

PRACTICAL MANUAL



BETTER MANAGEMENT PRACTICES

for Tambak Farming in Aceh



Supported by:



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A. KEY ASPECTS FOR SUCCESSFUL TAMBAK FARMING

1. Organize farmer group at village level.
2. Plan crop activities well in advance of the cropping season using farmer group.
3. Plan the crop within the financial capacity and tambak management skills of individual farmers and consider local environment capacity such as water quality and water availability.
4. Follow crop calendar system for tambak farming.
5. Implement all brackish water pond farming activities in a disciplined and cooperative manner.
6. Shrimp should be priority species only in hot season. In the rainy season milkfish should be the priority species.
7. Use poly-culture system of shrimp, milkfish and seaweed for better profit and to reduce the crop and economic risk.
8. Adopt better management practices (BMP) for tambak farming
9. Improve the quality and sale price of the crop by using better practices for crop harvesting and post-harvest handling of shrimp, fish and seaweed.
10. Establish better market access by collaborating with a reliable and good local processor / trader.

B. FARMER GROUP FORMATION

1. Farmer group should be formed at village level for self help and cooperation among local farmers.
2. A farmer group should ideally consist of about 20 to 30 farmers.
3. Farmer group ideally should have about maximum of 50 hectare of tambaks spread in one location and sharing the same water sources (canal).
4. Farmer group should meet at least once a week at a fixed time in a fixed place to discuss the crop activities, problems and solutions.
5. Unity in farmers through farmer group formation reduces risks in the crop and increases the success of the crop.
6. It gives better bargaining power to farmers for input purchases and product sales in the market thus increasing their profit.

C. TAMBAK CROP PLANNING

1. Attempt only two crops in a year. Hot season and rainy season crops.
2. Hot season (temperature > 30 degree Celsius) is good for shrimp farming. Shrimp should be priority species in the hot season.
3. Avoid shrimp culture or reduce the stocking density of shrimp during the cooler rainy season (August-January) due to higher risk of disease and slower growth in shrimps.
4. During the rainy season the priority species should be milkfish.
5. Plan the crop within financial capacity of individual farmers. If a farmer has 5 million Rupiah, plan the crop activities and crop yield within that available finance.
6. Plan the crop within tambak management skills of individual farmers. If a farmer can spend all of his/her time near the tambak then a higher crop yield can be planned. If a farmer can manage the farm on a part-time basis, the plan for a lower yield.
7. From the local experience of farmers, understand the local environmental capacity and plan the crop accordingly.
8. Use the crop calendar system.
9. Follow a polyculture system with shrimp, milkfish and seaweed to reduce the economic risk of crop failure.

D. CROP CALENDAR (NORTH ACEH-EAST COAST)

Crop Activity:	Crop planning by farmer group, Pond preparation	Seed selection and stocking	Water management, feed management, health management			Harvest and post-harvest handling
Crop 1: Hot season crop	Month 1: January	Month 2: February	Month 3: March	Month 4: April	Month 5: May	Month 6: June
Crop 2: Rainy season crop	Month 1: July	Month 2: August	Month 3: Sept.	Month 4: Oct.	Month 5: Nov.	Month 6: Dec.

E. BETTER MANAGEMENT PRACTICES FOR TAMBAK FARMING

- I. Locate the tambak according to national planning and legal frameworks in environmentally suitable locations.
- II. Design and construct shrimp farms in ways that minimize environmental damage.
- III. Pond preparation practices
 1. Completely drain out the water from the tambak;
 2. Remove the organic waste from pond bottom;
 3. Dry the pond bottom;
 4. Check the soil pH. If acidic soil, use lime;
 5. If fertilizing the pond, wait one week after liming and recheck soil pH;
 6. Fill the pond with water using water filter nets;
 7. Maintain a water depth of more than 80 cm in the shallowest part of pond;
 8. Do not use pesticides;
 9. Stabilize the plankton bloom (green / brown color water).
- IV. Shrimp seed selection and stocking practices
 1. Maintain farmer group discipline;
 2. Select active and strong shrimp seed;
 3. Select healthy shrimp seed;
 4. Test the seed for disease;
 5. Pack the seed in good condition and transport quickly;

