

NATURAL RESOURCES SYSTEMS PROGRAMME
PROJECT REPORT¹

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Western Orissa Rural Livelihoods Project (WORLP) Better Practice Guidelines. Part 2.
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NRSP Production System

High Potential

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Annex E3

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

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Spawn Production in Hapas

Indian major carps - catla, rohu and mrigal - spawn naturally in rivers but can be artificially spawned to produce fish seed for culture. "Hapa hatcheries" have been used for a long time. They are the simplest and cheapest way for breeding and seed production of fish on a small scale in rural areas.

Hapa hatcheries

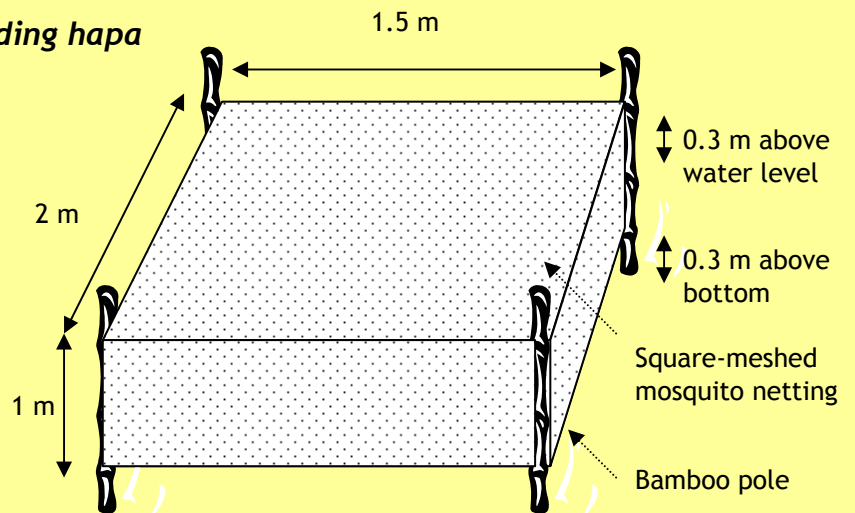
Hapa hatcheries are simple. They have a *breeding hapa* and a series of *hatching hapas*.

The *breeding hapa* is a box-like enclosure (2 m x 1.5 m x 1.0 m) stitched out of square-meshed mosquito netting cloth and tied on to bamboo poles fixed in ponds or tanks so that about 0.3 m is above the water level while its bottom is 0.3 m above the pond bottom.

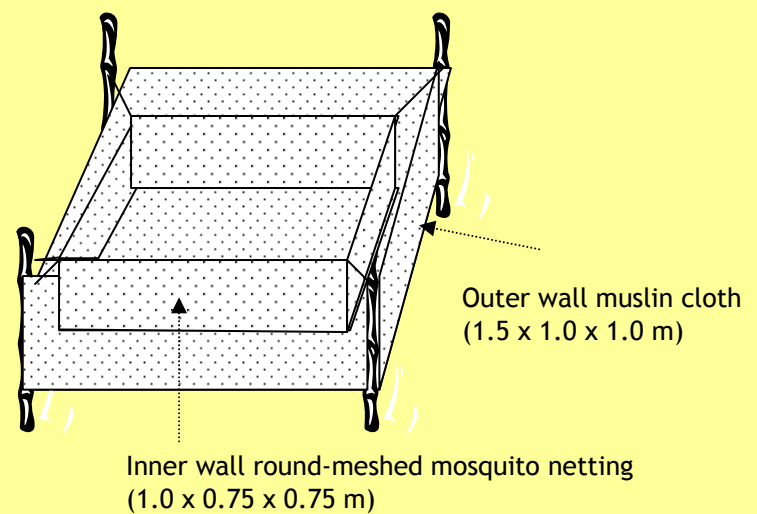
Normally the hapa has a plain cloth cover on the top. This has an opening on the wide side for inserting and removing the broodfish. The hapa is held tight by tying the four corners both above and below the water line.

Hatching hapas are double-walled. The outer wall (1.5 x 1.0 x 1.0 m) is made of muslin cloth and the inner wall (1.0 x 0.75 x 0.75 m) of round-meshed mosquito-netting.

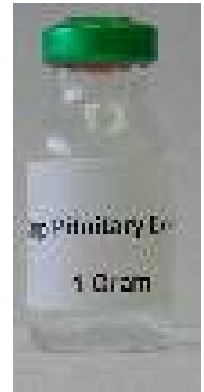
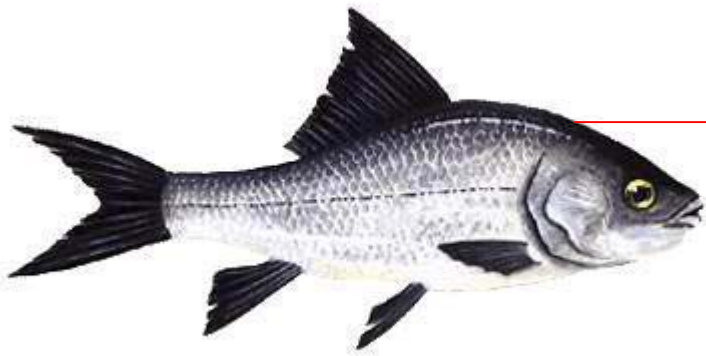
Breeding hapa



Hatching hapa



Spawning the fish



Below the brain of a fish is a gland called the pituitary, which controls the spawning of fish. It is removed, crushed in distilled water and injected into the fish muscle to stimulate the fish to spawn. You can also buy chemicals such as Ovaprim (from Syndel Lab, Canada, which is marketed by Glaxo in India), Ovotide (from Haemmo Pharma, Mumbai) and Wova-FH (from Wockhardt, Mumbai).

