

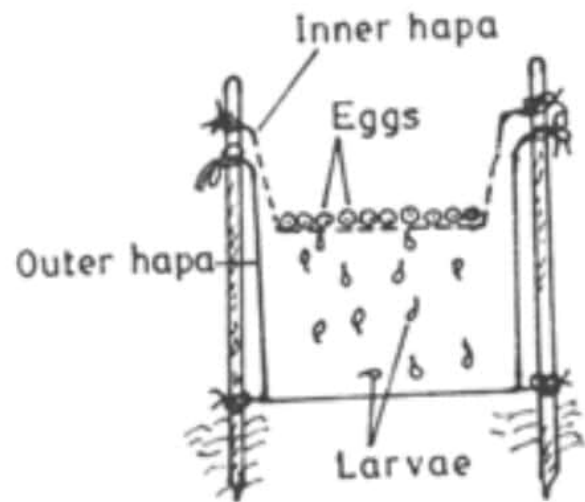
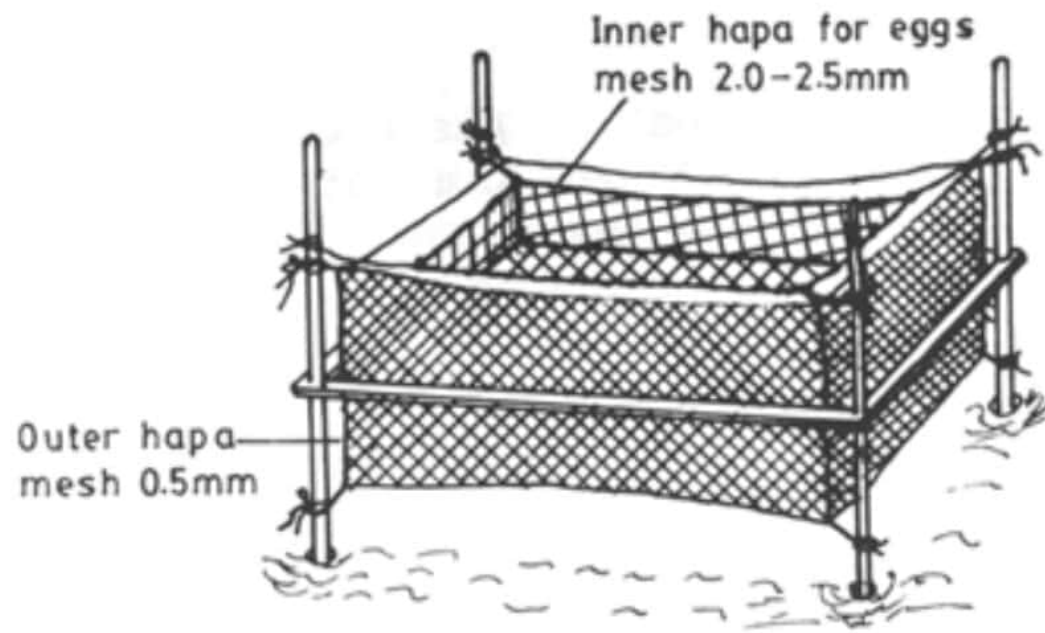
INDUCED BREEDING AND SEED PRODUCTION OF CARPS IN ECO AND FRP HATCHERY

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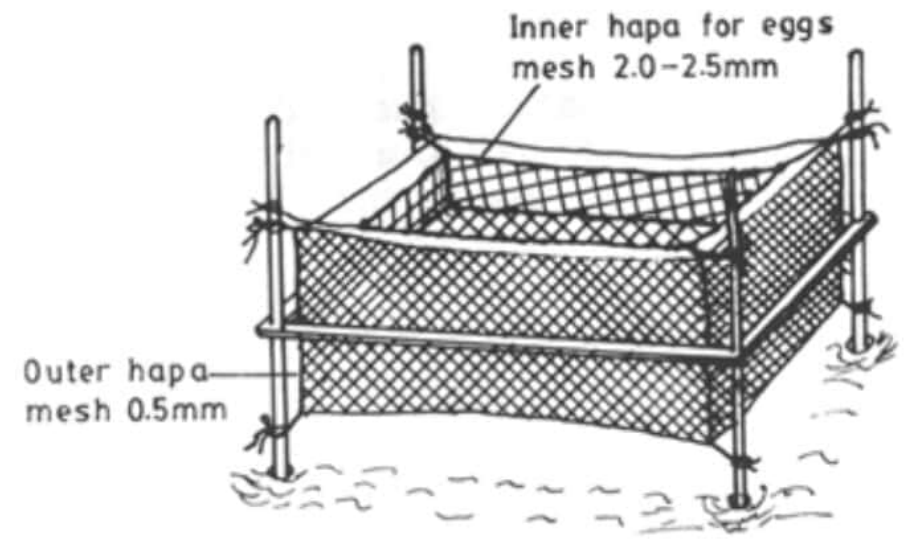
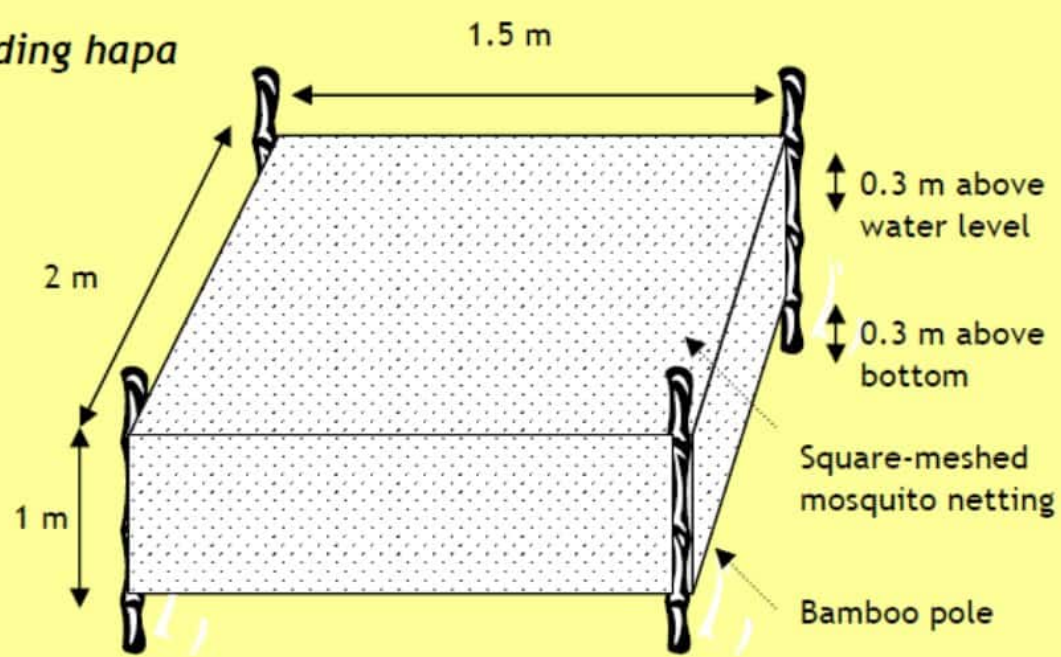


