Inland Fisheries– CIFTs Interventions in Harvest sector

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Introduction

Inland fisheries are any activity conducted to extract fish and other aquatic organisms from "inland waters". Inland fisheries serve important economic, cultural, and recreational roles and play a major role in sustainable ecosystem function throughout the world. More than 60 million people in the developing world work with various aspects of inland fisheries. Individuals can relatively easily begin fishing in inland waters because basic equipment needs (e.g., nets, hooks, traps) are generally inexpensive and do not require substantial skill to operate or maintain. Inland fisheries are predominantly small-scale in nature, but large-scale and commercial inland fisheries do make a contribution to livelihoods and food security. Exploitation of fisheries in the inland areas of the country was insignificant in the earlier years where fishing was being conducted purely on a subsistence level. The last few decades have witnessed many technological advances in fishing systems in inland waters.

Technological developments in inland harvest sector

Fish capturing methods are varied in different inland water bodies depending on topography, ecology and habitat of the fishery resources. Unlike marine sector, the extent of suitable technology applications in inland fishery sector is very low and the fisherfolk engaged in small scale fishing in reservoirs, lakes and rivers are in a socio-economically underprivileged condition. ICAR-Central Institute of Fisheries Technology for the last six decades has been engaged in research and development of efficient harvesting systems for inland fishing sector of the India. Appropriate craft designs and improved gear designs been developed and introduced for the inland fisheries. Considering the declining fish production and various environmental impacts associated with fishing, the institute has shifted its focus from increasing catch to responsible and eco-friendly fishing and developing technologies for sustainable harvesting with reduced emissions. The institute is involved in the design and optimization of a range of crafts and gears which has contributed to the advancement in inland harvest sector in the country.

Low cost alternative materials for conventional crafts

Traditionally, wood is used for construction of fishing vessels in India which has become scarce and costlier. Focused attention has been given in identifying alternate materials for fishing vessel construction, in order to reduce the dependence on traditional scarce wood species. Cheaper and readily available cultivated wood species with short life cycle such as rubber wood, fortified with dual preservative treatment using 7.5% ASCU and creosote, has been identified for construction of canoes operated in backwater and coastal fisheries. A number of preservative treated rubber wood canoes have been distributed for field operations by fishermen groups and cooperatives. The cost of the canoe is 35 – 40% less than a canoe of same size built of ‘Anjili’, the usually used wood. This saves the depleting forest wealth, helpsthe rubber farmer to get a better price for his underutilized wood and gives a

durable, maintenance free boat at affordable cost to the poor fisherman especially of the South West and North East where rubber trees are grown. Designs of fiberglass crafts have been developed for operation in inland waters. Fibreglass sheathing as protection against borer attack and biodeterioration and as preventive against environmental pollution while using preservative treated wood in boat construction has been popularized, in traditional sector. Use of Aluminium alloy for construction of inland and coastal fishing craft has been demonstrated. Durability, light weight, corrosion resistance, toughness and resilience, low maintenance and high re-sale value make aluminum alloy a good material for construction of fishing craft.

Treated Rubber Wood Canoe

Rubberwood comes as a by-product from the rubber plantations which can be efficiently utilized for fishing boat construction after upgrading by chemical preservative treatment. The institute has successfully designed and constructed rubberwood canoes treated with dual preservatives and combination treatment technology for marine and brackish water fishing. The cost of the canoe is 35-40% less than a canoe of same size built from wood. It ensures a good market for less utilised rubber wood, fetching good income for the farmer.

Coconut wood canoe

Institute developed technology for effective utilization of coconut wood for canoe construction. The standardised parameters for preservation help to enhance the physical and mechanical properties of the coconut wood. Also helps in the effective utilisation of the old coconut trees which are often discarded. The reduction in cost, when compared to traditional wooden canoes is estimated to be around 30%.

FRP boats

Improved design of FRP boat for backwater fishing was developed and canoes constructed for use in place of wooden canoes which are very costly. Light weight, strength and durability are the main advantage of this material. They also have longer life when compared to traditional wooden canoes. Safe and durable fishing boats of Fibre Reinforced plastics (FRP) following scientific designs and making use of Nano-Resin technology were developed. FRP sheathed rubber wood canoes (both treated and untreated) were also constructed which were found to be in sound condition even after 26 and 16 months field operation respectively.

FRP coracle

ICAR-CIFT has been instrumental in developing and improving fishing techniques in reservoirs. Traditionally they are made of a split bamboo frame covered with either few animal hides or plastic sheets and is tarred to make it waterproof. Apart from being simple and inexpensive, coracle has very good manoeuvrability in waters. Traditional coracles are less durable and require frequent maintenance also. FRP coracles which are safe, cheaper and durable following scientific designs for reservoir fishing were developed by the institute. Improvements in FRP coracle such as Marine Grade FRPs for better longevity, design upgradations were made over the years.