The spawning operation should be undertaken on a cool, rainy day.

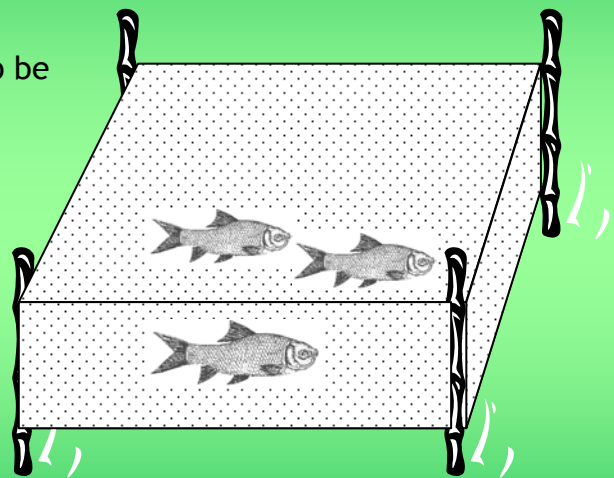
The fish should be carefully selected. Males should be fully mature (1.5-2.0 kg in weight and 2+ years in age) and should ooze milt at the slightest pressure on the belly. Females (2.5-3.5 kg in weight and 3+ years in age) should have a bulging abdomen and swollen, reddish vent.

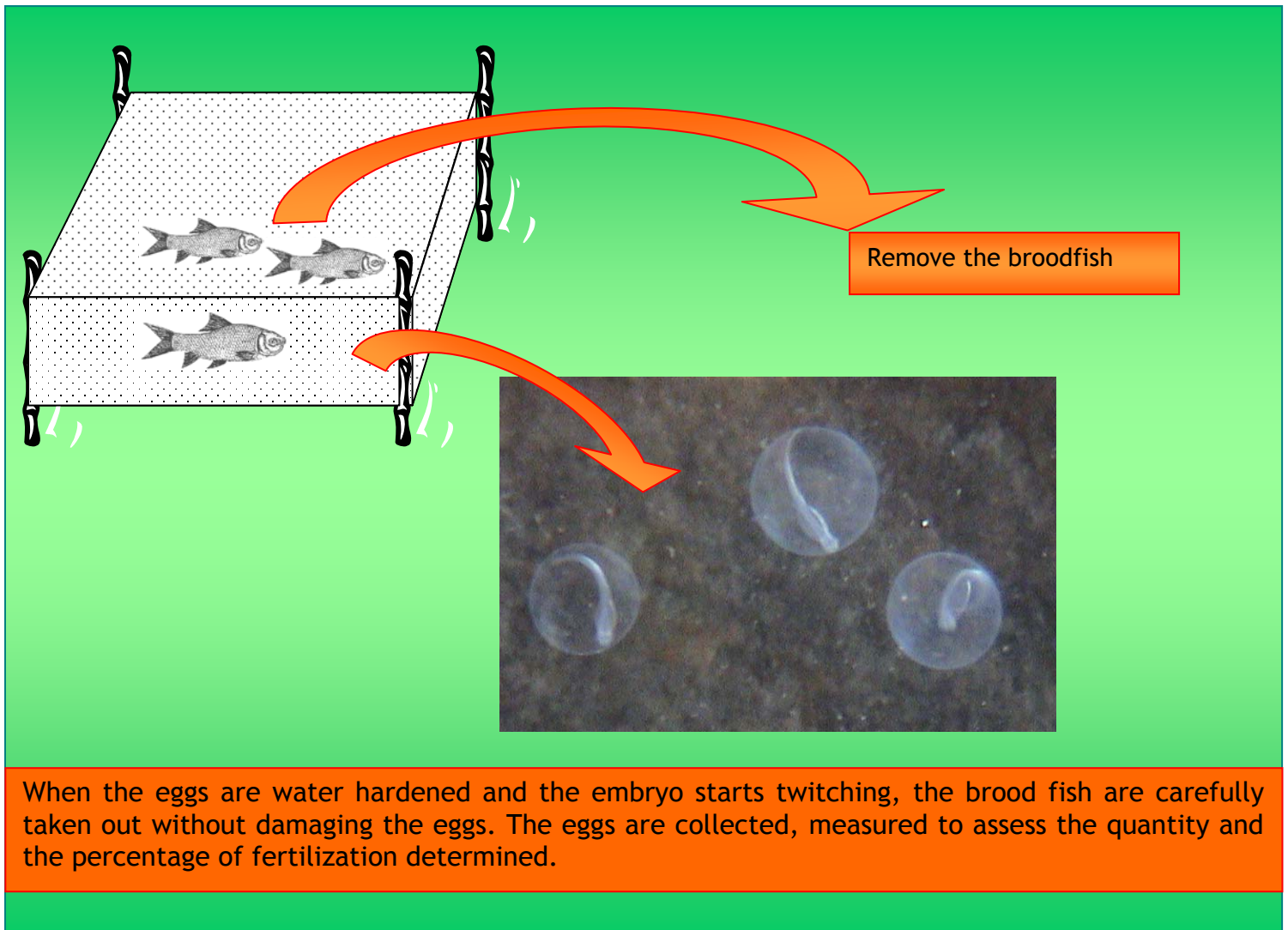
The fish are kept in the breeding hapa with two males to each female, preferably 1:1 by weight. After four to six hours, the female is injected with a first dose of crude pituitary extract at 3-4 mg extract/kg body weight in the evening.

Four to six hours later, the female is given a second injection at 6-8 mg/kg. At this time, the male may also be injected at 2-4 mg/kg depending on the condition of the brood fish and the weather.

If the weather is cloudy and cool and rain is expected, then the dose can be low, say 2 mg/kg, but if it is warm rather than cool the dose could be higher, say 4 mg/kg. The males and the females are released back in the hapa where they usually spawn within six hours.

