Facilitator Guide

Sector
ARGICULTURE AND ALLIED

Sub-Sector
Fisheries

Occupation
Aquaculture

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NSQF Level: 3
Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi
Prime Minister of India
About this Guide

Dear Trainer,

This Trainers Manual is intended to empower preparing for the Aquaculture Worker Qualification Pack (QP). Every National Occupational (NOS) is spread over Unit/s. Key Learning Objectives for the NOS check the start of the Unit/s for that NOS. The images utilized as a part of this book are portrayed beneath. Aquaculture Worker is in charge of Installation, Testing, Commissioning of Aquaculture Worker at agriculturist’s field for better water administration and increment in yield of product. The National Occupational Standards indicate the measures of execution an individual must accomplish when doing a capacity in the work environment, together with the information and comprehension they have to meet that standard reliably. These word related guidelines are appropriate both in the Indian and worldwide settings. According to these measures the Aquaculture Worker ought not to work freely, ought to be relentless and must be able to settle on operational choices relating to his range of work. The student ought to pick up clarity of work and ought to be result situated; The Trainee ought to likewise have the capacity to exhibit abilities to utilize different devices in the Aquaculture Worker. The mentor should guide and prepare the students’ in the accompanying abilities:

- **Knowledge and Understanding:** Satisfactory operational learning and comprehension to play out the required chore
- **Performance Criteria:** Pick up the required aptitudes through hands on preparing and play out the required operations inside the predetermined measures
- **Professional Skills:** Capacity to settle on operational choices relating to the zone of work

The course incorporates Trainer Guide including student handbook for the learners and coach’s aide; appraisal guide; session arrangement; and syllabus for you. The course material likewise incorporates a couple of blurbs as showing helps in the classroom. The appraisal guide subtle elements the assessment system. As a mentor you will assess the learners’ execution and grade them in light of the assessment parameters given in the aide. The system additionally incorporates field visit for the students where they will watch the method/operations and administrations of the Aquaculture Worker. Chapters are prepared to build up the expert abilities like – choices making, systematic and basic considering. We hope you will be able to impart your knowledge with our help to make this program a success and up-skill the workers to the recommended standards.

We trust you will have the capacity to confer your insight with our help to make this program a win and up-skill the workers to the suggested norms.

All the best!
Acknowledgements

We are thankful to all organizations and individuals who have helped us in preparation of this Participant manual. We also wish to extend our gratitude to all those who reviewed the content and provided valuable inputs for improving quality, coherence and content presentation of chapters. This handbook will lead to successful roll out the skill development initiatives, helping greatly our stakeholders particularly trainees, trainers and assessors etc. We are thankful to our Subject Matter Expert Dr. Asifa M Yasin who has given the content and helped us in preparation of Facilitator Guide.

It is expected that this publication would meet the complete requirements of QP/NOS based training delivery, we welcome the suggestions from users, Industry experts and other stakeholders for any improvement in future.
Role of the Trainer

As a trainer, keep in mind the following guidelines:

Know your job thoroughly

The Trainer ought to first know his/her learners (the students) keeping in mind the end goal to guarantee their productive contribution in the learning procedure. Fundamentally the majority of these contemplations are guided by the reasoning of participatory preparing, which advocates that preparation, not at all like instructing, is more worried with the general improvement of the human identity.

- As a Trainer, remember the accompanying rules:
- Training is not learning
- The trainer needs to learn for himself/herself, through his/her own particular activity and movement
- The trainer can just guide the understudy movement in a way that prompts a decent learning background
- The trainer can create reasonable situations fancied to deliver a powerful learning (curricular, co-curricular and additional curricular) experience
- Trainees’ response with the earth is relied upon to achieve an adjustment in conduct
- The trainer is the key component, as on him/her depends the arranging of the learning circumstance for accomplishing the sought result

Practice these common courtesies

- Greet the students
- Be warm and neighborly
- Introduce yourself
- Ask their names
- Explain the reason and objectives of preparing project
- Ask their desires
- Always make inquiries
- Listen to then quietly and answer their inquiries
- In case you can’t react to an inquiry say that you will hit them up
- Respect the students
- Do not hang over them, their work, or get in their work-space
- Do not take their work or move it without requesting their consent
- Be a decent onlooker
- Offer rededication for weaker students Correct the flawed practices of learners at work before they transform into propensities
- Do not condemn
- Show gratefulness where it is expected
- Always say 'please', 'thank you', and "too bad"
- Be a tutor
Responsibilities

• The trainer has a unique position and assumes a few parts. He/she is a go between the student and administration.
• The trainer has moral and lawful duties and guarantees the expert advancement as well as the prosperity of the young. You need to counteract:
  • Discrimination as a result of sexual orientation, race or nationality or some other kind
  • Bullying and/or lewd behavior
  • Abuse of liquor, prescription or whatever other substance
  • Physical threats through mischance, air contamination, commotion or risky chemicals
  • Overstepping the student’s physical limit
• You likewise need to secure that time directions or other lawful controls are not infringing—neither by you nor by the disciple.

Symbols Used

- Steps
- Time
- Tips
- Notes
- Objectives
- Do
- Ask
- Explain
- Elaborate
- Field Visit
- Practical
- Lab
- Demonstrate
- Exercise
- Team Activity
- Facilitation Notes
- Learning Outcomes
- Say
- Resources
- Activity
- Summary
- Role Play
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1. Introduction

Unit 1.1 – Freshwater aquaculture sector in India
Unit 1.2 – Fish farming
Unit 1.3 – Job role of an Aquaculture worker
Key Learning Outcomes

At the end of this module, you will be able to:

• Acquaint with scope, status and importance of aquaculture sector in India.
• Know different types of water bodies and culturable organisms under aquaculture practices.
• Know sub sectors under aquaculture.
• Understand fish farming, need, scope and economically important fishes for farming in fresh water.
• Know fish culture techniques including breeding.
• Know fish farming under composite fish culture.
• Know and undertake farm management such as pre and post stocking processes including hatchery operations.
• Know duties, competencies and skills required for undertaking aquaculture practices
• Know and practice hygiene and safety measures at the fish farm.
UNIT 1.1: Freshwater Aquaculture Sector in India

Unit Objectives

After completing this unit the trainees will be able to:

- Understand fisheries sector of India with respect to capture and culture system (Aquaculture)
- Develop acquaintance with different organisms cultured in different types of water bodies viz fresh water, brackish water and marine water.
- Develop an understanding of capture fisheries in different water bodies such as reservoirs, rivers, canals, beels and other natural fresh water bodies, estuary, lakes and lagoons of brackish water bodies and coastal and deep sea fisheries in marine ecosystem
- Know status of fresh water aquaculture in India
- Understand need and importance of fresh water aquaculture including fish farming in India.
- Know fresh water resources for aquaculture in India viz. ponds, tanks, lakes and reservoirs, beels and derelict waters, rivers, and irrigation canals.
- Know employment opportunities in aquaculture sector in India
- Know educational and training needs to develop skills and competencies to undertake fresh water aquaculture /fish farming
- Know duties and abilities of an aquaculture worker to be able to assist in the culture operation at the aquaculture farm.

Resources to be Used

- Available objects such as a white board, duster etc.
- Power point slides, Pictures / posters e.g. that can depict various role of Aquaculture.
- Assignments included in participants’ manual.
- Video film to show capture and culture of fishes in brackish water and marine water bodies.
- Teaching aids such as posters and charts to depict freshwater resources of India
- Smart class room equipped with Projector and laptop, etc.,

Do

- Make the students stand in a circle, close enough to the person each side of them that they can pass the parcel quickly.
- Say 'Stop' when the when students least expect it. The person who has the parcel at that time should get out.
- Those who get out should introduce themselves by providing their names and a little additional information such as name of his / her village, things people in their village do to earn living, favorite farm animal and why etc.
- The winner of the game should stand and introduce himself/herself along with the additional information as above at the end of the game.
• Thank everyone for their participation.
• Describe some comments of participants during the game regarding things people do to earn living.

Ask
• How many of you have visited sea shore, river, lakes etc.
• Is there any difference in the water of sea & river?
• Name few rivers of the country.
• Name some states where you find sea shore.
• What you know about brackish water.
• Who will tell difference between capture and culture fisheries?
• Explore with participants what they understand about the “word Aquaculture”; ask them to name equivalent word in local language. (Include images of Aquaculture equivalent Indian words in a power point slide)
• Ask three volunteers to give a short speech as what will they do to improve aquaculture.
• Ask few participants to describe people / occupations who are directly dependent on aquaculture to earn living.

Explain
• Introduce participants to definition of Aquaculture and explain the Aquaculture equation as mentioned in participant manual.
• Explain different categories of Aquatic animals and poultry with examples and pictures. Explain their role in livelihood, human health and nutrition.
• Explain various groups of Aquatic animals (e.g. fish, crustaceans, Molluscs, aquatic plants, algae, and other aquatic organisms).

Elaborate
• Elaborate on the role of Aquatic creatures (Provider of food, energy, tractions besides cultural and religious significance etc.)
• Size of population and importance of Aquaculture to Indian economy as per the participant handbook
Exercise

1. Which are the top three states in aquaculture production and why?

Answer: ..........................................................................................................................................................
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Notes for Facilitation

• Help participants to complete all the tasks included in the participant manual.
• A thorough understanding of the meaning of Aquaculture will help in inculcating serving attitudes and create awareness of 'people' dimensions associated with Pond care and development.
• While describing the role and importance of Aquaculture help participants to develop a sense of pride amongst themselves as would-be service providers of a sector that is important to country’s economy, social and cultural well-being.

Notes

Trainee should use the principle of learning using previous knowledge of the trainees. Then elaborate the discussion and start the topic with the help of posters charts, and/or video film
UNIT 1.2: Fish Farming

Unit Objectives

After completing this unit the trainees will be able to:

- Know principles and concept of fresh water fish farming
- Know components of fish farming system such as fish breeding, seed production, rearing and raising of fish seeds in grow out ponds, etc.
- Assist in breeding of fishes for seed production
- Assist in pre and post stocking pond preparation including water quality monitoring.
- Know sizes and stages of fish seeds for rearing, stocking and marketing purposes
- Ensure water supply in hatchery and maintain water levels in nursery, rearing ponds, and stocking ponds
- Know different types of ponds their sizes and suitable sites at the farm
- Know different daily activities at the farm and during breeding and rearing of fish seeds.
- Know different types of nets used for different types of operations at the farm viz. nursery nets, hand nets, cast nets, sine nets, plankton nets, etc.
- Undertake operation of nets at the farm for different purposes such as to collect brood fishes transfer of fish seeds to rearing ponds and to catch marketable size fishes
- Repair and maintenance upkeep of nets and gears after operation.
- Undertake packing of fish seeds (fry & fingerlings) for transportation.
- Handle emergency situations at the farm such as choking of aerators, short circuit/fire/ flooding/poaching/ mass mortality of fishes in rearing or stocking pond.
- Practice self-hygiene, maintaining hygiene conditions at hatchery and farm.
- Use of safety measures during culture operation, such as handling of chemicals, on- board operations snake or insect bites, etc.
- Cleaning of tools, nets, boats, weighing machine, hatchery, etc.
- Know the organizational set up of the farm to report the emergency situation to the concerned person and take direction/instruction to take up different activities/operation at the farm.