6. Acclimatize and release the seeds in to tambak;
 7. Avoid seed from poorly managed commercial nurseries.
- V. Feed management practices
1. Proper and judicious use of high quality feed.
- VI. Water management practices
1. Exchange water carefully;
 2. Regularly check the water quality parameters;
 3. Remove benthic algae;
 4. Remove filamentous algae and hydrilla;
 5. Maintain adequate oxygen levels in water.
- VII. Health management practices
1. Regularly monitor the shrimp health and growth;
 2. What needs to be done during disease?
- VIII. Harvest and post-harvest handling practices
- IX. Keeping tambak daily record book
- X. Improved marketing practices

1. LOCATE THE TAMBAK ACCORDING TO NATIONAL PLANNING AND LEGAL FRAMEWORKS IN ENVIRONMENTALLY SUITABLE LOCATIONS

1. Do not destroy or harvest vegetation inside the 150-m green-belt zone.
2. National law states that it is illegal to remove plant life inside the 150-m coastal zone.
3. Coastal vegetation, especially mangrove forests provides the necessary filtering capacity to treat effluents from shrimp farms.
4. Excess nutrients in water are taken up by plant life and converted into biomass, thus water is naturally treated and promotes better water quality for future crops.
5. Coastal vegetation also will intercept wave action and storm surge that can erode pond embankments



6. Do not locate shrimp farms on sandy soils or other areas where seepage or discharge of salt water may affect agricultural land or freshwater supplies.
7. Do not locate new shrimp farms in areas that have already reached carrying capacity for aquaculture.
8. Retain buffer zones and habitat corridors between farms and other users and habitats.
9. Obey land use and other planning laws and coastal management plans.
10. Improve existing farms in inter-tidal and mangrove areas through mangrove restoration, retiring unproductive ponds and increasing productivity of remaining farm areas above the inter-tidal zone.



II. DESIGN AND CONSTRUCT SHRIMP FARMS IN WAYS THAT MINIMIZE ENVIRONMENTAL DAMAGE.

- 1 Incorporate buffer areas and techniques and engineering practices that minimize erosion and salination of surrounding areas during farm construction and operation.
- 2 Minimize disturbance of acid-sulfate soils during construction and operation.
- 3 Conserve biodiversity and encourage re-establishment of natural habitats in farm design.
- 4 Minimize creation of degraded areas such as unused soil piles and borrow pits.
- 5 Design dykes, canals and infrastructure in ways that do not adversely affect hydrology.
- 6 Separate effluent discharge points from inlet canal to reduce self pollution and maintain biosecurity.



III. POND PREPARATION PRACTICES

I. COMPLETELY DRAIN OUT THE WATER FROM TAMBAK

1. Helps in removing the disease carrying fish and crustaceans from previous crops in the pond.
2. If the tambak is deeper than the water canal, use a water pump to drain out the water.



Water not proper dry



Water dry in proper

2. REMOVE THE ORGANIC WASTE FROM POND BOTTOM

- It results from decay of excessive feed, dead and decaying plankton/algae and faecal matter of shrimp and fish.
- It is in the form of layer on the soil with black color and bad smell.
- It may be present in low quantity or high quantities (1cm to a few feet) depending on the farming history of the tambak.
- It releases toxic gases like ammonia and hydrogen sulfide in the tambak leading to stress or death of shrimps
- Completely remove it especially from the feeding areas in the tambak.



Black soil



Normal soil

- It is easy to remove it when the soil is semi dried (slightly wet).
- Displace it in the ditch created on the top of embankment and cover it with good soil or deposit far away from the tambak site.
- Make sure that the displaced organic waste does not enter the pond again through rain washing and it doesn't cause environmental problem in displaced site.
- If the organic waste can't be removed at one time (e.g. because of high costs of removal) remove a proportion of it. Continue to remove some of the waste at each new crop cycle until the pond is completely cleaned.
- Be careful if using mechanical means to remove the sludge. This may expose acid sulphate soils. Request technical assistance, and test the soil.
- If it is difficult to completely remove the black soil (tilling), turn the soil when it is wet and let it dry.



