NATURAL RESOURCES SYSTEMS PROGRAMME

PROJECT REPORT[1]

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Annex E3

Western Orissa Rural Livelihoods Project (WORLP) Better-Practice Guidelines

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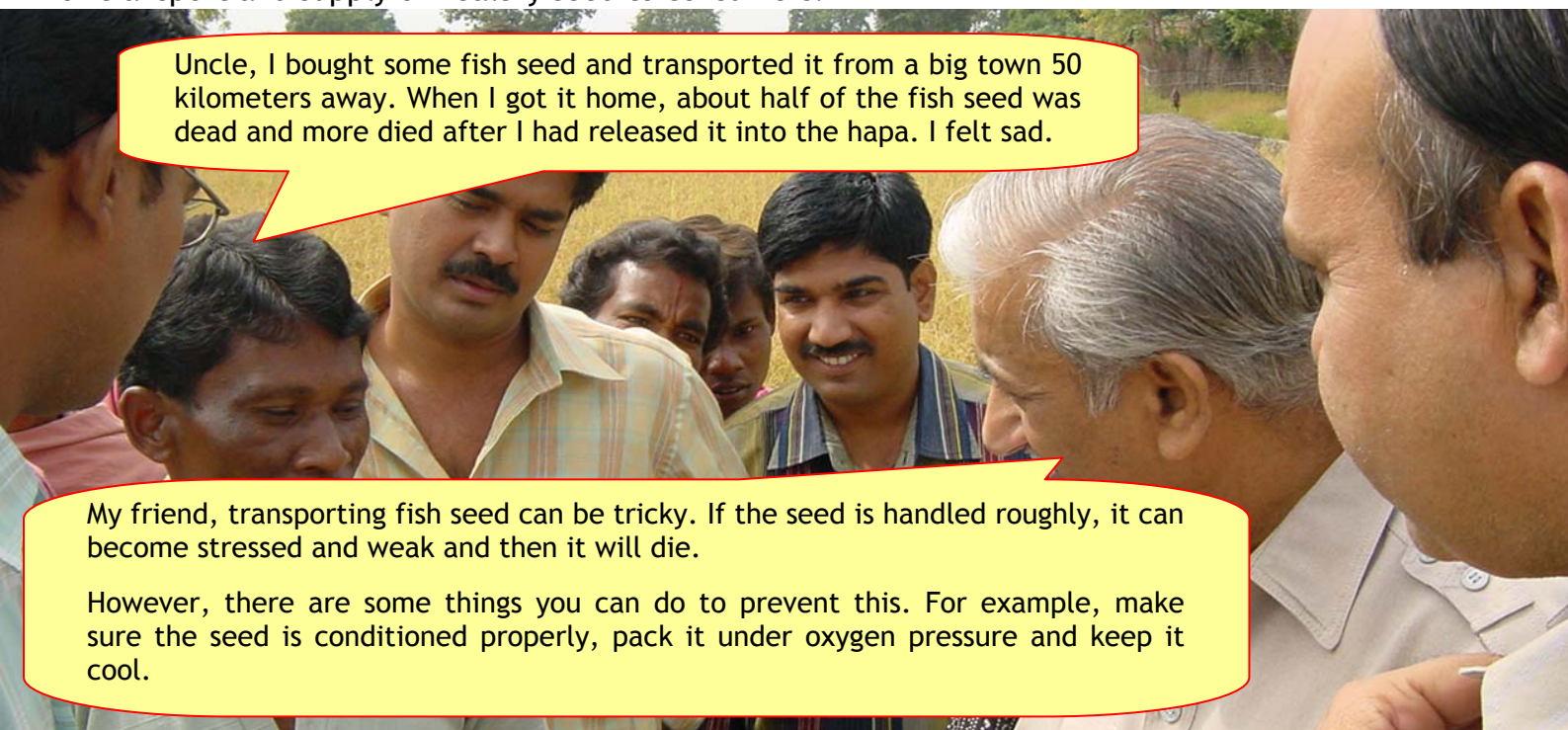
Packing and Transport of Fry and Fingerlings

Fish seed, fry and fingerlings come from hatcheries and nurseries which are often located far away from the ponds and tanks in which the fish are to be reared. The seed therefore needs to be transported as economically as possible in a healthy condition and without mortality.

The traditional method of transport uses open containers and people splashing with hands or legs to put oxygen into the water. On long journeys on trains, trucks and bicycles they may change the water from time to time. Often fish seed is then carried on slings along small roads and paths for delivery to villages and right to the ponds of fish farmers.

While this system is still prevalent and has actually laid the foundation of aquaculture in the country, it is expensive. An attendant can handle only two containers and has to travel along with the seed, exchange water and almost continuously agitate it for aeration. In the process, the seed gets heavily stressed. It suffers mortality either during transport or soon after stocking. Being weak, it easily falls prey to parasites and predators.

Modern methods of transport have done away with open containers, which are voluminous and heavy, and the need for attendants, water exchange and agitation for oxygenation. The seed is now packed in plastic bags filled with 1/3 water and 2/3 oxygen. The plastic bags are kept in light tin containers or cardboard cartons and transported long distances by road, rail or air. The following steps are essential for transport and supply of healthy seed to consumers.



Seed collection and conditioning

Fish seed should be collected with a nylon or cotton dragnet by expert fishermen who know how to handle it. Rough handling injures and kills the seed even before it is transferred for conditioning, during conditioning or when packed. The seed needs to be conditioned before packing so that it:

- Acclimates to more crowded conditions,
- Voids its gut contents which will pollute the water in the plastic bag, and
- Becomes less agitated and reduces its oxygen consumption.

When packing and transporting fry and fingerlings, follow these guidelines:

- Handle the seed carefully and gently
- Condition the seed for several hours when you have collected it, and
- Use clean, good quality water.

You can condition the seed in a nylon or cloth hapa.

The bigger the seed, the more time it takes to condition it.