Resources to be Used

- Available objects such as a white board, duster, flip chart board / paper etc.
- Assignments / class work included in participants’ manual.
- Equipment, raw material nets etc. used in fish culture i.e. pre-stoking, stocking and post-stocking (refer participant hand book of aquaculture worker).
- Models of hatchery and nets (nursery net, hand net, plankton net, cast net and gill net)
- Specimens of cultivable fishes, fish seed (fry, fingerlings), eggs (fertilized and unfertilized eggs).

Team Activity

- Make students into two or three groups. Ask them to do activities given in participant manual like specifying each equipment name and its purpose. Taking clue from the equipment, groups should discuss amongst themselves the functioning of each equipment.
The objective of the above activities is to prepare the participants for his / her future role as a responsible worker. Awareness of various equipment’s will effectively engage work under aquaculture farmer. In many situations Aquaculture Workers are required to assist Aquaculture Technician in mobilizing resources at the right time and in the right quantity. Aquaculture Workers are the first point of contact for field to know the problems associated with the aquaculture farm.

**Tips**

- The objective of the above activities is to prepare the participants for his / her future role as a responsible worker. Awareness of various equipment’s will effectively engage work under aquaculture farmer. In many situations Aquaculture Workers are required to assist Aquaculture Technician in mobilizing resources at the right time and in the right quantity. Aquaculture Workers are the first point of contact for field to know the problems associated with the aquaculture farm.

**Ask**

- Who will explain the difference between agriculture farming and fish farming?
- How many of you eat fishes. Do you know their names?
- How fishes multiply? Why fish farming is done?
- Who has seen a fish farm?
- Have you ever seen prawns in the market? What would be its price?

**Do**

1. Take trainees to the workshop to show models, nets and other equipment used at the fish farm.
2. Show model of hatchery, explain its components, use and operation.
3. Start the discussion in the class after getting answers from students about fishes, farming, agriculture, etc.

**Say**

- Thank everyone for their participation.
- Describe the objective of all the above activities.
- Review presentation of each group and add your comment with additional information / corrections – etc.

**Explain**

- Explain importance of fish farming.
- Enlist fishes which are used in farming to meet the market demand for table fish
- Explain nutritional value of fish
- Explain step wise procedure of fish farming or composite fish culture which may include:
  - Size of fish farm, suitable site and layout of farm
  - Different types of ponds in the farm and their uses
  - Water quality parameters suitable for ponds
  - Water mgt. at the farm with respect to quality and quantity (flooding).
  - Fish varieties commonly grown for commercial purpose, which may include indigenous and exotic varieties. Indigenous varieties include Rohu, Catla and Mrigal whereas exotic sps. Include silver carp, grass camp and Chinese or common carp.
  - (Show specimens and picture of these fishes)
  - Explain the criteria of selecting these varieties i.e. fast growing and different food habits.
Procurement of mature fishes to stock in ponds for induced breeding
- Raising of fishes as brooders
- Cleaning of hatchery
- Undertaking pre-stocking preparation such as removal of aquatic insects, weeds, liming and manuring to grow plankton.

Stocking of fish seeds in desirable ratio of different varieties such as Catla 30: Rohu 20: Mrigal 20: Grass carp 10: silver carp 10: and common carp 10:

Post stocking operation include supplementary feeding, thinning,

Harvesting of fry and fingerlings for sale and undertaking packing for transportation.

Harvesting of marketable size fishes

Repair and maintenance of nets, boats, hatchery components

**Activity**

- Each participant should memorize the equipment
- Ask interested group of participants to look for meaning of equipment and discuss about the same amongst themselves.

**Exercise**

1. Which are the most used equipment’s in Aquaculture production?

   Answer: ..........................................................................................................................................................
   .....................................................................................................................................................................

**Notes for Facilitation**

1. Trainer many use rotational basis for individuals or in groups to take up different activities, answering the question, etc.
2. Enhancing participation of trainees in the discussion and activities.
3. The activities at the fish farm for breeding, pre-stocking, stocking, post-stocking, harvesting and packing may be distributed among trainees by forming gps. The trainees in gps. Will assist in different on-farm operations. Rotation may be done on weekly basis.
4. Gp of trainees may also be given responsibilities of providing assistance in procurement of raw materials, cleaning, drying and maintenance of nets and equipment.
5. Trainees may record and understand the setup, role and responsibilities of workers, supervisors, managers etc. appointed to take up fish cultures operation.
6. An assignment may also be given to take stock of requirement of manpower (skilled &semi-skilled) at the fish farm along with the qualification and experience required. This will enable the trainees to prepare themselves and explore employment opportunities in the venture.

**Note:** Trainees must establish linkage with fish farm of state dept./agric.univ./private fish farm for practical, and on - the Job Training. The above mentioned steps should be included in OJT. Which should be organized in breeding seasons.
UNIT 1.3: Job Role of an Aquaculture Worker

Unit Objectives

After completing this unit the trainees will be able to:

• An Aquaculture Worker is responsible for providing assistance in carrying out different activities of the fish farm including water intake, water treatment, pond preparation, farming operation, sampling, harvest and effluent treatment etc.
• Enlist their duties at the fish farm during breeding of fishes, hatchery operation
• Pre and post stocking activities, packing of fish seeds for transportation
• Maintain record of raw materials
• Maintain record of spawn, fry and fingerlings stocked
• Maintain record of netting and sale of fish
• Record and maintenance of nets, boats, tools, equipment etc.
• Record of raw materials such as supplementary feed, time, and diesel, induce breeding agents, manures fertilizers, etc.
• Checking of pipeline of the farm to ensure water supply to hatchery and filling or dewatering from pond if required.
• Monitoring of water quality, sampling of water, soil and plankton.
• Observe and report emergency situation.
• Maintain hygiene conditions at the farm, proper cleaning of nets and hatchery boats, tools, etc.

Resources to be Used

• Video films of fish farm operation for fish farming.
• Slides in power point presentation showing specific creative images showing every small activity
• Teaching learning materials i.e. teaching aid and reference materials about fish farm operation to take stock of human resource requirement and duties of different personnel at various levels of operation.

Team Activity

• Divide the class into three teams. Give sufficient time for teams to refer to the text in participant manual related to roles of Aquaculture Worker. Facilitate team members to discuss amongst them. After this, each team will take their turn and sit in circle for a discussion on any one from amongst the following topics. Ensure that the other teams listen to any particular discussion and note down key points. No team should choose the same topic. At the end of three rounds of discussion ask each team to suggest other teams’ pointers that they may have missed while discussing on their chosen topic. The group making maximum suggestions to others should be awarded as winner.

1. Why should we focus more on water intake activities?
2. Why should we learn exactly about Post stocking culture?
**Ask**

- What do you know about functioning and workers i.e. number of personnel engaged at a fish farm?
- Do you have any idea that what personality attributes one should have while working at a fish farm.

**Do**

- Show or discuss the operation of nets and sailing of a boat.
- Enlist persons at a fish farm assigned different duties. However, these days' multi skilled persons are given preference.
- Organize group Activity to show case different activities at a fish farm under taken by scientists, supervisors, and field assistants.
- Make an organizational plan of a fish farm and depict different activities and cadre of people or multi skilled persons handling various farm activities

**Say**

- Sum up the key learning of above group discussion topics and relate it to the role and responsibility of Aquaculture Worker.
- Please describe the Assessment criteria of the job role by explaining the Principal components under each NOS as per the qualification pack.
- Introduce the participants to the legal provision in India ICAR whereby Aquaculture Worker can only deliver services rightly at ground level to farmer.
- Enlist and explain activities/farm operation
- Enlist types of personnel required to take up these activities, their qualifications and/or experience.
- Discuss personality attributes required for each person at the farm

**Elaborate**

- Elaborate on work environment of Aquaculture Worker: Discuss on model service delivery examples in India, where Aquaculture Workers are working under registered institutions and getting regular guidance from Aquaculture technicians. Indicate the need for partnership between practicing Technicians and Aquaculture Workers so as to ensure delivery of service to large number of farmers in remote areas.
- Show them the career progression pathways of the aquaculture worker to further job roles.
Notes for Facilitation

- Encourage participants of group discussion to ask questions so that they can clear their doubts (if any) on future job role.
- Assist participants to streamline their thought process while discussing the above question. E.g. Preventive service is good because it is less costly; animals retain their productivity etc.
- You can invite representative of any organization who employs Aquaculture Worker to speak on 'expectations from trainees'.
- Indicate briefly the option for career progression and career mobility of Aquaculture Worker completing training under NSQF framework e.g. an Aquaculture Worker can further study to become Aquaculture Technician. He/she can work anywhere in India or even seek employment outside the country.
2. Assist In Pond Preparation Activities

Unit 2.1 - Drawing and storage of water
Unit 2.2 - Water treatments
Unit 2.3 - Apply Organic Manure
Unit 2.4 - Eradicate aquatic weeds
Unit 2.5 - Eradicate predatory and weed fish
Unit 2.6 - Pond fertilization
Unit 2.7 - Aquatic insects control and treatment
Unit 2.8 - Stocking.
Key Learning Outcomes

At the end of this module, you will be able to:

- Undertake storage and water treatment
- Apply organic manure
- Understand the methods of aquatic weed eradication
- Understand the methods of eradication of predatory and weed fishes
- Apply pond fertilizers
- Undertake aquatic insect control and treatment
- Stock the seed
UNIT 2.1: Drawing and Storage of Water

Unit Objectives

At the end of this unit, you will be able to assist participants to:

- Understand the importance of water storage
- Undertake water storage

Resources to be Used

- Power point slides, Pictures / videos /posters / g. that depict various of water storage
- Pictures of local fish farm to demonstrate/locate nearby water resources to draw water in the farm for storage.
- Model of fish farm showing drawing and storage of water, with details of network of pipelines.
- Pictures of local fish farm to demonstrate/locate nearby water resources to draw water in the farm for storage.

Do

- Show a model of an ideal fish farm to explain use and the location of water inlet and outlet for storage and managing over flooding of water.
- Show or discuss the drawing of water into pond from a natural resource like river or reservoir.
- Alert students for receiving of water from agriculture farm, which may contain pesticides.
- During rainy reasons, trainees should be taken to the fish farm to show the location of outlet for expelling water in flooding conditions.
- Test the water of pond for its quality desired for fish culture.
- Demonstrate receiving/water filling from nearby natural water resource.