Black soil



Normal soil



Improper removal of black soil



Proper removal of black soil



Black soil disposed inside the tambak



Black soil disposed outside the tambak

3. DRY THE POND BOTTOM

- Sun drying kills fish/crustacean and their eggs in the tambak soil
- Helps in oxidizing the organic matter thus reducing the sludge



Well prepared tambak



Well prepared tambak

4. CHECK THE PH OF SOIL. IF ACIDIC SOIL, USE LIME

- Acidic soil causes
 - ◆ High shrimp and fish mortality rates
 - ◆ Low survival rates and poor condition of fish and shrimp
 - ◆ High disease risk
 - ◆ Poor algal blooms
 - ◆ High pond maintenance costs
 - ◆ Depletion of oxygen due to oxidizing of minerals (metals in soil)



Testing the soil pH

Dosage of lime to the soil	
pH of soil	Lime (kg/ha)
4.0	1600
4.5	1400
5.0	1000
5.5	750
6.0	500
6.5	100
7.0	None

- Use a soil pH meter to test the soil pH. Soil should be wet while using this equipment.
- Do not turn the soil (tilling) in acidic soil. If done, the soil will be more acidic.
- Wash the soil by water intake and drain 2-3 times to reduce the soil acidity.
- Use the dolomite or agricultural lime to neutralize soil acidity as per the dosage indicated in the previous page.



Application of lime to soil



Application of lime to soil

5. FILL THE WATER USING WATER FILTER NETS

1. Always use double layer of fine mesh filter net (300 micron mesh size) to filter the water at water inlet point (water gate).
2. After filling the pond, hold water for 10 to 15 days before stocking the seeds.
3. If filling pond from reservoir, hold water in reservoir 7 days before shifting to grow-out pond.



No water filter net



Properly fixed water filter net



Improperly fixed water filter net



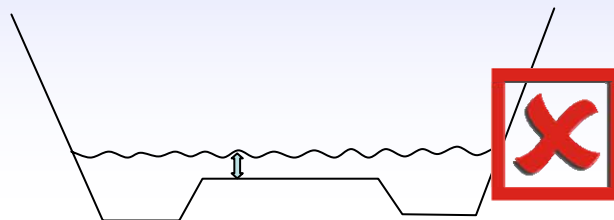
Properly fixed water filter net

6. MAINTAIN A WATER DEPTH OF MORE THAN 80 CM IN SHALLOWEST PART OF POND



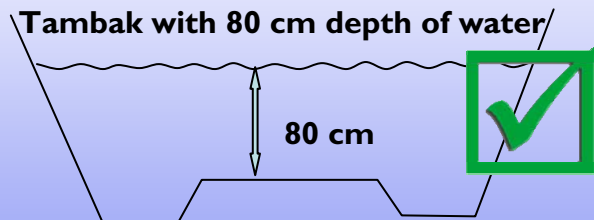
Tambak with shallow water

Tambak with shallow water



Tambak with > 80 cm depth of water

Tambak with 80 cm depth of water



7. DO NOT USE PESTICIDES

- Do not use pesticides to kill fish, shrimp and crabs in the tambak.
- If necessary use saponin (100 kg/ha) to kill fish and crustaceans.
- Pesticides will enter and remain in the body of shrimps and fish and when consumed cause health problems in humans.
- Pesticide-contaminated fish and shrimps are **BANNED** in the international market.



8. STABILIZE THE PLANKTON BLOOM (GREEN / BROWN COLOR WATER)

- Apply 25 kg/ha of super phosphate (SP-36) and 10 kg/ha of urea ideally to the bottom soil and repeat this for 2-3 times with a gap of 2-3 days after each application.
- Also use 100 kg/ha of dolomite and repeat this for 2-3 times with a gap of 2-3 days after each application.



Spreading of fertilizer using boat



Green water

- Do not apply lime and fertilizers together.
- Do not heavily fertilize the water to get dark green water. It will reduce the oxygen in water during night time thus suffocating the shrimps. It is one of the reasons for lower survival rate of shrimp seeds.



Transparent water



Dark green water

VI. SHRIMP SEED SELECTION AND STOCKING

I. MAINTAIN FARMER GROUP DISCIPLINE

- All the farmers in the village / cluster should stock the shrimp seed at the same time (within a period of one to two weeks) to follow crop calendar system (similar to rice culture).
- All the farmers in the village / cluster should stock same batch of seed. Avoid different batches of seed from different hatcheries.
- Stock the shrimp seed only one time per crop. Do not continuously stock with new batches of seed.



