply Digital technologies among rural population and farmers • Recording and documentation	30
AGR FAQ3 07 0322	Apply Agricultural Extension service for rural development	AGR FAQ3M08 1122	Applying Agricultural Extension service for rural development	• Promote the use of digital technology in Agricultural Extension • Understand Adult Learning • Integrate Gender in Agricultural Extension • Recognize Indigenous Knowledge	35

1.4 Duration of the ATVT-Program

The Program will have duration of **385 hours** including the on school/ Institution training and on-the-job practice or cooperative training time. Such cooperative training based on realities of the industry, nature of the occupation, location of the ATVT institution, and other factors will be considered in the training delivery to ensure that trainees acquire practical and workplace experience.

S. No	Module title	ATVT Institution training		Cooperative training	Total hours	Remark
		Theory	Practical			
1.	Preventing and Eliminating MUDA	11	20	4	35	
2.	Applying Agricultural Extension service for rural development	9	15	6	30	
3.	Establishing fish farm	18	34	8	60	
4.	Maintaining water quality	15	29	6	50	
5.	Applying aquaculture biosecurity measures	12	21	7	40	
6.	Producing algal and live feed cultures	18	34	8	60	
7.	Performing post-harvest handling	12	23	5	40	
8.	Processing and utilizing fish byproducts	12	23	5	40	
9.	Applying Digital Technology in Agriculture	9	15	6	30	
Total hour		**116**	**214**	**55**	**385**	

1.5 Qualification Level and Certification

Qualification is a formal certificate issued by an official agency in recognition to that an individual has been assessed as achieving learning outcomes or competencies to the standard specified for the qualification title. A qualification confers official recognition of value in the labour market and in further education and training. Based on the descriptors elaborated on the Ethiopian National ATVT Qualification Framework (NTQF) the qualification of this specific ATVT Program is Certificate III according to the level. The trainee will be awarded transcript and the institutional certificate after

successfully completing all the modules in the level.

1.6 Target Groups

Any citizen who meets the entry requirements under items 1.7 and capable of participating in the training activities is entitled to take part in the Program.

1.7 Entry Requirements

In principle everyone should be able to access training based on the labor market. Hence the prospective participants of this program are any citizens who possess the entry requirement directive of the Ministry of Labor and Skills.

1.8 Mode of Delivery

This ATVT Program is characterized as a formal Program on middle level technical skills. The mode of training delivery is in the institution and co-operative training. Cooperative training is a model of training by the cooperation of enterprises/industries and ATVT institutions whereby trainees spend much of their time in the enterprises/industries to acquire industrial knowledge, skills, experiences, and attitudes of the industrial environment and the remaining time in ATVT institutions to acquire basic skills and theoretical concepts. Therefore, it is necessary to make the ATVT sector more effective by strengthening a system of cooperative training accepted by the industry.

The program will employ different alternatives of cooperative training such as apprenticeships, internship and traineeship based on the nature of the occupation, location of the ATVT institutions, and interest of the industry. In addition, in the areas where industry is not sufficiently available the established production and service centers/learning factories in ATVT institutions will be used as cooperative training places. The Training-Institution and identified companies should have to take an agreement to cooperate with regard to the implementation of this program.

1.9 Institutional Assessment

Two types of evaluation will be used in determining the extent to which training outcomes are achieved. The specific training outcomes are stated in the modules. In assessing them, verifiable and observable indicators and standards shall be used.

The ***formative assessment*** is incorporated in the training modules and form part of the training process. Formative evaluation provides the trainee with feedback regarding success or failure in attaining training outcomes. It identifies the specific training errors that need to be corrected, and provides reinforcement for successful performance as well. For the teacher, formative evaluation provides information for making instruction and remedial work more effective.

Summative Evaluation the other form of evaluation is given when all the modules in the program have been accomplished. It determines the extent to which competence have been achieved. And, the result of this assessment decision shall be expressed in the term of institutional Assessment implementation guidelines.

Techniques or tools for obtaining information about trainees' achievement include oral or written test, demonstration and on-site observation. Therefore, a trainee is required to earn at least 60% to be theoretically qualified. This result should be 18% or more when converted to 30%. Regarding performance appraisal results, it must score at least 80% or at least 32% or more when converted to 40%. Must cooperate at least 80% out of 100% in cooperative training; When converted to 30%, it must register 24%.

1.10 ATVT Teachers Profile

The trainers conducting this particular ATVT Program are **A Level** and above who have satisfactory practical experiences or equivalent qualifications.

1.11 Training and Assessment methodology

The program is delivered using a variety of training methods. The table below shows training and assessment methodology for non-impaired trainees and with reasonable adjustment for impaired trainees. In addition, as per the nature of the module title the trainer can use recommended and possible training and assessment methodology.

Learning Methods:				
For none impaired trainees	**Reasonable Adjustment for Trainees with Disability (TWD)**			
	Low Vision	**Deaf**	**Hard of hearing**	**Physical impairment**
Lecture-discussion	❖ Provide large print text ❖ Prepare the lecture in Audio/video ❖ Organize the class room seating arrangement to be accessible to trainees ❖ Write short notes on the black/white board using large text ❖ Make sure the luminosity of the light of class room is kept ❖ Use normal tone of voice ❖ Encourage trainees to record the lecture in audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	❖ Assign sign language interpreter ❖ Arrange the class room seating to be conducive for eye to eye contact ❖ Make sure the luminosity of the light of class room is kept ❖ Introduce new and relevant vocabularies ❖ Use short and clear sentences ❖ Give emphasis on visual lecture and ensure the attention of the trainees ❖ Avoid movement during lecture time ❖ Present the lecture in video format ❖ Summarize main points	❖ Organize the class room seating arrangement to be accessible to trainees ❖ Speak loudly ❖ Ensure the attention of the trainees ❖ Present the lecture in video format ❖ Ensure the attention of the trainees	❖ Organize the class room seating arrangement to be accessible for wheelchairs users. ❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note ❖ Provide Orientation on the physical feature of the work shop