So 14-18 hours after placing in the hapa the fish spawn.





When the eggs are water hardened and the embryo starts twitching, the brood fish are carefully taken out without damaging the eggs. The eggs are collected, measured to assess the quantity and the percentage of fertilization determined.

Testing the eggs

Take a 10 ml container, fill it with eggs and pour them gently into a shallow dish. Count the total number of water-hardened eggs in a sample. Those which are transparent are good eggs but those that are white and opaque are dead. Repeat this two more times with two more 10 ml lots of eggs.

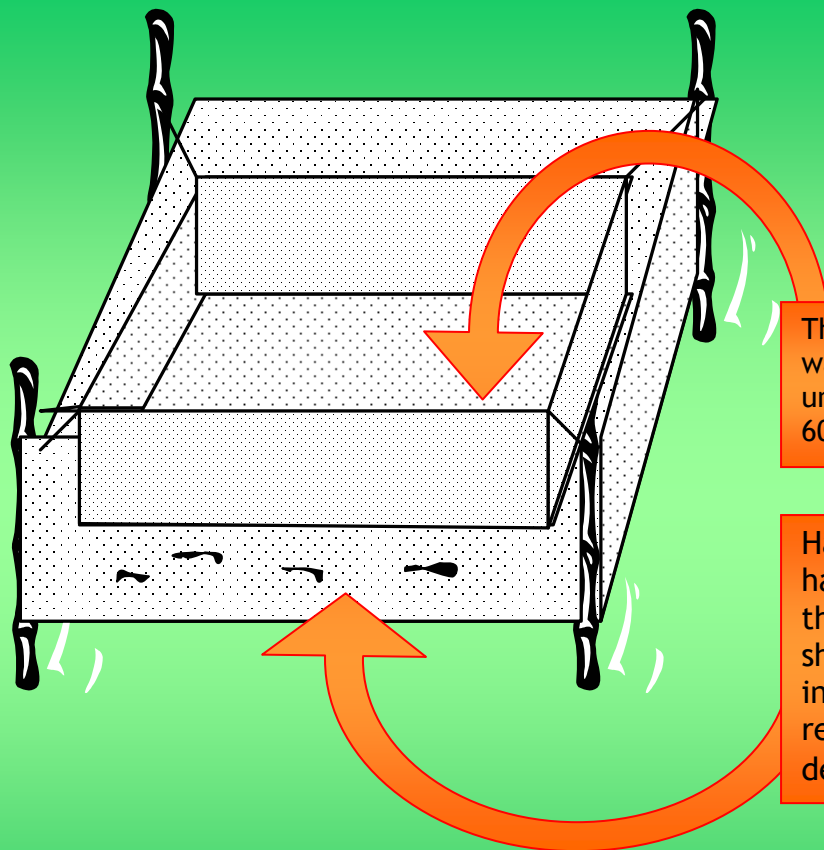
You can work out how many good eggs you have in total by measuring the total volume of eggs:

$$\text{Total number of eggs} = \frac{\text{total volume of eggs (ml)}}{10 \text{ ml}} \times \text{average number of eggs in 10 ml}$$

To know the percentage of good eggs:

$$\text{Percentage of good eggs (or fertilization)} = \frac{\text{Number of good eggs in the sample}}{\text{Total number of eggs in the sample}} \times 100$$

{Depending on the size and age of brood fish, there are often around 20 Indian major carp water-hardened eggs/ml and 500 Indian major carp spawn/ml.}



The eggs are then transferred to the double-walled hatching hapas where they are uniformly spread over the inner hapa, 60,000-75,000 in each hapa.

Hatching takes 18-24 hours when the hatchlings wriggle out of the meshes of the inner hapa (leaving behind the eggshells) and collect in the outer hapa. The inner hapa should be carefully untied and removed before egg shells start to decompose.

The hatchlings have a large yolk sac which provides the necessary food for the young to grow. This sac is fully absorbed within 72 hours. Before this the hatchlings are collected and measured, both to determine the hatching rate and the total quantity of the spawn (the same way the eggs were tested above). The spawn is either sold to others for rearing or stocked in nurseries.

Useful Contacts

Other Better-Practice Guidelines

There are many more Better-Practice Guidelines in this series.

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Spawn production in hatcheries

Modern hatcheries are made of permanent masonry, concrete or fiberglass. These pictures show a new fiberglass hatchery in Nuapara district of Orissa.

A Modern Hatchery

A modern hatchery has four parts:

- breeding/spawning pool,
- hatching/incubation pool(s),
- spawn collection chamber and
- overhead storage tank or water supply system

A larger hatchery may have:

- broodstock ponds and
- nursery-rearing ponds

A smaller hatchery may:

- buy adults from others for spawning
- link with a network of farmers who have nursery ponds



The hatchery in Nuapara has four pools: one breeding pool and three incubation or hatching pools. It also has a separate spawn collection chamber and an overhead water storage tank.



There is a flat working space around tanks with sunken valves (the cover of this one has been removed. A flat space is easy and safe to work in.

Before you set up a hatchery, you need to make sure you have a suitable site prepared.

Ask yourself these questions:

- Is the site easy to reach?
- Is there a bore hole or a clean water source?
- Is there an electricity supply?
- Is the site prone to flooding?



Breeding Pool

Incubation or hatching pools

The hatchery pools

This hatchery has a storage tank which feeds water into the hatchery pools.



This breeding pool is 2m wide. You could put up to 12 kg of broodfish in here.

The *water storage tank* contains a supply of clean water. This feeds into the hatchery pools when it is needed.

The *breeding pool* is circular.

On the bottom, in the center, there is an outlet. When the fish have bred, the fertilized eggs flow through this outlet into the spawn collection chamber.