Say

- First step is to make them understand about water and its importance in Aquaculture.
- Stress upon the ill effects and unhygienic conditions of water will increase the contamination and pest incidence on the aquatic creates. So, this will spoil the entire growth environment and leads to poor harvest.
- By saying above sentence further proceed to filtration and water treatment.
- Describe importance of water storage in a reservoir
- Describe method of water treatment to use water for culture of fishes in ponds.
- Alert trainees for not drawing water from the canal to prevent pathogens and parasite.
- Mention depth of water in different types of ponds to be maintained throughout the year
- Describe water quality parameters suitable for fish culture and explain water pollution.

Ask

- Ask participants to go through the participant handbook.
- Ask participants if they can demonstrate the water pumping into the pond.
**Demonstrate**
- Demonstrate various parts of water pump.
- Show various types and samples of water.

**Explain**
- Importance of water storage and give a short introduction to next chapter by stressing the importance of water treatment.

**Elaborate**
- Elaborate ponds receiving water from runoff during rainwater.

**Notes for Facilitation**
1. Give assignment to trainees to collect water samples from different sources of water such as canals, river, lake, reservoirs and ponds of fish farm. Compare water quality parameter such as DO, NO2, NO3, phosphates, pH, turbidity, total dissolved solids, etc. Mark the parameters suitable for fish culture and mention the water body sampled.
2. Organize practical sessions for water analysis for hands on experience.
3. Trainees may be guided to make a layout plan for inlet and outlets at the farm from drawing water and expelling water during flooding.

**Exercise**
1. Can we use overhead tank for storage of water for Aquaculture, explain why?

   Answer: ..........................................................................................................................................................
   ........................................................................................................................................................................
   ........................................................................................................................................................................

**Notes**
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UNIT 2.2: Water Treatment

Unit Objectives

At the end of this unit, you will be able to assist participants to:

• Apply chlorine for water treatment
• Apply lime for correcting pH
• Understand about turbidity and pH

Resources to be Used

• Available objects such as a white board, duster etc.
• Slides in power point presentation showing specific images (Refer participant manual for images)
• Chlorine and Bleaching powder.

Explain

• Explain the process to control Turbidity in the reservoir.
• Clearly explain the steps of Lime preparation.

Elaborate

• Effect of stress on water treatment in production of aquatic animals.
• Please describe the process of application of organic manure as specified in Participant Handbook.

Do

• Demonstrate testing of pH of the water sample by using pH strip.
• Measure turbidity to show the trainees and why it is harmful?
• Demonstrate the method of using hydrated lime and gypsum to reduce turbidity.
• Demonstrate and calculate the dose of cow dung to control clay, turbidity.
• Demonstrate process of chlorination of water

Demonstrate

• How to prepare lime for correcting ph.
• Application of Chlorine and Bleaching powder in water by following the specific steps.
Say

• Explain ill effects of acidic and alkaline water in fish farming
• Discuss source of water pollution and controlling measures
• Explain what is turbidity and its effects in relation to fish culture.
• Explain chlorination of water
• Describe methods of maintaining water quality with respect to acidic / alkalinity/ turbidity of farm water.

Notes for Facilitation

• Guide trainees to collect samples of water and undertake test for pH, dissolved oxygen and pathogens. Make notes as whether or not the water is suitable for fish culture.

Exercise

1. How many hours after chlorination we can stock the seed?
   Answer:._________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________

2. Can we use aquaculture water for agriculture? If no then why?
   Answer:._________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________

3. What is the quantity of cow dung needed for 1 hectare pond?
   Answer:._________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________

Notes
UNIT 2.3: Apply Organic Manure

Unit Objectives

At the end of this unit, you will be able to assist participants to:

- Understand when to apply organic manure
- Apply organic manure to the pond

Resources to be Used

- Cow dung
- Containers such as buckets, small cement or iron tanks for making slurry.
- Gloves

Ask

- Who will tell, what is organic manure?
- How it is made?
- Why it is used in fish ponds
- How it is applied in fish ponds
- What quantity is used?

Do

- Collect zooplanktons in a glass beakers from the fish pond.
- Show zooplanktons to familiarize the trainees and explain their importance as food of fish seeds in fish ponds and use of organic manure for their production in pond
- Demonstrate the procedure of production or procurement of organic manure i.e. cow dung for zooplanktons and poultry manure for phyto planktons production in pond.
- Show phytoplankton under the microscope.

Say

- Explain what is organic manure i.e. source to supply organic carbon, nitrogen and phosphorus for the food chain.
- Explain organic carbon and food chain in a pond
- Describe method of the production of organic manure.
- Describe method of the production of organic manure if not produced at their farm, then spots of its procurement.
- Explain steps to make slurry of organic manure in desired quantity.
- Demonstrate method, period and quantity of organic manure application
- Discuss different types of zooplanktons and phyto planktons in a fish pond.
Trainees may be asked to collect the following

- Cow dung samples
- Poultry manure sample
- Zooplanktons
- Phytoplankton
- Trainees should be given practical to make slurry of cow dung and administer in fish pond.
- Observe trainees for self-hygiene and use of safety measure.
UNIT 2.4: Eradicate the Aquatic weeds

Unit Objectives

At the end of this unit, you will be able to assist participants to:

- Understand the different methods of eradication of aquatic weed.
- Identify tools and equipment's used for eradication of aquatic weed.
- Identify different types of aquatic weed

Resources to be Used

- Available objects such as a white board, duster, flip chart board / paper etc.
- Any available video and PowerPoint showing specific weeds.
- Weed samples of a fish pond.
- Teaching aids such as charts / posters showcasing methods of eradication to acquaint trainees with pre-stocking preparations.
- Charts/posters of pictures of various tools and equipment required for eradication of aquatic weeds.
- Laboratory equipped with all equipment used for eradication of weeds.
- Video films on eradication of aquatic weeds
- Stationery items such as pencil, color pens, eraser, drawing papers etc. sketch pens to sketch different weeds equipment viz sickle, rakes, hooks, nets, and ropes used in mechanical/manual methods

Ask

- Why weeds should be removed from the fish pond.
- Do you think all types of weeds should be removed from the pond?
- If you know aquatic weeds, name a few as per their location of presence in the pond i.e. weeds of the margin, floating ones and emerging from the pond etc.

Explain

- Possible reason of particular behavior(s) as highlighted by teams.
- Discuss application of various methods mentioned in the participant manual.

Say

- Explain why aquatic weeds should be removed
- Enlist harmful weeds found in the fish pond followed by discussion on their features and nature such as emerging/sub-merged/marginal/floatings
- Acquaint trainees with harmful effects of weeds in a fish pond with reference to fish production
- detail for each of the control measures with proper instructions displayed in the lab/workshop
Discuss removal of aquatic by bio-control and mechanical methods or manually followed by demonstrations or showing video films specially weed cutting launcher

Discuss criteria for selection of chemicals viz. broad and narrow spectrum chemicals, efficiency (so as to use low dosage and less of chemicals), cheap and easy availability, shorter detoxification time, non-toxic to humans, quality fauna and livestock, less residual effect on fertility of the pond soil and water and lastly method or chemicals may not involve special expensive equipment

There should be special session on observing self-hygiene and safety measures during these operations

Precautions should also be discussed in detail for each of the control measures with proper instructions displayed in the lab/workshop

Do

- Demonstrate the use of implements viz. sickle, rakes, hooks, nets and ropes in removing aquatic weeds manually. Give practice session for removing small patch of weeds.
- Demonstrate operation of weed cutting launch fitted with power winches or mechanical lifts and diesel operated winches.
- Specify and repeat tasks involved in aquatic weed removal expected to be under taken by the trainees.
- Demonstrate handling of chemicals used for removal of weeds.
- Select chemicals for weed removal as per recommended criteria mentioned earlier.
- Use biological methods of weed control involve use of fish (grass carp) snails, Cray fish etc.
- Involve trainees in different weed control programs for providing assistance.
- Show video films on various weed removal methods before taking up weed control of different kinds of weeds i.e. sub merged and floating weeds.
- Show specimen of different fishes, snails, cray fish, etc.
- Put a chart of chemicals in the workshop with regard to uses and their doses required for different categories or types of weeds in the fish pond.

Team Activity

- Divide the class into 2 teams. Each team should refer and discuss amongst themselves common behavior related information given in participant manual or available in various internet sources. The team leaders should then make presentation preferably also highlighting experience of team members. Where feasible, encourage team members to show short video clips.
- (The objective of the activity is to develop interest amongst participants to learn more about aquatic weeds so that they can handle aquatic animals with ease and with minimum stress)

Notes for Facilitation

1. Give project to trainees to collect information on the presence of different kinds of weeds in nearby water bodies and fish pond.
2. Make a survey to collect information on various methods used by local fish farmers in the vicinity.
3. Give an assignment to trainees to collect different kinds of weeds, label them and preserve them as specimen to keep in the laboratory.
Exercise

1. What is Aquatic weed?
   Answer: ___________________________________________________________
   __________________________________________________________________
   __________________________________________________________________

2. What is necessary to eradicate aquatic weed?
   Answer: ___________________________________________________________
   __________________________________________________________________
   __________________________________________________________________

Notes

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UNIT 2.5: Eradicate Predatory and weed fish

Unit Objectives

At the end of this unit, you will be able to assist participants to:

• Identify the common predatory and weed fishes
• Know the methods to eradicate predatory and weed fishes

Resources to be Used

• Live specimens of weed and predatory fishes in local areas.
• Equipment required for removal of weed and predatory fishes, such as hooks, lines and nets, measures, weighing machines, buckets etc.
• Raw materials and chemicals as per method to be used such as mahua oil cake, tea seed cake derris, bleaching powder, urea and anhydrous ammonia.
• Video film on operation of removal of weed and predatory fishes.
• Teaching aids such as charts & posters showing different weed fishes, predatory fishes, equipment’s etc.
• Illustrations of operations involved.

Ask

• What do you know about predatory and weeds fishes?
• What harm is expected by the presence of predatory & weed fishes in the pond.
• Name a predatory and a weed fish
• Should any chemical be used to eradicate these fishes? If not then what alternative method can be used.

Explain

• The control methods with specific dosages and application time.

Say

• Predatory and weed fishes are harmful to the cultured species as they not only compete for food and space but also directly prey on them. These fishes enter into the pond with the surface run-off and establish their population. They also greatly affect the dissolved oxygen levels of the pond. SO these fishes needs to be eradicated from the pond.
• Explain why predatory and weed fishes should be removed from a fish pond with the help of illustration of the fishes.
• Give a list of common predatory and weed fishes to trainees to procure from local water bodies/fish pond as specimens for the laboratory.
• Discuss all methods of removal of predatory and weed fishes with specific reference to environment friendly method.
Do

- Collect specimen of predatory and weed fishes to display in the laboratory along with labeling viz. name of the fish, name of water body collected from, date of collection and name of collector.
- Demonstrate common biological control method of eradication of predatory and weed fishes.
- Demonstrate use of chemical methods for removal of weed and predatory fishes including safety measures to be practiced.
- Provide all chemicals and biological agents in the laboratory (to be identified by the trainees) used for removal of predatory and weed fishes.
- Demonstrate use of safety measures and self-hygiene desirable during chemical control measures.
- Prepared or procure illustrations of common predatory and weed fishes to be put in the laboratory.