Lecture-discussion	❖ Provide large print text ❖ Prepare the lecture in Audio/video ❖ Organize the class room seating arrangement to be accessible to trainees ❖ Write short notes on the black/white board using large text ❖ Make sure the luminosity of the light of class room is kept ❖ Use normal tone of voice ❖ Encourage trainees to record the lecture in audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	❖ Assign sign language interpreter ❖ Arrange the class room seating to be conducive for eye to eye contact ❖ Make sure the luminosity of the light of class room is kept ❖ Introduce new and relevant vocabularies ❖ Use short and clear sentences ❖ Give emphasis on visual lecture and ensure the attention of the trainees ❖ Avoid movement during lecture time ❖ Present the lecture in video format ❖ Summarize main points	❖ Organize the class room seating arrangement to be accessible to trainees ❖ Speak loudly ❖ Ensure the attention of the trainees ❖ Present the lecture in video format ❖ Ensure the attention of the trainees	❖ Organize the class room seating arrangement to be accessible for wheelchairs users. ❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note ❖ Provide Orientation on the physical feature of the work shop
Demonstration	❖ Conduct close follow up ❖ Use verbal description ❖ Provide special attention in the process of guidance ❖ facilitate the support of peer trainees ❖ Prepare & use simulation	❖ use Sign language interpreter ❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training ❖ Show clear and short method ❖ Use gesture ❖ provide tutorial support (if necessary)	❖ Illustrate in clear & short method ❖ Use Video recorded material ❖ Ensure the attention of the trainees ❖ provide tutorial support (if necessary)	❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipments/ machines ❖ Assign peer trainees to assist ❖ Conduct close follow up ❖ provide tutorial support (if necessary

Group discussion	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	❖ Introduce the trainees with their peers
Exercise	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/practical training ❖ Introduce new and relevant vocabularies	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/ practical training	❖ Assign peer trainees ❖ Use additional nominal hours if necessary
Individual assignment	❖ prepare the assignment questions in large text ❖ Encourage the trainees to prepare and submit the assignment in large texts ❖ Make available recorded assignment questions ❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy	❖ Use sign language interpreter ❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	

Assessment Methods:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges
Written test	❖ Prepare the exam in large texts ❖ Use interview as an option if necessary ❖ Prepare the exam in audio format ❖ Assign human reader ❖ (if necessary) ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment ❖ Time extension for trainees having severe upper limb impairment
Demonstration /Observation	❖ Brief the instruction or provide them in large text ❖ Time extension	❖ Use sign language interpreter ❖ Brief on the instruction of the exam ❖ Provide activity-based/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

2. Learning Module Design

Module code and title	**AGR FAQ3 M01 1122: Preventing and Eliminating MUDA**
Nominal duration:	**35 hours**

MODULE DESCRIPTION: This module covers the knowledge, skills and attitude required by a worker to prevent and eliminate MUDA/wastes in his/her workplace by applying scientific problem-solving techniques and tools to enhance quality, productivity and other kaizen elements on continual basis. It covers responsibility for the day-to-day operation of the work and ensures Kaizen Elements are continuously improved and institutionalized.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

LO1. Prepare for work

LO2. Identify MUDA and problem

LO3. Analyze causes of a problem

LO4. Eliminate MUDA and Assess effectiveness of the solution

LO5. Prevent occurrence of wastes and sustain operation

MODULE CONTENTS:

Lo1. Prepare for Work

1.1. Using work instructions

1.2. OHS requirements

1.3. Selecting tools, equipment and material

LO2. Identify Muda and Problem

2.1 Preparing plan

3.1 Listing causes of a problem

2.1 Identifying and measuring wastes

LO3. Analyze causes of a problem

3.2 Analyzing causes by using 4M1E

3.3 Eliminating the root cause

LO4. Eliminate MUDA and Assess Effectiveness of the Solution

4.1 Adopting the basic principles for improvement

4.2 Reducing and eliminating wastes

4.3 Recording results.

LO5.Prevent Occurrence of Wastes and Sustain Operation

5.1. Preparing standards

5.2. Preventing occurrences of wastes

5.3. Creating waste-free workplace

Learning Methods:

- Lecture
- Group discussion
- Demonstration
- Role playing
- Brainstorming

Assessment Methods:

- Written test
- Oral questioning
- Practical demonstration

ASSESSMENT CRITERIA:

LO.1 Prepare for work

- Work instructions are used to determine job requirements, including method, material and equipment.
- Job specifications are read and interpreted following working manual.
- OHS requirements, including dust and fume collection, breathing apparatus and eye and ear personal protection needs are observed throughout the work.
- Appropriate material is selected for work.
- Safety equipment and tools are identified and checked for safe and effective operation.

LO.2 Identify MUDA and problem

- Plan of MUDA and problem identification is prepared and implemented.

- Causes and effects of MUDA are discussed.
- All possible problems related to the process /Kaizen elements are listed using statistical tools and techniques.
- All possible problems related to kaizen elements are identified and listed on Visual Management Board/Kaizen Board.
- Tools and techniques are used to draw and analyze current situation of the work place.
- Wastes/MUDA are identified and measured based on relevant procedures.
- Identified and measured wastes are reported to relevant personnel.

LO.3 Analyze causes of a problem.

- All possible causes of a problem are listed.
- Cause relationships are analyzed using 4M1E.
- Causes of the problems are identified.
- The root cause which is most directly related to the problem is selected.
- All possible ways are listed using creative idea generation to eliminate the most critical root cause.
- The suggested solutions are carefully tested and evaluated for potential complications.
- Detailed summaries of the action plan are prepared to implement the suggested solution procedures.

LO. 4 Eliminate MUDA and Assess effectiveness of the solution.

- Plan of MUDA elimination is prepared and implemented by medium KPT members.
- Necessary attitude and the ten basic principles for improvement are adopted to eliminate waste/MUDA.
- Tools and techniques are used to eliminate wastes/MUDA based on the procedures and OHS.
- Wastes/MUDA are reduced and eliminated in accordance with OHS and organizational requirements.
- Tangible and intangible results are identified.
- Tangible results are compared with targets using various types of diagrams.
- Improvements gained by elimination of waste/MUDA are reported to relevant bodies.