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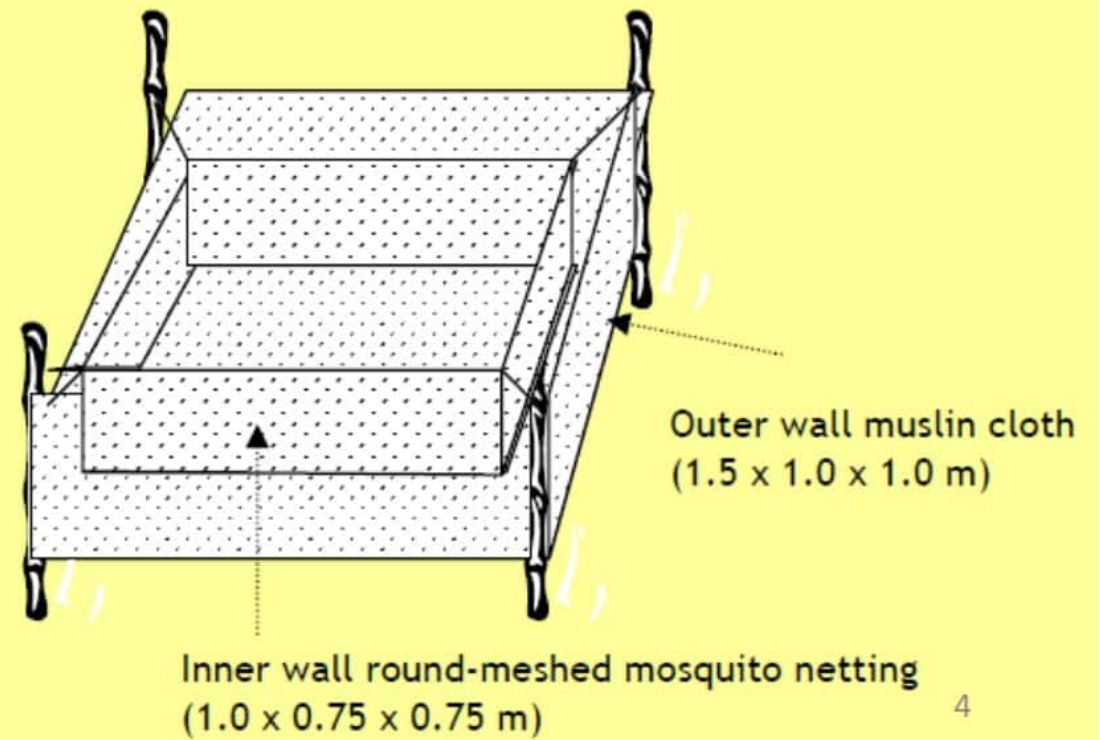
- **Earlier times**, Seed were collected from rivers, bundhs and other natural resources by different methods using different devices
- **After 1957**, carps were induced bred by Crude Pituitary Gland Extract (CGPE) under captivity,
- The breeding of fish, egg collection, incubation, hatching, and rearing of hatchling up to spawn stage were carried out in rectangular hapas
- They were fixed in the pond for clear oxygenated water. In hapa system, the entire operations were weather dependent and subjected to various environmental hazards.
- **During seventies**, glass jar hatching units of various capacities were designed and made to use successfully for hatching purposes. The system had its own demerits for commercial seed production.
- **During eighties**, the Chinese carp hatchery technology got familiar in India



Breeding hapa



Hatching hapa





MODERN HATCHERY

1. **“D” Series Hatchery:** CIFE, Mumbai designed this type of hatchery during 1980-86 (Dwivedi & Ravichandran, 1982; Dwivedi et al., 1983; Dwivedi and Reddy, 1986)

2. Chinese Circular Carp Hatchery:

- Most popular circular hatchery developed in **China** during 1960
- Provide **suitable environment** for easy induced breeding
- Successfully tried **in India during 1982**
- Chinese hatchery have **some problem** which leads to low recovery of spawn and high water requirement during breeding operation

Eco-Hatchery: The circular type of hatchery with **several modifications** in its **water inlets, out-lets** and **duck mouth** presently known as **eco-carp hatchery in India**.