Tambaks stocked at different time

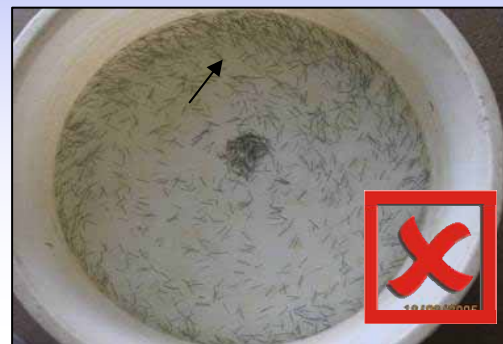


All tambaks stocked at same time

2. SELECT ACTIVE AND STRONG SHRIMP SEED

- Always purchase shrimp seed from a well maintained hatchery or certified hatchery.
- Prefer PL-12 stage or older (total body length should be more than 12 mm). Smaller sizes may not be ready for stocking and may quickly die in the pond.
- Shrimp seed should be uniform in size and dark or light brown colour. Seed with red, blue or green colour must be rejected.
- Shrimp seed should be strong and active (swimming against the water current).
 - Collect about 500 seeds from the bottom of the seed tank and pour in a round tub. Stir the water. Wait for 2-3 minutes. If many seed concentrate in the centre then do not select that seed batch.
- Shrimp seed should pass a salinity stress test.
 - Collect about 50 seeds in a glass with pond or brackish water and pour equal quantity of fresh water (drinking water). Wait for 3 hours. If more than 90% of the seed survives, then select the seed batch.

**Weak and inactive seeds
in the centre**



Active and strong seeds



3. SELECT HEALTHY SHRIMP SEED

- Shrimp seed should have full gut and well developed hepatopancreas.
 - Collect 10-20 seed. Observe under a magnifying glass or microscope.
 - The gut should not be empty.
 - The hepatopancreas should not be small and light in colour.



Hepatopancrease not well developed and empty gut

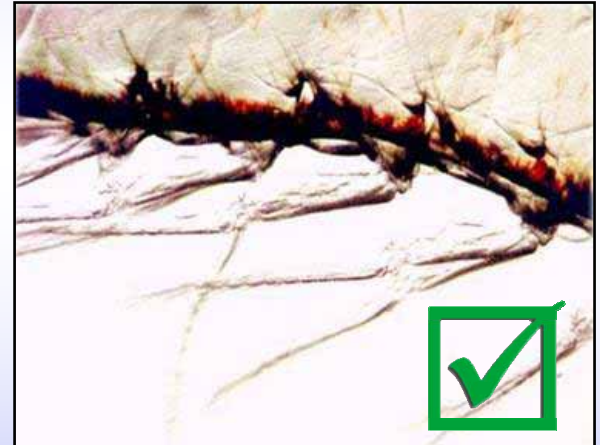


Hepatopancrease well developed and full gut

- Shrimp seed should be clean and without any damaged or missing legs.
 - The same 10-20 seed should be also checked for any dirt on body surface and broken, blackish or missing legs. If these signs are found then reject the batch.



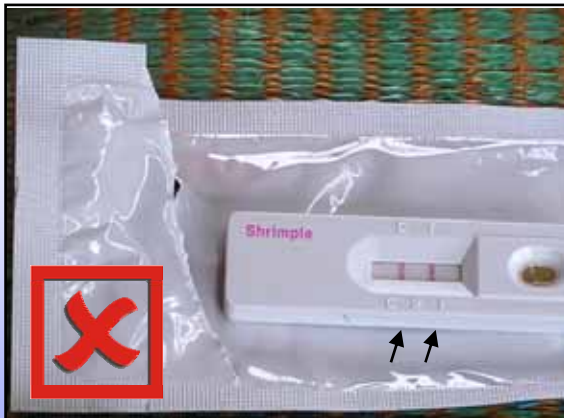
Damaged Legs



Legs without any damaged

4. TEST THE SEED FOR DISEASE

- Shrimp seed may have pathogens like White Spot Syndrome Virus (WSSV) and Monodon Baculo Virus (MBV). Viral related disease can cause mass mortality of shrimp in tambaks.
- Collect and pack about 100 seed in a seed bag and send to a shrimp health laboratory for disease testing.
- The result should be negative for WSSV by PCR test. Similarly it should be negative for TSV if it is relevant in the farming area.
- If you do not have a laboratory facility nearby, use dot blot test kit (eg. Shrimple™ test kit) to test for WSSV. If double bands appear on the kit then reject the seed batch. If only single band appears on the kit then the batch can be selected.
- Also test for MBV by simple microscopy (staining method). If MBV infection is medium or very high, then do not select the seed batch.