LO.5 Prevent occurrence of wastes and sustain operation

- Plan of MUDA prevention is prepared and implemented.
- Standards required for machines, operations, defining normal and abnormal conditions, clerical procedures and procurement are discussed and prepared.
- Occurrences of wastes/MUDA are prevented by using visual and auditory control methods.
- Waste-free workplace is created using 5W and 1Hsheet.
- The completion of required operation is done in accordance with standard procedures and practices.
- The updating of standard procedures and practices is facilitated.
- The capability of the work team that aligns with the requirements of the procedure is ensured and trained on the new Standard Operating Procedures (SOPs).

Module Code and Title	AGR FAQ3 MO2 1122: Establishing Fish Farm
Nominal Duration :	**60 Hours**

Module Description : This module covers the required knowledge, skills and attitude to select site, establish fish farm and construct infrastructure facilities based on production plan of fish farm.

Learning Outcomes

At the end of the module the trainee will be able to:

LO-1: Select site for fish farm establishment

LO-2: Prepare for construction work

LO-3: .Construct fish farm

LO-4: Complete construction work

Module Contents:

LO-1: Select site for fish farm establishment

1.1. Site selection criteria

1.2. Identifying Legal requirements and constraints

1.3. Site preparation

LO-2 Prepare for construction work

2.1. Preparing construction work plan

2.2. Identifying types of pond

2.3. Set bill of quantity

2.4. Identifying equipment, tools, materials and PPE

2.5. Preparing brief layout of fish farm

LO-3 Construct fish farm

3.1. Occupational health and safety regulation

3.2. Measuring, Cleaning and excavating site

3.3. Position and construct farm structures

3.4. Fish farm infrastructure

3.5. Water supply and disposal systems

3.6. Assembling and fixing fixtures and fittings

3.7. Stock culture structure

LO4. Complete construction work

4.1. Undertake checking and commissioning

4.2. Cleaning, checking and returning equipment and materials

4.3. Disposing waste materials

4.4. Organizing, documenting and reporting works

LEARNING METHODS:

- Lecture and Discussion
- Demonstration
- Practical work
- Simulation
- Roleplaying

ASSESSMENT METHODS:

- Quiz, Written test, Oral questioning, Written exam (assessment)
- Individual and group assignment
- Practical demonstration

ASSESSMENT CRITERIA:

LO-1: Select site for fish farm establishment

- Site selection criteria are understood and identified
- Selection of site performed based on production plan
- Legal requirements and constraints on development processes are identified.
- Site preparation requirements are assessed and determined according to enterprise guidelines

LO.2. Prepare for construction work

- Construction work plan is prepared and undertaken to establish the farm
- Types of pond is identified to undertake construction
- Bill of quantity are set for construction
- Personal Protective Equipment (PPE) are identified and used for construction work
- Equipment, tools and materials are identified in the construction work
- Brief layout is prepared and undertaken to establish the farm

LO.3. Construct fish farm

- Equipment operation and work practices are conformed to occupational health and safety regulations

- Site are properly measured, cleaned and excavated based on the design plan
- Farm structures are positioned according to construction work plan.
- Fish farm are constructed according to the production plan
- Fish farm infrastructures are constructed according to farming procedures.
- Water supply and disposal systems are constructed and installed as indicated in the construction plan
- Fixtures and fittings are assembled and fixed according to construction plan.

LO4. Complete construction work

- Checking and commissioning is undertaken to ensure that the finished product fits design specification.
- Equipment and material is cleaned, checked and returned to storage; waste and debris is disposed of in accordance with enterprise procedures
- Work reports are provided including any damage to tools and equipment, and any problems that may have arisen
- Documents are organized, documented and reported for the responsible body

Module Code and Title	AGR FAQ3 MO3 1122: Applying aquaculture bio-security measures
Nominal Duration :	40 Hours

Module Description : This module covers the skills, knowledge and attitude required to identify fish diseases, pests and predators and apply bio-security control and treatment measures.

Learning Outcomes

At the end of the module the trainee will be able to:

LO-1: Identify biosecurity control measures

LO-2: Apply biosecurity control measures

LO-3: Maintain records and monitor biosecurity procedures

Module Contents:

LO-1: Identify biosecurity control measures

1.1. Aquaculture biosecurity plan
1.2. Fish diseases, pests and predators
1.3. Materials, tools and equipment
1.4. Personal protective equipment
1.5. Hazard and risk control measures and procedures

LO-2: Apply biosecurity control measures

2.1. Control measures of transmission routes
2.2. Control measures of vectors
2.3. Control measures to farm production practices
2.4. Control measures of routine work
2.5. Treatment measures

LO-3: Maintain records and monitor biosecurity procedures

3.1. Ensuring records of stock
3.2. Keeping traceability of farm inputs and outputs
3.3. Monitoring and surveillance data
3.4. Monitoring effectiveness of control measures of risks
3.5. Monitoring work duties and ensuring biosecurity
3.6. Reporting issues and concerns with biosecurity

LEARNING METHODS:

- Lecture
- Group Discussion
- Demonstration and
- Observation

ASSESSMENT METHODS:

- Quiz, Written test, Oral questioning, Written exam (assessment)
- Individual and group assignment
- Practical demonstration

ASSESSMENT CRITERIA:

LO1. Identify biosecurity control measures

- Organization aquaculture biosecurity plan are accessed
- Identify fish diseases, pests and predators that are considered as biosecurity threats
- Materials, tools and equipment are identified
- Appropriate personal protective clothing and equipment are identified.
- Hazard and risk control procedures are identified
- Control measures are identified to minimize the risk

LO2. Apply biosecurity control measures

- Control measures related to transmission routes onto, within and from the aquaculture farm are applied
- Control measures related to movement of vectors of disease into, out of and within the aquaculture farm are applied
- Control measures related to farm production practices are applied
- Control measures into own work routines and others of responsibility are incorporated
- Treatment measures are identified and applied

LO3. Maintain records and monitor biosecurity procedures

- Records of stock are ensured and equipment are kept for traceability of farm inputs and farm outputs according to own work responsibility
- Monitoring and surveillance data retained
- The effectiveness of control measures in addressing risks are monitored
- Work duties of self and others are monitored to ensure biosecurity control measures are applied appropriately
- Issues and concerns with biosecurity are reported to senior personnel

Module Code and Title	AGR FAQ3 MO4 1122: Maintaining Water Quality
Nominal Duration :	**50 Hours**

Module Description : This module covers the knowledge, skills and attitude required to collect, taste, preserve, pack and label water samples for water quality maintaining. It also covers taking treatment measure based on test result.