3. Portable FRP Carp Hatchery:

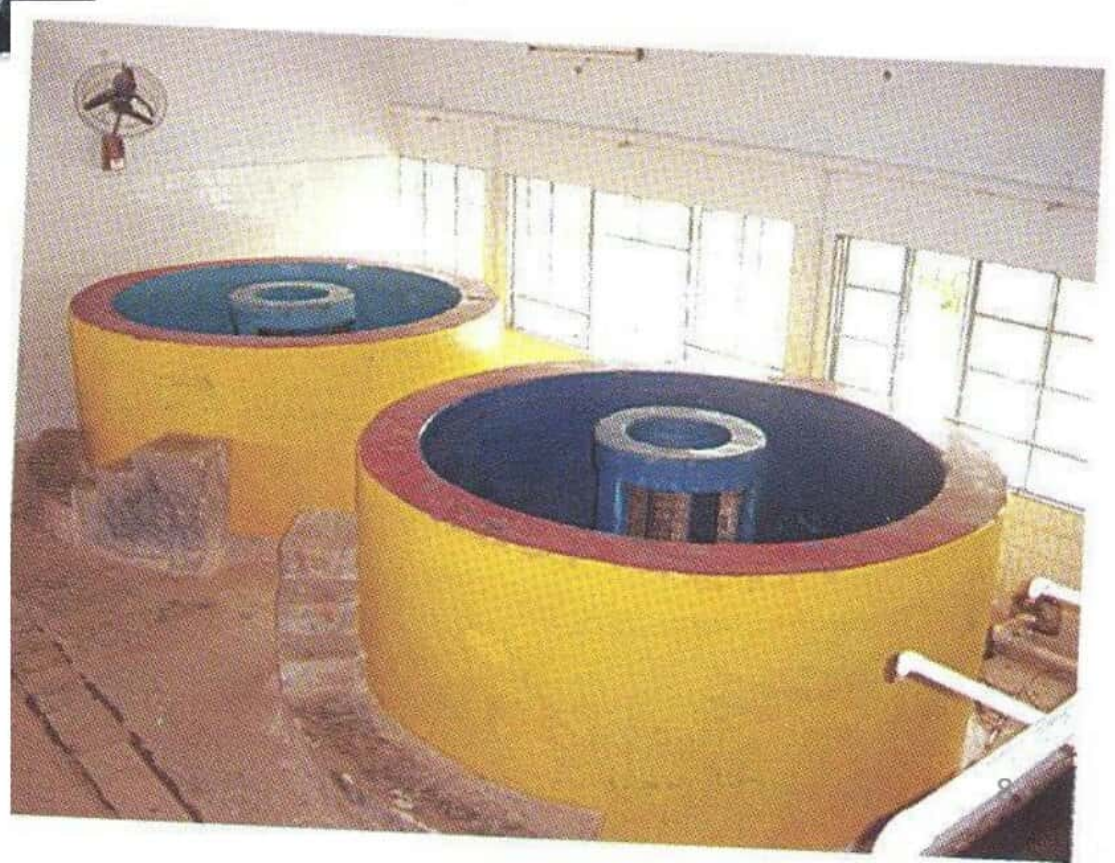
- Based on the principle of eco-hatchery
- Made up of Fibre Reinforced Plastic (FRP)
- Developed by CIFA, Bhubaneswar
- It is light & transportable

Parts of Eco-hatchery:

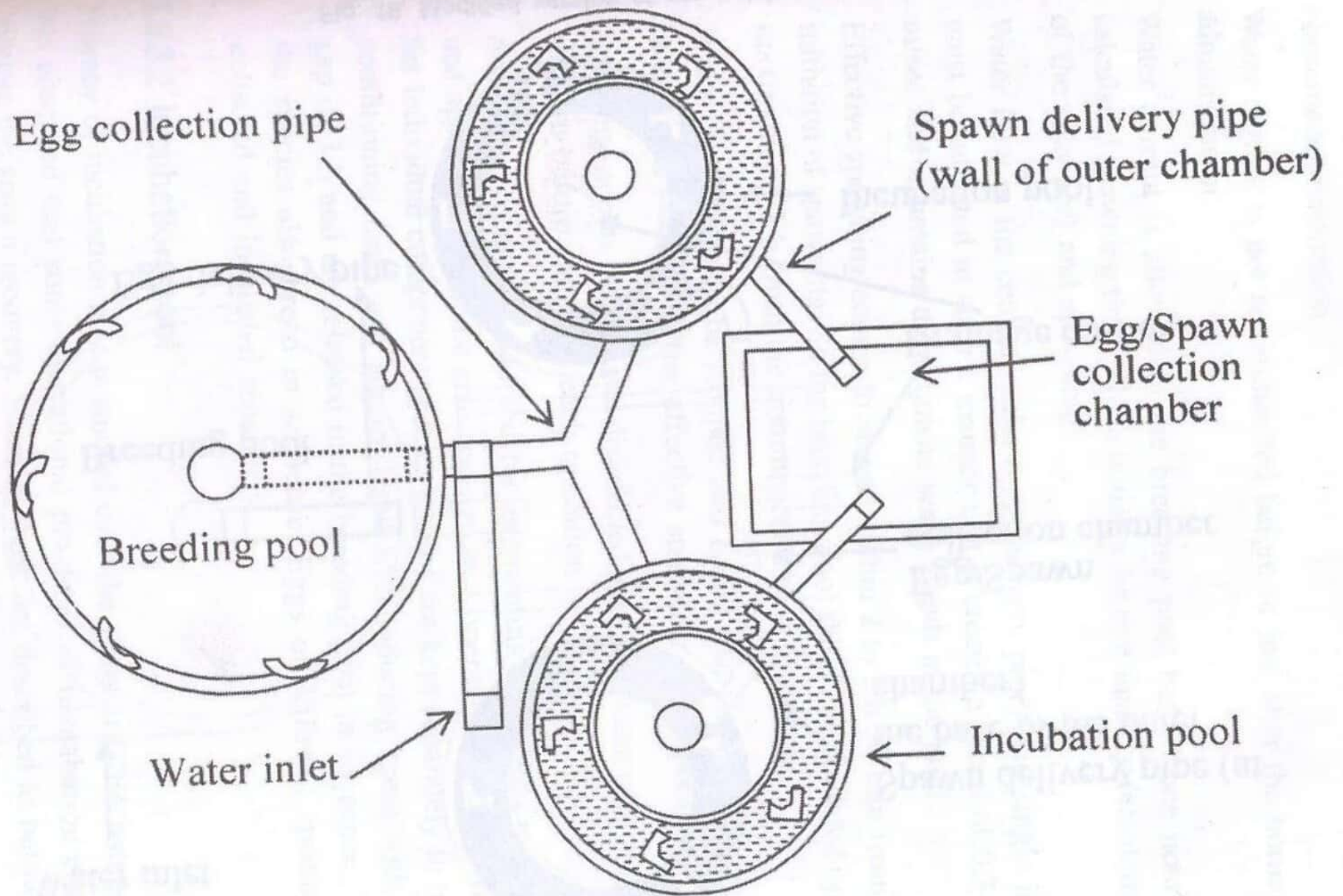
- 1. Breeding Pool**
- 2. Hatching/Incubation Pool**
- 3. Fertilized Egg & Spawn Collection Unit**
- 4. Water Storage Tank (Over-head Tank)**
- 5. Larval Rearing Unit**



