SMALL-SCALE INLAND FISHERIES: AN ANSWER TO LIVELIHOOD AND NUTRITIONAL SECURITY IN INDIA

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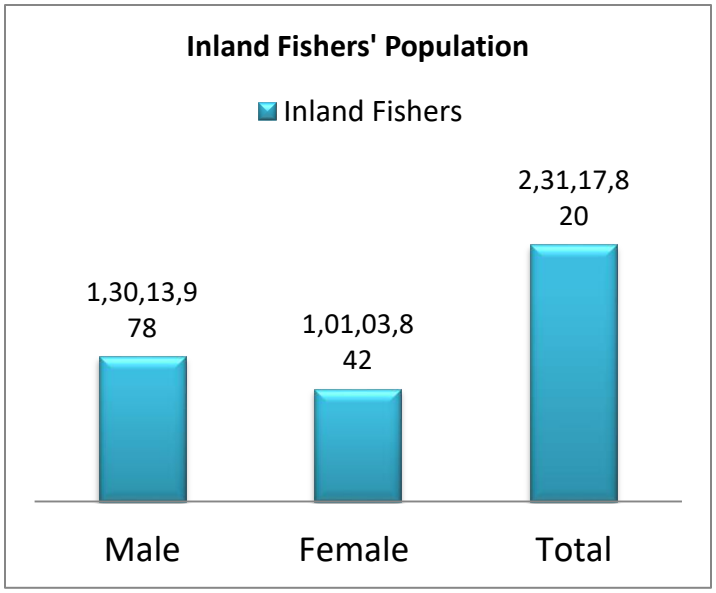
Inland fisheries resources are abundant and diverse in India including rivers, canals, ponds, lakes, reservoirs, upland lakes, and floodplain wetlands that support livelihoods, income, and nutrition of people from time immemorial. About, 1,95,210 km of rivers and canals, 3.54 million hectares of minor and major reservoirs, 2.4 million hectares of ponds and lakes, and approximately 0.8 million hectares of floodplain lakes and abandoned water bodies make up India's freshwater resources. Over one billion people worldwide rely on fisheries as a food source and as a vital component of their livelihoods as per FAO (2015) report inland fisheries account for about 15% of all global employment. In India, inland fisheries are considered as the sunrise fisheries sector contributing about 1.24% to National Gross Value Added (GVA) and 7.28 % to agricultural GVA (2015-16). In our country, about 2.31.17, 820 people are involved in inland fisheries out of which 43.7% are women (Handbook of fisheries statistics, 2020). In India, overall fish production from the inland capture sector is at 1.46 million tonnes (FAO 2020), majority (nearly100%) of which come from the



small-scale sector. The inland fisheries sector in India is dominated by small scale fisheries, characterized by highly diverse fisheries operations, seasonally and geographically. The small-scale artisanal fisheries are dominated by fishers mainly belonging to the fisherman community. These fisherman communities are one of the poorest and most unorganized communities in India (Sharma and Chandra, 2015).

Fisheries as a part of Indian ethos

Fish and fisheries have long been a part of Indian culture, as evidenced by the abundance of stories and allusions to fish and fisheries in the country's ancient scriptures, legends, and epics. In Indian mythology, Lord Vishnu has assumed the form of an "Avatara" whenever the universe has been in upheaval, and "Matsya" (Fish) was the first of Lord Vishnu's ten major avatars to save the first man, "Manu." The great epic ‘Mahabharata’ was written by Veda Vyasa, who was a son of a fisherwoman. In India, particularly in eastern and southern India, fish and fisheries have a long history and tradition (Hora, 1951). There are numerous tales, including "Kavya" and "Poetry," that mention open-water fisheries. We also learn the name and preparation methods for different kinds of fish, such as "Manasa Mangal Kabya."

Characteristics of inland fisheries in India

In India, small-scale fisheries are not formally defined. The United Nations Food and Agricultural Organization (FAO) has defined small-scale fisheries as those where there is less use of capital and energy, use of small fishing vessels, and more use of household labour, and the harvest is primarily used for local consumption or sold in local markets. In India, as inland open-water fisheries require less time and money, it is regarded as small-scale fisheries (Debroy et al., 2021; Roy et al., 2022).

Fisheries in India are divided into freshwater aquaculture, brackish water aquaculture, the post-harvest industry, and marine fisheries, including island fisheries and mariculture. Inland fisheries include riverine fisheries, reservoir fisheries, lake fisheries, wetland fisheries, estuarine fisheries, and ornamental and recreational fisheries. Depending on the location and context, SSF in each of these categorized sectors takes on its own characteristics.