Outlet from breeding pool to spawn collection chamber

The *spawn collection chamber* is located at a level lower than the hatching pool. It is usually a rectangular cistern.

When the outlet of the breeding pool is opened, the spawn drains into the spawn collection chamber.

A hapa is usually fixed in the chamber. This makes it easier to collect the spawn for transfer to the hatching pool and to drain the surplus water.



It is much easier to collect the spawn when you use a hapa in the spawn collection chamber.

Here the hatchery staff are rinsing the sides of the hapa so that they don't waste any eggs.

They want to get all the eggs they can.

The hatching pool is smaller than the breeding pool.

Water enters the hatching pool through duckmouths. These create a flow and keep the eggs moving.

The net around the overflow stops the eggs washing out of the pool.

In the center of the pool, there is a central outlet pipe for draining the surplus water.



This duckmouth makes the water flow in a circular motion.



Can you see the 'duckmouths' on the bottom?

Spawning and hatchery management

The broodstock pond is prepared by liming and fertilization. By January/February, it should be stocked with catla, rohu and mrigal.

The brood stock should be 2-3 years of age and 1.5-4.0 kg in weight.

Before putting the broodfish in the pond, they should be dipped in potassium permanganate solution.

Every fortnight, the pond should be netted to check the condition of the fish.

From the end of May or early June, breeders can be selected for spawning.

These are carefully transferred to the breeding pool.

The water in the breeding pool should be about 1 m deep. The broodfish should be stocked at about 3-4 kg/m³.

In a breeding pool that measures 2m across, there is just over 6m³ of water, so you can stock up to 12 kg of fish. In a breeding pool that is 3m across, you can stock up to 28 kg of fish.

The broodfish should be left in the breeding pool for 4-6 hours to acclimatize. After this, the females are taken out, injected and returned to the pool.

Four to six hours after this, the females are injected again. The males are also injected at this time, if necessary.



“Ovaprim” is an inducing agent. It helps fish to spawn.



Three to four hours after the second injection, the duckmouths are opened to create a circular current inside the pool. A shower head above the tank simulates the rain.

When the fish have spawned, the eggs are transferred to the hatching pool. At this time the fertilization rate should be checked.

The hatching pool can hold about 7 or 8 lakh of eggs/m³ of water for hatching.

Hatching takes 16-20 hours. The broken egg shells pass out through the nylon netting.

After 72 hours the hatchlings (spawn) are collected in the Spawn Collection Chamber.

The spawn is measured to determine the quantity obtained.

The spawn can now be reared in the nursery.



This hatching pool is 1 m wide and can hold 20 lakh of eggs.

The spawn stays in this pool until it's big enough to go into the nursery pond.



How much should I feed the broodfish?

Normally, you feed them at 2% of the weight of the fish, but from the beginning of May, you reduce this from 2% to 1% of the weight of the fish.

Make a mixture that is half rice bran and half groundnut oilcake.

Give them half of it soaked in the morning and the other half powdered in the evening.

Measuring the fertilization rate

Humans ask lots of questions, unlike fish.

How do I measure the fertilization rate of the eggs?



Collect some eggs in a glass dish like this and count the good eggs and the bad eggs.

Why is it so important to measure the fertilization rate?

Well, this step is important and necessary because it tells us how much spawn is available for stocking in the nurseries.

First of all, take three random samples. Each one should have about 250 eggs. Look at these carefully in a Petri dish or a glass plate.

The good eggs are transparent. The bad ones are opaque.

The percentage of good eggs in each dish is determined and the average of the three gives the percentage or the fertilization rate.

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Spawn Production of Common Carp

Common Carp is a foreign fish and there are several varieties. The variety used in Western Orissa is the fully scaled carp, which suits the tropical climate.

Common Carp lives and feeds near the pond bottom and can be grown with the Indian Major Carps, Catla, Rohu and Mrigal as a 'polyculture' (which means growing many different types of fish together). It can also be grown alone, as a 'monoculture' in rice fields with high dykes that retain water.

Common Carp is also a good fish for seasonal ponds because it grows fast.



Development and maintenance of broodstock

Common Carp grows almost as fast as catla. It reaches 1.0-1.5 kg in one year. It grows slower if too many fish are in the pond or if the wrong quantity of fertilizers and feed are added.

The Common Carp always matures at six months old whatever its size. It can breed two to three times a year: during the monsoons, at the beginning of winter and at the beginning of summer.

Winter breeding is not very common, but the Common Carp breeds plentifully during the monsoons and a little less during February-March.

The broodstock can be raised with other carps in ponds but the males and females should be separated at least a month before the breeding season.

Separating the fish prevents them from spawning in the pond. It also prevents them becoming stressed during netting and selection.

You can tell females and males apart quite easily. The vent of the male is deep and pit like. When you put a slight pressure on the belly during the breeding season, it oozes milt. The vent of the females is like a small tube-like outgrowth and the female's belly is soft and bulging.

Common carp grows fast.

It matures at six months.

It breeds two or three times a year.

Males and females can be raised together...

... but they must be separated before the breeding season.

Mature males and females are stocked separately in fertilized ponds at 6-8 kg per decimal (1,500-2,000 kg/ha).

Feed them rice bran at 2% of their body weight per day (that is 20g to a 1 kg fish each day).

Check the broodstock regularly to ensure that there is no disease and that the eggs are developing well.



Spawning the carp in hapas

How will I know that the fish are ready to spawn?

Select fully mature fish. Males should weigh about 1 kg. They should ooze milt freely with the slightest pressure on their belly. Females should weigh 1.0-1.5 kg. The belly of the female should be sagging. The most mature females can sit on their belly without falling to the side.

Two males are put into a breeding hapa with one female. The two males together should weigh the same as or slightly more than the one female. The hapa should be 2 m by 1 m by 1 m.