Learning Outcomes

At the end of the module the trainee will be able to:

LO-1: Prepare for water quality maintaining

LO-2: Carry out sampling

LO-3: Test and maintain water quality

LO-4: Complete water quality maintaining activities

Module Contents:

LO-1: Prepare for water quality maintaining

1.1. Identifying tools, equipment and materials

1.2. Personal protective equipment

1.3. Physical and chemical nature of pure water

1.4. Identifying water quality and environmental parameters

1.5. Water quality maintaining techniques and schedules

1.6. Collect data or record sheets

LO-2: Carry out sampling

2.1. Calibrating water quality measurement tools and equipments

2.2. Sampling techniques and procedures

2.3. Sample collection

2.4. Preserving, packing and labeling water sample

LO-3: Test and maintain water quality

3.1. Undertaking water quality test

3.2. Detecting and interpreting results

3.3. Recording results and physical characteristics of water

3.4. Analyzing physicochemical water quality

3.5. Basic treatment measures

LO-4: Complete water quality maintaining activities

4.1. Recording and reporting water quality and environmental parameters

4.2. Handling tools, equipment and materials

4.3. Discarding damaged tools, equipment and waste materials

4.4. Store leftover materials and chemicals

LEARNING METHODS:

- Lecture
- Group Discussion
- Demonstration and
- Observation
- Role playing

ASSESSMENT METHODS:

- Quiz, Written test, Oral questioning, Written exam (assessment)
- Individual and group assignment
- Practical demonstration

ASSESSMENT CRITERIA:

LO1. Prepare for water quality maintaining

- Tools, equipment and materials required to maintain water quality are identified and ready for use
- Suitable personal protective equipment (PPE) is selected and checked prior to use
- Water quality and environmental parameters to be measured are identified.
- Water quality maintaining schedules are prepared.
- Water quality maintaining techniques are understood.
- Data or record sheets/books are collected and ready for use

LO2. Carry out sampling

- Water quality measurement tools and equipments are calibrated
- Sampling techniques are identified and applied
- Samples are collected for water quality test according to the sampling procedure
- Water sample are preserved, packed and labeled for laboratory test in accordance with enterprise procedures and laboratory requirements.

LO3. Test and maintain water quality

- Water quality test are undertaken in according to working guidelines and procedures
- Detecting and interpreting test results for monitoring environmental parameters
- Test results and observations of physical characteristics of water are accurately recorded on data sheets.
- Results of test and Observation of physicochemical water quality are analyzed
- Undertaking basic treatment measure according on observation report

LO4. Complete water quality maintaining activities

- Routine water quality and environmental parameters are recorded and reported for responsible body
- Tools, equipment and materials are cleaned, sanitized, repaired and stored in accordance with enterprise procedures.
- Malfunctioning tools and equipment is repaired on site or sent to manufacturer or specialist.
- Damaged tools, equipment and waste materials are discarded
- Leftover materials and chemicals are properly stored for reuse

Module Code and Title	AGR FAQ3 MO5 1122: Producing algal and live-feed cultures
Nominal Duration :	**60 Hours**

Module Description : This module covers the knowledge skill, attitude to produce algal and live-feed cultures including preparation of algae and live feed production and to harvest culture for fish feed.

Learning Outcomes

At the end of the module the trainee will be able to:

LO-1: Prepare for algae and live-feed production

LO-2: Undertake algal and live-feed cultures

LO-3: Harvest culture

LO-4: Complete culture production activities

Module Contents:

LO-1: Prepare for algae and live-feed production

1.1. Production schedule
1.2. Preparing tools, materials and equipment
1.3. Labour and resource requirements
1.4. Occupational health safety(OHS)
1.5. Risk factors affecting quality of culture
1.6. Planning to minimize risks
1.7. Assembling and commissioning culture systems

LO-2: Undertake algal and live-feed cultures

2.1. Production vessels or structures and other equipment
2.2. Physic-chemical requirements of culture organism
2.3. Performing water treatment
2.4. Maintaining sterile conditions and equipment
2.5. Inoculation cultures
2.6. Nutrient formulae or media
2.7. Culture health
2.8. Production activities and equipment operations

LO-3: Harvest culture

3.1. Harvesting equipment

3.2. Substandard equipment

3.3. Collecting algal and live culture

3.4. Transporting algal and live culture

LO-4: Complete culture production activities

4.1. Refilling production vessel

4.2. Cleaning, repairing and storing of equipment

4.3. Treating and disposing unused cultures and wastes

4.4. Ecologically sustainable development principles.

4.5. Recording culture production data

4.6. Reporting work conditions

LEARNING METHODS:

- Lecture
- Group Discussion
- Demonstration and
- Observation

ASSESSMENT METHODS:

- Quiz, Written test, Oral questioning, Written exam (assessment)
- Individual and group assignment
- Practical demonstration

ASSESSMENT CRITERIA:

LO1. Prepare for algae and live-feed production

- Production schedule is prepared
- Tools, materials and equipment are prepared for algae production, and live feed.
- Labour and resource requirements for production are confirmed
- Suitable personal protective equipment (PPE) is selected and checked according to occupational health safety(OHS) guideline
- Risk factors that could affect the quality of the culture during production are identified and plans are made to minimize risk.
- Efficient culture systems are assembled and commissioned for use.