Inland fisheries sector in India is either private, community-based, or cooperative. The country's inland small-scale fishing sector is severely unorganized, with a limited data source. There is no solid information on the number of fishermen involved in small-scale inland fisheries in the country and no information on the sector's employment and livelihood, as well as fisherman's earnings. There is a scarcity of data on small-scale fish farming and its percentage contribution to local consumption and commercial purposes.

Table 1: The characteristics of small-scale and large-scale inland fisheries

Characteristics	Small-Scale	Large-scale
Size of fishing vessel/engine	Non-motorized Small 3-7m <12 m	Motorized Large with high horse power engine
Type of craft/Vessel	Wooden boats, canoes, coracles, dingi	Trawlers, Big wooden motorized boats with deck
Fishing area/ground	Rivers, lakes, wetlands, creeks, channels, small reservoirs	Estuarine fisheries Cage culture in reservoirs
Fishing unit	Individual/ Family members/Small community group	Smaller to larger groups with specialized division of labour
Ownership	Craft/gear owner operated	Trawler or motorized boat owner, usually non-operators; share or cooperative ownership
Time/ Employment	Usually part time/ Seasonal	Full time/ seasonal

Catch Disposal	Local market, Farmgate sale and household consumption	Sale to organized market
Utilization of catch	Fresh consumption	For consumption, Commercial dry fish production, fish meal
Technology/Knowledge	Traditional knowledge, Scientific management	Experience, manual and mechanized gears, motorized boats, Cage technology, Scientific knowledge
Factors of production	Labour intensive	Labour and capital intensive
Benefits	Direct consumption Income	Income, Profit and Tax

Sustainable Development Goals (SDGs) -Inland fisheries

In 2015, more than 190 world leaders committed to 17 Sustainable Development Goals (SDGs) - Inland fisheries can contribute to accomplishing six goals in a sustainable manner which will help to achieve a more prosperous, equitable, and sustainable world. Fisheries and aquaculture provide many opportunities to lessen poverty, increase economic growth, improve nutrition, reduce hunger, and make better use of natural resources.

Goal 1: Eradication of poverty: The livelihoods of the vulnerable group of underprivileged fishers are supported by inland fisheries.

Goal 2: Zero hunger: The issue of food security is addressed by inland fisheries.

Goal 3: Good health and well-being: Inland fisheries provide high micronutrients and protein-rich food that promotes health and well-being. In India, the majority (90%) of inland fish caught, goes for local consumption.

Goal 5: Gender equality: Though inland fisheries management we can empower women and contribute to gender equity; however, women's role has largely been unrecognized

Goal 8: Decent work and economic growth: In India, the primary sector of inland fisheries employs nearly 14 million people.

SDG 14, Life below water: An essential component of a healthy aquatic ecosystem is inland fisheries. The objective can be achieved by incorporating the ecosystem approach into the management of inland fisheries.

Factors, contrivance, and consequence influence inland fisheries sustainability

Inland fisheries are significantly impacted and changed as nations develop their land and water resources for agriculture. They are facing increasing pressure and risks as a result of the significant changes to the aquatic environment caused by human activities like damming, navigation, wetland reclamation for agriculture, urbanisation, water extraction, waste disposal, and transport. And this needs to be addressed right away.

Table 2: Factors that influence inland fisheries sustainability

Factor	Contrivance	Consequence	Way out
Demand	Demand for Income Demand for food	Over-fishing Exploitation of open water resources Excessive fishing pressure	Demand is relative dependent on human population and which is not in control of the fisheries sector
Natural factor: direct actor that influence inland fisheries			
Climate change	Drought; shift in seasons(prolong dry spell/ erratic rainfall)flood and extreme climatic events,	Decline in fish production; breeding failure; increased abundance, introduction invasive species, siltation etc	Man is still helpless in face of nature. Mitigation and adaptive strategies can be taken up like- Climate resilient net pen-culture in wetlands, changing in water extraction policies etc
Human, social and factors: *direct actor that influence inland fisheries*			
Damming for Hydropower	Dam mining for hydropower or for	Interrupt the migration path ways of fishes	Environmental flow studies