Presence of Disease: Double band



No disease: Single band

5. PACK THE SEEDS IN GOOD CONDITION AND TRANSPORT QUICKLY

- Do not mix the seed batches from different seed tanks of a hatchery or from different hatcheries.
- The salinity of seed tank water and tambak water should be the same and should not differ by more than 5 ppt.
 - Prior to packing the seed adjust the salinity of the seed tank water to the salinity of tambak water. Start adjusting the salinity at PL-10 stage and complete the process of adjusting at least one day prior to seed packing.
- Bags should have enough oxygen (water : oxygen = 1:3)
- Each bag should have about 1000 PL (1000-2000 PL/ltr water)
- Transport time from hatchery to tambaks should be less than 6 hours
- If transportation time is longer, slightly reduce the temperature using chilled water and transport in thermo cool boxes.
- Transport during cool hours of the day (6 PM – 7 AM)
- Transport in enclosed vehicle.



Proper seed packing



Sufficient oxygen in the pack



Quick transportation within 6 hours



Transport during evening, night or early morning

6. ACCLIMATIZE AND RELEASE THE SEED IN TO TAMBAKS

- Seed should be released in to tambak during cool hours of the day, i.e., after 6 PM or before 8 AM.
- Make sure the plankton bloom is strong and stable (green colour water). Avoid stocking if tambak has transparent water or dark green water.



Do not release seed in shallow water



Release seed in deeper water

- Stock the seed in deeper part of the tambak, not in shallow water.
- Acclimatize the seed in tambak water before releasing
 - Keep the seed bags floating in water for 20-30 min.
 - Slowly mix the tambak water in seed bag during next 30 min, and then release the seeds to tambak.



Do not release seed in transparent water



Acclimatize the seeds before releasing

7. AVOID SEED FROM POORLY MANAGED COMMERCIAL NURSERIES

- Do not use the juveniles from poorly managed commercial nurseries. It may lead to high chances of importing disease.
- Maintain on-farm nursery. i.e., small nurseries within the tambaks of farmers.



Commercial nursery



On-farm nursery

- Nurse the hatchery seed in a small earthen enclosure within the tambak (on-farm nursing) for 10-15 days.
- If hapa is used to nurse the seed then tie the hapa properly inside the tambak and nurse the seed for a maximum of 7 days.



Improperly fixed hapa



Properly fixed hapa

V. FEED MANAGEMENT PRACTICES

I. PROPER AND JUDICIOUS USE HIGH QUALITY FEED

- Start feeding from the day of seed stocking
- Use only commercially produced shrimp feed pellets.
- Feed quantity on daily basis should not exceed the quantity that is indicated in the feed chart given on the next page.
- Determine the pellet size based on the size of shrimp.
- Use feed check trays (4 trays / ha) to monitor the feed consumption by shrimp.



Use feed check tray to control the feed



Check the shrimp for feeding using feed

- Check the shrimps 2 hours after feeding, if the gut is empty then feed again.
- Do not give excessive feed. The excess feed will decay and release toxic gases which are stressful to shrimp.
- Spread the feed all over the pond by using boat/floating device; not just spread on the sides of pond.
- Check the pond bottom soil on a regular basis and avoid feeding in areas with black and badly smelling soil.
- Do not feed raw or boiled meat / fish / shrimp / crabs / snails etc.
- Do not use poultry or cattle feed in shrimp tambaks.
- Never mix any chemicals especially antibiotics with the feed.
- Always store the feed bags in dry and dark place to increase the shelf life.



