

Certain aspects of mechanisation in aquaculture

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Introduction:

Aquaculture is generally a rural activity involving the farming of fish, crustaceans, molluscs, aquatic plants under controlled or semi-controlled conditions. Today's aquaculture is diverse and varied; the diversity of aquaculture production is reflected in terms of holding units like ponds, raceways, pens & cages; management levels-like semi-intensive, intensive; monoculture or polyculture of species, static system or flow-through system like that. Whatever it is, aquaculture has been playing a crucial role in the national economy. Fish production in India has increased several folds during the last 50 years compared to capture fisheries and sectors that include terrestrial farmed meat production. Its spectacular growth has been possible mainly because of the sustained application of scientific principles generated through research efforts in various disciplines including seed production, culture technology, fish genetics, nutrition and feeding, disease diagnostics to mention a few and all these led to the high fish production to meet the domestic consumer demand as well as for export augmentation purposes. Currently aquaculture is dealing with multiple species in diverse production environment. Rising demand for aquatic food products and inability to increase the fish catch from capture fishery resources call for steeper increase of aquaculture production in the coming years on a priority basis. The competition for resources, -land, water, essential inputs like feed are continuously changing the context and content of aquaculture sector in the country. The future appears to be highly challenging for the researchers, development agencies, farmers with the task of 'producing more from less for more' and that too emphasising efficient natural resource management. Under such a scenario and also in the context of providing ample livelihood opportunities for rural youths, a viable option is to look for the positive role of mechanisation, wherever possible for further improvement in production, productivity and profitability. Engineering technological inputs in agriculture sector have made remarkable contribution in increasing production through



farm operation. Since so far not much has been done like this in aquaculture, the opportunities in the development are immense to bring about maximum and continuous return.

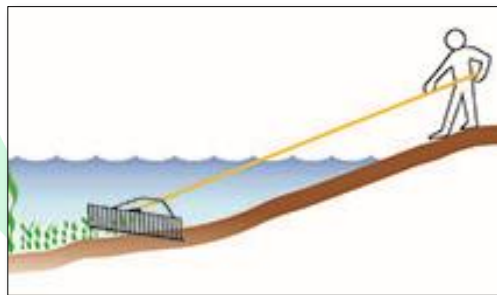
A few areas in aquaculture where mechanisation processes can effectively contribute towards its development are stated as follows.

- 1. Pond Raker:** During fish farming activities, waste material in the form of faecal matter, dead organisms, uneaten feed portions accumulate in pond bottom; through microbial actions, putrefaction may occur resulting in formation of gaseous compounds including hydrogen sulphide form. Such obnoxious chemicals can create a stress condition particularly for bottom dwellers by depletion of dissolved oxygen there. Agitating the pond bottom with a raker will reintroduce oxygen into the pond muck, partially suspend the sediments that will assist in the mineralisation and help in the production of natural fish food organisms, fish will have a better environment that will increase their food utilisation efficiency.
- 2. Lime applicator:** Lime, rate of application of which depends on selected water quality indices particularly, pH of pond water helps fish culture in several ways. Major beneficial effects of lime application are to correct the pH of soil and water, as a disinfectant, mineralisation acceleration, efficient utilisation of applied manure and many others. Lime stone – calcium carbonate, quick lime -calcium oxide, slaked lime, - calcium hydroxide are the various forms of lime. Sometimes along with lime dolomite application is also made. But whatever it is, in a large pond, manual application may not become possible on a regular basis. Use of lime applicator may be a viable option.
- 3. Aerator:** In a pond, dissolved oxygen can change dramatically over a 24-hour period. Generally, oxygen level goes down to a low level very early in the morning while its level becomes high in the afternoon hours. In fish culture operation, dissolved oxygen has to be maintained above the critical levels considered stressful for the cultured species. As a thumb rule, dissolved oxygen level must be maintained above 3 ppm (or 3 mg per lit.) round the clock. Prolonged exposure to low, apparently non-lethal levels of dissolved oxygen constitute a chronic stress and will cause derangement in their feed intake followed by reduction in the ability to convert ingested feed into body flesh

conversion. All these will finally make them susceptible to disease infestation. Maintaining safe levels of dissolved oxygen requires provision of aeration installing an aeration system is, therefore, important.

4. **Mechanical netting:** Intermediate fish netting and final harvesting are essential prerequisites in any fish culture operation. Fish harvesting is generally done in the late night or at dawn. During winter months, it really becomes painful for fishermen to do the netting, again since for a netting to be done at least six people are needed. A mechanical netting which has been developed at CIFA, Bhubaneswar can be an option in the context of manpower shortage.
5. **Cryopreservation of fish sperm in Cryocan:** Cryopreservation is a process wherein cells or tissues are preserved by cooling at sub-zero temperature, typically to -196 degree Celsius to increase the longevity of gametes without any change in the fertilization efficacy. In fish farming, storage of milt can facilitate some of the programmes like selective breeding, commercial seed production, supply of sperm to accredited hatcheries. Successful cryopreservation also offers several benefits such as stock protection from being totally eliminated due to sudden disease outbreak, natural disaster and like that. Use of cryopreservation over non-cryogenic preservation is thus a better option.
6. **Fish tagging:** This is an important tool in the assessment of fish population. This can provide useful information with regard to the movement, seasonal variation, harvest level and mortality rate all of which can lead to healthier fish stock. Generally, tags are inserted into the muscle at the back near the first dorsal fin. Tag readers (Passive Integrated Transponder)
7. **Feed Preparation and Mechanised Feeder:** Fish feed is sharing lion-share of total culture cost around 60%. Fish feed production systems including grinder, mixer, pelletizer, like that. In technological advancement hand feeding technique has been replaced by mechanised feeder (like demand feeder).
8. **Water and soil quality analyser system:** In aquaculture system, maintaining the all water and soil quality parameter (pH, dissolved oxygen, total dissolved solids, ammonia etc) is crucial factor for production. Hence, regular check-up of this parameter provides the information regarding the health of the water body.

All these may not be required simultaneously but application of technology along with traditional knowledge in the farming system would certainly reduce the time and hard work. To begin with some kind of hands-on training may be needed and initial investment will certainly be a point to think of but solar-powered and LED –led systems will be less expensive and hopefully mechanisation in a phased manner will usher a new era in aquaculture in the country.

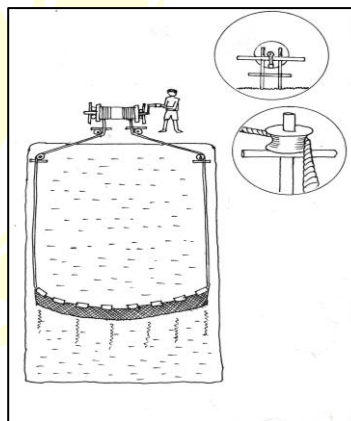


1. Pond Raker

2. Lime Application



3. Aerator



4. Mechanical netting



5. Cryocan



6. Fish



7. Feed Preparation and Mechanised Feeder :



8. Water and soil o