This female Common Carp is small but fully mature.

How long will the spawning take?

The fish are put into the hapa for breeding in the evening. They spawn within 6-8 hours. When you look at the hapa in the morning, small, orange-colored, shiny eggs will be found sticking to the weed.



You can use strands of plastic weighted at the bottom instead of weeds for spawning Common Carp.

These carp eggs are sticking to the white strands of plastic.

What should I do when the fish have spawned?

When the fish have spawned, transfer the weed with the eggs attached to it, to a hapa for hatching.

A 1 kg female will give about 1.5 lakh of eggs. These eggs should be divided between three to four hapas. Each hapa should have no more than 50,000 eggs.

It is quite easy to tell which eggs are good and which are bad. The good eggs are shiny and translucent and the bad ones are white. Take some samples to check how many of the eggs have been fertilized.

Could you give me some advice about spawning carp in hapas?

The eggs of Common Carp are sticky so we put fresh aquatic weeds in the hapa. The female fish spawn on these.

The weeds that you put in the hapa, should weigh twice as much as the female fish. They should be washed with water, rinsed in a solution of potassium permanganate and spread in the hapa.

How long do the eggs take to hatch?

Hatching takes 40-72 hours. If the weather is cool the spawn takes a longer time to hatch. If it is warmer it hatches out more quickly.

After this time, you will see hatchlings on the sides and the bottom of the hapa. These hatchlings will have a yolk sac.

Remove the weeds carefully removed and the keep the hatchlings in the same hapa for 3-4 more days until the yolk sac is absorbed.



This spawn has just hatched out. It still has a yolk sac.

What should I do with the spawners then?

The spawners (both males and females) are given a potassium permanganate bath and released back in the respective pond to be used again.

The males mature quite quickly and can be used again for a second time after about a fortnight.

Spawning the carp in hatchery tanks

If you have large-sized females, it is better to spawn them in breeding pools in a hatchery.

You can use three or even four males of a smaller size for one large 3 to 4 kg female. In this case, you need to provide 6 to 8 kg weeds.

The breeding pool is the best method for mass breeding, especially during October-November and February-March, when the carp hatchery is not being used to breed Indian Major Carp.

Sometimes, weeds can create oxygen problems in the night, so we can use plastic strips or synthetic fibers which are tied or anchored at the bottom.

This prevents infection of the eggs by the bacteria and fungi sometimes found on the weeds from ponds.



These Common Carp are being spawned in a breeding pool in a hatchery.

Plastic strips are being used instead of weeds. This reduces the risk of infection and disease.

Spawning the carp using hormone injections

Common Carp can be made to spawn by injecting inducing agents such as *Ovaprim* and *Ovatide*. These can be bought at the market.

Only the females are injected. The males are kept separately to be used for fertilizing the eggs.

Fish farmers injecting a fish in Cambodia.

About three to four hours after the injection, the female is ready to release the eggs.

She is taken out and wiped with a dry towel.



To strip the eggs, hold the fish with its head higher than the tail so that the eggs can be collected in a tray.

Slowly and gently move the forefinger and the thumb from the neck region towards the vent, pressing slightly. The eggs will come out of the vent.

Spread the eggs evenly in the tray. This helps all the eggs to become fertilized and prevents them sticking in a single egg mass where oxygen be reduced.

More about spawning common carp using hormone injections

As soon as you have stripped the eggs, spread the milt from the males over them. If you have spread the eggs evenly in the tray, the milt will reach all of them.



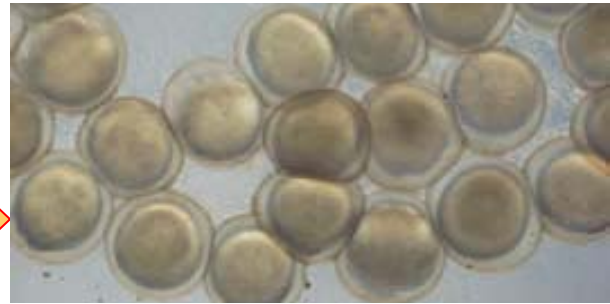
Milt needs to be spread immediately over the eggs to fertilize them.

Common Carp eggs, close-up, before washing.

When you have stripped the eggs and spread the milt over them, you need to remove the stickiness of the eggs.

Prepare a solution of 30 g urea and 40 g of sodium chloride in 10 liters of clean water. Add half of this to the egg-milt mixture. Stir it continuously for about five minutes. Then, use the rest of the solution to wash the eggs. Do this by adding small quantities every five minutes 10-12 times. During this process the eggs absorb water and swell (water-harden).

Finally wash the eggs using fresh water and put them into the hatching pool. Hatching will take 36-48 hours. After this, the spawn is ready for stocking in prepared nurseries at 20,000 per decimal.



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Fry Production: nursing spawn

‘Spawn’ is the name for the young fish about three days old that are available from hatcheries. Sometimes these young fish are also called hatchlings. The spawn of catla, rohu and mrigal is about 6-8 mm long. At this stage, the ‘yolk sac’ is absorbed, the mouth opened and the fins fully developed. Spawn are reared intensively, first to the ‘fry’ size and then to the ‘fingerling’ size. All the three stages are marketed and are collectively called ‘fish seed’.



Spawn - that's me - surrounded by food!

It is best to stock ponds and tanks with ‘fingerlings’ - fish from 100-150 mm long. It is more common to find ‘fry’ which are not yet that big, but stocking fry straight into a pond often results in low survival.



I am fry of catla. Don't put me in the big pond yet.