LO2. Undertake algal and live-feed cultures

- Production vessels or structures and other equipment are checked for serviceability
- Water treatment is performed to meet the physic-chemical requirements of the culture organism.
- Sterile conditions and equipment are maintained in parent and stock cultures.
- Inoculation cultures to meet the required stocking density are readied for use.
- Nutrient formulae or media are prepared in accordance with enterprise procedures.
- Culture health is checked regularly by sampling the culture water and appropriate action is taken to achieve the production schedule.
- Production activities and equipment operations are supervised and monitored to ensure consistency with production schedule, operational guidelines and occupational health and safety (OHS) requirements.

LO3. Harvest culture

- Harvesting equipment is collected and checked for serviceability in accordance with enterprise procedures.
- Substandard equipment is repaired or replaced to enterprise procedures and manufacturers‟ guidelines.
- The required quantity of algal and live culture are collected and transported to fed fish

LO4. Complete culture production activities

- Production vessel is refilled with preconditioned water and nutrients
- Clean up of work area, repairs and storage of equipment is supervised and condition are reported.
- Unused cultures and wastes are treated and disposed of according to ecologically sustainable development (ESD) principles.
- Relevant culture production data, observations or information are recorded legibly and accurately and any out of range or unusual records are checked, reported and communicated

Module Code and Title	AGR FAQ3 MO6 1122: Performing fish postharvest handling
Nominal Duration :	**40 Hours**

Module Description : This module covers the skills, knowledge and attitude required to handle postharvest fish on boats, landing sites, fish farm premises, and in processing plant.

Learning Outcomes

At the end of the module the trainee will be able to:

LO-1: prepare for fish postharvest handling

LO-2: Perform fish postharvest handling on boat

LO-3: Handle during landing and transportation

Module Contents:

LO-1: Prepare for fish postharvest handling

1.1. Plan for post-harvest handing
1.2. Post-harvest handling techniques
1.3. Suitable storage and facilities
1.4. Tools, materials, equipment and machines
1.5. Identifying risk factors
1.6. Occupational health and safety(OHS) procedures
1.7. Hygienic condition of working area

LO-2: Perform fish postharvest handling on boat

2.1. Signs of spoilage, defects, parasites and defective fish
2.2. Removing gill and gut of large fish
2.3. Caring fish
2.4. Fish keeping container and position
2.5. Cleaning postharvest handling tools
2.6. Handling fish with ice box
2.7. Monitoring temperature of fish
2.8. Protecting fish from contamination
2.9. Postmortem change of fish
2.10. Causes of fish spoilage

LO-3: Handle during landing and transportation

3.1. Handling fish

3.2. Insulated or refrigerators trucks
3.3. Transporting fish
3.4. Controlling time and moving fish
3.5. Handling and disposing offal's and waste materials
3.6. Food safety and hygiene regulations and procedure
3.7. Packing gutted and filleted fish
3.8. Freezing and storing gutted and filleted fishes
3.9. Record keeping

LEARNING METHODS:

- Lecture
- Group Discussion
- Demonstration and
- Observation
- Role play

ASSESSMENT METHODS:

- Quiz, Written test, Oral questioning, Written exam (assessment)
- Individual and group assignment
- Practical demonstration

ASSESSMENT CRITERIA:

LO1. prepare for fish postharvest handling

- Plan for post-harvest handing are prepared based on post-harvest handling techniques
- Availability of suitable storage and facilities for harvested fish are confirmed
- Tools, materials, equipment and machines are selected, calibrated.
- Risk factors that affects the quality of harvested fish are identified
- Occupational health and safety(OHS) procedures and safe working practice are applied including the selection of personal protective equipment (PPE)
- Clean work area before starting and maintain hygienic conditions throughout operations.

LO2. Perform fish postharvest handling on boat

- Fish are visually inspected for any signs of spoilage, defects, parasites and defective fish are identified and set aside.

- Removal of gill and gut of large fish are undertaken
- Care the fish from mechanical injuries are applied
- The fish are kept on appropriate container
- The fish are laid belly downward
- Boat deck, fish hold, container, bucket, cutting utensils, ice box, etc. are washed and cleaned with chlorinated water
- The fish is handled with icebox and use proper ice ratio with fish
- The temperature of fish is monitored with a thermometer.
- Fish are protected from contamination through appropriate placing the fish on boat.
- Post mortem change of fish are understood
- Causes of fish spoilage are identified

LO3. Handle during landing and transportation

- Fishes are properly handled while unloading to landing sites
- Insulated or refrigerators trucks on land transportation are used
- Fish are transport on time as organization guideline
- Fish are moved through each stage without delay and control the time taken in each stage.
- Offal's are handled and disposed appropriately and Waste materials produced during cleaning/gutting and filleting work clean appropriately dispose.
- Record keeping is carried out about postharvest handling.
- The fish postharvest handling shall follow and respect the food safety and hygiene regulations and procedure
- Gutted and filleted fishes are packed with polyethylene bag
- Gutted and filleted fishes are properly freeze and stored with proper temperature

Module Code and Title	AGR FAQ3 MO7 1122: Processing and utilizing fish byproducts
Nominal Duration :	**45 Hours**

Module Description : This module covers the skills, knowledge and attitude required to process and utilizes fish by products, fish by product processing techniques and steps, grinding, packing, storage and transportation of fish meal.

