

# Evolution of Fisheries and Aquaculture in India



**N.G.K. Pillai & Pradeep K. Katiha**

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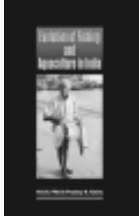
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## **Evolution of Fisheries and Aquaculture in India**

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## Prioritization of technologies to benefit poor households

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An exercise was conducted to identify and finalise the criteria and key indicators for prioritising aquaculture technologies and fishing practices for the poor. The criteria, key indicators and respective weights are given in Table 77. These are according to their respective importance to benefit and uplift the poor fishers. The results of prioritisation exercise for aquaculture technologies and fishing practices in various aquatic eco-systems and post-harvest technologies are given below. The methodology adopted to prioritize and rank the technologies is as follows:

$$TWR = \sum_{i=1} \sum_{j=1} W_i R_{ij}$$

Where  $W_i$  is Weight to  $i^{\text{th}}$  indicator

$R_{ij}$  is the rank of  $j^{\text{th}}$  technology and  $i^{\text{th}}$  indicator

TWR is the total weighted rank

The TWR is arranged in descending order and is ranked in numerical order.

### Freshwater aquaculture

Freshwater aquaculture is recognised as one of the most potential sector for enhancing fish production in India. Under this sector 17 technologies were identified and prioritised (Table 78). The extensive polyculture of Indian major carps ranked the highest followed by semi-intensive polyculture of IMC and other minor carps in sewage-fed waters. The third was integrated-semi-intensive polyculture followed by extensive polyculture of catfishes particularly air-breathing and semi-intensive polyculture of IMC. Most of intensive technologies involving monoculture ranked low as they require high investment, involve less diversification, equity issues for poor fishers and face high risk.

**Table 77.** The criteria, indicators and weight assigned to different indicators for prioritization of technologies

Criteria	Aquaculture	Weight	Fishing practices	Weight	Post-harvest	Weight
Efficiency	Gross return/ total cost	12	Gross Return/ total cost	10	Gross Return/ total cost	15
	Operational cost/ kg fish produced	12	Operational cost/ kg fish caught	10	Minimum loss during processing (%)	10
	Vulnerability to natural hazard and diseases (score)	6	Adverse effect on catch of poor fishers: Rank 1-9	5		
	Total	30	Total	25	Total	25
Food/ nutrition security	Retail price of fish produced through the technology	7.5	Retail price of fish caught through the technology	6	Retail price of the processed product through the technology	8
	Share (qty) of the fish produced in the system to poor's fish consumption (%).	7.5	Share (qty) of the fish caught by the tech. to poor's fish consumption (%)	9	Share (qty) of the processed products by the tech. to poor's fish consumption (%)	8
					Food safety – scoring (lesser weight - 2:2:1)	4
	Total	15	Total	15	Total	20
Employment	Labor factor share (%).	8	Labor factor share (%)	10	Labor factor share (%).	10
	No. of jobs generated (Man-days / \$100 invested, or scoring)	8	No. of jobs generated (Man-days / \$100 invested, or scoring)	10	No. of jobs generated (Man-days/ \$100 invested, or scoring)	10
	Higher share of women in the total employment (% or scoring)	4			Higher share of women in the total employment (% or scoring)	5
	Total	20	Total	20	Total	25