Do not use crabs as feed for shrimps



Use only palliated shrimp feed

DAILY FEED REQUIREMENT PER 1000 SHRIMP IN THE TAMBAK

Days after seed Stocking	Shrimp size (count/kg)	Feed quantity (grams/day)
1	1000	50
7	500	95
15	250	185
23	200	225
26	175	260
30	150	300
35	125	335
40	110	370
45	100	400
50	90	430
55	80	475
60	75	485
65	70	505

Days after seed Stocking	Shrimp size (count/kg)	Feed quantity (grams/day)
70	65	530
75	60	555
80	55	580
85	50	600
90	45	615
95	40	625
100	35	610
110	30	560
115	28	540
120	26	575
127	24	625
135	22	680
140	20	750

- For first 60 days feed 2 times a day by splitting the daily required feed quantity into 2 meals
- After 60 days feed 3 times a day by splitting the daily required feed quantity into 3 meals
- For every meal adjust the feed quantity using feed check tray results from previous meal.

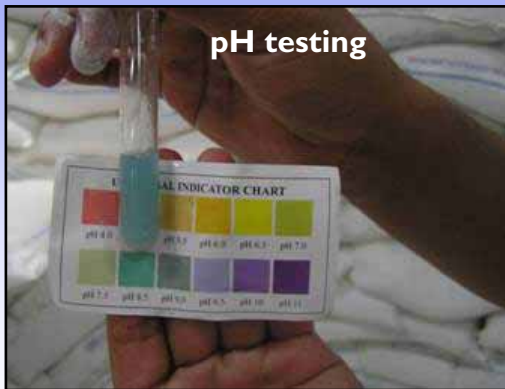
VI. WATER MANAGEMENT PRACTICES

I. EXCHANGE WATER CAREFULLY

- Do not exchange or in-take water frequently.
- For first month, there should not be any water exchange. Starting second month, if necessary, water exchange can be done but try to minimize it as much as possible.
- Release the water when the plankton bloom is too thick (dark green water).
- When releasing the water disturb the pond bottom near the water gate to release the black coloured organic waste from the pond.
- Do not release or in-take more than 15-30 cm depth of water per day.
- Take the water in only when there is no disease in the tambak cluster.
- Always use double layer water filter net of 300 micron mesh size to filter the in-take water.
- Use agricultural lime after every water intake / exchange and after rains. It acts as a buffering agent for water.
- If there is foam on the water surface or if the water colour suddenly changes or becomes clear then exchange 5-10 cm of water and add agriculture lime (200-300 kg/ha).

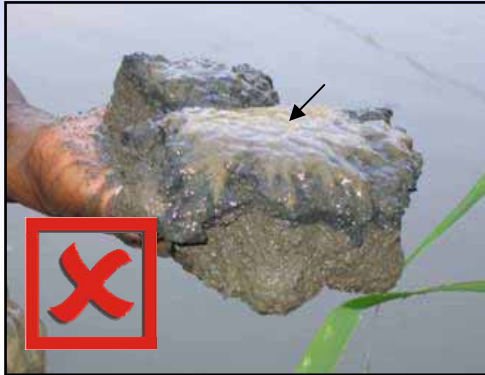
2. REGULARLY CHECK THE WATER QUALITY PARAMETERS

- pH of water should be 7.5 - 8.5.
 - Use Universal Liquid Indicator for pH measurement.
 - If the pH is lower than 7.5 apply shell lime to increase the pH.
 - If the pH is higher than 8.5, exchange the water to reduce the pH.
- Ideal water salinity for shrimp is 10-25 ppt.
- Dissolved oxygen (DO) concentration should be 5-6 ppm.
- Water colour should be green / brown colour
 - Not turbid.
 - Not transparent.
 - Not dark green/ dark brown colour (heavy plankton bloom).
- Alkalinity should be 100 ppm. Use alkalinity instant test kit.
- Ammonia should be less than 0.5 ppm. Use ammonia instant test kit.
- Hydrogen sulfide should be 0 ppm. Use hydrogen sulfide instant test kit.



