

Cage aquaculture

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Concept

In general, fishes are stocked at high density for farming in cages. Cages are the most versatile and cost effective units used for aquaculture operations. Both floating and fixed cages are used. Sufficient water flow is considered important to remove waste from the cage area. The technique is **potential** to the poor, marginal and disadvantaged group having no ponds or fields for fish farming. Commercial fish farming in cages is also gaining popularity day by day.

Advantages

Some **advantages** of cages are: relatively low cost, simple and fast to assemble, not too dependent on land availability, easy to move and relocate if needed, do not require water supply installation and relatively easy to service.

History and development

Use of cages for holding and transporting fish can be traced back almost two centuries ago to the Asian region. The oldest records in Great Lake region of Kampuchea to keep *Clarias* spp. catfishes and other commercial fishes in bamboo cages until ready to transport to market. Similar cage to grow *Leptobarbus heoveni* fry captured from the wild in Mundung Lake, Indonesia since 1922. The practice of cage culture in inland waters has spreaded throughout the world to more than 35 countries in Europe, Asia, Africa and America, and by 1978 more than 70 species of freshwater fish had been experimentally grown in cages.

Cage is a very recent introduction as compared to pond farming. Introduced into Bangladesh in the late 1970s on an experimental basis at BAU. DoF conducted a cage culture project in Kaptai lake during 1985–86. CARE/DFID initiated CAGES (Cage Aquaculture for Greater Economic Security) project at the end of 1995 until 2000 . Cages was piloted and introduced in Bangladesh primarily to landless poor with access to lakes, rivers, water canals and seasonal water bodies. During 2008-2010 RU/IC initiated research in small cages in Mahananda river. During 2009-2011, Karitas/BFRF/WorldFish Centre, Bangladesh made cage based research on the production of fry and food fish in ponds by the poor indigenous people. However, cage farming at large scale is also gaining popularity at present. Since 2002 caged farming of Monosex tilapia is operated in Dakatia river under Chandpur district and Meghna river channel under Laxmipur district. RU and SAU initiated cage based reseach in flood plain and haor ecosystem during 2018-2020. Commercial caged fish farming is now found to be operated in rivers/floodplains at different parts of the country.

Considerations for fish farming in cage

Site selection: suitable water flow in river (4-8 inches/second is desirable); closer to locality so as to ensure maximum security; pollution free area; and easy communication so as to facilitate fish marketing.

Cage frames: Major frame types are **wood/bamboo** (cheapest and widely used), **steel/aluminium/iron bar** (expensive), **flexible tube** (expensive); and **plastic pipe** (normally PVC is used, less expensive, used for smaller cages).

Floatation: **Plastic floats**-buoys can be used for smaller floatation requirements; **bamboo**- used if available locally and cheap but tends to absorb water become heavy and require replacement regularly; **drums**- plastic chemical or steel oil drums, widely used, laid horizontal, tied between or below cage frame, reasonable durable, relatively expensive; **polysterene block**- used either uncovered or inside GRP or plastic casings, can be easily positioned in cage framework.

Nets: length range from 3 to 20m, height ranges from 3 to 10 m. High density, low volume cages used for species such as tilapia and common carp in still water have optimal operating volumes of 1-4 m³. Nets should be relatively light, manageable and durable, should not cause damage to the stock through trapping or abrasion.

Mooring systems: typically comprise: **fixing devices**- anchors, blocks or holdfasts such as shore fixing pins; **connecting lines**- combination of chain, cable and rope, sometimes with additional components; **buoys, weights**- to modify the elasticity of the lines; **surface gear**- lines, platforms and or buoys to which individual cages or group of cages can be attached; **connecting gear**- chains, shackles, hinges and links, together with “shock absorbers” such as rubber tires, buoys to limit wear between specific components.

Cage setting: Two types of cages are used- fixed cage (used in shallow water, less expensive) and floating cage (used in deep water, comparatively expensive). Considering the seasonal water depth fluctuation, floating cage is suitable for monsoon and that of fixed cage is suitable for other seasons. Size of the cage depends on the culture type; nature and depth of the waterbody. Size of floating cage in river may be of 6m x 3m x 2m or of 3m x 3m x 2m. Inputs required for setting a floating cage are: main stock net (polyethelene net with a mesh size of 0.025 to 0.75 inches), cover net (to protect the fishes form birds), nylon rope, 2.5 cm GI pipe (70 feet for each cage), drum (with a capacity of 200 litres, weight above 9 kg), anchor, bamboo (to be tied with frame).

Culture type: In case of small scale farming, cage can be used for both nursery rearing (to produce spawn to fry and fry to fingerling) and table fish production. Usually commercial cage fish farming includes the table fish production at high stocking densities.

Species selection: Important considerations are: fast growing, good market demand, high tolerance to fluctuation in temperature and other water quality parameters, habituated to take supplementary feed and easy availability of the fish seeds. Species of carps (IMCs), catfishes, tilapia and silver barbs can be selected for farming in cages.

Stocking density: Density for stocking fishes in cages depends on several factors like species and production target; water depth and current; mesh size of the net; quality and quantity of supplementary feed etc. A stocking density of 30 to 40 fishes per m³ can be used for feed based mono-sex tilapia (initial stocking weight of 25-30g) farming in cages in river.

Feeding: Regular feeding is required as high density is maintained in cage system. Supply of sufficient amount of aquatic plants or weeds are necessary for the production of herbivore fishes. Protein rich supplementary feed for other fishes should be supplied as per requirements (protein content in diet should be 20-25% for carps, 28-30% for tilapia and 35-40% for catfishes).

Fish harvesting: Based on the type and stocking weight of the species, fish production (table fish production) under 2-3 cycles per year can be obtained from cage farming.

Problems reported: Some constraints are identified to promote the cage farming at different regions of the country: lack of quality seed; lack of low cost supplementary feed, management problem due to long distance of the cage area from the residence, lack of interest and therefore lack of care including lack of cooperation during community based farming, fish escape during flood and net cutting by crabs, small size of the cage causing less productivity, poor water quality specially due to jute retting, poor weather and storm, mortality due to disease and parasites, poaching and poisoning.