When a small quantity of seed, say 20-25,000 fry, is handled, conditioning is done by putting the seed in a nylon or cloth hapa (2 m x 1 m x 1m, mesh 1 mm). However, when commercial quantities of seed are to be supplied, a narrow, long (10 m) hapa can used.

Hapas can be fixed in ponds with clean, good quality water, without plankton. If running water is available so much the better. Otherwise the water in the pond can be splashed onto the hapa. During this time the fish empties its gut contents.

The period for which the seed should be conditioned depends on the size of the seed, the prevailing temperature and the duration of transport involved. The fry needs to be conditioned for a minimum of 3 hours, early fingerlings (35-50 mm) for 6 hours, advanced fingerlings (80-100 mm) for 9 hours and juveniles (150 mm) for 12 hours.

Preparations for packing the seed

Before the seed is packed give it a bath in a solution of potassium permanganate (2-3 ppm) or common salt (0.3%).

Check the plastic bags for any leakage and keep them in clean kerosene oil tins provided with a lid to close it. Put pieces of used newspaper between the bags and the wall of the tin and also at the bottom to provide insulation from heat. Or use foldable, cardboard cartons that are laminated to avoid these problems.

Fill the bags with water taken from where the seed is taken but if that water is rich in plankton or is turbid, avoid it and use agitated well water instead.

Tap water should not be used unless kept for 2-4 hours and well agitated to drive off the chlorine. Tube well water is usually rich in iron and poor in oxygen.

Keep the tins with bags in shade and pack the seed either in the morning or evening.

Packing the seed under oxygen pressure

The seed is packed in plastic bags whose specifications are 84 cm x 61 cm with a thickness of 0.6 mm. The bag is filled with 6 l of well-agitated clean water before the seed is put in.

Before the seed is put in the bags, it is first graded through a sieve to sort out the fry or fingerlings of uniform size. At least three random samples of seed are taken using a cup and counted separately and the average taken. This gives the number of seed per cup.

Aluminum cups (locally called *bati*) – in various denominations of 100 ml, 200 ml, 500 ml with perforations at the bottom to drain out the water – are now available in the market or ordinary cups could be purchased and perforations made.

The seed are packed in plastic bag 1/3 full of water and 2/3 full oxygen tied with string and placed securely in a tin container with water.

Uncle, could you tell us how we should put the oxygen in the bags?

Well, first of all you put the required number of seed into the bag. Then you twist the upper portion and expel all the air above the water level.

Then you insert the tube from the oxygen cylinder into the bag and release the oxygen by turning the key. Allow the bag to bloat.

When the bag is fully blown, close off the oxygen supply and remove the tube. Give the top of the bag two or three twists and then fold it on itself to prevent any leakage of oxygen. Tie it tightly with a fine cotton, jute or nylon rope.

All this needs to be done as fast as possible and the tins put in the vehicle for road transport or for shipment by rail and air. Any interval between these activities is a loss from the total time the packing can sustain.

The tins must be handled with care and kept in the shade during the day.

They should be transported during morning or evening, but if the distance to be covered is 4-6 hours or more, they should be transported at night.

More about packing the seed under oxygen pressure

The following table gives the numbers of a particular size that could be transported for a period of 12 hours with negligible mortality:

Size of the seed (mm)	Numbers that could be packed (range)
Spawn (10)	35,000-50,000
Fry (20-25)	1,000-1,500
Fingerlings (35)	500-800
Fingerlings (45)	300-500
Fingerlings (55)	200-250
Fingerlings (65)	100-125
Fingerlings (75)	75-100
Fingerlings (85)	40-50

Remember to check the fish during transport and keep them cool. On arrival make sure the temperature in the bag has a chance to become the same as that in the pond, then release the fish gently into the pond.

Caution: If you or others are working around an oxygen cylinder, check that it is safe and regularly inspected. If it stands up it should be securely strapped to a post or wall.

Useful Contacts

Other Better-Practice Guidelines

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Marketable Fish Production: Seasonal Ponds

It was common to believe that fish cannot be cultured in seasonal ponds. However, fish can be produced in any pond of any size, anywhere in Orissa, provided that the water quality is good enough. A small (0.02-0.05 ha) and shallow (depth 1.0-1.5 m) pond that retains water for two months can be used for raising fry. A larger (0.04-0.2 ha) and deeper (1.5-2.0 m) pond holding water for three to four months can be used for fingerling production.

Culture of Medium Carps in seasonal ponds

If a pond holds water for about six months it can be used for producing so-called Medium Carps such as:

Gonius (*L. gonius*)

Reba (*Cirrhinus reba*)

Bata (*Labeo bata*)

Medium Carps are marketable at a much smaller size and are highly suitable for culture in seasonal ponds. Medium Carps which mature when only one year old can be easily produced and are commercially available from certain hatcheries and farms.

Culture of Catla, Rohu and Mrigal in seasonal ponds

To make use of a seasonal pond for Catla, Rohu and Mrigal:

a) Stock spawn at a low density and sell some at the early fry and fingerling stage and rear the rest to marketable size
b) Stock early fry at a low density and raise advance fingerlings, sell a part of these and rear the rest to marketable size
c) Stock advanced and stunted fingerlings as early as possible and harvest 300 to 500 g fish

Pond preparation

It is good to prepare the pond a month or two before the rains.

A seasonal pond has neither aquatic weeds nor predatory or weed fishes. However, weeds will develop as soon as a pond fills up and fish will enter if the inlets and outlets are not screened.

Bushes and shrubs that have grown during the dry period should be removed manually before the rains as these will create problems during netting and would rot in the pond.

To avoid the growth of plants in the dry season that take away the soil nutrients, you can broadcast summer *moong* or *dhaincha* as soon as the pond starts drying up. These plants stop others growing, help to improve the status of soil nitrogen and save on the cost of manures. They can be ploughed in before the rains start.