*Contd.*

Environment	Degree of waste discharge (scoring)	5	Adverse impact on biomass: Rank 1-9 (including by catch)	10	Impact on environment (waste coming from post harvest) – scoring	15
	Risk of disease spreading	5	Adverse impact on ecosystem: Rank 1-9	5		
	Adverse impact on biodiversity (scoring) Rank 1-9	5				
	Total	15	Total	15		
Acceptability (by poor)	Low investment need (total fixed + operational capital, \$ for Minimum Initial Scale; or scoring)	6	Low Investment need (total fixed + operational capital, \$ for Minimum Initial Scale; or scoring)	7	Low Investment need (total fixed + operational capital, \$ for Minimum Initial Scale; or scoring)	4
	Simplicity of technology: Rank 1-9	6	Simplicity of technology: Rank 1-9	7	Simplicity of technology: Rank 1-9	4
	Social, cultural & legal acceptability: Rank 1-9	4	Social, cultural & legal acceptability: Rank 1-9	6	Social, cultural & legal acceptability: Rank 1-9	2
	Compatibility with natural resources endowment accessible to poor Rank 1-9:	4	Promotion of community participation (Scoring)	5	Utilization of locally available raw materials (fish) – scoring	5
	Total	20	Total	25	Total	15

Source: Survey under the project.

**Table 78.** Prioritization for freshwater aquaculture technologies

Technology	Species	Rank
Polyculture Extensive	Indian major carps, <i>Catla catla</i> , <i>Labeo rohita</i> , <i>Cirrhinus mrigala</i>	1
Sewage fed Semi-intensive	Indian major carps, <i>Catla catla</i> , <i>Labeo rohita</i> , <i>Cirrhinus mrigala</i> with minor carps	2
Integrated-semi-intensive	IMC	3
Poly culture Extensive	IMC, Catfish	4
Polyculture Semi-intensive	IMC, Catfish	5
Rice farming monoculture extensive	Carps	6
Rice farming polyculture extensive	IMC Prawn	7
Rice farming monoculture intensive	IMC, Catfish, Chinese carp, common carp	8
Polyculture Extensive	Prawn, IMC	9
Polyculture Semi-intensive	Catfish, IMC	10
Poly culture Sewage fed Semi-intensive	Prawn, IMC	10
Mono culture Intensive	IMC	11
Polyculture Intensive	IMC	12
Mono culture Semi-intensive	Prawn	13
Mono culture Semi-intensive	Catfish	14
Mono culture Semi-intensive	Pearl	15
Mono culture Intensive	Catfish	16
Mono culture Intensive	Prawn	17

Source : Survey under the project

## Fishing practices - Inland

The fishing practices for capture, culture-based and culture fisheries in Indian rivers, reservoirs, floodplain wetland, ponds and tanks are considered simultaneously (Table 79). In most of the waters, only indigenous/traditional wooden or tin country boat was prevalent. Therefore, the craft-gear combination included only this type of boat. Among the gears, gill net was ranked first due to comparatively easy operation and selectivity. Similarly, cast net and hook and line ranked second.

**Table 79.** Prioritization of inland fishing practices

Resource	Type of craft	Type of gear	Rank
Inland	Indigenous / Traditional craft	Gill net	1
	Indigenous / Traditional craft	Cast net	2
	Indigenous / Traditional craft	Hook and line	3
	Indigenous / Traditional craft	Trap	4
	Indigenous / Traditional craft	Drag net	5
Brackishwater	Canoe, Plank built boat	Gill Net	1
	Canoe, Plank built boat	Cast Net	2
	Canoe	Stake Net	3

In brackishwaters, plank built boats and canoes were very common alongwith gear combination of three gears (Table 79). These are considered for prioritisation. The gill net ranked highest followed by cast and stake net. The prioritised fishing practices for the brackishwater were almost the same as for the inland sector.

### Culture-based fisheries

India is endowed with vast inland open waters in the form of reservoirs, lakes, floodplain wetlands, etc. These waters are well suited for culture-based fisheries enhancements. The process of development of culture based technologies has already started in India. It is primarily limited to stocking enhancements. These enhancements can be taken up in small reservoirs, accounting for nearly 47% of the area. It is recognised as the priority sector in X Five Year Plan also. Thus, the culture-based fisheries enhancements are high priority technology benefitting the rural poor fishers.