Solar powered boat

The increasing fuel cost causes substantial financial burden to fishers. Taking this to account, ICAR-CIFT designed and introduced a multipurpose solar powered boat suitable for inland water bodies including aqua farms to promote the renewable energy utilization. Solar powered boat can be used for gillnetting, lining and recreational fishing. The boat is capable of running for 2.5-3hrs after complete charging and attains a speed of nearly 4 knots in calm waters. The twin hull construction gives high stability during the fishing activities and deck area is wider compared to a similar sized conventional boat. The navigational lights are also run by the solar power produced which is an additional feature compared to traditional boats which facilitates safe fishing during early morning and late night. Though this boat is two times costlier than the conventional boat, due to the cost of photovoltaic cells, battery bank and control system, it is compensated by minimum operational and maintenance cost.

Design modifications and optimization of fishing gears

Introduction of modern gear materials, have directly influenced and brought about important changes in the design, dimensions and method of handling fishing gears. Extensive use of synthetic materials like polyamide, polyethylene and polypropylene have perceived in 1960s which created a revolution in fabrication of fishing gears. Today, the entire fisheries sector uses only synthetic fibers for gears especially the polyamide monofilaments. The efficiency of fishing gears are influenced by factors such as mesh size, colour, fishing height, hanging ratio, yarn/twine diameter and gear material. Improvements /design modifications as well as optimum mesh parameters will help to reduce overexploitation and capture of juveniles and bycatch to a minimum. Technological interventions are made by the institute for optimization and improving the catch efficiency of the fishing gears.

Gillnets

Gill nets are the predominant fishing gear in inland fishing. The simplicity of its design, fabrication and low manpower and energy requirement for operation make gillnets very popular especially in the inland sector. By the 1950s, the material substitution by synthetic fibres revolutionized the gillnet sector. Over the years, many need based changes have taken place in gillnets with respect to the material used, dimensions, net design, mesh sizes, mode of operation. ICAR-CIFT has conducted extensive research to improve the design and operational parameters to make gillnet efficient for inland waters. Optimization in the mesh sizes, hanging ratio, introduction of suitable materials with specific characteristics like thickness, colour were developed. Optimum mesh size for the sustainable harvest of major fisheries resources in reservoirs were also estimated. Frame nets and trammel nets were also introduced in reservoirs which are observed to be efficient where the fish population is sparse and comprising of large size groups.

Pots and Traps

Various indigenous pots and traps are operational in the inland waters of the country. Traditional traps made of natural materials have intrinsic limitations such as a short life span, bulkiness, and inability to be stacked among others. Comparative studies demonstrate that indigenous traps are less effective than modern, species-specific traps. ICAR-CIFT has

contributed significantly to the documentation and development of different species-specific traps designs. Collapsible fish traps, ring traps, are some of the trap designs developed and popularized. ICAR-CIFT has designed and developed two different designs of innovative collapsible fish trap with dimensions of 1 m ×0.6 m ×0.6m &1.5 m x 0.8 m for fishing along the backwaters. HDPE webbing of 80mm mesh size rigged with iron bar as frame was used and two funnels measuring 35cm Ø were attached both the sides to allow fish to enter. These traps were supplied to the traditional fishermen and experimental trials were conducted along backwaters of Kerala. The design is simple and 40% lighter in weight when compared to the conventional traps. Durability of the trap is 3-4 times more than the conventional traps.

Stake nets/bagnets

The stake nets are widely operated in the estuaries and backwaters of Kerala. ICAR-CIFT has documented the design of stake nets along Cochin coast and catch composition in relationship with lunar cycle and tidal variations. The findings from the research recommended the minimum mesh sizes to protect juveniles of shrimps. To tackle bycatch issues in Hooghly riverine systems, square mesh windows were introduced in the bagnets. The invention has facilitated the escape of juvenile hilsa, *Tenualosa ilisha* and many fast swimming fishes to achieve sustainability.

Biofouling resistant polyethylene cage aquaculture nettings

Fish cage culture is currently regarded as an important method for increasing the productivity of inland waters. In cage culture, however, fouling and the associated reduction in water exchange is a common issue. Biofouling in aquaculture cage nets causes occlusion of mesh openings, thereby increasing weight and drag, deformation of cages due to the ensuing stress, reduction of volume, thereby decreased stocking density per area, anoxic condition due to disruption of dissolved oxygen flow, blocking of food waste diffusion, restriction of water exchange, increased hydrodynamic force, all of which adversely impacted fish health. It has been reported that removal of fouling from a cage net costs 25% of the total project budget. Cages are fabricated mainly with high density netting whose nonpolar nature makes incorporation of antifouling biocides difficult. The surface of polyethylene needs to be modified to develop strategies against fouling. The novel approach employed by ICAR-CIFT was to synthesise a coating of polar or conducting molecule over non-polar polyethylene to incorporate antifouling biocides thereby rendering protection to protect the polyethylene aquaculture cage nets from biofouling. In addition to fouling control, proper netting materials for cage construction, optimal mesh size, etc. were also recommended.