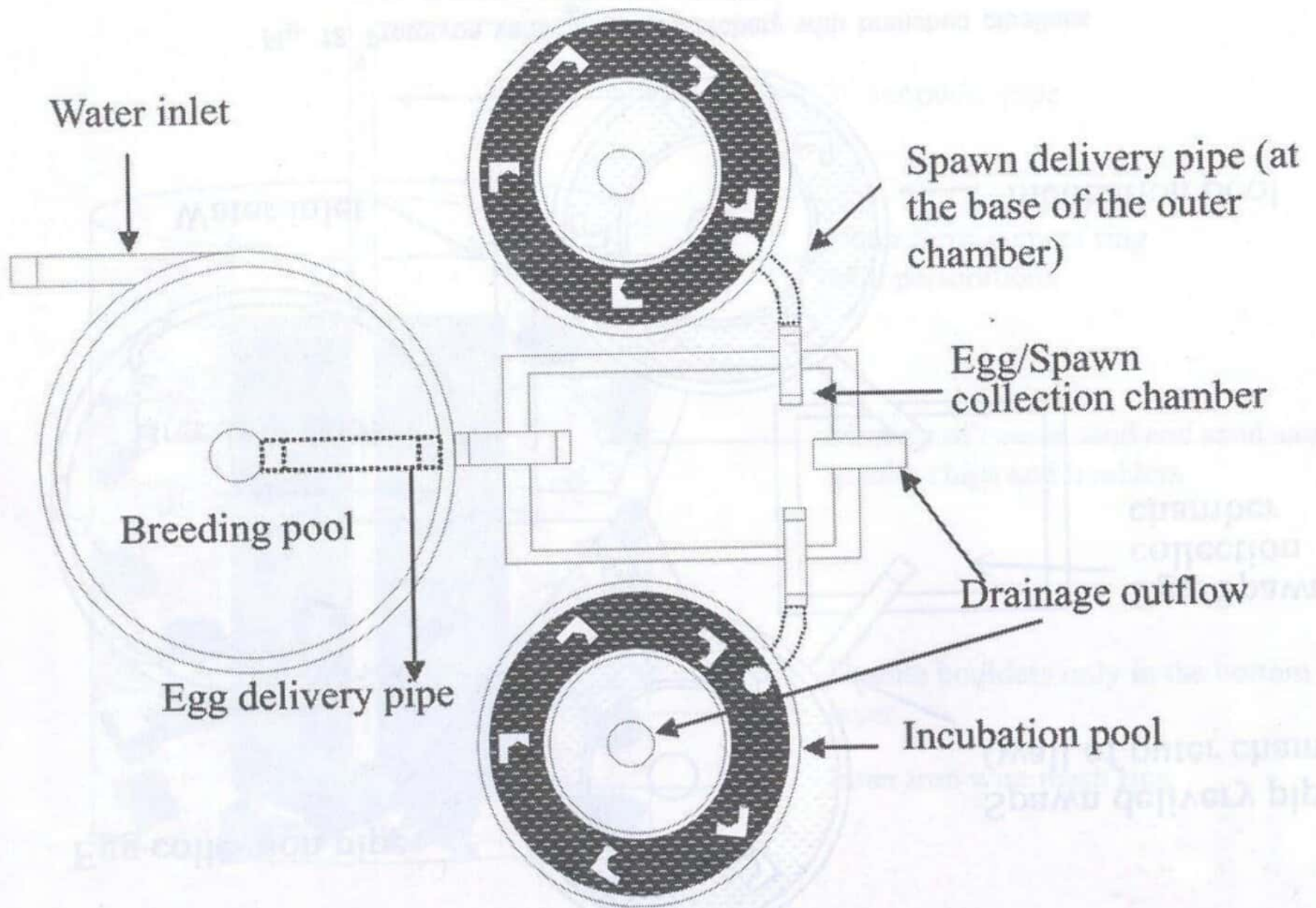
Breeding Pool



Hatching Pool



Eco-hatchery with branched pipelines











Fish Seed in Spawn Stage

MANAGEMENT PRACTICES FOLLOWED IN HATCHERY

Breeding/spawning pool

- i) ~~Good~~ Good quality water with at least 5-6 PPM of DO is essential
- ii) 1.0 m ~~is~~ of water depth ~~is~~ in the pool ~~is~~ ^{should be} maintained
- iii) Brood fish in the pool should be under shower before and after hormone administration
- iv) Water current is not recommended before and after hormone administration
- v) Water current should allowed in the breeding part before one hour of calculated spawning time

- vi) water flow in the central outlet (egg delivery pipe) and a single inlet should be adjusted in such a manner that requisite water depth should ~~be~~ will be maintained in the pool
- vii) Effective spawning comes to an end within 2-2.30 hr from the initiation of spawning. So the breeding pool should be operated upto a max^m of 3h from the start of spawning
- viii) Just after effective spawning, brood fish should be transferred to the pond.
- ix) spawning pool should be cleaned and disinfected with $KMnO_4$ solⁿ before and after each operation
- x) Eggs of different species are collected and incubated separately. ~~or~~ when breeding of more than one species operate at a time in same breeding pool for assessment of...

Management practices in Incubation pool

Egg should be received in the collection chamber on a water cushion.

bag stuffed
with soft material

Direction of the duck-mouth and speed of the water are maintained in such a way that they keep developing eggs away from both screen and wall of the incubation chamber.

* The water speed of the pool should be 0.4-0.5 m/sec for 1st 12 hr, 0.1-0.2 m/sec for next 6 hr and 0.3-0.4 m/sec for rest of the operation.

* DO should not be less than 4 ppm

* cleaning of hatchery pool during operation increases the survival and recovery of spawn.

The floating, or suspended and settled debris including egg shells and dead spawn should be cleaned.

→ Incubation chamber should be loaded with recommended quantity of eggs @ 7.0 Lakh/m^3 .

→ ~~not~~ Better not to incubate poor fertilized eggs.

→ Care to be taken to prohibit premature hatching due to mechanical injury and low O_2 tension in the system.