3. REMOVE BENTHIC ALGAE

If not removed, they will decay in the pond bottom and release toxic gases stressful to shrimp



Benthic algae grown on surface of bottom soil



Benthic algae



Dead and Decay benthic algae in the water



Removal of benthic algae

4. REMOVE FILAMENTOUS ALGAE AND HYDRILLA



Hydrilla in low saline water



Filamentous algae



Remove Hydrilla



Removed Hydrilla



Filamentous algae

5. MAINTAIN ADEQUATE OXYGEN LEVEL IN WATER

- Dissolved oxygen (DO) concentration should be 5-6 ppm.
- If oxygen levels deplete in the pond, shrimp will start swimming near the water surface especially during early morning period.
- DO should not fall below 4 ppm; if concentrations fall below 4 ppm during night and early morning, use pump to aerate water by spraying over pond. Exchange the water if essential and if there is no disease outbreak in nearby ponds.
- It is not essential to use aerators in traditional tambaks



Shrimps swimming on the water surface



A long-arm aerator

VII. HEALTH MANAGEMENT PRACTICES

I. REGULARLY MONITOR THE SHRIMP FOR HEALTH AND GROWTH

- Check the health of shrimp in feed check trays on daily basis.
- Check the general health and growth of shrimp collected by cast net on weekly basis.
- The shrimp should be clean with normal colour, have a full gut and without loss of any legs or antennae.
- While checking 5-10 shrimp from feed tray or from cast net, if the shell or gills of shrimp are dirty it means that the pond bottom where shrimp stay is not clean. Therefore spread the feed to another cleaner bottom areas in the pond and exchange 10 cm of water and apply 200 kg/ha of agricultural lime.
- If white faeces or sick / dark shrimp are found on the surface water then check if they have dirty or black gills. If so, reduce feeding and exchange 10 cm of water.



Cast net sampling



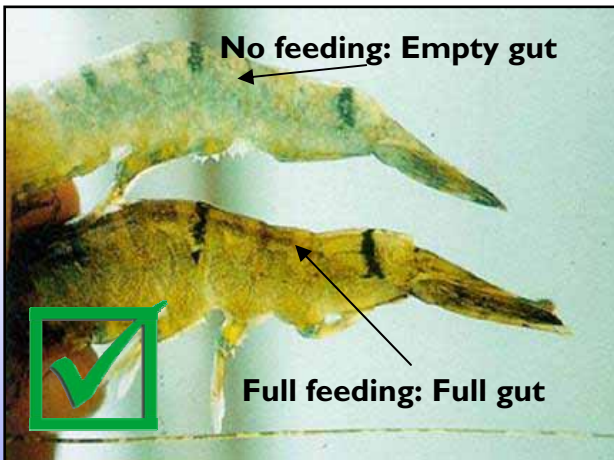
Use of feed check



A healthy shrimp



Shrimp with full gut



No feeding: Empty gut

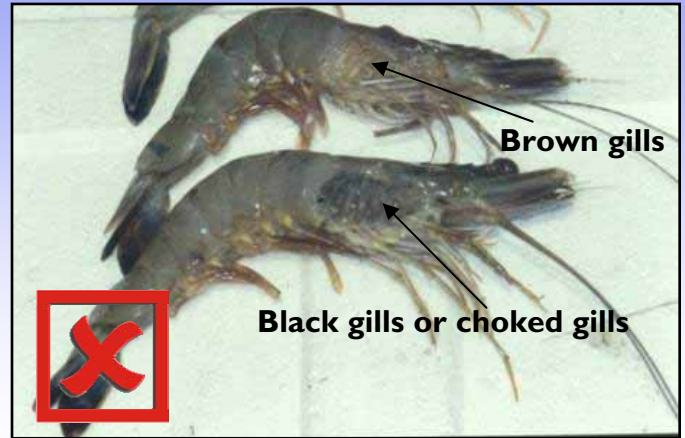
Full feeding: Full gut



Tail of a healthy shrimp



No clean body surface



Brown gills

Black gills or choked gills



Clean legs of a healthy shrimp



Legs not clean

2. WHAT TO NEEDS TO BE DONE DURING DISEASE?

- On a daily basis record the number of diseased and dead shrimp.
- If the daily mortality remains low (less than 5 shrimp per day) or subsides, then there is no need to go for an emergency harvest. Continue monitoring the pond, for signs of rapidly increasing mortality.
- Remove the diseased and dead shrimp and burry them far away from the tambak site.
- Do not throw away the dead and diseased shrimp in water canal or on open places.
- Do not apply any chemicals/medicines without advice from shrimp health specialists.