	irrigation purpose	present in the rivers, disrupt natural flow which alters the natural spawning ground of the fishes, siltation in riverine resources	
Industrial influence	Pollution due to industrial waste Water abstraction	Habitat degradation persuades loss of bio-diversity	Checkpoint for effluent discharge, control sewage discharge
Agricultural impact	Water abstraction Pesticide pollution Eutrophication	Less water is available for fish; natural habitat destruction for fish and other aquatic organisms and extinction of many Small Indigenous Fish Species	Appropriate land-water use policy
Encroachment	Inland water resources are often encroached by agricultural activities, human settlements and commercial activities	biodiversity loss, rapid aging extinction or invaluable resource	Appropriate land-water use policy
Lack of access and control over inland resources	Fisher's traditional use of resources often not recognized by others who want to utilize the resource	Water used by other agencies, loss of biodiversity , habitat degradation, loss of income of the fishers	Legal acknowledgment of traditional property rights
Governance and Management factors: direct actors that influences inland fisheries			
Production enhancement	Introduction of alien species through stocking/ ranching	Increases production , but may cause genetic contamination, damage to existing fish stock	Follow the accepted guidelines for stocking and introduction of species
Unregulated fishing	Use of destructive fishing gears	Over-exploitation	Mesh-size regulation, fish sanctuary, regulation on destructive fishing gears

Source: Das et al, 2022

Fish and Inland fisheries

Out of the 30,700 fish species that have been recorded worldwide, 930 fish species, representing 326 genera, are present in the inland water bodies of India. The Gangetic Carps or Indian Major Carps (IMC) are native to the Indus-Ganges River Systems and the Indo-Gangetic Plains of India, and the IMC include the catla (*Labeo catla*), rohu (*Labeo rohita*), and mrigal (*Cirrhinus mrigala*), which account for 60% of the production of all carps. The major carps - the catla, rohu, and the mrigal, contributes 5.96 million tonnes in production, followed by the minor carps (0.489MT), exotic carps (9.81MT), murrels-*Channa sp*. (2.01MT), and catfishes, primarily *Wallago attu* and pangas (4.32MT). The most widely cultured freshwater fish are Indian Major Carps, which account for over 85% of all aquacultured fish, followed by exotic carps, minor carps, catfish, and trout. Of the 266 carp species found in the Indian region, about 34 are economically significant and are primarily produced through capture fisheries. Less than 10 carp species are produced in the nation through both culture and capture fisheries. Silver carp, grass carp, and common carp are examples of exotic carp. There are also smaller carps, known as minor carps which includes the reba (*Cirrhinus reba*), the bata (*Labeo bata*), the fringe-lipped carp (*Labeo fimbriatus*), the calbasu (*Labeo calbasu*), the white carp (*Cirrhinus cirrhosus*), and the Cauvery carp (*Labeo kontius*).

Small Indigenous Fish Species (SIFS) are also available in abundance in inland waters *viz.* floodplains, lakes, beels, streams, lowland areas, wetlands, paddy fields, ponds, and tanks. About 1035 native freshwater fish species, 450 are SIFs. The country's north-eastern region has the highest diversity of SIFs in freshwaters, followed by the Western Ghats and Central India and about 23% (104 SIF species) are very important as food fish and have other local significance as well as important for the aquarium trade and for providing livelihood and nutritional security.

Inland fisheries for livelihood and nutritional security

Small-scale inland fisheries play a fundamental role in sustaining the livelihoods of millions of the rural poor, providing food and nutritional security and opportunities for diverse categories of income and employment generation (Chandra and Das 2019). Most of these fishers are living preferably in the surrounding of water bodies in remote rural areas of India. The socio-economic condition of these fishers is poor to marginalized with low standard of living condition.

Employment: In India, a total of 2,31,17,820 fishers, fish farmers and fish workers are the majority engaged in small-scale fishing to earn their livelihoods. It employs many people due to its labor-intensive nature. Inland fisheries are typically a seasonal activity, so people can participate in small-scale inland fisheries activities occasionally or on a part-time basis.

Income: Small-scale inland fishers in the country has low-income venture with average income of Rs. 30690.96 per fisher per year (Sharma et al., 2013). Fishing households receive cash income from inland fisheries. The fishermen sell between 75 and 90 percent of their catch, which helps them to make money that they can use to buy things like food, clothing, health care, and education. As a result, fishermen have the chance to invest their cash earnings in other assets, such as live livestock and gear, to create sustainable means of subsistence.

Poverty alleviation: Inland fisheries can be a vehicle for poverty alleviation. Poverty alleviation has two components: Poverty reduction and poverty prevention. Inland open-water fisheries are almost synonymous with small-scale fisheries and have the ability to generate wealth and capital, which helps people to lift out of poverty. That means inland fisheries can help in poverty reduction through - wealth generation at the family unit or household level and economic growth at the community or country level. On the other hand, inland fisheries activities can help people to maintain a minimum standard of living, reduce risk and act as a safety net. In fact, inland fisheries have a crucial role in poverty prevention.