→ Care should be taken to disinfect the hatchery units equipments @ at regular interval preferably with formaldehyde 50%

- ❑ DO, pH, Total alkalinity, temp to be maintained
- ❑ Iron rich water and heavy metal contaminated water should not be used
- ❑ DO should be 5 -6 ppm
- ❑ Total alkalinity should not be more than 100 ppm
- ❑ Ground water often contains low DO, CO₂, CH₄, H₂S gas etc. beyond the tolerable level of fertilized eggs so, if water source is ground water then expose to open air in earthen pond and then use.
- ❑ Recycling of used hatchery water not desirable which may leads to heavy microbial load and cause disease
- ❑ The used hatchery water should be discharged to another pond and should be treated with @ 50 kg lime /ha
- ❑ Favorable water temp. should be 24-29°C
- ❑ pH should be 6.5 to 8.5

Keeping in mind the needs of seed production in farmers field, CIFA, Bhubaneswar has designed and developed the complete unit of hatchery system in FRP for carp fish breeding and hatchery rearing of seed.

- The FRP carp hatchery technology got commercialized and released to the nation during 2006.
- The Glass Fibre Reinforced Plastic (GRP) is popularly known as FRP

Salient Features:

- ❖ Light in weight & Easy to Transport
- ❖ Easy to install
- ❖ Easy to dismantle
- ❖ High abrasion resistance
- ❖ Maintenance free
- ❖ Easy to repair
- ❖ Easy for operation
- ❖ Suitable for small and marginal farmers
- ❖ Durable for 10-15 years

Hatchery Components:

1. Breeding spawning pool
2. Hatching incubation pool
3. Egg spawn collection tank, and
4. Overhead storage tank water supply system

Breeding/Spawning Pool

Shape	: Cylindro-vertical
Diameter	: 21 - 50 mm
Height	: 900 mm
Total volume	: 3409 l
Operational volume	: 2950 l
Bottom slope at the centre	: 1: 22
Wall thickness	: 6.0 ± 0.5 mm
Duck mouth	: Five numbers (15 mm diameter - Rigid PVC) fixed inner side at bottom of the pool in clockwise direction
Main water inlet	: 25 mm diameter of GI1 PVC pipe
Water sprinkler	: One stainless steel1 plastic shower (Std. size)
Breeding capacity	: 10 - 12 kg of carps in normal conditions
Water flow rate	: 1-1.5 l sec, depending on species B weight
Fittings	: All the pipes and fittings as per ISI standard

Hatching1 Incubation Pool

Outer Chamber

Shape	: Cylindro-vertical
Diameter	: 1400 mm
Height	: 980 mm
Total volume	: 1400L
Net egg incubation volume	: 1200 L (Space between outer and inner chamber)
Side slope at the wall	: 1 : 12
Wall thickness	: 5.5 ± 0.5 mm
Duck mouth	: Five 15 mm diameter - rigid PVC at the bottom of the pool in clockwise direction placed fixed in between inner and outer chamber
Main water inlet	: 25 mm diameter of GI/ PVC pipe connected to all duck mouths at outer bottom wall of the pool
Water sprinkler	: One stainless steel/ plastic shower (Std. size)
Hatching capacity	: 1.0 - 1.2 million eggs per operation Water flow rate: 0.3 - 0.4 l1 sec. depending on egg quantity/volume
Hatching time	: 14 - 18 hours remain in the pool for 72 h.

Inner Chamber

Socket diameter	: 400 mm
Height	: 890 mm
Chamber cover	: Nylon bolting cloth of 0.25 mm mesh

Egg/ Spawn Collection Tank

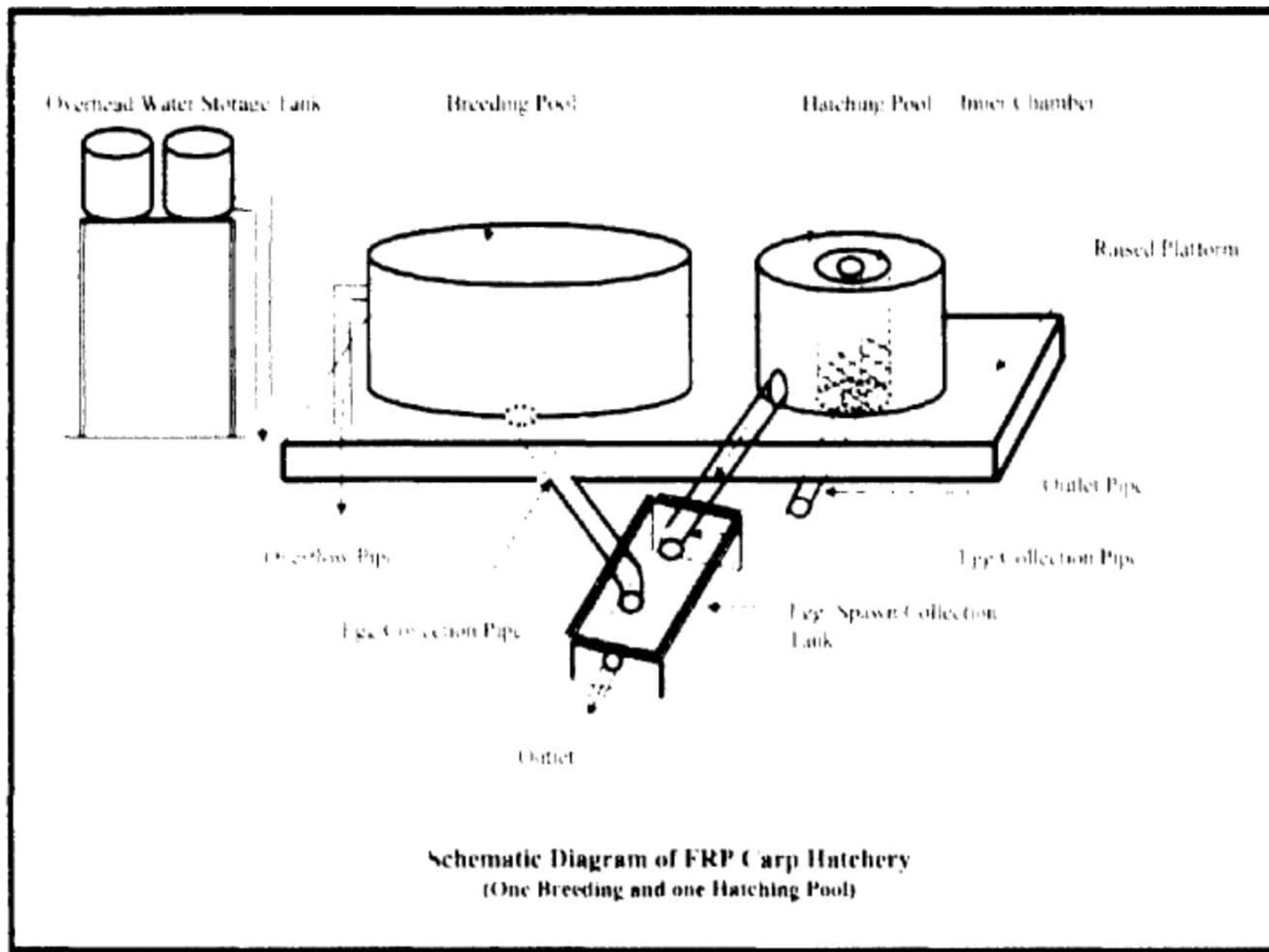
Shape	: Rectangular
Size	: 1000 x 500x 500 mm
Total volume	: 250 l
Operational volume	: 225 l
Wall thickness	: 3.5 ± 0.5 mm
Reinforce	: Reinforced with MS angle of 25 x 25 x 5 mm at all sides from the bottom at a height of 350 mm to avoid deflection
Level of water	: 450 mm in the tank
Water outlet	: Rigid PVC pipe of 63 mm diameter and 150 mm Length is fitted at a distance of 387 mm from the bottom