Liming and manuring

Slightly acid soils are common in Western Orissa. Adding lime at least three weeks before the rains can improve the soil. Liming will reduce acidity and will reduce the amount of mud at the pond bottom. It will destroy parasites. It is particularly useful before fertilizing the water. Quick lime (CaO), which is used for whitewashing houses, can be used at 300 kg/ha. Quick lime can be spread as a powder or dissolved in water and, when cool, broadcast over the entire bottom including the corners and crevices.

Seven days after liming, the pond can be manured with raw cow dung at 10,000 kg/ha (or a mixture of 5,000 kg of cow dung and 2,500 kg of poultry manure/ha) spread uniformly all over the pond bottom. Instead of manure, *mahua* oilcake, which is plentiful in Western Orissa, can also be used as manure. This will also kill predatory or weed fish entering the pond with the first rain. The toxic effects of the cake will go away after about ten days. Assuming an average level of 25 cm of water in the pond with the first rain, 750 kg/ha of good quality *mahua* oilcake would be sufficient.

An alternative method which is possible, even as the rains start, is to fertilize with urea at 25 kg/ha followed a day later by 50 kg/ha of bleaching powder with 30% chlorine. This will kill fish and pathogens but will become safe within seven days. Then, to maintain a high nutrient level in the pond, a mixture of raw cow dung (1,000 kg/ha) and poultry manure (500 kg/ha) can be added.

Stocking the pond

The pond should be stocked with fingerlings as soon as the toxic effect of *mahua* or bleaching powder is gone and when plankton production is high. To test when to stock, try the following:

a) The water color should be brown.
b) Fix a hapa in the pond and add 20-25 fry or early fingerlings and observe for 24 hours. If there are no deaths, the pond may be stocked.
c) Put your hand in the water up to the elbow. If your hand is visible there is not enough plankton – add more manure in small doses.

To harvest marketable fish in four to five months, stunted fingerlings (100-125 mm) or juveniles (150-175 mm) or advanced fingerlings can be stocked at 4,000 to 5,000 fingerlings/ha. A shallower pond (1.5 m) should be stocked less than a deeper one (2 m and above).

Supplementary feeding

Groundnut cake (left) and rice bran (right)

For good growth, you can fertilize about every two weeks with 500 kg of cow dung and 250 kg of poultry manure/ha. It may not be possible to fertilize ponds and tanks used for drinking water or for washing. In such cases fish growth will be less.

You can supplement the food that is in the pond after manuring by adding finely ground soya bean, groundnut or mustard oilcakes - for protein, and rice or wheat bran – for carbohydrate and energy. Mixing equal weights of oil cake and bran is about right to feed in the morning and evening, 3% of the body weight for the first two months and then reduced to 2% by September.

How to measure the feed:

Small fingerlings weigh about 10g, so the total weight of 4,000 stocked will be 40 kg. Three percent of 40 kg is 1.2 kg (or 1,200 g), so you can begin by adding 600 g in the morning and evening. Every month capture a sample of fish and weigh these to calculate the new quantity to feed.

Average individual fish weight (in g) x expected number surviving x 3/100 = feed required daily in g

The feed should be soaked in water and placed in baskets or trays suspended just below the water surface, at least one basket for each 0.1 ha of water area. This way the fish always gather at the same place (and are easy to catch for weighing) and the quantity of feed eaten can be easily seen (if a lot remains, feed less; if it is all taken, feed more).

Health care

Look out for unusual fish behavior – it may be a warning that something is wrong

Fish rubbing along the sides of the dykes or the poles fixed for hanging feed baskets, or swimming in an unusual manner not noticed before, can often mean infection by parasites.

- Manuring and feeding should be immediately suspended and the fish examined for parasites or any other disease infection. The nearest Fisheries Officer may be approached for advice and direction before mortality sets in.

Fish coming to the surface gulping air, especially in early morning, may be due to low dissolved oxygen.

- Manuring and feeding should be immediately suspended. Beating the water with sticks or swimming by a number of persons may relieve the situation. Or spray a solution of potassium permanganate on the water surface evening or morning.

Harvesting

When the water level starts falling and reaches an average depth of 1 m, harvesting should be done. If the pond is large, the fish may be harvested in two or three installments so that it could be easily marketed. Manures should not be applied in the last month. Once the pond is partially harvested, feeding should also be proportionately reduced and no feeding should be given on the morning the pond is to be netted.

A production of 2,000 kg/ha should be expected.

Harvesting teams can charge a lot or take a large part of the stock. You may be able to lease fishing nets and other equipment and harvest your pond yourself.

Inspecting the hauls from drag nets

Useful Contacts

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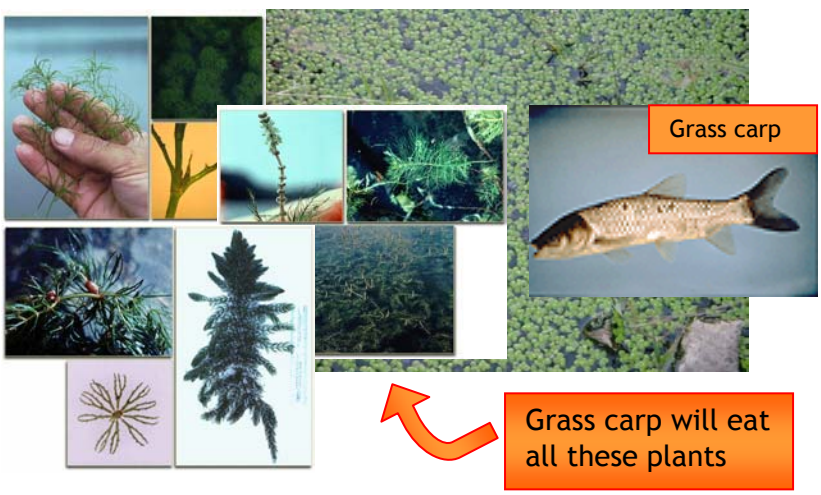
Marketable Fish Production: Perennial Ponds