### Brackish and Marine

#### Aquaculture

The aquaculture technologies for brackish water and marine waters are prioritised simultaneously, considering almost same area of distribution for these waters and almost same clientele. The extensive mud crab fattening in the brackishwater ranked the highest followed by extensive farming of mussel and extensive brackishwater culture of shrimp (Table 80). Similar to freshwater aquaculture, the technologies with higher intensity culture ranked low primarily due to higher investments.

**Table 80.** Prioritization of brackishwater aquaculture and mariculture technologies

Technology	Species	Rank
Brackishwater extensive	Crab fattening	1
Mariculture extensive	Mussel	2
Brackishwater extensive	Shrimp	3
Mariculture extensive	Seaweed	4
Brackishwater extensive	Fin fish culture	5
Brackishwater extensive	Edible oyster	6
Mariculture extensive	Pearl oyster	7
Brackishwater improved extensive	Shrimp	8
Brackishwater semi-intensive	Shrimp	9

Source: Survey under the project.



## Fishing practices - Marine

**Table 81.** Prioritization of marine fishing practices

Type of craft	Type of gear	Rank
<b>Non-motorized</b>		
Canoe, Plank built boat	Gill net	1
Canoe, Plank built boat	Hook and line	2
Canoe, Plank built boat	Cast net	3
Canoe, Plank built boat	Beach seine	4
Canoe, Plank built boat	Shellfish and seaweed collection	5
Canoe, Plank built boat	Trap	6
<b>Motorized Small Scale</b>		
Plank built boat / Beach landing craft	Gill net	1
Plank built boat / Beach landing craft	Hook and line	1
Plank built boat / Beach landing craft	Ring seines or Ring nets	2
Plank built boat / Beach landing craft	Mini Trawl	3
<b>Commercial</b>		
mechanised boat	Gill net	1
mechanised boat	Hook and line	2
mechanised boat	Pole and line	3
Plank built with 2-3 OB engines	Ring seine	4
Mechanised boat	Trawl	5
Mechanised boat	Purse seine	6
mechanised boat	Do/net or Set bagnet	7

Source: Survey under the project.

### Non- motorised

The canoe and plank built boats (non-motorised crafts) were prioritised with different gears. Gill net ranked the highest followed by hook and line and cast net (Table 81). The destructive fishing practices received the low ranking.

### Motorised

The motorised category was further classified into small scale and commercial as per the depth of operation, resources targeted, and the level of resource exploitation, *i.e.* inshore/offshore, and pelagic/demersal.

### Small scale

Under small scale fishing sector, plank built / beach landing crafts are the most prevalent. These are operated in all the craft gear combinations. Low energy gears got the highest priority, *i.e.* gill net and hook and line.

Comparatively high energy gears like ring seines and mini trawls got low priority.

### Commercial

In the case of commercial sector, mechanised boats with inbuilt engines were prominent for most of the gears, except the plank built boat with outboard engine (2-3) in combination with ring seine. In this case also, gill net ranked the best followed by hook and line, pole and line, ring seine, trawl, purse seine and *do/or* set bag net.

### Artificial fish habitats (AFH) technology

Artificial fish habitats to attract and aggregate finfishes and shellfishes in the coastal waters are becoming increasingly popular among the artisanal fishers, as a way of getting better catches. Therefore, it may also be considered as a high priority technology for poor coastal fishers.

### Post-harvest

The prioritisation of post-harvest technologies includes both traditional and modern technologies. The technologies ranked high included drying, processing of fish products, salting and drying, boiling, drying and smoking (Table 82). Most of the traditional processing technologies ranked higher. It may be due to low investment, simplicity and availability of raw material.

**Table 82.** Prioritization of post-harvest technologies

Technology	Rank
Drying	1
Processing of fish products	2
Salting & Drying	3
Boiling, Drying and smoking	4
Icing	5
Electrical & Solar Drying	6
Chilling	7
Freezing	8
Processing of Sea-weed products,	9
Canning	10
Fish meal processing	11

Source: Survey under the project