Overhead Tank

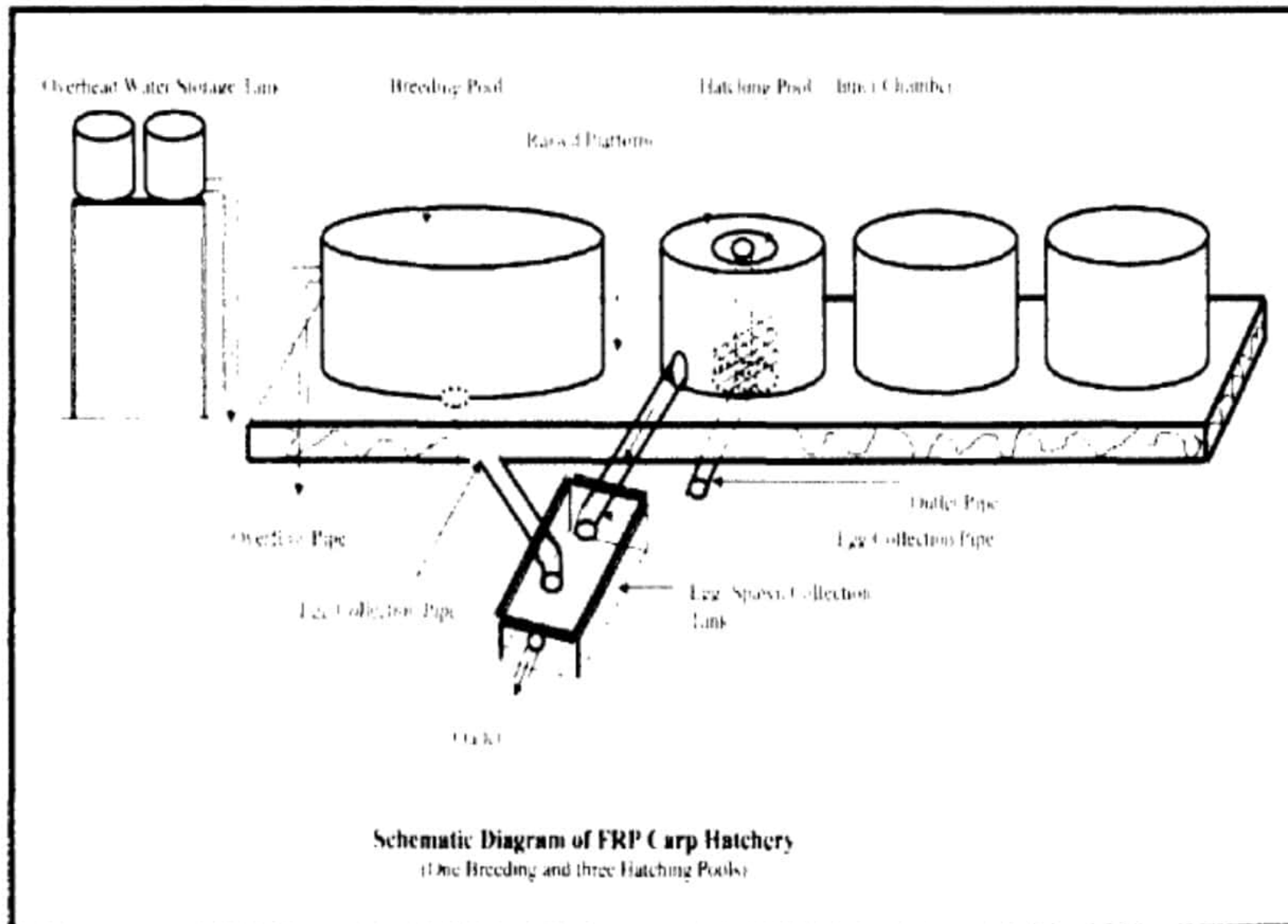
One tank of 2000 l or 2 tanks of 1000 l capacity each can solve the purpose. One 1.0 HP pump set is required to fill the storage tank periodically to supply water to hatchery. Based on the capacity of the hatchery and operational needs, the storage capacity is to be decided.