Perennial ponds suitable for carp polyculture

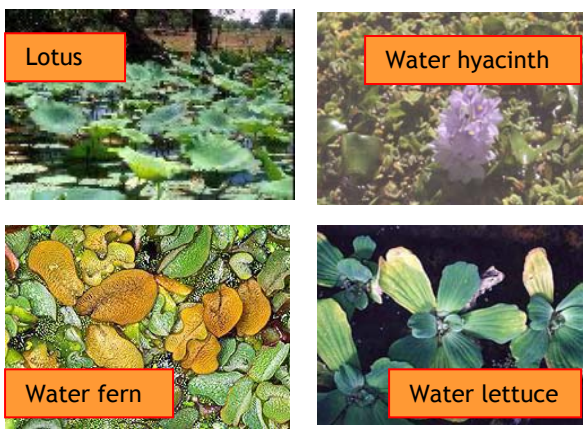
Perennial ponds are especially good for fish if they are rectangular, free from floods and pollution, 0.2 to 2.0 ha in size and 2.0 m in depth during summer. Well-built bunds and a flat pond bottom make it easy to use a drag-net. They should be easy to guard. It should also be easy to transport inputs and get fish to markets.

Marketable fish production in perennial ponds has three phases: Pre-stocking, Stocking and Post-stocking. Pre-stocking includes clearing unwanted plants, removing predatory and weed fishes, and supporting the development of lots of natural food by adding lime and manure.

Pre-stocking



Remove these plants by hand



Predatory and weed fishes

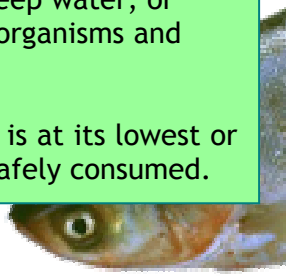
Predatory and weed fishes compete for food and space with the carps that are cultivated. There are three ways to remove them:

- If ponds are used for other purposes where a farmer cannot use toxicants to remove fish, the only option is repeated netting and angling which may reduce their population.

Otherwise, there are two main toxicants:

- Add urea at 100 kg/ha followed a day later by bleaching powder at 150 kg/ha for 1-m deep water, or
- Add *mahua* oilcake at 2,500 kg/ha (which will not only kill all the fishes but also other organisms and later act as a fertilizer once its toxic effect is lost).

The deeper the water, the more toxicant you need to add. So it is best to act when the water is at its lowest or could be drained to a satisfactory level. The fish killed by bleaching powder or *mahua* can be safely consumed.



Development of natural food

Fish grow well on natural feed. For good growth of natural food and fish, the soil should not be acid (the pH should be 7.0). To raise and stabilize the soil pH, add lime at 200-300 kg/ha.

If bleaching powder is used for eradication of weed or predatory fishes, the quantity of lime could be reduced.

It is better to use lime after the application of *mahua* as it reduces the toxicity period.

To produce natural food, we need to fertilize. No manure need be used for the first month of culture if *mahua* oilcake is used. However, application of raw cow dung at 2,000 kg/ha or a mixture of raw cow dung (1,000 kg) and poultry manure (500 kg/ha) is necessary one week after adding bleaching powder.

Stocking

The pond can be stocked with carp fingerlings when the toxicity from the bleaching powder or *mahua* is lost. This should be tested by fixing a hapa in the pond and putting in 20-30 fingerlings. If they survive, the toxicity is gone and the pond could be stocked.

There should be enough plankton in the pond so that the color of pond water is brown. You can test this by pushing the hand in water up to the elbow. If the fist disappears, then the amount of plankton is enough. (See below.)

The pond should now be stocked with advanced fingerlings (>150 mm), stunted fingerlings (125-150 mm) or just fingerlings (100 mm). If advanced or stunted fingerlings are stocked, two crops could be harvested in a year, providing a quick return, higher production and greater profits.

The stocking density should not be more than 5,000 fingerlings/ha.

Post-stocking

Post-stocking management of perennial ponds includes supplementary feeding, adding manure, health care and harvesting.

Supplementary feed

The best supplementary diet is equal weights of groundnut or mustard oilcake and rice bran or wheat bran.

Fingerlings are fed daily at 3% of their body weight.

To work out how much to feed, - we need to know the weight of the fish and how many are in the pond each month.

As the fingerlings grow, their weight increases, so the amount we feed increases. To work out how much to feed we can:

- Catch a sample of fish (perhaps using a cast net)
- Weigh the fish
- Count the fish
- Work out the average weight by dividing the weight by the number of fish

Example: If I catch 20 fish and their total weight is 500 g, then 500/20 = 25 g average weight.

Over time in the pond some fish will die, so the numbers of fish needing feed will be less.

It is difficult to measure how many fish remain in a pond so we can assume that maybe 5 fish in 100 will die each month.

Example: If I stock 5,000 fish, after 1 month I might have 5,000 x 0.95 = 4,750 fish. After 2 months, I might have 4,750 x 0.95 = 4,512 fish.

Example:

Month	average weight	number of fish	total weight	Feed (3%)
1	25 g	5,000	125 kg	3.75 kg/day
2	40 g	4,512	180 kg	5.4 kg/day
3	?	?	?	?

When the temperature drops fish eat less so the amount of feed should be reduced. Always check that the feed placed in baskets is being eaten. If feed remains, then reduce the feeding and check for oxygen and fish health.

Grass carp eat plants. When those in the pond are gone, we should add from outside. When the temperature is high they eat more and produce a rich fertilizer of partly digested plants.

Finely powdered cake and bran should be properly mixed and soaked in water for 2-3 hours before putting it in feed baskets hung at suitable sites, 30-40 cm below the surface, near the bund.

So feeding is reduced during the winter months to 1% or 0.5% of the total fish weight.

Feed when the water gets warm, maybe by 4 pm.