Inland fisheries to household poverty alleviation

Millions of people engaged in inland fisheries activities as a part of a multiple-activity livelihood strategy. It is a driver of poverty reduction in rural India. It helps to build nexus of sales, business, income, employment consequently helping in poverty alleviation.

Inland fisheries to economic growth at the national level

Fisheries in India provide employment to 14.5 million people in India and contribute 1.07% towards the total GDP of the Nation. Inland fisheries have relative advantage over large-scale industrial fisheries in terms of social, cultural, economic and environmental. Even though the data available at the national level is not separate the contribution of inland open water fisheries, but it's a matter of fact that at the national level, inland fisheries can contribute in three main ways – by multiplying GDP effect; by generating revenue and by generating foreign exchange. The inland sector's economic output provides vital contributions to poverty alleviation and food security by generating income and employment. It also supports the livelihood of the rural masses and contributes to food security through direct consumption (subsistence). The harvest being a cash crop, act as a safety net for the populace.

Small-scale inland fisheries can play a crucial role in creating income and employment opportunities in far-flung rural and can contribute to building up the livelihoods of the populace's cash-income generation.

Nutritional security: Fish plays an important role in meeting the protein requirement and therefore ensuring the nutritional security of the country due to its high protein, essential amino acids, vitamins, minerals and other essential fatty acid content; making it the "nature's superfood. In low-income countries like India, carbohydrate-based staple food such as rice,

wheat, maize and millets are consumed by people, which are sources of energy. However, some micronutrients and vitamins are absent in these staple food, and the deficiency of such nutrients may be fulfilled by fish.

Natural freshwater bodies like wetlands, canals, lakes, and rivers are rich in fish biodiversity including the Small Indigenous Species (SIS) which are also known as 'Nutrifish' and are rich in minerals and vitamins (Mohanty et al., 2019).

Our country is facing massive challenges to deal with the 'hidden hunger' of the vulnerable populace. In spite of, several nutritional interventions at the community level, undernourishment remains a public health issue. Inclusion of nutrition-rich Small Indigenous Fish in the daily diet through different Government schemes may help our country to accomplish wholesome human nutrition (Roy et al., 2020).

***Voluntary Guidelines for* Small-scale fisheries**

Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication, in short, the SSF Guidelines (FAO, 2015), beyond fisheries, emphasize the rights of fishermen and fish workers. Overall, they are not just about fish but also about people. All the stakeholders working to protect sustainable small-scale fisheries, eradicate poverty and hunger, and human rights can be addressed by the SSF Guidelines. These guidelines can be served as a tool to direct discussion, policy-making, and action at all scales, from small communities to international fora. The SSF Guidelines, which are supported by a human rights-based perspective, are an essential tool for enabling small-scale fishing communities, including marginalised and vulnerable groups, to participate in decision-making and take on responsibility for the sustainable use of fishery resources. These Guidelines are based on international human rights standards. SSF guidelines have thirteen guiding principles: 1. Human rights and dignity 2.

Respect for cultures 3. Non-discrimination 4. Gender equality and equity 5.Equity and equality 6. Consultation and participation 7. Rule of law 8. Transparency 9. Accountability, 10. Economic, social and environmental sustainability, 11. Holistic and integrated approaches 12. Social responsibility 13. Feasibility and social and economic viability. India, being a signatory country has the moral duty to implement the SSF guidelines in the inland fisheries sector.

Table 3: SSF guidelines and issues related to SSF in India

SSF guideline section	Issues related to SSF in Indian
Governance of tenure in small-scale fisheries and resource management	The purpose of these guidelines is to address the need for responsible and sustainable use of aquatic biodiversity and natural resources satisfy the developmental and environmental needs of current and future generations. The inland fishery resources are sometimes governed by the big players and that caused limited access or control over fisheries resources. In India, the major reservoirs of Maharashtra has leased in by the giant players and that is hampering the sustainable use of resources and the maintenance of the ecological foundation. Women often do not get membership in Fishermen's Cooperative Societies
Social development, employment and decent work	The literacy rate among fishermen is not very encouraging; it is lower than the country's overall literacy rate i.e. 74.04 percent. Example, in lower Gangetic wetlands the average literacy rate of the fisherfolk community is 68%. The monthly income for wetland fishermen is Rs. 5799. The fishermen who work in canal fisheries make a monthly income of Rs. 2500, and in most of cases it is their part time occupation. The fishermen also fish for their subsistence.
Value Chain and post-harvest trade	Markets and auction yards are dominated by men. In post harvest sector, particularly is dry fish industries, women play significant role often paid less wages than men. In Indian Sundarbans the women dry fish workers are getting 15-20% less wages than men.
Gender equality	No policy for gender equity and equality particularly for fisher-women of Sundarbans. Women labour in a fisher