Hatchery unit of "one million spawn production per operation" consists of

- ✓ one breeding pool associated with one hatching pool.
- ✓ In this hatchery the spawn (final product from hatchery) is harvested on 4th day during operation.
- ✓ Because the fertilized eggs are kept in hatching pool for incubation and it takes 14-18 hours for hatching, and then after 72 hours for transformation to spawn.
- ✓ Thus four days are required for spawn production from one million capacity unit.
- ✓ Similarly hatchery for "two million spawn capacity" means one breeding pool associated with two hatching pools and "three million capacity" includes one breeding pool with three hatching pools.
- ✓ In case of two million capacity hatchery, the eggs produced from two consecutive fish breeding operations can be incubated in two hatching pools, thus two times the seed can be harvested (totaling to two million seed production from two operations) i.e., on 4th and 5th days from initial hatchery operation. Once one hatching pool is free after harvest, the next breeding programme can be taken up. In case of three million capacity hatchery, three times the seed can be harvested (totaling to three million seed production from three operations) i.e., on 4th, 5th and 6th days from initiation of hatchery operation. Then after operations can continue with serial harvesting of spawn from hatching pools.



Layout diagram of FRP Carp Hatchery (with one breeding pool and three hatching pools)



Steps of Hatchery Operation

1. Clean the breeding and hatching pools by potassium permanganate (KMnO_4) solution and then by water before the hatchery operation.
2. Close the outlet valve of breeding pool and then fill it with desired water level of water. Fix a clean cotton hapa inside it.
3. Collect brood fish (male to female ratio in 1:1), transport them to breeding pool, place them in hapa and run the shower(s) for conditioning.
4. After **1-2 hours of conditioning, inject the breeders with** suitable inducing agents and dose, release them to the breeding pool, remove the hapa and run the shower(s).
5. After **4-5 hours of injection, allow water flow/circulation** in the breeding pool, open the outlet valve, allow the water to pass from breeding pool through the hapa of the egg/spawn collection tank to the outside. If eggs released from the fishes, collect them in hapa in the egg/spawn collection tank. Create water current in the breeding pool by regulating the water flow through the inlets and outlet.
6. In hatching pool, fix the screen on the inner chamber FRP socket, fix the PVC drain pipe in the center of the tank to drain excess water, maintain the height of the drain pipe

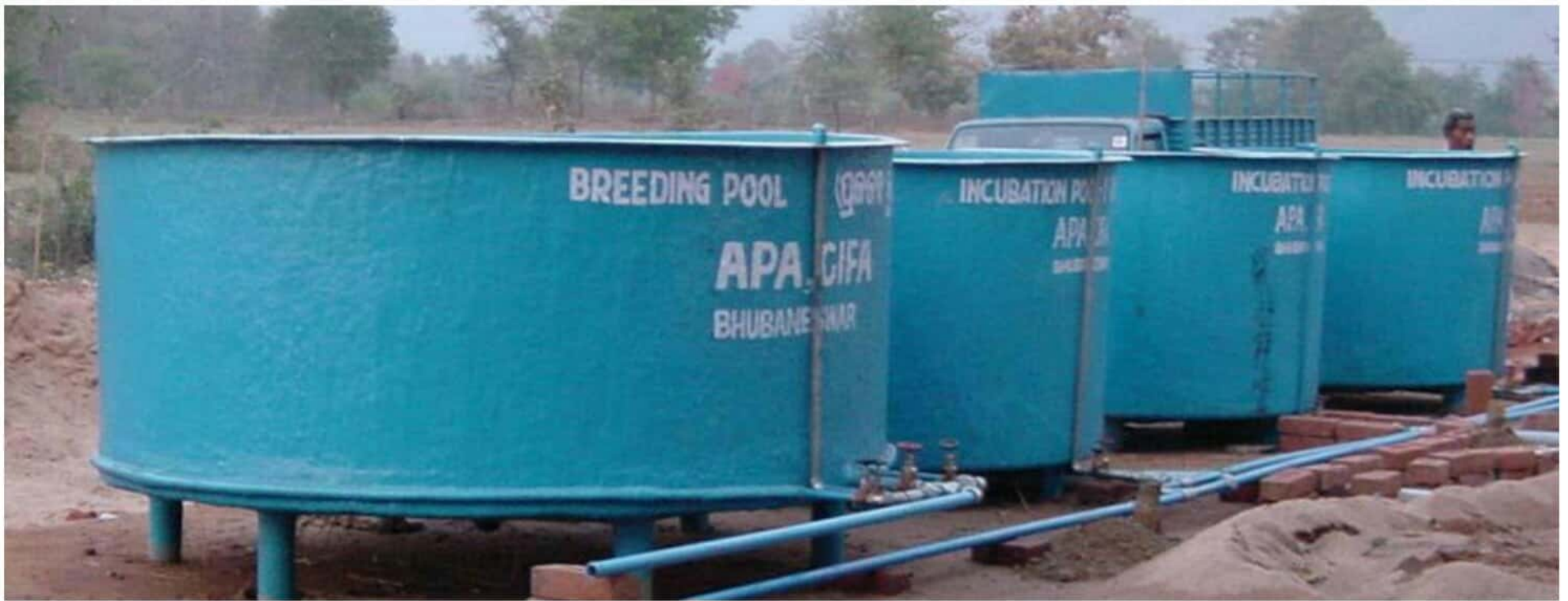
8. in the pool at 900 mm or as needed so that up to that height water level is maintained, give water circulation in the egg incubation chamber through duck-mouths (inlets).
9. Collect the released eggs from the egg/spawn collection tank by hapa time to time, measure them, release them in the egg incubation chamber of the hatching pool. The egg release generally stops within 8-10 hr from injection.
10. Remove the breeders from breeding pool once the breeding is over, release them to the pond after dipping in 5 ppm KMnO_4 solution; clean the breeding pool by KMnO_4 solution and then by water.
11. On release of eggs maintain the flow rate in the hatching pool in such a way that the eggs float in the water (can be checked by putting light from a torch from the top of water), periodically check the eggs/spawn, clean the filtering mesh by a brush with long handle from the inner side of inner chamber to avoid water choking.
12. On **4th day from egg release, collect the spawn through** hapa in the egg/spawn collection tank by opening the outlet valve connected to the outer wall of the hatching pool. Provide mild water circulation in the pool during spawn collection.
13. After spawn removal clean the hatching pool and the egg/spawn collection tank by KMnO_4 solution and then by water.