Periodic manure application

To keep a good level of nutrients in the pond, add raw cow dung (500 kg/ha) or a mixture of cow dung (250 kg/ha) and poultry manure (125 kg/ha) every two weeks. If biogas slurry is available, you can use it in place of cow dung or poultry manure at 100 kg/ha/day. The slurry does not use much oxygen and the bacteria in it is a good food for the zooplankton.

Routine care and harvest

- Try to watch the fish regularly. Tell a fisheries officer if you see any odd behavior, like scraping along the bottom or scales flashing. You can then decide together what has to be done.
- Measure the water pH level and if it falls below 8.0, add lime at 200 kg/ha. Lime must be dissolved in water and the solution cooled before it is sprayed over the pond surface.
- If the fish are gulping air in the early hours of the morning, the surface water could be agitated by beating with sticks or swimming and splashing to add more oxygen. Adding 5 g/m^3 potassium permanganate in the evening and again in the morning – if the fish are found to be gulping at the surface – will also add oxygen.
- Regularly test the plankton - put an arm in the water to the elbow and if the fist is not seen, the pond is rich enough in plankton (check that the color is due to plankton and not cloudiness due to silt and clay or any coloring material). If there is not enough plankton, add manure (see "Development of natural food" on page 2).

Fish that are above 1 kg by November may be harvested. Then the quantity of feed required is reduced and the fish have more space to grow. Stocking could be done again with as many fingerlings of each species as are removed. A second harvest should be done by March when fish above 1 kg are removed again. The remaining fish should be finally harvested when the pond would be prepared again for the next crop.

A production of 4 t/ha could be expected.

Potassium permanganate

Testing plankton

Useful Contacts

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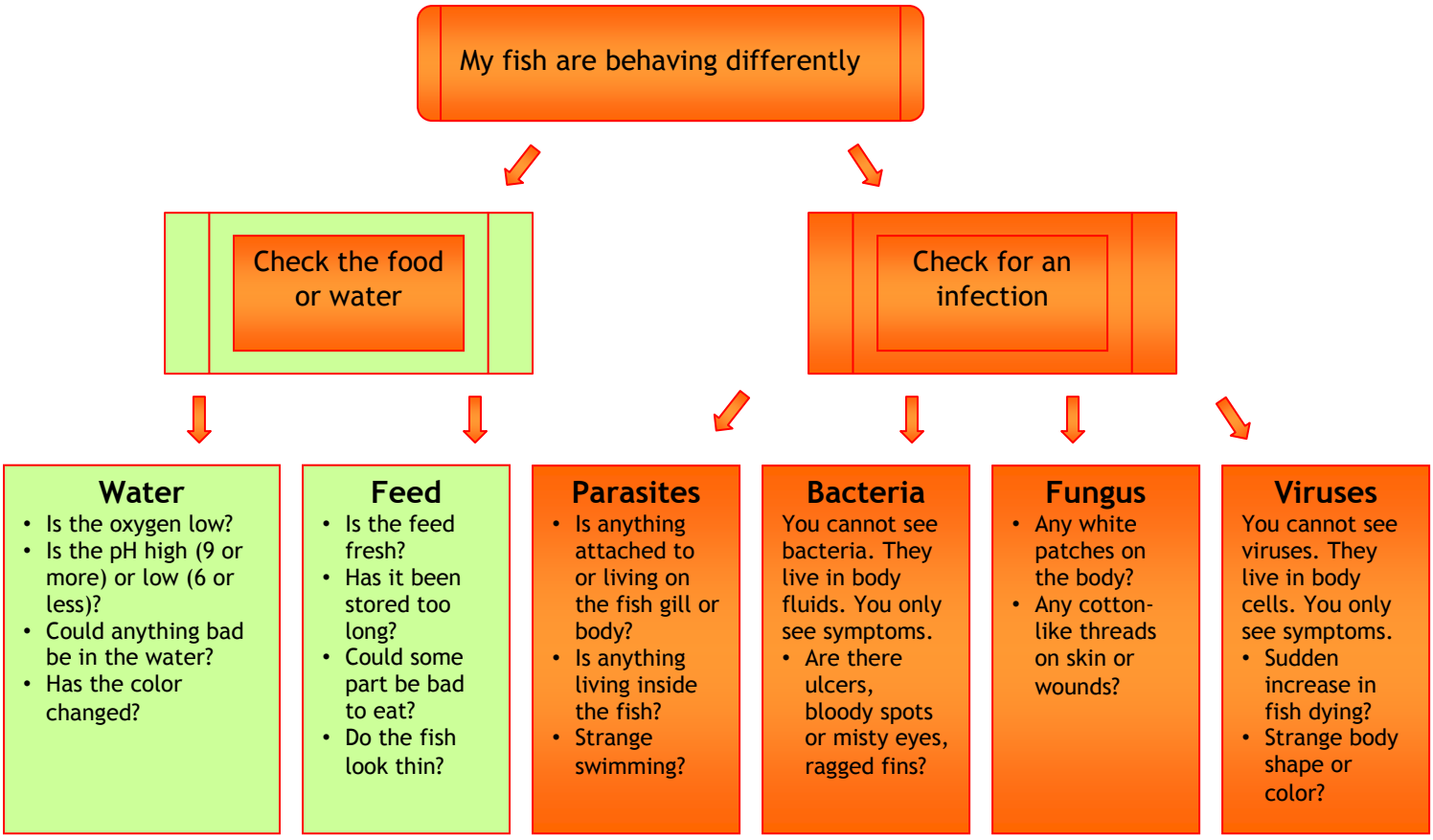
Recognizing and Managing Common Fish Diseases

If the place where fish live is good and healthy, fish rarely die from diseases. If we stress fish by roughly handling them, by keeping too many together, or by not feeding them well, they may suffer from disease. Depending on the disease, we may see lots of fish die in a short time, small numbers of fish deaths every day, reduced growth, marks on the fish, or a change in the way they look or swim.

What is the problem?