Learning Outcomes

At the end of the module the trainee will be able to:

LO-1: Prepare work area for processing and utilizing

LO-2: Process fish byproduct

LO-3: Complete fish by product processing activities

Module Contents:

LO-1: Prepare work area for processing and utilizing

1.1. Processing tools, equipment and materials

1.2. Types of fish byproducts

1.3. Fish byproduct sources

1.4. Fish byproduct processing techniques and steps

1.5. Use of fish byproduct

1.6. Collecting fish byproducts

1.7. Occupational health and safety procedures

1.8. Unsafe and inefficient aspects of the work area

LO-2: Process fish byproduct

2.1. Grinding large fish and byproducts

2.2. Cooking and heating fish byproducts

2.3. Pressing

2.4. Drying press cake

2.5. Grinding, sifting and packing the dried meals

2.6. Storage and transport of fish meals

LO-3: Complete fish by product processing activities

3.1. Handling waste materials

3.2. Handling material, tools and equipment

3.3. Recording and documenting work outcomes

LEARNING METHODS:
• Lecture • Group Discussion • Demonstration and • Observation • Role play
ASSESSMENT METHODS:
• Quiz, Written test, Oral questioning, Written exam (assessment) • Individual and group assignment • Practical demonstration

ASSESSMENT CRITERIA:

LO1. Prepare work area for processing and utilizing

- Processing tools, equipment and materials are identified and organized
- Types of fish byproducts are identified and understood
- The fish byproduct sources are identified
- Fish byproduct processing techniques and steps are understood.
- The use of fish byproduct are identified and determined.
- The fish byproducts are collected
- Occupational health and safety(OHS) procedures and safe working practice are applied including the selection of persona protective equipment (PPE)
- Unsafe and inefficient aspects of the work area are identified and rectified.

LO2. Process fish byproduct

- Large fish and byproducts are grinded or hashed
- The fish byproducts are cooked and heated by using a steam.
- Pressing (or occasional centrifugation) are conducted to remove a large fraction of the liquids from the mass.
- The press cake is dried.
- The dried meals are grinded, sifted and packed.
- Storage and transport of fish meals are performed according to organizational procedures and standards

LO3. Complete fish by product processing activities

- Waste material produced during fish byproduct processing is handled according to rules and regulations
- Material, Tools, equipment and machinery are cleaned, maintained, handled, transported and stored according to the industry guidelines.
- Work outcomes are recorded and documented

Module Code and Title	AGR FAQ3 MO8 1122: Applying Digital Technology in Agriculture
Nominal Duration :	30 Hours

Module Description : This module covers the knowledge, skills and attitude required to Understand the Concept of digital technology, apply Digital technologies among rural population and recording and documentation system.

Learning Outcomes

At the end of the module the trainee will be able to:

LO-1: Understand the Concept of digital technology

LO-2: Apply Digital technologies among rural population and farmers

LO-3: Recording and documentation

Module Contents:

LO-1: Understand the Concept of digital technology

1.1. Understanding Digital technologies
1.2. Importance of digital technologies
1.3. Role of digital technologies in agriculture
1.4. Principles of Agricultural technology
1.5. Application of Smart phones and template functions

LO-2: Apply Digital technologies among rural population and farmers

2.1. Identifying tools, equipments and infrastructures
2.2. Developing digital technology skills
2.3. Developing digital Agri-preneurial skill
2.4. Digital technology communication tools and techniques
2.5. Promoting digital technologies

LO-3: Recording and documentation

3.1. Developing Data collection formats
3.2. Identifying data collection methodologies
3.3. Organizing, analyzing and interpreting collected data
3.4. Reporting organized, analyzed and interpreted data
3.5. Collecting feedbacks

LEARNING METHODS:
• Lecture • Group Discussion • Demonstration • Simulation • Role playing • Observation
ASSESSMENT METHODS:
• Quiz, Written test, Oral questioning, Written exam (assessment) • Individual and group assignment • Practical demonstration

ASSESSMENT CRITERIA:

LO1. Understand the Concept of digital technology

- Digital technologies are understood to apply digital technology
- Importance of digital technologies are understood in agricultural sector
- Role of digital technologies in agriculture is identified to enhance agricultural development.
- Principles of Agricultural technology are identified to apply in the agricultural sector
- Mobile/Smart phones and template functions are understood to collect data and use in the reporting system

LO2. Apply Digital technologies among rural population and farmers

- Require tools and equipment are identified and coordinated to apply digital technologies
- Digital technology infrastructures are identified to implement in agricultural development
- Digital technology skills are developed among the rural population
- Digital Agri-preneurial skill is developed for agricultural transformation.
- Digital technology communication tools are used to collect data and reporting system
- Digital technologies, tools and techniques are used to deliver digital education
- Implementation of digital technologies is promoted to enhance productivity

LO3. Recording and documentation

- Data collecting formats are developed based on the needs

- Data collection methodologies are identified and selected based on the intended objectives
- Collected data are organized, analyzed and interpreted based on the intended objectives
- Organized, analyzed and interpreted data are documented and reported
- Feedbacks are collected from the relevant stakeholders

Module Code and Title	AGR FAQ3 MO9 1122: Applying Agricultural Extension service for Rural development
Nominal Duration :	30 Hours

Module Description : This module covers the knowledge, skills and attitudes required to promote the use of digital technology agricultural extension, understand adult learning, Integrated gender agricultural extension and Recognize Indigenous Knowledge.

Learning Outcomes

At the end of the module the trainee will be able to:

LO-1: Promote the use of digital technology in Agricultural Extension

LO-2: Understand Adult Learning

LO-3: Integrate Gender in Agricultural Extension

LO-4: Recognize Indigenous Knowledge

Module Contents:

LO-1: Promote the use of digital technology in Agricultural Extension

1.1. Digital technology in Agricultural extension

1.2. Skills in using digital technology

1.3. Role of digital technologies in agricultural extension

LO-2 Understand Adult Learning

2.1. Concept of adult learning

2.2. Principles of Adult learning

2.3. The importance of Adult learning

2.4. Adult learning methods

2.5. The role of adult learning

LO-3 Integrate Gender in Agricultural Extension

3.1. The concept of gender

3.2. Creating gender awareness and sensitization

3.3. The role of gender in agriculture

3.4. Implementation of gender mainstreaming

LO4.Recognize Indigenous Knowledge

4.1. The concept of indigenous knowledge

4.2. Understanding Characters of indigenous knowledge

4.3. Promoting Exchange of indigenous knowledge

4.4. The importance of indigenous knowledge 4.5. Studying the controversial issues of the debate on indigenous knowledge
LEARNING METHODS:
• Lecture and Discussion • Demonstration • Simulation • Roleplaying
ASSESSMENT METHODS:
• Quiz, Written test, Oral questioning, Written exam (assessment) • Individual and group assignment • Practical demonstration

ASSESSMENT CRITERIA:

LO.1. Promote the use of digital technology in Agricultural Extension

- The use of Digital technology in Agricultural extension is introduced to familiarize its importance
- Skills in using digital technology is built to strengthen agricultural extension services
- The role of digital technologies in agricultural extension services is understood to enhance agricultural development.