Shrimp with white spot disease



- If there is rapid increase in mortality (more than 5 dead shrimp/day) on a daily basis (over 2-3 days) and with or without white spots on shrimp, combined with rapid decrease in feed consumption, prepare for emergency harvest. As early as possible in this process (i.e. after 1 or 2 days of increasing mortality), conduct Shrimple™ test, if available, for WSSV infection. Even if the test result is negative, if mortalities rapidly reach 50 per day and pond records do not indicate an obvious environmental cause, harvest the entire crop by cast net and retain water in pond for at least a one month. If shrimp are too small to harvest, retain them, with the water, in the pond for at least one month.
- If there is urgency to prepare for another crop, then apply 1000 Kg/ha bleaching powder (calcium hypochlorite) to disinfect the tambak water. After 15 days release the water in to the canal.
- Drive away animals and birds from disease affected ponds.
- Do not move farm workers or exchange farm utensils from diseased ponds to other ponds.



Diseased shrimps near the sides of tambak



Check the disease using test kit



**Do not throw the diseased shrimps
in open places**



Remove the diseased shrimps



Drive away the birds

VIII. HARVEST AND POST-HARVEST HANDLING

- Co-ordinate the harvest with other farmers. Make sure the neighboring farmers are informed about the harvest.
- Three to four days before harvest apply agricultural lime (100-200 kg/ha) to the pond and pond bottom where it is more black especially in corners and trenches.
- Avoid harvest during the molting period (full moon or new moon). 2 days before harvest check if there are any newly molted shrimp, if newly molted shrimp are >10%, delay the harvest by a day or two. Do not exchange water or reduce water level 3 to 4 days before harvest.
- Do not feed the shrimp 6 hours prior to harvesting to keep the gut empty and improve the shelf life.
- Complete the harvesting process (draining and harvesting) within 6-8 hrs. Harvest between 6 PM to 6 AM. Avoid harvesting and packing shrimp during hot time of the day



Dip the shrimps in ice slurry for cold kill

- Use more water pumps if necessary to complete the harvesting in time and to catch most of the shrimp with the bag net. Avoid using cast nets for harvesting.
- If normal draining of the pond water is difficult, use artificial gates (made up of bamboo sticks or fish nets) inside the pond in a corner at deeper side of pond for fixing the bag net and to harvest shrimp.
- Separate hand-picked shrimps from bag net harvested shrimp, thoroughly wash the handpicked shrimps in clean water and pack them separately.
- After washing dip the harvested shrimps in slurry of ice for not less than 15 minutes. If possible use fresh water to make this ice slurry. Do not use dirty pond water. This process improves freshness.
- Do not use any chemicals while washing the shrimp or chill killing with out processors knowledge
- Make sure good quality ice is used (prepared with treated, potable water) during harvesting and packing.
- Pack the shrimps in transport tubs (insulated boxes) with crushed ice at 1:1 ratio for better preservation.
- Before stacking the packed crates one above the other make sure bottom of the crates are clean. Always maintain cleanliness.



Use sufficient ice for packing



IX. KEEPING TAMBAK DAILY RECORD BOOK

- On daily basis write down the tambak activities in a book. The information should consist of:
 - Pond preparation details
 - Information on seed quality
 - Hatchery name
 - Date of stocking
 - Treatments given to soil and water
 - Water exchanges
 - Feed quantity and type
 - Numbers of observations made on any diseased or dead shrimps
 - Water colour, pH, algae etc.
 - Harvest date
 - Harvested quantity
 - Any other tambak observations
 - Expenditures on each activity and final income from sales.
- Keeping tambak daily record book helps to analyse the crop results, possible causes of disease, low yield etc. Also it helps to keep a check on crop related expenditures and income thus to improve the economic efficiency of the crop management by the farmer.

X. IMPROVED MARKETING PRACTICES

- Organizing in farmer groups is the only way for small-scale farmers to achieve better efficiencies in marketing.
- Farmer group can easily facilitate the purchase of the quality farm inputs at cheaper prices thus reducing the cost of production.
- Several local farmer groups can join together to market the farmed product including shrimps for better prices.
- Certified shrimps are in demand in international market. This can give edge to farmers in the highly competitive international market not only to successfully sell their product but also to sell at premium prices.
- Responsible and successful farmer groups are attractive to the banking and insurance sectors to extend credits and crop insurance. This will reduce the financial burden and risk on farmers.

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