What you can do about it

Water

- **Oxygen low** – Add fresh water. Beat the water with sticks. Pump water around. Add potassium permanganate.
- **pH high or low** – Add lime to water and spread it over the pond at 250 kg/ha.
- **Pollution** – Look to see if anything dirty has got into the water. Remove it or move the fish.
- **Algae which are bad** – We fertilize to get tiny plants that fish eat. But algae are bad and kill fish. Ask a fisheries officer if you think you have this problem.

Feed

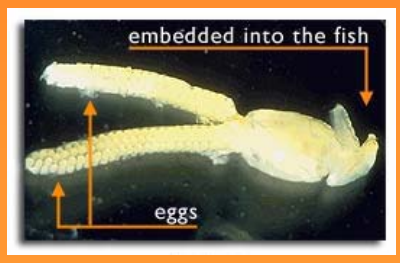
- **Fresh** –Try to use feed when it is fresh.
- **Store it carefully** - Keep feed dry and out of the sun.
- **Don't use bad feed** - If feed is covered by white threads, it may be affected by fungus and should not be used.
- **Feed enough** – Make sure the fish have enough to eat from natural feed and added rice bran and oilcake.

Parasites

- Look carefully at fish that are behaving differently (sick fish that are alive are more useful than dead ones).
- Look at the skin, inside the gills and inside the body.
- Can you see any worm-like or crab-like animals attached to or moving on the fish? Is there a lot of slime on the fish? Are there ulcers on the skin?

I'm a fish louse.
I attach to the body or move about on the skin.
You can see me, I'm about this big ◄►
I cause a lot of problems in ponds with a lot of organic matter.
I feed on blood, leaving big ulcers. The fish make lots of slime.
I cause damage which allows other things to attack the fish.
The fish try to scrape me off. They become sluggish and don't eat.

- For fish louse and anchor worm the fish can be bathed for 1 minute once a week for 3 weeks in Malathion (0.25 mg/l). TAKE CARE since this is a pesticide. See a fisheries officer.
- Clean up the pond.



I'm an anchor worm.
I attach to the gills and body.
You will see a large number of dark, thread-like tails.
I am a big problem for Catla.
Fish affected by anchor worm become weak.

We are flukes that attach to the gills and skin.
You may see blood and white patches of skin.
We cause a lot of problems in ponds rich in organic matter and kill lots of fish in nurseries.
We cause damage which allows other parasites to attack the fish.

- Bath the fish in formalin at 20-25 mg/l. TAKE CARE since formalin is toxic. See a fisheries officer.
- Clean up the pond.

Some parasite are less easy to see, but you see the symptoms.

I'm the problem but you can't see me.

I cause white spot disease. Fish look like they have been sprinkled with salt.
I kill fry and fingerlings.
I am really difficult to treat.
My life is like this: (over 5 days) I grow on the fish. I burst out and go to the pond bottom.
Babies are born and swim about affecting other fish.

I'm the problem but you can't see me

I cause damage to the gills and skin.
You may see blood or white patches on the skin.
Fish become slimy. Some have problems breathing. I kill fry and fingerlings.

- Bath fish in salt solution for 1 minute (mix 20 g of salt per liter of water in the bath).

Bacteria

- If you notice fish are dying, a few each day or in larger numbers, you may have a disease caused by bacteria.
- Sometimes there are symptoms which you can recognize.

'COTTON WOOL' DISEASE appears as white spots on the head, lips and fins and may then cover the whole body.

This is different from the fungus diseases below.

➢ A 15-minute bath in potassium permanganate (20 mg/l) or its wiping onto the affected areas of the body is a good cure.

TAIL AND FIN ROT DISEASE affects all the stages of fish, from fry to adults, resulting in the gradual loss of tail and fins.

➢ Treatment with copper sulphate (500 mg/l) on the affected area.

ULCER DISEASE appears as white tuft-like patches on the body, which damage the skin and leave circular, dark red ulcers. When acutely diseased, the fish dies.

➢ Clean up the pond and use lime at regular intervals. Add Oxytetracycline (25 mg/kg) to the feed for seven days (this is an antibiotic).

BLOOD POISONING is when large bleeding cuts appear on the mouth and gill covers, around the anus and the base of the fins, and causes young fish to die.

➢ Add Oxytetracycline (50-70 mg/kg) to the feed for ten days.
➢ Add methylene blue (4 mg/l) to pond water each week.

EDWARDS DISEASE can kill all your spawn in 1-3 days. It is a common disease of carps, especially mrigal, during winters in ponds poor in fish food. The fish become pale and thin, sometimes with pinhead-sized reddish spots over the body and, when cut, give out an offensive smelling liquid.

➢ Water quality improvement is the only solution to curb the disease from spreading further.

Fungus

COTTON WOOL DISEASE affects eggs, fry and fingerlings, and fish that are injured due to netting and handling, or when affected by other diseases causing skin problems.

This is different from the bacteria diseases above.

- Treat infected eggs or fish with 1 mg/l Malachite green bath for up to 1 hour.
- Fry benefit from a 2% salt bath which helps them to flush the fungus from their gills.

EUS is caused by fungus. It occurs soon after the rains or the beginning of winter, leaving red ulcers on the body that become infected, for example, with cotton wool disease. The disease is common and can spread rapidly.

- CIFAX, developed at CIFA, Bhubaneswar, when used at 1 l/ha-m stops EUS from developing and treats infected fish, stopping mortality and improving the condition within seven days.

Viruses
It is not possible to treat viruses!

A milligram is small (1/1,000 grams) and difficult to weigh. For the treatments discussed above, ask a fisheries officer for help.

Useful Contacts

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The WORLP Office is:

Marketing and Hygiene

Fresh fish is so popular in much of eastern India that harvesting will usually draw a crowd of pond-side customers. Marketing is no problem as long as the quantities are small.

When bulk quantities are fished out, a trader, wholesaler or middleman may take the fish and, depending on the distance, time of the day and season, transport them to the market with or without ice.