LO.2. Understand Adult Learning

- The concept of adult learning is understood to bring behavioral changes
- Principles of Adult learning is determined for the implementation of extension services
- The importance of Adult learning in Agricultural Extension is understood to enhance agricultural extension services
- Adult learning methods are understood to enhance the knowledge and skills of extension beneficiaries
- The role of adult learning is understood to allow farmers develop knowledge and skills

LO.3. Integrate Gender in Agricultural Extension

- The concept of gender is understood to provide inclusive agricultural extension services
- Gender awareness and sensitization is created to increase the contribution of gender in agricultural development
- The role of gender in agriculture is determined to enhance agricultural development.
- Gender mainstreaming is implemented for effective outcome of extension services

LO4. Recognize Indigenous Knowledge.

- The concept of indigenous knowledge is understood to strengthen the service of agricultural extension
- Characters of indigenous knowledge are understood to promote local experience
- Exchange of indigenous knowledge is promoted to enhance community development
- The importance of indigenous knowledge is understood to facilitate its contribution to the development processes.
- The controversial issues of the debate on indigenous knowledge are further studied to propose the urgent need, to document, learn, preserve, and exchange indigenous knowledge

3. Required resources

SN	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by the trainer	25	1:1
2.	Reference Books			
2.1	Aquaculture and Fisheries Biotechnology: Genetic Approaches,	Rex A. Dunham, 2014. 2nd Edition	5	1:5
2.2	Aquaculture Farming, Aquatic Animals and Plants	John S. Lucas *et al.*, 2013.	5	1:5
2.3	Aquaculture and fish farming	Brendan Marshall (2017)	5	1:5
2.4	Aquaculture nutrition, gut health, probiotics and prebiotics,	Arun Kumar *et al.* (2014)	5	1:5
2.5	Aquaculture Technology, Flowing Water and Static Water Fish Culture	Richard W. Soderberg (2017)	5	1:5
2.6	Digital technology for agricultural and rural development in the global south	Amanda Caine (2018)	5	1:5
2.7	Fish processing sustainability and new opportunity	George M. Hall *et al*, (2012)	5	1:5
2.8	Infectious disease in aquaculture prevention and control	C. J. Secombes *et al*. (2012)	5	1:5
2.9	Sustainable aquaculture techniques	Krishna R. Salin *et al*. (2014)	5	1:5
2.10	Trends in fish processing technologies	Javier Borderías *et al*, (2018)	5	1:5
2.11	Water quality requirements and management strategies for fish farming	Warish Khan, Adil Masood (2017)	5	1:5

2.12	Waste water management through aquaculture	B.B. Jana and R.N. Mandal (2018)	5	1:5
B.	**Learning Facilities & Infrastructure**			
1.	Class room	31.5 m^2	1	1:25
2.	Laboratory room	100 m^2	1	1:25
3.	Internet room	100 m^2	1	1:25
4.	Library room	Per section 105 – 180 m^2	1	1:25
5.	Duplication room	20m^2	1	1:25
C.	**Consumable Materials**			
1.	A4 papers	80gms	5 reams	1:5
2.	Boots	Plastic made	25	1:1
3.	Sunhats	Made from straw	25	1:1
4.	Sunglass	Made from glass	25	1:1
5.	Sunscreen creams	Form: Lotion Block more than 90% ultraviolet radiation	5	1:5
6.	Gown	Made from canvas or kaki cloth	25	1:1
7.	Overall	Made from canvas or kaki cloth	25	1:1
8.	Raincoat	100% water proof	25	1:1
9.	Wader	Chest Waders	25	1:1
10.	Gloves	Made from Synthetic rubber	25	1:1
11.	Life saver jacket	• Material: Nylon+TPU and • Buoyancy: 85N/150N/275N	25	1:1
12.	Helmets	• Material: ABS+EPS • Top shell material: ABS • oven tape: Nylon	25	1:1
13.	Aprons	• Fabric: Polyester, Nonwoven, Cotton • Material: Cotton • Style: Sleeveless	1	1:25
14.	Plastic boots	Plastic made or rubber of different size	25	1:1
15.	Nose protector	• Material: PP, Meltblown, Non-woven • Size: 21*8cm • Filter Rating: 98% - 99.9% • Type: medical mask	25	1:1
16.	Face mask	better bacteria filtration and air	25	1:1

		permeability		
17.	Pipettes	Lab disposable yellow blue 200ul 1000 1.5 ml gilson micro transfer pipet pippete pipette tip of different types	pack	1:1
18.	Syringes	2ml 3ml 5ml 10ml 20ml plastic medical vaccine syringe disposable sterile safety syringe with needle	pack	1:1
D.	**Tools and Equipments**			
1.	Desktop Computer	64-bit OS; 8 GB RAM; Intel core i7 (Processor)	25	1:1
2.	Smart phone	• RAM+ROM: 8GB+128GB / 8GB+256GB, • Front Camera: 32.0 Mp • Screen Resolution:1080 x 2400 • Display Type: LCD	5	1:5
3.	Test tube	• Material: Glass • Capacity (ml): 5-30 • Color: Transparent	25	1:1
4.	Sample kit	• Material: 100% nylon • Tube size: 5ml-10ml • Sample holding capacity:30	5	1:5
5.	Sensitive balance	• Power: AC/DC 9V/150MA or 6xAA battery • Resolution: 1/60000-1/30000 • Large LCD display • Auto calibration from key pad	1	1:25
6.	Scoop nets	• Type: Hand Net • Material: Aluminum Alloy • Mesh Size: 5mm • Depth:35cm	5	1:5
7.	Dredge bottles	• Material: Plastic • Capacity: 15ml 30ml 50ml 80ml 100ml 120ml • Shape: Cylinder	25	1:1
8.	Traps	• Material: Nylon multi net • Shape: Circle • Diameter: 210D/10PLY and 210D/12PLY	1	1:25
9.	Cages	• Material: stainless steel	5	1: 5