	household is often not accounted (Williams2015).
Disaster risks and climate change	Climate change is adversely affecting the small-scale fisheries. Small-scale fishing communities on small islands of Indian Sundarbans, where climate change may have particular implications for food security, should be supported.
Policy coherence, institutional coordination, and collaboration	No specific policy for the small-scale fishers is exist
Capacity development	Training programmes organized for Small Scale Fisheries management or development are inadequate in numbers
Information, research, and communication and implementation support and monitoring	Importance of communication and information should be recognized as it is necessary for effective decision making.

Existing schemes or policies in India

The 2018 Committee for Doubling Farmers' Income emphasised the need for a shift away from field crops and toward other allied sectors, with a focus on fisheries as the allied sector with the highest returns. Through the Blue Revolution Scheme, Rs. 3000 Crores were allotted for the sector's development in 2015–16. The Fisheries and Aquaculture Infrastructure Development Fund (FIDF) allocated Rs. 7522 Crores in 2018–19, and in 2020–21 the Pradhan Mantri Matsya Sampada Yojana was introduced for the sector's all-around development and with the allotment of Rs. 20050 Crores. The key reforms and initiatives under PMMSY have enhanced investment in the value chain; technology infusion; policy support; financial inclusion; productive utilization of land and water alternative livelihood and entrepreneurship.

Constraints and challenges faced by SSF

There are many socio-economic challenges and constraints faced by small scale fishers. Some of them are given as under

- Unequal power relation to other sectors in terms of socio- economy-political space
- Scattered distribution, diverse management regime, & weak governance

- Lack of credit support
- Weak or defunct Cooperative societies
- Competition for lease of water bodies between fishermen and contractors in some of the states
- Lack of alternative livelihood
- Declining share of fishers in consumer rupee
- Access to higher education and basic healthcare

Way forward

- Strengthening of Primary Fisheries Cooperative Societies is required to promote equal rights to fishers
- Maintaining the sustainability of the fisheries resources: rational exploitations of the water bodies and avoid over-exploitation
- Generating wealth and alternative livelihoods: greater control over the systems and prescribe for strong regulatory regimes
- Recognize the role of SSFs communities and indigenous peoples to restore, conserve, protect and co-manage local aquatic and coastal ecosystems
- Consultation and participation: ensuring active, free, effective, meaningful and informed participation of small-scale fishing communities in the whole decision-making process related to fishery resources affecting their livelihood options

- Conflicts resolution mechanisms: As the fisheries suffering from multi-dimensional conflicts, there is a need to develop an effective and credible conflict resolution mechanism for sustaining the livelihood of small-scale fishers
- Effective mechanism to document the fish catch by individual fishers and maintenance depicting the group/category-wise catch of SIF is suggested for estimating the actual fish production. The fish used for domestic consumption/hidden harvest must also be systematically recorded. Development and application of mobile applications may help to directly monitor and estimate the SIF catch.
- Overfishing and the use of destructive fishing gear should be strictly prohibited and public awareness among the local community can be effective measures for enhancing the SIF population as well as restoration of native small fish stock.
- Small indigenous fishes, the most ignored yet indispensable group of freshwater fishes, are presumed as first and easy hits of climate change. Therefore, climate resilient management strategies have the potential to cope with adverse impacts of climate change on small indigenous fishes.

Conclusion

SSF are a crucial part of India's food and nutritional security, and improved governance and regulatory framework for the SSF sector can greatly increase the sustainability of SSF in the nation. Emerging challenges for SSF in India include water use conflicts, siltation, encroachment, loss of connectivity of wetlands with parent river, climate change, loss of biodiversity, and overexploitation. Managing SSF is primarily a socio-legal issue, and political decisions are reflected in legislation. Due to the SSF's extremely diverse nature, governance is challenging. As a result, it is possible to update, revise, and integrate all of the existing and

dispersed laws pertaining to fisheries. It may be possible to conduct a valuation of goods and services to persuade planners and policymakers of the significance of SSF in inland open-water

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