INSTALLATION & Assembly of different parts of Hatchery Unit

- Proper installation of the hatchery unit in one place for a longer period requires a platform of size 6.0 x 4.0 m.
- Make the height of the platform in such a way that the egg/spawn collection pipes coming out of breeding and hatching pools placed on the platform can be rested on the egg/spawn collection tank which is kept at ground level.
- For better collection of egg/spawn, maintain the height of the platform at about 0.5 m from ground level.
- For stability construct the periphery walls of the platform with bricks/stones and fill it with coarse sand.
- If the hatchery needs repeated shifting, platform construction is not required. Sand filling below the breeding pool is required for providing better foundation to the pool.
- In case of 1:1 ratio hatchery unit (one breeding pool with one hatchery pool) the water supply to the unit may be provided with 25mm pipe from storage tank. In case of 1:3 unit it may be through 50mm pipe for getting required water flow.

Do's and Don't Do's

- ✓ Check alignment of the pools and tank while installation
- ✓ *Clean hatchery with $KMnO_4$ solution and water before and after operation*
- ✓ *Use water free from any tree leaves, grasses or waste materials to avoid clogging of duck mouths. Clean the clogged duck mouths with old hacksaw blade*
- ✓ *Be sure that the egg/spawn collection tank is full with water before collection of egg/spawn*
- ✓ Mild water flow is required in hatching pool while collection of egg/spawn
- ✓ *Open outlet control valves slowly during the hatchery operation*
- ✓ Use M-Seal to stop minor leakage in FRP structure
- ✓ *While cleaning/washing use soft cloth/sponge*
- ✓ *Avoid any corrosive chemicals during cleaning/washing*
- ✓ *Don't expose the hatchery unit to direct sunlight for long period*
- ✓ *Don't allow cattle and other animals near to the unit. They may damage the structures/pipelines.*





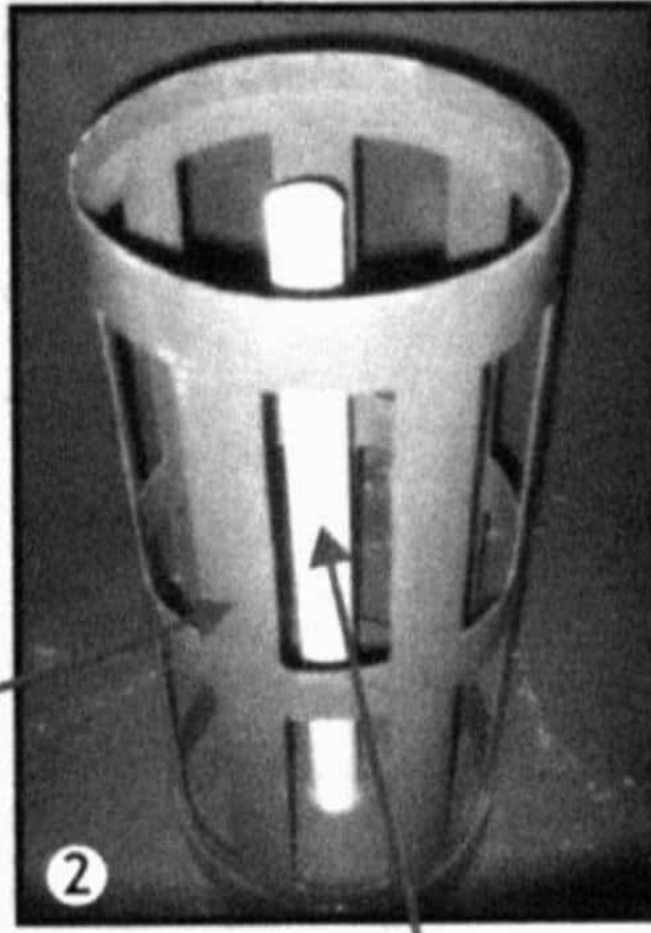
Shower connection

water line to pool

Inner chamber wall

1

Fix the central inlet pipeline for supplying water flow to duck mouths and shower



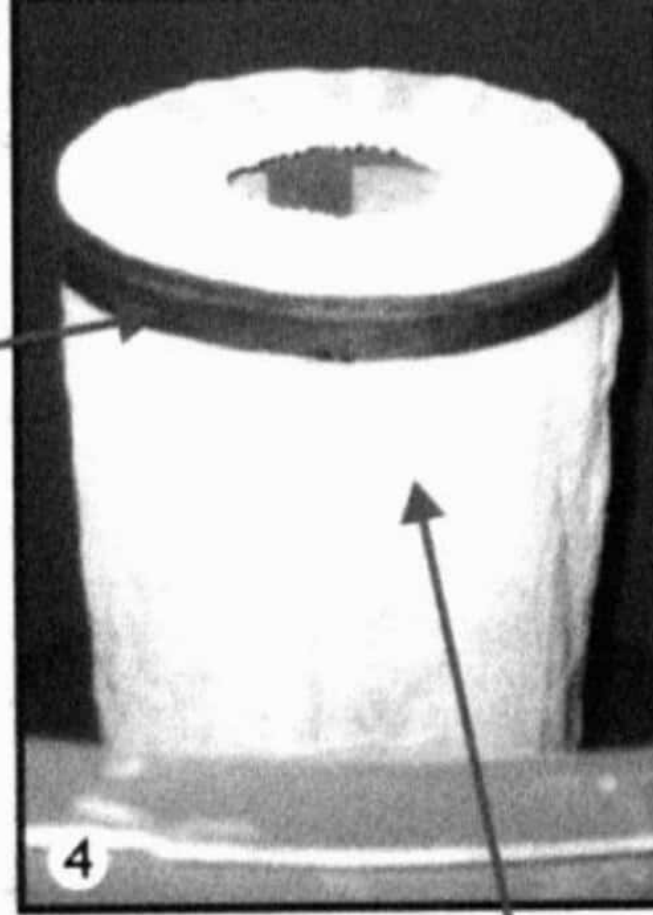
2

Fix the central outlet pipe with the socket provided at the bottom of the pool. Fix the inner chamber wall by push fitting on the socket provided at the bottom



Fix the duck mouths to the nipple provided on the bottom of the pool in clockwise direction

Rubber band



Cover the inner chamber wall with nylon-bolting cloth during hatchery operation.