Demonstrate

- Demonstrate the following on eliminating predators indicating precautions to be taken:

Notes for Facilitation

- Undertake those activities of removal of these fishes repeatedly which trainees are expected to undertake as assistant.
- Organize visit to fish farm and local water bodies along with fishermen to catch fishes. Then the catch may be analyzed for various economically important fishes, weed fishes and predatory fishes.
- Engage trainees in various chemical and biological control operations used for eradicating these fishes.
- Organize frequent demo of various operations and preserving predatory and weed fishes.
- Equip the laboratory with equipment, raw materials, chemicals and specimen of predatory and weed fishes.

Notes
UNIT 2.6: Pond fertilization

Unit Objectives

At the end of this unit, you will be able to assist participants to:

• Understand the need and time of pond fertilization
• Know the types of inorganic fertilizers used in aquaculture

Resources to be Used

• Teaching aids to show case principles of pond fertilization
• Acquaintance with inorganic fertilizers used in pond fertilization
• Samples of oil cakes of ground nut and mahua and superphosphate.
• Illustration to show doses and method of application of inorganic fertilizers.
• Plankton nets
• Buckets
• Mugs

Ask

• Can any one of you tell difference between fertilization used in an agriculture crop field and fish pond.
• Who will tell what fertilizer is and what is its use in our agriculture field or fish pond.
• What is the food of fish seeds?

Do

• Show the illustration of phytoplankton and zooplankton.
• Show live plankton from pond by using plankton net.
• Show illustration of different stages of fish seeds viz. spawn, fry and fingerling.
• Demonstrate the fertilizer preparation in form of paste i.e. steps which include soaking of oil cake for overnight, mixing with cow dung and single super phosphate to make a paste.
• Demonstrate application of fertilizer in the pond.

Elaborate

• Application time and quantity to be applied
Say

- Explain use of fertilizers in the fertilization of the pond.
- Talk about stages of fish seeds with the mention of their sizes with respect to age in hours/days i.e. stages spawn, fry & fingerlings.
- Explain ground nut oil cake, mustard oil cake, mahua oil cake, in terms of their sources, use, procurement and price etc.
- Also discuss the use of cow dung for manuring and single super phosphate as sources of carbon, nitrogen & phosphate.
- Discuss phytoplankton and zooplankton as food organisms for fish seeds present in a fish pond produced by using cow dung, oil cakes and single super phosphate.
- Explain why manure and fertilizer should be applied in the pond during morning of sunny days.
- Explain the process of preparing mixture of fertilizer and their application in fish pond in terms of doses and stocking of fish seeds.

Tips

- Request participants to refer to tips included in the participant manual and discuss any relevant pointers helpful to participants.

Notes for Facilitation

- Trainees may be asked to collect information on types of oil cakes give more growth of phytoplankton.
- Set up an experiment to show the efficiency of different oil cakes.
- Organize visit to a fish farm to actually see the application of fertilizers and growth of plankton in rearing and grow out ponds.
- Trainees should be guided to maintain a record of administering manure and fertilizers with respect to time, dose and growth of plankton and fish seeds.

Exercise

1. Why Pond fertilization is important, explain?
Answer: ____________________________________________________________
                                           ____________________________________________________________
                                           ____________________________________________________________

Notes
UNIT 2.7: Aquatic Insects Control and Treatment

Unit Objectives

At the end of this unit, you will be able to assist participants to:

- Identify the common aquatic insects
- Know the methods to eradicate and control of aquatic insect

Resources to be Used

- Specimen of aquatic insects
- Chart posters of illustration of aquatic insect and netting operation
- Drag net
- Kerosene oil
- Buckets
- Soap oil

Ask

- Can anyone tell that why aquatic insects should be removed from nursery and rearing pond.
- Do you think that these insects can be netted out or not? If not then what safe method of without using chemicals they can be removed.

Do

- Show specimen or live aquatic insects found in the fish pond.
- Demonstrate operation of drag netting for aquatic insect’s removal in the nursery and rearing pond
- Demonstrate preparation of oil and soap emulsion used for removing insects.
- Demonstrate application of emulsion to remove aquatic insects.

Say

- Discuss about damage caused by aquatic insects in nursery and rearing ponds
- Give identification tips for Recognizing harmful aquatic insects in nursery and rearing ponds.
- Discuss principle of using soap-oil emulsion for trapping aquatic insects.
- Describe all methods of control and removal of aquatic insects from fish seed stocking ponds.
Tips

- Prepare a presentation where major and emerging aquatic pests present in the particular geographical area as per the stocking season.

Notes for Facilitation

- Organize visit to show actual operation of drag net and method of eradicating aquatic insects.
- Prepare teaching aids such as collage, posters etc. to show aquatic insects and method of their control.
- Video film may also be used to show operation of drag net to catch insects.
- Trainees may be asked to collect aquatic insects by hand nets.
- Trainees should preserve and arrange specimen in the laboratory with proper labeling.
- Trainees should be given schedule of stocking of fish seeds so that they may plan to remove aquatic insects from the ponds.

Notes
UNIT 2.8: Stocking

Unit Objectives

At the end of this unit, you will be able to assist participants to:

- Different life stages of different cultivable fishes.
- Know the stocking density of different fishes.

Resources to be Used

- Teaching aids viz charts & table showing different stages of fish seeds and stocking ratio respectively.
- Pictures or video of composite fish culture
- Live fish seeds viz. spawn, fry fingerling.
- Beaker, bucket, nursery hapa, at the fish farm
- Raw Materials like paper, pen, color, pencil, eraser, picture of fish seeds and ponds for making collage, charts etc.

Ask

- Do you know what fish seeds are and how old they are?
- Why there should be certain ratio of different sps. To be stocked.
- Why different varieties of fish seeds are stocked together.
- What is acclimatization?

Do

- Show different stages of fish seeds i.e. spawn, fry & fingerlings.
- Make a table to show stocking ratio of fish seeds of different fishes which may be stocked together in different ponds at the fish farm
- Demonstrate process of taking out fish seeds from hatchery or nursery ponds/rearing pond.
- Organize a visit to fish farm to observe fish seed stocking
- Demonstrate to check pH and temperature of water of bag & pond.
- Demonstrate the procedure of acclimatization.
- Demonstrate how spawn, fry and fingerlings are released in respective ponds, show step wise procedure of stocking through video film or through collage or poster viz unloading seed bag and keep in the pond under shade, add pond water in the bag, check temperature and pH of packed water, mixing of pond water in the bag, lower the seed bag in the pond and start releasing the fish seeds in the pre-selected pond.
Say

- Describe different stages of fish seeds of different varieties cultured in composite fish culture.
- Describe why combination of the four or six sps. is used in composite fish culture viz Catla, Rohu, Mrigal, Silver Carp, Grass Carp and common carp.
- Describe need of different stocking ratios of different sps. Mentioned above.
- Discuss the need of acclimatization of fish seed to be stocked.
- Explain the process of collecting spawn, fry & fingerling from the hatchery, nursery and rearing ponds respectively.
- Acquaint the trainees with different nets, tools, stocking bags, hapa etc.

Notes for Facilitation

- Teaching aids should be prepared such as charts and tables for soil & water quality desirable parameters
- Organize visit to nearby fish farm to see netting of fishes to check their growth and diseases, soil and water sampling operations.
- Table must be put in the laboratory regarding symptoms, treatment and control of fish diseases.
- Model fishing nets and samplers for soil and water must be put in the lab.
- Guidance must be provided to trainees with respect to procurement of soil water analysis reagents, glass ware, chemical kits etc.
- Assignment may be given to trainees to collect samples of water and soil.
- Trainees may be asked to compile information on occurrence of fish diseases in nearby pond fishes. The observations may include symptoms, prevention, control and treatment.

Exercise

1. What is the right time in a day for these activities?
   (I) Stocking
   (ii) Feeding
   (iii) Harvesting
   Answer: ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

Notes
3. Assisting In Carrying Out Culture Operations

Unit 3.1 - Sampling and netting operation
Unit 3.2 - Supplementary Feeding
Unit 3.3 - Manure and Fertilizers
Unit 3.4 - Aeration and water Replenishment
Unit 3.5 - Periodic Checking
Unit 3.6 - Harvesting
### Key Learning Outcomes

**At the end of this module, you will be able to:**

- Undertaking fish seed stocking in nursery, rearing and grow out pond respectively as per size.
- Managing and administering supplementary feed as per schedule
- Post stocking operation
- Maintaining soil and water quality management throughout the culture operation.
- Fish sampling for monitoring growth, marketable size and disease identification
- Prevention and control of diseases in fishes stocked in ponds
- Harvesting of marketable size of fishes.
- Post-harvest operation of fish crop.
UNIT 3.1: Sampling and Net

Unit Objectives

At the end of this unit, you will be able to assist participants to:

- Know the right time of sampling
- Know the methods of sampling
- Identify different nets used for different types of samplings.

Resources to be Used

- Samples of soil, water and record of fish growth every fortnight
- Nets for fish samples of appropriate mesh size.
- Core sampler
- Polythene bags,
- Water sampling bottles
- Permanent marker pen for numbering and labeling the water sample bottles and soil sample bags regarding data, location and collected by.
- Tray or racks for keeping soil and water sample bags and bottles.
- Teaching aids such as illustrations showing method and time of taking soil and water samples using core sampler, table showing water and soil parameters and their limits desirable for fish cultivation and charts showing nets used for fish sampling
- Tarter pen for numbering and labeling the water sample bottles and soil sample bags regarding data, location and collected by.
- Tray or racks for keeping soil and water sample bags and bottles

Explain

- Different Sampling techniques?
- What is Sampling and why is it important?
- Why should Aquaculture Worker maintain data of fish sampling for effective netting operation?

Elaborate

- Various methods of fish sampling.
- Data collection tools and process information to Technician
Ask

- Why soil and water samples are collected from fish pond
- Who will tell, as to how one decides to harvest fishes from stocking ponds to sell in the market
- What do you think as to why netting of fishes is done at regular intervals?
- Why certain quantity of water and soil is fixed for taking samples
- Why samples of soil and water are taken from different locations.
- What do you think that is it desirable to do sample netting frequently, if yes what steps should be taken for safe handling of fishes?

Say

- Discuss quality of soil and water suitable for fish culture
- Acquaint trainees with desirable limits of different soil and water parameters with the help of table showing desirable limits of N, P, S and acidic or alkaline nature of soil.
- Through tabular text, water quality parameters such as dissolved oxygen, pH, turbidity, conductivity etc. may be discussed with respect to standard procedure.
- Discuss the principle/concept of netting of fishes by using desirable mesh size of the net.
- Desirable length-weight relationship of growth of fishes, for which netting is done at fortnight intervals.
- Trainees should be acquainted with common types of diseases and their symptoms in fishes.
- Discuss the marketing strategy of fishes with respect to demand and supply, outlet, marketable size of different sps of cultivable fishes.
- Explain correct procedure of water and soil sampling and different types of nets.