It is best to rear spawn in a small, shallow, seasonal pond, known as a nursery pond. A nursery pond is often between 5 and 10 decimals (0.02-0.04 ha in size) and 1 to 1.5 m deep. These small ponds:

- are well-oxygenated
- are easy to sample and harvest
- are easy to fertilize and disinfect
- need little water for draining and refilling



Remember:

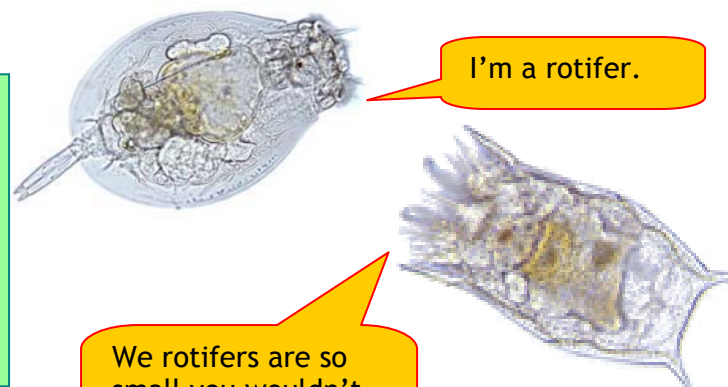
- Plan carefully before you start.
- Raise the spawn intensively before stocking it in a pond.
- Spawn like to be reared in a small, shallow, safe, nursery pond.

The spawn has a small mouth and feeds on tiny swimming animals called zooplankton which it can easily digest.

Fertilizing a pond provides a rich crop of zooplankton such as rotifers. This is the best food for the growth and survival of spawn of common carp, catla, rohu and mrigal.

Management of nursery ponds comprises three phases, all of which need considerable attention:

- Before stocking the spawn
- Stocking the spawn
- After stocking the spawn



I'm a rotifer.

We rotifers are so small you wouldn't even see us.


Actually, I'm a daphnia! I'm too big for spawn food.



Before stocking the spawn

There are four steps to preparing a nursery pond.

Remove the weeds



If I take the weeds out of the nursery pond, I will get a good harvest.


The pond should be weed-free

The nursery should not have any kind of plants at the bottom or on the sides up to the water line. This is because these plants:

- provide a breeding ground for predatory insects
- use up pond nutrients
- shelter predators (that prey on the spawn) and competitors for food
- compete for space and oxygen
- obstruct the movements of spawn/fry
- and, reduce the harvest

You might need some extra help to make sure your nursery pond is absolutely free of weeds.

Remove the predators



Whether my pond is perennial or seasonal, I need to get rid of predatory fish.


The pond should be free from predators/weed fishes

Predators and weed fish are always found in a perennial pond, that's why a seasonal pond can be better. However, there is no guarantee that a seasonal pond will be free from predatory fish.

Many predatory fish can easily get into the pond during the rainy season. If predatory fish are present, they must be removed.

For a 5 decimal (0.02-ha) nursery pond which is 1 m deep, use 7 kg of good quality bleaching powder to kill all the fishes. Another way is to apply 2 kg of urea 18-24 hours before applying the bleaching powder, if you do this, you will only need half the bleaching powder (3.5 kg).

Remove the insects



I have to get rid of the insects because they will eat the spawn.

I want to stock the pond on Monday morning, so I should spray the pond on Sunday night. I hope the weather isn't windy.

The pond should be made free of aquatic insects

Insects can fly from one pond to another. They can also live in nurseries where they multiply rapidly. Insects eat fish spawn. They also compete with the spawn for food. Insects must be controlled and their population reduced to the minimum.

Twelve hours before stocking the spawn, make a mixture of washing soap, vegetable oil and lukewarm water. (Use 300 g of soap and 1 liter of oil for a 5 decimal nursery pond.) Spray this on the surface of the pond in the evening when it is not windy. The entire surface of the pond must be carefully covered.

The spawn can be stocked the next morning before the temperature of the pond water goes up.

Now there is one more step.

Manure the pond

I want to put spawn into my pond in two weeks time, so I will start fertilizing my pond now.



Children, please go and collect some cow dung and poultry manure to put in the pond so that our fish will be big and healthy.

Stocking the spawn

Spawn is normally packed in plastic bags and transported with water and oxygen (from a cylinder). The bag is then sealed.

When you are releasing the spawn into the nursery pond, let some pond water slowly mix with the water in the bag. You don't want the water temperature to change too quickly.

Let the spawn wriggle out by itself rather than being dropped into the water.

We usually stock no more than 50 lakh spawn per ha, so we would stock 1 lakh in a 5 decimal nursery pond.

If you can get the spawn of the three Indian Major Carp species separately, it is better to stock a single species in a pond. When these are harvested, as fry of catla, rohu and mrigal they can be mixed in the proper proportions for rearing to fingerling size.

After stocking the spawn

The spawn eats up the plankton and we need to keep adding manure to the pond to keep the amount of plankton high.

Add small doses of manure (25 kg of cow dung and 15 kg of poultry manure) every five days after stocking or when the water starts becoming clear. Fermented manure is good as it uses up less oxygen. You can also use biogas slurry instead of manure.

The pond should be rich in fish food organisms

Normally, there are small amounts of fish food in a pond, but these increase quickly when we add manures and fertilizers.

Manures fertilize the pond slowly, so these are not so good if you need to stock the pond quickly.

Nutrients from manure get locked up in the acid soils, which are common in Western Orissa. You can test if your soil is acid by measuring something called pH. If the pH is less than 7 you can add 'lime'. Start with about 5 kg for a 5 decimal nursery (250 kg/ha) then test again after 3-4 days to see if it has come up to 7.

Cow dung takes longer to break down than poultry manure. Using a mixture of 100 kg cow dung and 50 kg poultry manure is a cheap and effective. The color of pond water should turn brown and have a lot of zooplankton in about two weeks. You can then stock the spawn.