Large quantities are usually auctioned; the bids fluctuate depending on arrivals, demand, festival or marriage seasons, and also the variety, size and condition of the fish itself. A Commission Agent (who buys from a producer and sells to a wholesaler) or the wholesalers are involved before it is taken over by the retailers who in turn might distribute still smaller quantities to be sold by petty merchants on wayside "stalls" or from door-to-door. The longer the chain through which the fish passes the more handling affects the quality of fish and also increases its price. Ice and clean water are often in short supply and hot and humid weather can lead to spoilage.

Keeping fish alive in a large hapa will ensure they stay fresh and may avoid having to agree to a rapid sale at a low price.

This hapa can hold 150 kg of carp for many hours.

Conditions at the site of harvest should be clean with fish sold from a washable surface.

Conditions in many wholesale and retail markets could be made more hygienic. Wholesale markets are generally close to railway stations or bus stands and many are not enclosed or fenced. Retail markets in villages are commonly in the open. Often fish is sold on the roadside; there are no platforms and no drains. There is commonly not enough water to wash fish, or containers or gunny bags. Larger fish are cut on a piece of wood or the gunny bag itself and there may be dogs, crows and flies all around. The sale of fish in poor and unhygienic conditions brings no benefit to the producer, the seller, the buyer or the consumer.

Fresh fish is good to eat!

Fish is a good thing to eat regularly; it provides a high protein food, and is especially good for children and mothers. It is rich in calcium, iron and vitamin A. Vitamin A deficiency is the leading cause of preventable blindness in children and raises the risk of disease and death from severe infections. The Orissa Government recognizes this and was the first Indian state to combine vitamin A supplementation and polio immunization. Regular intake of foods rich in vitamin A is the best way to provide for the needs of children and women.

- The fish's eyes should be clear and bulge a little.
- Whole fish and fillets should have firm and shiny flesh.
- Dull flesh may mean the fish is old.
- Fresh whole fish should also have bright red gills free of slime.
- If the flesh doesn't spring back when pressed, the fish isn't fresh.
- There should be no darkening around the edges of the fish or brown or yellowish discoloration.
- The fish should smell fresh and mild, not fishy or ammonia-like.

- Some of the fats in carp (omega 3 fatty acids) are good for a healthy heart.
- Whole small fish, often fried, are an important source of calcium in rural communities where dairy products are limited due to problems with availability or storage.
- Fish is a popular part of the diet in Orissa. Though at present much of Orissa's fish is imported from Andhra Pradesh, local fresh fish, even of a small size, will often sell better than imported fish.

<u>A note from the cook</u>

Recipe for Delicious Steamed *Rohu*

Put 8 pieces of *Rohu* fish in a container, marinate with salt (to taste), ½ teaspoon of turmeric powder, 2 tablespoons of mustard seed and green chili paste, and 20 ml (6-7 tablespoons) of mustard oil. Then close the container tightly with the lid and place it in a pressure cooker and cook for 10 minutes (3-4 whistles of the pressure cooker).

Food safety

Keeping food safe is everybody's business. Try to do the following things:

Think about the best point to avoid each hazard - At the time of growing, catching, transporting, selling or processing fish.

Look out for hazards - like germs; chemicals, such as a pesticide; or solids, such as stones, glass or metal **and the chance they will affect the fish.**

… and what has to be done - for example, using platforms that can be cleaned to sell from, or for cooked fish. This might include suggesting a minimum cooking temperature and time to kill germs.

And who should do it …

It's good to discuss the possible hazards and to agree on the best actions to take. Keep a record of what you do. Find out the best ways to keep foods safe!

It can be useful to draw a table for each hazard, saying what can be done to prevent it, how often and by whom. Some examples are given below.

Tables like these are used by people who are making their best efforts to understand and control hazards that might happen at any point in the chain of production, transport, marketing, preparation and consumption of fish.

1	2	3	4	5	6	7	8	9	10
Control Point	**Hazard**	**Critical Limits for Each Preventive Measure**	**Monitoring**				**Corrective Action(s)**	**Records**	**Verification**
			What	**How**	**Frequency**	**Who**			
Before harvest	Chemical contaminants	Agricultural and industrial practices in the area immediately surrounding the pond must not be reasonably likely to cause contamination of the fish flesh above the guidance levels.	Agricultural and industrial practices near the pond	Ask questions and observe agricultural and industrial practices	Once per year	Field agent	Make suitable arrangements with neighbors	Field agent report	Review monitoring and corrective action records

1	2	3	4	5	6	7	8	9	10
Control Point	**Hazard**	**Critical Limits for Each Preventive Measure**	**Monitoring**				**Corrective Action(s)**	**Records**	**Verification**
			What	**How**	**Frequency**	**Who**			
At the point of selling	Glass, stones and metal	Clean up the area immediately around the point of selling. Glass, stones and metal must not be reasonably likely to cause contamination of the fish.	Glass stones and metal near the point-of-sale	Use a cleanable platform for selling	Every time	Seller	Discard fish that become contaminated	Sellers report	Review monitoring and corrective action records

You can get more information about food safety from:

International HACCP Alliance, 120 Rosenthal Center, 2471 TAMU, College Station, TX 77843-2471
Phone (979) 862-3643 Fax (979) 862-3075 E-mail kharris@tamu.edu (Dr Kerri B Harr

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One-stop Aqua Shops (OAS)

Aquaculture is easy. I rely on my own efforts. I work hard. – The difficult part was getting started.

I am new to aquaculture, and am trying to see someone at the Fisheries Department for some technical guidance. When I went last week the Extension Officer was not in town and everyone else was busy and could not speak to me, they said to come back.

It is difficult to travel sometimes from my village, the path is not good and in the rainy season there is little chance to move.

If I spend a day away from the village it is hard for my wife to manage, so my son stays off school to help, but then he misses his learning.

The officials were very helpful but I needed to return to my village to discuss with all those in our Self-Help Group. I had the right form but we filled it out wrong the first time and then had to go back again and then again to submit the right papers.