Do

- Demonstrate sampling of soil, water and fishes to check growth, occurrence of diseases etc.
- Fish body is checked which include body surface, base, and gills to check parasites and lesion appear due to some diseases.
- Prepare atleast 3 charts viz recommended soil and water parameters, charts depicting diseases, their symptom, control and treatment of fishes.
- Demonstrate recording of different parameters of soil and water

Demonstrate

- Soil sampling method using core sampler
- Model record sheet to be maintained by Aquaculture Workers for inspection of his / her supervisor.
- Mobile devices and process of reading sampling, data entry and transmission

Practical

- Assist participants to do netting and take record.
- Assist participants to practice use of mobile devices or work sheet for data collection.
Each participant should be evaluated based on the following:

1. Skill of Fish sampling.
2. Ability to use field data collection tools (including electronic / mobile based data collection) as per given specification.

Notes for Facilitation

- Teaching aids should be prepared such as charts and tables for soil & water quality desirable parameters
- Organize visit to nearby fish farm to see netting of fishes to check their growth and diseases, soil and water sampling operations.
- Table must be put in the laboratory regarding symptoms, treatment and control of fish diseases.
- Model fishing nets and samplers for soil and water must be put in the lab.
- Guidance must be provided to trainees with respect to procurement of soil water analysis reagents, glass ware, chemical kits etc.
- Assignment may be given to trainees to collect samples of water and soil.
- Trainees may be asked to compile information on occurrence of fish diseases in nearby pond fishes. The observations may include symptoms, prevention, control and treatment.

Exercise

1. Participants should be encouraged to visit nearby ponds on their own and examine filled-in record formats. They should be able suggest simple changes in record format – where required.
   Answer: ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2. Enlist The Different Types of Sampling Gears and Equipment’s.
   Answer: ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

Notes
UNIT 3.2: Supplementary feeding

Unit Objectives

At the end of this unit, you will be able to assist participants to:

• Know the feed requirements of fish at different stages.
• Know the different feeding methods.

Resources to be Used

• Supplementary feed, ground nut and mustard oil cake and rice bran, formulated feed.
• Feeding trays, bags or other feed broadcasters.
• Teaching aid for tubular presentation of preparation, application and doses or quantity of feed to be broadcasted.
• Video film to show preparation and broad casting of feed.

Explain

• Feeding at right time and place and in the right quantity as recommended by the technician
• Importance of observation of surrounding and history taking.
• The process of history taking.
• Importance of group approach (not just focusing on single creature)
• Why should Aquaculture Worker maintain data of his / her health intervention?
• Daily Feed requirement?

Ask

• What do you think that why fish seeds i.e. fry and fingerlings need supplementary feeding
• What is the principle of using oil cake and rice bran in the preparation of supplementary feed?
• How fish seed will eat the food.

Say

• Explain the importance of giving supplementary feed.
• Discuss the nutritional requirement for growth of fish seeds.
• Describe criteria for selecting feed ingredients and sources to prepare supplementary feed.
• Explain ingredients of supplementary feed
• Explain difference between supplementary and formulated feed.
• Discuss steps for the preparation of feed mixture in proper ratio of ingredients.
• Describe methods of application including quality/doses of supplementary and formulated feed for spawn, fry and fingerlings in nursery, rearing and grow out pond.
• Trainees may prepare a table for feeding programme as mentioned below:
For feeding of spawn, raw feed mixtures should be boiled, dried and powdered for easy intake by spawn and fast absorption resulting in fast growth.

In rearing ponds, lime should be applied in the feeding area to avoid infection and keeping the area clean.

To feed spawn, very finely powdered feed should be administered.

Feed bag should be placed in the 30-40 cm depth of water level.

Feed bag should be cleaned and dried every day.

Comprehensive description should be given about estimating feed quantity or ratio as per fish seed weight (biomass), method of application of feed, duration, periodic intervals, etc. with complete feeding management as this is the most important task in raising fish seeds to fingerlings stage.

Taking weight of 10-20 fish to make estimation for quantity of food or ration must be demonstrated and practiced by the trainee on repeated basis.

Application of lime i.e. quantity, time, and location must also be demonstrated and given hands on experience.

### Tips

- For feeding of spawn, raw feed mixtures should be boiled, dried and powdered for easy intake by spawn and fast absorption resulting in fast growth.
- In rearing ponds, lime should be applied in the feeding area to avoid infection and keeping the area clean.
- To feed spawn, very finely powdered feed should be administered.
- Feed bag should be placed in the 30-40 cm depth of water level.
- Feed bag should be cleaned and dried every day.
- Comprehensive description should be given about estimating feed quantity or ratio as per fish seed weight (biomass), method of application of feed, duration, periodic intervals, etc. with complete feeding management as this is the most important task in raising fish seeds to fingerlings stage.
- Taking weight of 10-20 fish to make estimation for quantity of food or ration must be demonstrated and practiced by the trainee on repeated basis.
- Application of lime i.e. quantity, time, and location must also be demonstrated and given hands on experience.

### Elaborate

- Important points to remember as included in the participant manual.

### Role Play

- Request few volunteers to enact a scene of history taking in village setting with following role play e.g. complaining farmer, Aquaculture Worker (lead role), ailing fish, other healthy fish, technician and neighbors. Place some noticeable things within the environment e.g. few cans of pesticide in one corner of the farm.
- (At the end of the play, comment on observed positive and negative points, re-emphasize the need of careful listening of complain, creature approach, looking into detail of environment etc.)
Notes for Facilitation

- Trainer must organize the visit to a fish farm to give demonstration and exposure to real situation of post stocking operation, specially feeding of fish seeds.
- Teaching aids i.e. tabular presentation of feeding schedule and quantity of feed.
- Participation of trainees must be encouraged specially in fish sampling for estimating quantity of feed, in administrating feed in bags and broadcasting in nursery pond. Also an exposure must also be given for procurement of feed ingredients.

Exercise

1. Calculate daily feed requirement of 45 days old fish.
   Answer: ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

Notes

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
UNIT 3.3: Manure and Fertilizers

Unit Objectives
At the end of this unit, you will be able to assist participants to:

- Apply different kind of manures used in aquaculture

Resources to be Used
- Teaching learning materials with illustration of pond measurement to calculate water volume and dose of manure and inorganic fertilizers
- Video film to show application of lime, manure and fertilizers
- Practical's may be organized at the fish farm

Explain
- The definition of a healthy creature.
- Importance of nutrition to creature. Vital parameters e.g. temperature, pulse, respiration and indicate normal values for various species so that participant can differentiate animals.
- Different types of soil classification

Elaborate
- Ways to identify a sick creature based on observation of appearance, movement.
- Disease symptoms.
- Lime application technique

Say
- Technicians use many other methods to conduct more detailed examination of pond to evaluate various functional systems. As an Aquaculture Worker you can endeavor to learn these techniques with more study and practice while assisting technicians.
- In future you should learn to assist technicians in calculating manure requirement.

Ask
- Amongst trainees who will explain difference between manure, fertilizers and therapeutics
- Why there is need to apply lime, manure, fertilizers, therapeutics in fish pond.
Practical

- Assist participants to show how to apply lime based on the slope of pond.

Do

- Measure the depth of water, calculate water volume and then calculate quantity of fertilizers/manure to be applied in the fish pond.
- Demonstrate application of manure, lime and fertilizers.
- Organize visit to a farm to observe steps for application of manure and fertilizers in the fish pond.
- Apply lime in the pond as per need.

Notes for Facilitation

- It is suggested that this unit may be taught at the fish farm along with practical of calculation of doses as per water volume, application of fertilizers, manure and lime
- Model of a pond may be used to show calculation of water volume.

Exercise

1. What is to be apply when soil is alkaline and what is to be apply when soil is slightly acidic.
Answer: __________________________________________________________
___________________________________________________________
___________________________________________________________
___________________________________________________________

Notes
UNIT 3.4: Aeration and Water Replenishment

Unit Objectives
At the end of this unit, you will be able to assist participants to:

- Know the methods of aeration of water
- Know the right quantity of water to be replenish and when

Resources to be Used
- Basic model of aerators
- Illustration of different types of aerators or air diffusers, inlet structure and filtration system
- Practical’s may be organized at the fish farm

Explain
- Why proper aeration and water replenishment in the culture pond is important and its practical approach

Elaborate
- Various types of aerators and its operation

Say
- Microbes that causes disease are called ‘pathogens’. Typically, the term is used to describe an infectious agent. Pathogenic organisms are of five main types: viruses, bacteria, fungi, protozoa, and worms.
- A diseased animal shows clinical (or disease related) signs and symptoms. Signs are those which you can observe. As an Aquaculture Worker you should give more importance on clinical signs of various diseases. Symptoms are those which an animal experiences. Pain is a symptom and in animals, we use behavioral signs and knowledge of likely causes of pain to guide its management.
- When an animal / bird is infected with an infectious disease agent but displays no clinical signs it’s called as ‘carrier’.
- The biggest difference between viruses and bacteria is that viruses must have a living host - like a plant or animal - to multiply, while most bacteria can grow on non-living surfaces.
- There are some useful bacteria but all viruses are harmful. Antibiotics can kill bacteria but not viruses. Antiviral drugs help to slow reproduction of viruses but cannot stop it completely.
Since microbes may become resistant, one should be very careful in using antibiotic and antiviral. A veterinarian's guidance and proper prescription is must.

Ask

- What is an aerator and its function in a fish pond
- Where and why aerator is used.
- In which circumstances water replenishment is done in the pond.
- What if water has been exchanged still aerator will be needed.
- Tell something about emergency situation when water exchange and/or replenishment is required.

Activity

- Each participant should operate the aerator

Notes for Facilitation

- Organization of visit to a fish farm or establishing linkage with a fish farm
- Prepare or procure teaching learning materials for an understanding of structure of aerator and its installation in the fish pond, to acquaint trainees with working principle of aerator, air diffusion, water replenishment and water depth in the pond, dyke height, etc.
- A farm technician may also be invited to take these sessions
- Provide opportunity for hands on experience at the fish farm

Exercise

1. How many aerators are required for 1, 2 and 5 hectare ponds respectively?

Answer: _______________________________________________________
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Notes
UNIT 3.5: Periodic Checking

Unit Objectives

At the end of this unit, you will be able to assist participants to:

• Understand the importance of periodic checking in aquaculture.

Resources to be Used

• Specimens of fishes with indicators of disease such as fishes having lesions, red patches, etc.
• Video film to show abnormal behavior or developing lesion/red patches as indicators of different fish diseases.
• Teaching aids such as charts or collages showing symptoms of diseases, their control, treatment and prophylactic measures, if any.
• Nets and gears, farm implements such as brush, cutter, sickle, spade, pipes, aerator, sampling containers & nets, feed bag.
• Note: These resources can be made available if these activities or sessions are held at a fish farm. Hence tie up or linkage is a must for demos, hands on experience, experts for technical advice, etc. common abnormality.