To test whether the pond has enough plankton put your arm at an angle of 45° into the water up to your elbow. If you can still see your fist, the pond is not yet ready, but if your fist is no longer visible, spawn can be stocked.



The spawn will grow well if you give them some extra food. Give finely powdered and sieved rice bran and groundnut oilcake in equal proportions by weight.

Give 100 g/day in a 5 decimal nursery for the first 5 days, followed by 200 g/day from the 6th to the 10th day and 300 g/day for the next five days.

Half the feed should be given in the morning and half in the evening. Just broadcast the feed from the dyke. Make sure that it does not get blown away by the wind.



After 15 days, the fry grow to about 25 mm. You can harvest them now using a drag-net. Then you can either sell them, or rear them to fingerling size in a larger pond. Do not feed the fry on the day before they are harvested. Harvest them in the early morning, then condition them in a hapa for about two hours before you pack them.

If you rear the spawn carefully, maybe as many as 60% will survive to the fry stage.

The same nursery can be used for rearing a second crop of spawn. Stock the second crop three days after harvesting the first crop. Make sure that you add fertilizer and control the aquatic insects before you stock. You can produce at least four crops of fry in a nursery in two months during the breeding season if the spawn is available from the hatcheries.

Useful Contacts

Other Better-Practice Guidelines

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Fast Fingerling Production: nursing spawn in ponds

It takes about 75-90 days to rear fingerlings. Growing spawn to fry takes 15-21 days and then fry to fingerling size a further 1.5 - 2.5 months. Thus, if spawn is stocked in a nursery on 1 July the fingerlings are usually ready by the end of September. Yet many people who have seasonal ponds like to stock with advanced fingerlings when the pond fills up (usually in July) so that they can harvest a crop of market size fish by November-December.

The “fast fingerling system” can produce advanced fingerlings about two months earlier than they are normally available from fish farms.



The farmer uses just one pond for continuous growing until fingerling size is reached, and fewer fish are stocked. A farmer with a small, seasonal pond can produce fingerlings in one month. These can then be sold for a high price because everyone wants fingerlings as early as possible.

The number of spawn stocked is low because it is important that there is no overcrowding. The manuring and feeding schedules are also different. In all other ways the fast fingerling system is similar to normal fingerling rearing.

How does the “fast fingerling system” work?

How does the “fast fingerling system” work?

People with seasonal ponds need to stock fingerlings as soon after the rains come as possible, to get the longest growing period.

Usually many fry are stocked in a small pond. With the fast fingerling system the number of fry stocked in the pond is less and they grow to fingerling size more quickly.

So it's a great system for people who only have seasonal ponds!

Yes, especially in Western Orissa. It is difficult here to get large fingerlings early in the wet season. This means that it is more difficult for people with seasonal ponds to get a good crop of fish before their water dries up.

The fast fingerling system makes it easier for people with seasonal ponds to get a good crop.





What size should the pond be? Do I need to prepare it in a special way?

What else do I need to do?

- You need to kill any organisms that might harm the fish before stocking your seed. To do this:
1. Spray bleaching powder on the bottom and the sides of the pond. Use 600 g per decimal (150 kg/ha).
 2. Ten days after this spread mahua oilcake. Use 6 kg per decimal (1,500 kg/ha). This is poisonous. At first it kills anything harmful then acts as a fertilizer.
 3. Three days after this, spread lime. Use 400 g per decimal (100 kg/ha).

- Select your pond carefully. Your pond should:
- be smaller than 25 decimals
 - have water less than 1.5 m deep
 - have no weeds in the water or around the edges
 - have no inlets or outlets.
 - be in a place that will not flood
 - not be easy for predators to get into
 - be difficult for poachers to reach
 - have less than 15 cm of silt at the bottom when full



I'm a notonectid. I love to eat spawn.

The pond is ready ten to fifteen days after you have added the oilcake. The water should be a brown color from the zooplankton (the tiny swimming animals that spawn eat). If you filter 50 l of water with a plankton net, you should get 2-3 ml of plankton.

Before stocking test for toxicity, collect some pond water in a container and add 15-20 spawn and observe them for 4 hours. If they survive, the water is no longer poisonous.

Before stocking the spawn

So when I have applied the bleaching powder, mahua oilcake and lime, the pond is ready? Can I put the spawn into the pond then?

No, no! There is one step you MUST take before your stock the spawn.

What's that?

You have to make sure that there are no notonectids in your pond. Notonectids cause havoc. They eat the spawn and they also eat the same food as spawn. It is very important to control them.

How do I do that?

Use a mixture of washing soap (70g) and any cheap vegetable oil (200ml)/decimal. Spray this over the water surface 12 hours before putting the spawn in the pond. You have to do this very carefully so as to fully cover the entire pond surface.

Can I stock the stock immediately after I have done this?

No, you should wait until the next morning, then put the spawn in the pond while the day is still cool.



This fish can talk.

That's amazing!

Stocking the spawn

How many should I stock?

In the fast fingerling system, you stock less spawn than is normal in nurseries. The rate for the fast fingerling system should be 1200/decimal (3 lakh/ha) instead of (50 lakh/ha)

The spawn must be conditioned before you release it. This means that spawn needs to get used to the new place slowly.

First rest the plastic bag in which the spawn is packed on the surface of the pond for some minutes. Then, open the bag and slowly let small quantities of pond water in. Finally allow the fry to wriggle out into the pond by itself.

How should the spawn be conditioned?

Should I grow all three species?

Do not rear one type of spawn alone. Rear spawn of all the three species - catla, rohu, and mrigal. Use these proportions: 40:30:30 or 35:30:35. Stock these together.

Caring for your spawn

The density of the spawn is lower than in a normal pond, but it will find enough food. However, you must still manure the pond so that the amount of plankton is kept high.