		• Diameter: 50cm/customized • Size: 50*20cm/customized • Mesh size: 1.5*1.5cm • Frame: 6mm, 7mm, 8mm, customized		
10.	Plankton nets	• Material: 100%nylon • Size: 90*30cm	5	1: 5
11.	Micropipettes	• Material: PPO • Volume: 100ul-1000ul • Autoclavable: semi autoclavable • Application: Chemical Laboratory	1	1:25
12.	Microscope	• Drawtube: Trinocular • Nosepiece: Quadruple Nosepiece • Light Source: Built-in 3W LED Illumination, Brightness Adjustable • Eyepiece: Plan Eyepiece 10x/20, Diopter Adjustable	5	1:5
13.	Secchi disk	• Material: Plastic • Size: 9 inches • Application:Teaching	5	1:5
14.	Soil analysis kits	• Power: 72W • Operation: touch screen • Memory: 4G • System: Android system	1	1:25
15.	Spectrophotometer	• Wavelength range: 190-1020nm • Wavelength accuracy: ± 2nm • Focal length: Null • Display: 40*70mm backlit LCD	1	1:25
16.	Chlorinometer	• Measuring range: 0.005~20ppm(mg/L) • Electrodes: glass bulb, Platinum • Cable length: 5 m silver-plated three-core cable • Accuracy: ±2% or ±10 ppb	25	1:1

		• Working pressure:10bar at 20 ℃		
17.	PH meter	• Working voltage: 220V±22V,50Hz±0.5Hz • Temperature range: 0-99.9° • Measuring range: 0-14pH • Accuracy:±0.05 • Working condition: • ambient temperature:0~60℃	5	1:5
18.	Thermometer	• Power: Battery • Measuring Range: -50℃-300℃/-58 ºF-572ºF • Resolution: 0.1℃/℉ • Display: LCD • Operating temperature: -10~50℃ • Operating humidity: 10~90RH	25	1:1
19.	Refractometer	• □rix Range□□□□□□□□□ • Brix: 0-10% • Measurement Range: 0-100%, 0-100(%) • Measurement Accuracy: ±1 ppt/±0.1%	1pcs	1:25
20.	Oxmeter	• Temperature Range: 0-65 degree Celsius • Permeable membrane: fluorine plastic • Electrode insertion length: 80,150,200,250,300 mm • Measuring range: (0~20.0)mg/L • Electrode body material: stainless steel	1	1:25
21.	Electric generators	• Voltage: 220 / 380v • Speed: 3000/3600RPM • Engine type: Air-cooled 4-stroke • Fuel tank capacity:15L	1	1:25
22.	Gutting knives	• Blade Material: Stainless steel • Material: Metal • Blade Material:2cr13 stainless	5	1:5

		steel • Blade length: 16.5cm/6.5 inch		
23.	Gutting table	• Material: Stainless Steel • Surface: Polished Glossy • Thickness:0.8mm • Type: Kitchen Work Table	1	1:25
24.	Fish boxes	• Material: Plastic • Style: Solid Box • Size: Customized Size • Loading Capacity: 20kg	5	1:5
25.	Weighing balance	• Type: Hanging scale • Capacity: 100kg	1	1:5
26.	Deboning machines	• Power source: Electric • Power: 2.2KW • Voltage: 220V/230V, 50/60 Hz • Production Capacity: 180-500kg/h • Function: Remove Fish Scale • Material: stainless steel	1	1:25
27.	Ice boxes	• Material: PE Outer + PP Inner + PU Foaming • Feature: Waterproof, insulated • Capacity: 65L	5	1:5
28.	Hand cart	• Wheel: Four-wheel • Material: Steel, plastic and rubber • Load Capacity: 10-50KGS • Body size: 1260*840*330MM	1	1:5
29.	Chiller	• Voltage/Frequency:220~240v/50hz/110v/60hz • Temperature:2~8℃ • Refrigerant: R404a/R134/R22a • opening for optional: glass door/lifting glass door/sliding glass door • cooling system: compressor inside/outside	1	1:25
30.	Plastic tanks	• Material: Plastic • Capacity: 1000L, customized	1	1:25
31.	Measuring cylinder	• Material: Glass	25	1:1

		• Size: 10ml, 25ml, 50ml and 1000ml		
32.	Filtration	• Material: Stainless steel • Design vessel pressure :0.6-1.0Mpa • Operate temperature:-20-140°C • Filtering accuracy: 0.1-20um • Productivity:500L/Hour	1	1:25
33.	Pumps	• Horsepower: 1HP • Pressure:150Kpa • Voltage:110V/220V, 110V/ 220V • Outlet Size:25mm • Power: 750W	1	1:25
34.	Siphons	• Material: Plastic, ABS Plastic • Usage: Aquarium Cleaning • Application: Water Circulation	1	1:25
35.	Sieves or screens	• Material: Stainless steel • Technique: woven • Sieve Diameter: 20cm 30cm • Usage: Testing Filter	5	1:5
36.	Nets	• Material: PE net + Plastic coated steel • Mesh size: *1cm, 1.5*1.5cm, 2*2cm, customize • Size: 25*45cm, 30*60cm, customize • Frame: 4mm, 6mm, customize	5	1:5
37.	Autoclave	• Power: AC220V.50/60Hz • Dimension(L*W*H): 410*410*750 mm • Working temperature: 126°C • Timer range: 0-99 min • Max. safety pressure: 0.165Mpa	1	1:25

4. Developers Profile

No	Name	Qualification (Level)	Field of Study	Organization/ Institution	Mobile number	E-mail
1	Alemayehu Tolera	MSc	Animal Production	Bako PTC	0994132626	toleraalex@gmail.com
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4	Mathewos Kussa	BSc	Animal Production	Wolaita Sodo ATVT	0913889302	matkusa.mk@gmail.com
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5. Coordinators profile

No	Name	Qualification (Level)	Field of Study	Organization/ Institution	Mobile number	E-mail
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