Elaborate

• Common clinical signs of diseases.
• Reporting types of parasites and creatures causing abnormality
• Importance of cleanliness in using farm equipment’s
• Removing dead and adversely infected fish
• Using net of appropriate mesh size is important to reduce sampling stress (entangling, scale removal)

Say

• Knowledge of clinical signs helps in identification of any particular disease but many a time clinical signs alone is not sufficient for proper diagnosis. Always consult with supervising technician who may suggest laboratory test for confirmation and appropriate line of treatment thereof.
• Many a time disease incidence are related to change in season.
• Never attempt treatment without consulting supervising technician or following organizational guideline.
• Treating pond with drugs without guidance of technician is illegal. This is because of the fact that inappropriate drugs and wrong administration of same to a pond may not only harm the fish but also can affect human consuming products of that fish.
• If you know any local or traditional treatment method, check whether same is scientifically tested, documented and widely practiced.
• When a fish is infected with an infectious disease agent but displays no clinical signs it’s called as ‘carrier’.
• The biggest difference between viruses and bacteria is that viruses must have a living host - like a plant or animal - to multiply, while most bacteria can grow on non-living surfaces.
• There are some useful bacteria but all viruses are harmful. Antibiotics can kill bacteria but not viruses. Antiviral drugs help to slow reproduction of viruses but cannot stop it completely.
• Explain the background and need of the periodic checking
• Discuss what parameters and observations will be recorded during periodic checking
• Explain importance of each parameter and observation in fish seed rearing. The parameters may include quality of water (pH, DO & turbidity), depth of water, conditions of dykes, condition of fish seeds-overcrowding, any abnormal behavior due to asphyxiation, loss of balance while swimming, erratic condition with frequent gulping of air, lesion, red spots or patches on fishes, mortality etc.
• Enlist farm implements, type of nets and gears and their uses.
• Explain procedure of sample netting in fixed intervals and/or when required in emergency situation.
• Discuss emergency situations which may occur at a fish farm.

**Do**

• Demonstrate net sampling for observing growth of fish seeds to check overcrowding, with emphasis on using desirable mesh size of the net.
• Take water samples to check water quality.
• Undertake sampling and collect fishes in containers (for 15 minutes) to observe their growth, diseases or infection etc.
• Demonstrate removal of weeds, under take grass cutting in the peripheral dyke
• Undertake cleaning and maintenance of pump aerator, pipes, nets, sampling net, feed bag, etc.
• Show and remove moribund and dead fishes.
• If disease fish is found, then explain indicator of infection or attack of pathogens, causative agents of disease.
• Demonstrate control and treatment of fishes for diseases.
• Make a chart of periodic maintenance activities at the fish farm.
• Make a register to enter all these information viz. date, time, number of netting or sampling, length-wt. measurements, record of fish disease and their treatment strategies, water level or depth, water volume etc.
• Maintain stock register also for details of implements, raw material, nets, gears etc.

**Team Activity**

• A team of 3-5 participants should select any one common symptoms from the participant manual or any diseases declared to be common in local context. The team then should discuss common clinical signs of the disease, species affected etc. and make presentation before the class.
• Divide the class into two teams. While one of team prepares a list of deficiency related diseases of pond animals the other team should list production related diseases. They should exchange the list thus prepared.
Field Visit

- Organize a visit of the participants to nearby village with good population of fishes. They should interact with a select group of village elders and farmers to list season wise diseases of pond fishes. On return they should visit local outlet and collect any published pictorial disease calendar or atlas of diseases of pond fishes. A volunteer should be asked to record and present learning of the class as a whole including that of information in collected publications.
- (During field visit, interact informally with participants regarding prevalent farming system, social, geographical and environmental condition of service area).

Notes for Facilitation

- Organize visit or establish linkage to fish farm for technical and practical sessions and hands on experience.
- Provide teaching learning materials viz charts, table, to do list, periodic checking schedule, etc.
- Video session for practical and training.

Exercise

1. List out 20 things that have to be checked every day on farm.
Answer:.________________________________________________________________________
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2. List out top 10 diseases and pests in your area and their control.
Answer:.________________________________________________________________________
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UNIT 3.6: Harvesting

Unit Objectives
At the end of this unit, you will be able to assist participants to:
- Harvest the fish based on its growth
- Grade fish in different lots

Resources to be Used
- Available objects such as a white board, duster etc.
- Slides in power point presentation pictorially explaining harvesting procedures and steps.
- Specimens or live fish of bigger size which is recommended for harvesting.
- Fish catch of mixed sizes to enable understanding and selection of right size of fish.
- Nets & gears for harvesting
- Buckets, jars & beakers to check and select desirable size of fish.

Explain
- What is a partial harvesting?

Elaborate
- How one can involve in minimum handling during harvest till marketing.
- Tips taken during Transportation

Say
- Different fish grades and export quality fishes based on weight and other regulations

Team Activity
- Divide the class into four teams.
- Take them to pond and ask to specify fish by various weight and grade
Ask

- What do you think how big a fish could be sold in the market as table fish?
- Think about what process will enable selection of desired size of the fish.
- What will happen if you touch fishes harshly and put them in nets in hurry and roughly.

Say

- Talk about stocking, rearing and raising of fish seeds to marketable size as table fish and/or fly to fingerling stage for stocking purposes.
- Explain demand of marketable size to fetch high value of fish if proper size is sent to the market.
- Describe the process of harvesting i.e. operation of net, transferring and handling of fishes in the hapa to send to the market.
- Discuss about taking care of fish while netting, transferring and putting as the catch in the desired manner
- Describe precautions of safe and less handling of fishes during netting and transferring to hapa for market to increase their shelf life.
- Describe steps to be taken for self safety during netting operation.
- Describe hygienic conditions to be mentioned for self, for fishes and at the landing centre or in the shop.

Do

- Organize visit to fish farm to get exposure and hands experience of harvesting of fish.
- Undertake netting of fishes to observe for desirable size.
- Undertake selection of marketable fishes from the catch.
- Demonstrate and give instructions for safe handling of fishes during harvesting
- Demonstrate packing of fishes for market.
- Demonstrate cleanliness, good self hygiene measures, keeping the catch in clean place, maintain hygienic conditions in the boat, and at the landing centre.
- Demonstrate correct method of harvesting using right mesh size, and netting in desired way.

Notes for Facilitation

- Providing opportunity at the fish farm to participate in the netting operation, removing fishes from the net, collect the catch in the boat, safe handling, and self hygiene and safety measures.
- Send trainees to the market to observe various sizes, hygienic conditions, healthy fishes fetching high price and demand/supply of fishes
- Attach trainees to fish farms during harvesting season to obtain hands on experience.
- Engage farm technician to discuss and demonstrate harvesting.
Exercise

1. What are the preparations that you need to undertake before and immediate after the harvest?
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Notes

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4. Ensure Safety, Hygiene and Sanitation Practices For Culture Operation

- Unit 4.1 – Safety measures
- Unit 4.2 – Practice personal Hygiene
- Unit 4.3 – Hygiene measures at field level
- Unit 4.4 – Mange water Quality
- Unit 4.5 – Clean Pond site
- Unit 4.6 – Maintaining fish health
Key Learning Outcomes

At the end of this module, you will be able to:

- Know methods of protecting crops during natural calamities.
- Know the various precautionary measures that should be taken during application of chemicals.
- Know measures to ensure hygienic conditions in fish handling during sampling and crop harvest.
- Identify the possible source of contamination and take appropriate measures to prevent those.
- Know importance in promoting safer aquaculture products to protect public health.
UNIT 4.1: Safety Measures

Unit Objectives

At the end of this unit, you will be able to assist participants to:

- Ensure safety measures while using hazardous material
- Remove weeds, rubbish chemical containers and old equipment from pond site

Resources to be Used

- Teaching aids: Pics of fish farm and drawing of layout, illustration of a pond with dykes, fixing of net in the pond to prevent fish to escape, filter nets on the inlet to stop entry of undesirable fishes.
- Table may be prepared on a chart to enlist observations to keep vigil and undertake actions for safety of the farm in regular day and in emergency situation.
- Pictures of handling emergency situations such as flooding, mass mortality of fishes, poaching and use of bird scary devices.
- Chart of Do’s as given below:
  - Observe presence of predators and preying organisms.
  - Observe safety measures in netting operation and handling of chemicals.
  - Use of life jackets, while in the pond, use of gloves in handling chemicals viz. pesticides, oil emulsion, etc.
  - Use of disinfection agent at the entry of the farm for every entrant to take a dip of their feet.
  - Chart of don’ts (may be put in the workshop)
    - Entry of unauthorized persons in the farm or restricted entry.
    - Do not use nets without disinfecting them
    - Do not handle lime & bleaching powder directly by hands.
    - Do not keep any chemical at the farm without labeling.

Ask

- Have you even seen any fish farm with over flowing or flooding of water in the raining season.
- What do you think, what kind of dangers one can come across at the fish farm.
- Think of emergency situation at the farm.
- Mention some safety measures coming to your mind.

Say

- Discuss preparations and suitable measures for flooding of fish pond and entry of undesirable fishes
- Discuss importance of dykes, inlets and outlets and their maintenance.
- Describe strategies to protect fishes and fish seeds in the pond from escaping and attack of predatory fishes.
- Share experiences of poaching of the pond and entry of unauthorized persons in the farm.
- Discuss the importance of desired quantity of chemicals to avoid over dose and check of expiry date.
- Mention basic safety check before using any equipment
- Regular check and keeping vigilance on fishes for any disease or pathogen attack.
**Do**

- Demonstrate use of safety measure such as apron, hand gloves, boots, etc.
- Take a visit to fish farm to explain safety measures in reference to preparations and precautions against natural calamities such as floods, fire, breaking or erosion of dykes and over flowing of pond water, prevent loss of fish crop due to flooding, entry of unwanted fishes.
- Planning of stocking after the flooding situation and harvesting prior to rainy season
- Demonstration of using webbings of bamboo to prevent escape of fishes.
- Make bird scaring models and show the location to put them in the farm preferably on dykes to chase away birds and save fishes in ponds.
- Procure specimens of unwanted fishes i.e. predatory and weed fishes.
- Make a model of fish farm and show how pond can be covered with nets and put thread lining to prevent predatory birds.
- Prepare list of do's and don'ts for the farm for display at the farm.
- In calculate awareness and observing safety regarding application of chemicals by spraying pesticides or weedicides against the wind direction.

**Tips**

- Ask participants to refer the participant handbook
- Make a presentation where the description of various chemicals and their dosages

**Notes for Facilitation**

- Preparation of teaching/training aids.
- Preparation or procuring of desired models.
- Establish linkages with the fish farm for conducting practical and hands on experience.
- Display of charts, posters, collages, showing good practices to be followed with respect to safety measures.
- Prepare chart of safety measures in handling chemicals and for dosage, toxicity level method of application of chemicals/medicines.
- Procure and display basic safety checks and guidelines to carry out regular inspection to prevent spread of diseases.