Make a mixture of 100 kg cow dung, 50 kg poultry manure and 25 kg mustard oilcake. Add this every seventh day after stocking.

When you make this, soak the oilcake with cow dung and poultry manure for 24 hours. Then dilute it with pond water. Broadcast it evenly over the entire surface of the pond.

The spawn needs Vitamins B and B12. These help increase the survival rate of the fish. They also help produce plankton.

To add Vitamins B and B12 to the water, spray a solution of cobalt chloride. The day before stocking spray 250 g/ha.

Ten days after stocking spray 100 g/ha. Then spray 100 g/ha again 20 days after stocking.

The spawn will grow well if you give a supplementary diet of finely powdered and sieved groundnut oilcake and good quality rice bran.

This should be a 1:1 mixture. So, from days 1 to 5 the fish need 150g of feed. Of this, 75 g should be oilcake and 75 g rice bran.

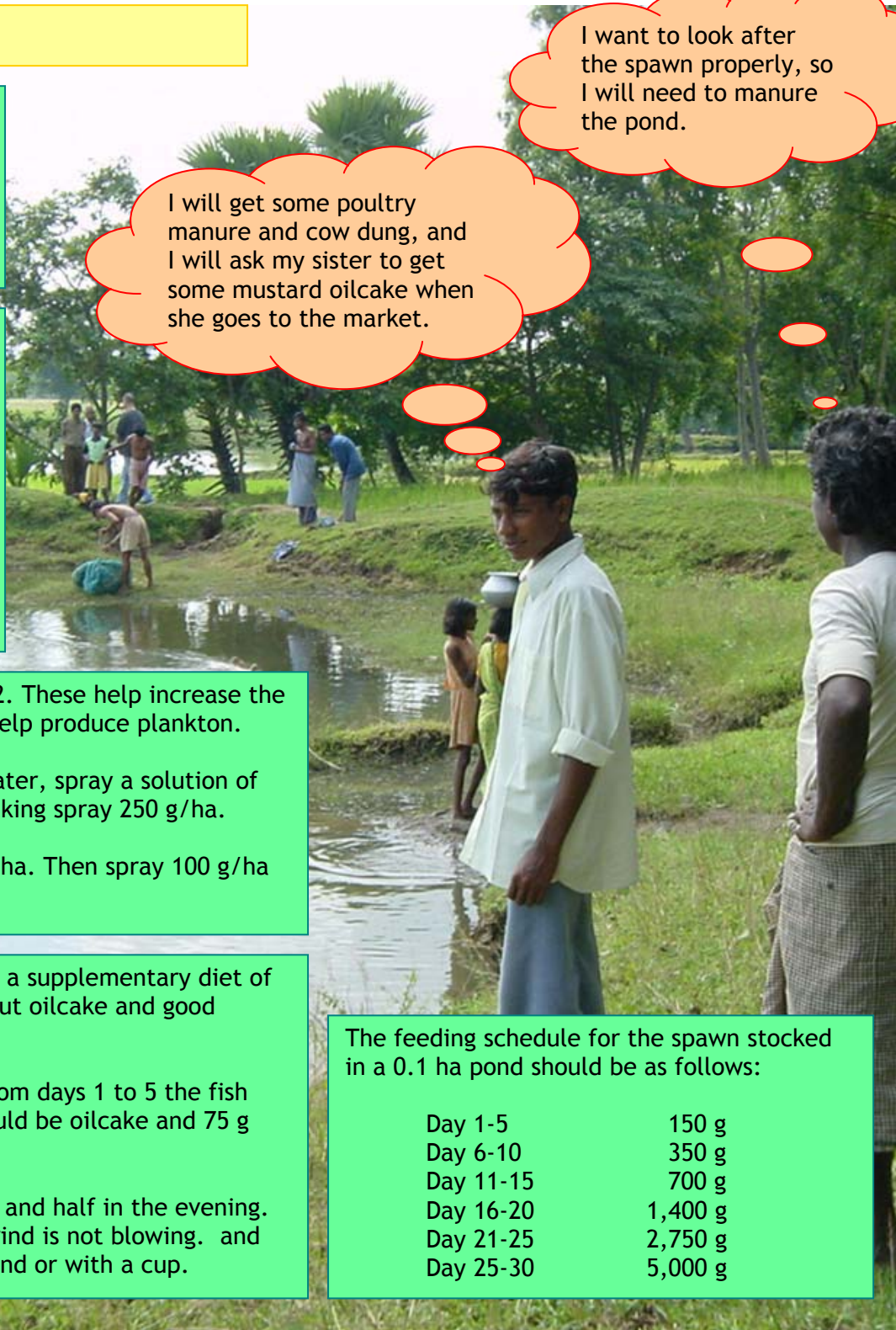
Give half of the feed in the morning and half in the evening. Make sure that you feed when the wind is not blowing. and small quantities are broadcast by hand or with a cup.

I want to look after the spawn properly, so I will need to manure the pond.

I will get some poultry manure and cow dung, and I will ask my sister to get some mustard oilcake when she goes to the market.

The feeding schedule for the spawn stocked in a 0.1 ha pond should be as follows:

Day 1-5	150 g
Day 6-10	350 g
Day 11-15	700 g
Day 16-20	1,400 g
Day 21-25	2,750 g
Day 25-30	5,000 g



Harvesting the fingerlings

After 30 days, the spawn will attain the fingerling size.

The fingerlings can be harvested and sold when they weigh on average about 8-10 g and measure 80-100 mm.

The fingerlings should not be fed on the day before you harvest. They should be netted early in the morning and conditioned for about three hours before packing.

The survival rate should be of 30%-40%.

A woman separates fingerlings according to size in Cambodia.



Grass carp fingerlings

A farmer in Cambodia cleans the hapa where his fingerlings are stocked.



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