To get the fish seed we need means making repeated visits to a farm which is quite some distant. The fish trader brought seed to us once but they were so small that they hardly grew before the water

We are going to start fish farming, it looks like a good business for us, and our project proposal is finished and recommended for a loan and a subsidy. My friends expect it will still take a few more visits to the Department to get everything sorted.

When people talk about growing fish, many say their biggest problem was getting started. In Delhi in April 2003 farmers and officials met with policy makers and said that one of their most pressing recommendations for change was to the way information is made available. They asked for a single-point, under-one-roof center, near to their place, where they could get much of what they needed. Policy makers in governments and NGOs listened. Some farmers, already in federations of Self-Help Groups, having identified the problem have decided to solve the problem themselves. A few years on, and nine so-called 'One-stop Aqua Shops (OAS)' have come up in Orissa, Jharkhand and West Bengal.

They aim to make it easier to start aquaculture, to get information, loans, grants and inputs.

The first OAS in the country

A One-stop Aqua Shop has many services.

- Application forms for bank loans
- Information about availability and rates of fish seed
- Information about fertilizers and other aquaculture inputs
- Technical literature in local languages
- Facilities for testing soil and water quality
- People to talk to and ask advice from

The first OAS in the country was established by the Department of Fisheries, Jharkhand, at the Fish Farmers' Development Agency in Ranchi on 7 May 2004.

There you can meet the Fisheries Extension Officer (FEO). The room is full of posters dealing with the different aquaculture technologies and the various activities of the Department especially the schemes meant for people from poor and tribal communities.

Application forms for bank loans and for government schemes for grants and loans from the Department are also available on payment of a token amount.

The price of different sizes of fish seed and where they are available, and the rates of other aquaculture inputs such as rice bran, oilcakes and lime are shown on a blackboard.

The farmers who visit the OAS are registered; their requests and the purpose of their visit are recorded. An attached verandah is available for the farmers to sit and discuss. The FEO can provide technical literature in local language and also advice. Facilities for testing the soil and water quality are made available on payment of nominal charges.

The second OAS: by a Federation of SHGs in West Bengal

The second OAS was set up in August 2004 in Kaipara Village of Purulia District in West Bengal, by Self-Help Groups involved in aquaculture. All the groups have invested money to set up the local information service which also rents out a large fishing net and other equipment.

Since opening, many people are coming to the village to provide services like training and banking facilities. The OAS seems to draw in the services that people need because bankers and extension officers know they can travel to the village to see many, not just one farmer at a time.

The President of one of the SHGs has provided rent-free accommodation in the form of a room and a big verandah for the establishment of the OAS. In addition to the posters and all other items available at the OAS in Jharkhand, there are two special features of this OAS, one is that almost all services are available free, and the second is that the OAS/Federation has taken a few ponds on lease for seed production. The OAS procures quality spawn for rearing in these ponds under expert supervision and the seed is supplied to its members at no-profit no-loss basis. The OAS plans to supply quality seed to all the fish farmers of the region in the next two years.

OAS development in Orissa

In 2004 a planning workshop for OAS was held in Ranchi, Jharkhand. The Director of Fisheries from Orissa at the time, Mr Satyabrat Sahu, asked if he could take part in the workshop and visited a local OAS. He considered the concept quite useful for the farmers and the Extension Officers. He promised to provide FEOs to staff OASs in the poorest districts of Nuapara and Bolangir if the Orissa Watersheds Development Mission would help with the buildings. The effort of the two institutions to link up to provide what farmers wanted has paid off. By the end of 2005 four OASs have been set up in the western Districts of Orissa by the government, and two more by NGOs associated with the Watersheds Development Mission. All the leaflets and pamphlets published by the Fisheries Department for extension and publicity are placed in each OAS. Facilities including telephone and computer are being installed.

The OASs are at Bolangir, Patnagarh and Kankelgoan in Bolangir district and in Nuapara, Khariar and Bilenjore in Nuapara district. The Agriculture Secretary-cum Commissioner in Bhubaneswar says that he would like to see much greater development of One-stop Aqua Shops in blocks across the state.

OAS Bilenjore Komna Block, district Nuapada

The OAS at Bilenjore (Komna Block, district Nuapada) is hosted by the NGO – Sahabhagi Vikash Abhiyan (SVA) right beside a hatchery for seed production which has also been established during the monsoon season of 2005. A network of Self-Help Groups in different villages is nursing the fish seed from the hatchery.

SVA already supports crop seed supply and small-scale processing, providing farmers with facilities for milling and oil extraction. It therefore also provides a plentiful supply of quality feed stuffs such as rice bran, oilcakes and toxicants (mahua oilcake) which are sold at half the market price.

Besides training facilities including boarding and lodging for 100 farmers at a time, SVA has a group of well qualified, dedicated workers including a fisheries graduate. A computer facility with internet connection is also available. The NGO has taken a large tank on 10-year lease just adjacent to its campus and has constructed three nurseries which are being further expanded and broodstock ponds have been planned. The OAS, hatchery and training center are a very useful location for farmers interested in producing fish

OAS Bolangir, district Bolangir

Role of STREAM-India Communications Hub

The STREAM Initiative supports communications and learning and had Communications Hubs in countries around Asia Pacific. STREAM-India's Communication Hub is in Bhubaneswar, Orissa since and shares knowledge and learning from other parts of India and also the Asian region with all the One-stop Aqua Shops through its recently launched One-stop Aqua Shop Information Service (OASIS). It is providing copies of a journal that is published every three months called the STREAM Journal in English, Hindi, Bengali and Oriya.

Through OASIS at One-stop Aqua Shops, farmers, fishers and their immediate service providers can:

- Access Better-Practice Guidelines (like this series)
- Visit the STREAM Virtual Library of computer-based materials
- Find out about suppliers of materials and services
- Get their questions answered both at the OAS and also by specialist through the internet

OASIS is helping link up the small-scale farmers in different parts of the world.

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