**Exercise**

1. List out the 10 safety measures that you follow while handling hazardous chemicals?

   Answer: ____________________________________________________________
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UNIT 4.2: Safety Measures

Unit Objectives

At the end of this unit, you will be able to assist participants to:

• Practice good safety and personal hygiene

Resources to be Used

• Self learning materials and teaching aids to explain factors responsible for personal hygiene and practices to be undertaken for maintaining hygienic conditions.
• Apron/working uniform, gloves, soap, towels, boots, etc.

Ask

• What do you understand by personal hygiene and maintaining hygienic conditions at the work place?
• Who will tell, what hygienic conditions are to be followed during netting, eradication of weeds, aquatic insects, cleaning of hatchery, handling and disposal of dead fishes, cleaning of nets, equipment and fishing boat.

Say

• Explain relation of micro organisms and hygienic conditions.
• Discuss various activities undertaken during fish farming and other aquaculture operations with special mention of personal hygiene, sanitation and hygienic conditions to be maintained at aquaculture/fish farm.
• Highlight importance of using apron, gloves, uniforms etc. during cultural operations.
• Enlist precautions and tips for maintaining hygienic condition at the farm and display the same in the workshop.
• Discuss environmental hazards associated with plastics bags, bottles, containers, use of agro chemicals, wastes from the farm, discarded equipment etc.

Do

• Guide trainees in making a chart to depict or enlist various activities during cultural operation with mention of hygiene care in each of them. The activities could be breeding of fishes in hatchery, netting of brooders and fish seeds, application of manure, fertilizers, lime, supplementary feeding, use of chemicals or emulsion for eradicating aquatic insects etc.
• Demonstrate hygienic practices including washing of hands, cleaning nails and feet, using boots.
• Demonstrate taking care with respect to hygienic handling and up keep of aquaculture equipment, nets, boats, glassware, and buckets.
• Enlist sources of contamination and indicate strategies for decontamination or removal.
• Demonstrate proper disposal of farm wastes including dead fishes in order to maintain hygienic condition at the farm.
Exercise

1. List out the 10 hygiene habits that you follow every day?

Answer:
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Tips

- Should emphasize the environmental hazards associated with plastic bags, bottles and containers especially from a fish health and safety perspective.
- Show videos of diseases spread through lack of personal hygiene

Notes for Facilitation

- Prepare teaching aids and learning resource material
- Make an inventory of regulations for maintaining hygienic environment.
- Prepare strategy to enact regulations about sanitation and hygiene strictly.
- Organise a field visit to a commercial aquaculture farm to show these practices.
- Procure norms/regulations of national and international organizations and display the same at the workshop and fish farm, such as WHO.

Prepare slogans to put at the farm such as given by WHO;

A) Practice good personal hygiene  B) Clean the pond site  C) Manage water quality
D) Keep fish healthy  E) Use clean harvest equipment and containers.
UNIT 4.3: Hygiene measures on pond

Unit Objectives

At the end of this unit, you will be able to assist participants to:

• Use toilet or latrine to urinate and defecate.
• Wash and dry hands with a clean, dry towel after toileting, diapering a child and contact with animals.
• Cover cuts and sores when working around fish ponds.
• Wash hands and change clothes after working around the ponds and harvesting fish.

Resources to be Used

• Available objects such as a white board, duster, flip chart board / paper etc.
• Slides in power point presentation.

Explain

• About quarantine area and how to implement protocols of Quarantine.

Elaborate

• Bacterial Contamination and personal hygiene
• The fisheries industry is currently facing a number of environmental problems.
• Aquaculture activities of building ponds, stocking and harvesting fish can contaminate hands and clothes with chemicals or dangerous microorganisms. Changing clothes after working around fish ponds and harvesting fish helps prevent contamination of food, people and the environment.

Practical

• Take participants to slightly contaminated pond and show them important points to follow the quarantine measure

Tips

• Spend quality time in showing them regular hygienic activities for pond depends on personal hygiene
UNIT 4.4: Manage Water Quality

Unit Objectives

At the end of this unit, you will be able to assist participants to:

- Select a water source that has a very low chance of contamination with heavy metals, other chemicals and harmful microorganisms
- Prevent people and animals, including ducks, geese and pets, from flying over, wading or swimming in ponds.
- Keep rubbish, food and faecal waste removed from the home away of the pond.
- Do not pen animals over the pond

Resources to be Used

- Available objects such as a white board, duster, flip chart board / paper etc.
- Slides in power point presentation

Explain

- Describe why water quality is important?

Elaborate

- Potential source of Water contamination

Say

- Rubbish, food and faecal waste can harm water quality directly and by attracting animals that can contaminate pond water through their faeces. Removing the rubbish and waste from around the pond helps prevent water contamination. Placing items that look scary or make noise (such as a scarecrow or windmill) help keep animals out of the pond site. Putting shiny ribbons around the ponds helps scare away birds.

Field Visit

- Examine the water quality with the participants by visiting 3 to 5 farms
Exercise

1. How do “you” examine the water quality on farm?
Answer: __________________________________________
________________________________________________________________________________
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UNIT 4.5: Clean The Pond Site

Unit Objectives

At the end of this unit, you will be able to assist participants to:

- Locate ponds away from latrines, livestock, and poultry
- Remove weeds, rubbish chemical containers and old equipment from pond site
- Keep livestock and poultry in an area that prevents access to the fish pond

Resources to be Used

- Available objects such as a white board, duster, flip chart board / paper etc.
- Slides in power point presentation

Explain

- Describe why water

Elaborate

- Cleaning pond site regularly to avoid contamination

Say

- Environmental hazards associated with plastic bags, bottles and containers especially from a fish health and safety perspective.

Field Visit

- Divide class into 5 groups and ask to observe areas which are contaminated and non-contaminated.
- Identify the sources of contamination in the area and focus the discussion on how these sources can be identified and removed, or decontaminated
Repetedly stress on hygienic activities and common safety measures.
Use videos to describe about microbial contamination where participants should be able to clearly glance about microbial activity.
UNIT 4.6: Keep Fish Healthy

**Unit Objectives**

At the end of this unit, you will be able to assist participants to:

- Stock ponds to the proper density with healthy fish seed stock from a certified hatchery or reliable supplier
- Maintain stock at the proper density in the growing pond
- Remove and dispose sick and dead fish daily.
- Avoid using unapproved chemicals to maintain fish health

**Resources to be Used**

- Available objects such as a white board, duster, flip chart board / paper etc.
- Slides in power point presentation

**Explain**

- Fish breeding procedure in simple manner and then how to differentiate seed quality

**Elaborate**

- Revise various parasites involved in fish breeding.

**Say**

- Stocking density varies by species, temperature and other environmental factors. Check with your local authority (government agency or university) to find out the amount of stock that is appropriate for your fish species, area and pond size.

**Tips**

- Show various important videos on parasites in fish and how its affect entire value chain.
Exercise

1. Explain the Do’s and Don'ts to keep a fish healthy.
Answer: ________________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
UNIT 4.7: Use Clean Harvest Equipment’s and Containers

Unit Objectives
At the end of this unit, you will be able to assist participants to:

• Wash harvest containers and equipment with clean water
• Harvest fish early in the day and transport live or cool quickly
• Use clean water to wash harvested fish
• Keep harvested fish in clean containers on non-porous material

Resources to be Used
• Available objects such as a white board, duster, flip chart board / paper etc.
• Slides in power point presentation

Explain
• Measures involved in transporting fish

Elaborate
• How to maintain equipment and harvesting areas clean
• Stress on personal hygiene before harvesting the fish.

Say
• Clean the area used for washing, sorting and packing fish at the end of each day to reduce the risk of contamination.

Practical
• Go to field and harvest the fish
• Keep harvested fish by putting them in containers.
• Use clean ice to cover the fish entirely.
Exercise

1. List out the different types of cleaning agents that can be used at freshwater aquaculture farm.
   Answer: ____________________________
   ____________________________
   ____________________________
   ____________________________
5. Annexures

Annexure I : Training Delivery Plan
Annexure II : Assessment Criteria
## Annexure I

### Training Delivery Plan

**Program Name:** Certificate Course in Aquaculture Worker  
**Qualification Pack Name & Ref. ID** Aquaculture Worker – AGR/N4904, AGR/N4919, AGR/N4920, AGR/N4918,  
**Version No.** 1.1  
**Version Update Date** 31/08/2016  
**Minimum Class VIII**  
**One year of experience in community / village level work is preferable.**

### Training Outcomes

By the end of this program, the participants will be able to:

- Assist his / her immediate community in providing cattle breeding, management and business development related services to farmers.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Module Name</th>
<th>Section Name</th>
<th>Session Objectives</th>
<th>NOS Reference</th>
<th>Methodology</th>
<th>Training Tools/Aids</th>
<th>Duration</th>
</tr>
</thead>
</table>
| 1.    | Introduction| Aquaculture  | • Know the freshwater pond resources of the country  
|       |             | sector in India| • Know importance of aquaculture in supplying fish protein  
|       |             |                 | • Know organizational structure of a fish farm  
|       |             |                 | • Know employment opportunity available in the aquaculture sector  
|       |             |                 | Bridge module | Lecture, Group activity, Exercise. | Available objects such as a white board, duster etc.  
|       |             |                 |                 |               | Power point slides. Trainer’s Guide | 8 hours |
| 2.    | Introduction| Fish farming  | • Basic information on the fish farming operations in the fish culture.  
|       |             |                 | • Drawing water and treat it for use in the fish farm.  
|       |             |                 | • Applying organic manure and inorganic fertilizers.  
|       |             |                 | • Identify aquatic weed and apply appropriate methods to eradicate.  
|       |             |                 | • Apply pesticide to eradicate predatory and weed fishes.  
|       |             |                 | • Manage nursery, rearing and grow-out ponds prior to seed stocking  
|       |             |                 | Bridge module | Lecture, Team activity, other activities, Exercise | Available objects such as a white board, duster, flip chart board / paper etc.  
|       |             |                 |                 |               | Slides in power point presentation. | 8 hours |
### Introduction
**Job Role of an Aquaculture Worker**
- Responsible for providing assistance in carrying out different activities of the fish farming.
- Soft skills like physical strength, ability to understand instructions, ability to lead the team of workers to accomplish the assigned work should be focused.
- He should identify the problem if any that occurs during the culture operation and report it immediately to the higher official in the farm.

### Assist in pond preparation activities
**Drawing and storage of water**
- To introduce participants to:
  1. Understand the importance of water storage
  2. Undertake water storage

### Water Treatment
1. Apply chlorine for water treatment
2. Apply lime for correcting pH
3. Understand about turbidity and pH

### Eradicating Aquatic weeds
1. Understand the different methods of eradication of aquatic weed.
2. Identify tools and equipment used for eradication of aquatic weed.
3. Identify different types of aquatic weed

### Eradicating Predatory and weed fish
1. Identify the common predatory and weed fishes
2. Know the methods to eradicate predatory and weed fishes
<table>
<thead>
<tr>
<th>Week</th>
<th>Activity Description</th>
<th>Topic</th>
<th>Training Content</th>
<th>Tools/Equipment</th>
<th>Duration</th>
</tr>
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<tbody>
<tr>
<td>8</td>
<td>Assist in pond preparation activities</td>
<td>Pond fertilization</td>
<td>1. Understand the need and time of pond fertilization.</td>
<td>Power point slides.</td>
<td>8 Hours</td>
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<td>2. Know the types of inorganic fertilizers used in aquaculture</td>
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<tr>
<td>9</td>
<td>Assist in pond preparation activities</td>
<td>Pond fertilization</td>
<td>• Understand the need and time of pond fertilization.</td>
<td>Available objects such as a white board, duster etc. Slides in power point presentation</td>
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<td></td>
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<td></td>
<td>• Know the types of inorganic fertilizers used in aquaculture</td>
<td></td>
<td>(8 hrs)</td>
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<tr>
<td>10</td>
<td>Assist in pond preparation activities</td>
<td>Aquatic insects control and treatment</td>
<td>1. Identify the common aquatic insects</td>
<td>Available objects such as a white board, duster, flip chart board / paper etc. A available video showing specific farm animal behavior.</td>
<td>8 hours</td>
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<td></td>
<td>2. Know the methods to eradicate and control of aquatic insect</td>
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<tr>
<td>11</td>
<td>Assist in pond preparation activities</td>
<td>Stocking</td>
<td>1. Different life stages of different cultivable fishes.</td>
<td>Available personal protective equipment</td>
<td>(8 Hours)</td>
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<tr>
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<td></td>
<td>2. Know the stocking density of different fishes.</td>
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<td></td>
</tr>
<tr>
<td>12</td>
<td>Assisting in carrying out culture operations</td>
<td>Sampling and Net</td>
<td>1. Know the right time of sampling.</td>
<td>Required tools for restraining</td>
<td>12 Hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Know the methods of sampling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Identify different nets used for different types of sampling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Activity</td>
<td>Sub-topic</td>
<td>Knowledge Points</td>
<td>Methodology</td>
<td>Duration</td>
</tr>
<tr>
<td>---</td>
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<td>-----------</td>
<td>------------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>13</td>
<td>Assisting in carrying out culture operations</td>
<td>Supplementary feeding</td>
<td>1. Know the feed requirements of fish at different stages. 2. Know the different feeding methods.</td>
<td>Lecture, Role play and team activity</td>
<td>8 Hours</td>
</tr>
<tr>
<td>14</td>
<td>Assisting in carrying out culture operations</td>
<td>Manure and Fertilizers</td>
<td>1. Apply different kind of manures used in aquaculture</td>
<td>Lecture, demonstration, Exercise</td>
<td>8 Hours</td>
</tr>
<tr>
<td>15</td>
<td>Assisting in carrying out culture operations</td>
<td>Aeration and Water replenishment</td>
<td>1. Know the methods of aeration of water 2. Know the right quantity of water to be replenish and when</td>
<td>Lecture and activity</td>
<td>8 Hours</td>
</tr>
<tr>
<td>16</td>
<td>Assisting in carrying out culture operations</td>
<td>Periodic checking</td>
<td>1. Understand the importance of periodic checking in aquaculture. 2. Undertake appropriate action when you found some abnormality.</td>
<td>Lecture and activity</td>
<td>8 Hours</td>
</tr>
<tr>
<td>17</td>
<td>Assisting in carrying out culture operations</td>
<td>Harvesting</td>
<td>1. Understand the importance of periodic checking in aquaculture. 2. Undertake appropriate action when you found some abnormality.</td>
<td>Lecture and Team Activity</td>
<td>8 Hours</td>
</tr>
<tr>
<td>18</td>
<td>Ensure Safety, Hygiene and Sanitation practices for culture operations</td>
<td>Safety Measures</td>
<td>1. Practice good safety and hygiene 2. Clean the pond appropriately 3. Remove weeds, rubbish chemical containers and old equipment from pond site</td>
<td>Lecture and Practical</td>
<td>8 Hours</td>
</tr>
<tr>
<td>19</td>
<td>Ensure Safety, Hygiene and Sanitation practices for culture operations</td>
<td>Practice good personal Hygiene</td>
<td>1. Practice good safety and hygiene 2. Clean the pond appropriately 3. Remove weeds, rubbish chemical containers and Old equipment from pond site</td>
<td>Lecture</td>
<td>8 Hours</td>
</tr>
</tbody>
</table>
| 20 | Ensure Safety, Hygiene and Sanitation practices for culture operation | Hygiene measures | 1. Use toilet or latrine to urinate and defecate.  
2. Wash and dry hands with a clean, dry towel after toileting, diapering a child and contact with animals.  
3. Cover cuts and sores when working around fish ponds.  
4. Wash hands and change clothes after working around the ponds and harvesting fish. | AGR/N4918 | Lecture and Practical | Available objects such as a white board, duster etc. and Slides in power point presentation pictorially explaining site or aquaculture Hygiene. | 8 Hours |
| 21 | Ensure Safety, Hygiene and Sanitation practices for culture operation | Manage Water Quality | 1. Select a water source that has a very low chance of contamination with heavy metals, other chemicals and harmful microorganisms  
2. Prevent people and animals, including ducks, geese and pets, from flying over, wading or swimming in ponds.  
3. Keep rubbish, food and faecal waste removed from the home away of the pond.  
3. Do not pen animals over the pond | AGR/N4918 | Lecture and Field Visit | Available objects such as a white board, duster etc. and Slides in power point presentation pictorially depicting various water samples | 8 Hours |
Annexure II

Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for ASCI- Aquaculture Worker

<table>
<thead>
<tr>
<th>Job Role</th>
<th>Qualification Pack</th>
<th>Sector Skill Council</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquaculture Worker</td>
<td>AGR/Q4904</td>
<td>Agriculture Skill Council of India</td>
</tr>
</tbody>
</table>

S.No. Guidelines for Assessment

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.

2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.

3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).

4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria.

5. To pass the Qualification Pack, every trainee should score a minimum of 50% in aggregate.

6. In case of successfully passing only certain number of NOS’s, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

7. The marks are allocated PC wise, however, every NOS will carry a weight age in the total marks allocated to the specific QP.

Marks Allocation

<table>
<thead>
<tr>
<th>Assessment Outcome</th>
<th>Assessment Criteria</th>
<th>Total Marks (100)</th>
<th>Out of Theory</th>
<th>Skills Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. AGR/N4919</td>
<td>Assist in pond preparation activities</td>
<td>10</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Pc1. draw water</td>
<td>from source to reservoir upto the desired level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pc2. treat the</td>
<td>water with appropriate methods such as chlorination etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC3. pump the</td>
<td>treated water to culture ponds from the reservoir</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC4. drain perennial pond and leave for sun drying</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC5. apply organic manure (if required)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

74
<table>
<thead>
<tr>
<th>Pc6. eradicate the aquatic weeds using various methods and also know the precautions for using the chemicals/herbicides</th>
<th>10</th>
<th>3</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pc7. eradicate predatory and weed fish using various methods</td>
<td>10</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Pc8. fertilize the pond with inorganic fertilizer to get desired plankton growth.</td>
<td>10</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Pc9. control aquatic insects prior to seed stocking.</td>
<td>10</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>PC10. stock the seed after following due acclimatization procedure and at appropriate density and species ratio</td>
<td>10</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. AGR/N4920 Assist in carrying out culture operations</th>
<th>100</th>
<th>30</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pc1. provide supplementary feed at right time and place and in the right quantity as recommended by the technician.</td>
<td>100</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Pc2. carry out split feeding (if any) as per instruction of the technician.</td>
<td>7</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Pc3. carry out periodic soil, water and fish sampling and netting operation.</td>
<td>7</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>PC4. apply manure, fertilizer and therapeutic as prescribed/recommended by the technician</td>
<td>8</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Pc5. apply lime periodically in the pond, slope.</td>
<td>7</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Pc6. ensure proper aeration and water replenishment in the culture pond.</td>
<td>8</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Pc7. take note of abnormal behaviour, if any, observed in pond or presence of parasites, lesion on body etc. and report it to the technician.</td>
<td>7</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Pc8. take care of the farm implements, nets and gears, cleaning of pond dyke and slope, periodic pond maintenance activity, etc.</td>
<td>8</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Pc9. remove dead and moribund fish from the pond.</td>
<td>7</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Pc10. use nets of appropriate mesh size.</td>
<td>8</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Pc11. select desired size of fish in case of partial harvesting.</td>
<td>8</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Pc12. ensure minimum handling during harvest till marketing.</td>
<td>8</td>
<td>2</td>
<td>6</td>
</tr>
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<td></td>
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<td>---</td>
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</tr>
<tr>
<td>Pc13. ensure that the harvested fish is ready for transportation.</td>
<td>8</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td><strong>Pc1.</strong> ensure suitable measures for protection from natural calamities such as flood, protect dyke from erosion or break.</td>
<td>100</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>Pc2. ensure protection and prevent escape of the cultured organisms.</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Pc3. identify common predators and preying organisms in water bodies.</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Pc4. apply suitable methods such as fencing to keep away predators in water bodies to protect fish culture.</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Pc5. restrict entry of unauthorized persons into the premises.</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Pc6. be fully aware of the dosage, toxicity level and method of application of chemicals / medicines used for fish culture.</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Pc7. ensure all chemicals are adequately labelled and stored safely.</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Pc8. identify a quarantine area and implement protocols of quarantine.</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Pc9. be aware of the possibilities of bacterial (water borne, air borne, formite borne) and other contamination from human handling.</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Pc10. apply effective systems and routines to ensure healthy and hygienic conditions during all stages of fish culture including transportation and marketing.</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Pc11. ensure that the fish culture premises are constantly monitored/inspected for breaches in the protection provided by health and hygiene measures.</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Pc12. undertake basic safety checks before operation of any equipments.</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Pc13. wear protective clothing as and when required and ensure adherence to safety guidelines.</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Pc14. report potential hazards to the supervisor immediately.</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Pc15. follow standard procedures to deal with accidents and emergency situations.</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Pc16. use first aid kit as and when required and provide appropriate treatment in case of any injuries.</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Pc17. ensure maintenance of suitable soil and water quality parameters at all times with frequent tests.</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Pc18. ensure specified feed is provided to organisms at regular intervals and excess feeding is avoided.</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Pc19. carry out regular inspection of organisms for possible presence of parasites, pathogenic infections, any phenotypic disorder, spot, etc. which are usually the signs of ailments or disease outbreak.</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Pc20. ensure all nets, utensils and vessels used are decontaminated and clean.</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Pc21. implement effective security measures for prevention of theft/sabotage.</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>30</strong></td>
<td><strong>70</strong></td>
</tr>
</tbody>
</table>