

# An overview of growth and future prospects of fish farming in the North-East India.

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## Abstract

In line with tremendous fish production and growth of the fisheries sector, it is to be recorded that it has shown a dramatic rise in recent years, especially in India. A fisherman or fisher is a person who captures fish and other aquatic animals from a water body. At the primary level, about 16 million fishers and fish farmers are employed in this sector, and along the value chain, that number is almost twice as high. This indicates a great potential for livelihood generation and economic advancement as a whole. North-eastern part of India is endowed with diversified fishery resources. Although the Northeastern India is naturally rich and significant in terms of fisheries, in this paper we will provide more emphasis on state of Assam. The ponds, rivers, derelict water areas, beels (wetlands), reservoirs etc. holds the major potential; specifically encompassing an area of about 2.86 Lakh hectares in Assam only. This untapped food reservoir can be termed as 'fisheries potential'. Technology can act as a core catalyst in transforming fish production and trade in Assam. The basic objective of our study is to analyse the trend of fish production what are the prospects of technology intervention are there and how it can be a source of livelihood. This study allows us to understand the current trends in fish production, livelihood aspects and technological advancements in the sector. However, a holistic approach will surely be of greater result than a standalone initiative. Our study is primarily based on secondary sources of data. These may deliberate emphasis on the harmonized utilization and to achieve projected results for govt. release in upliftment of the sector and the current trend of fish production in the state; for the greater interest of the farming community. Digital advances now allow innovative monitoring equipment to better manage fish stocks and productivity, which are used in all stages of the value chain. New technologies, including Big Data, the Internet of Things (IoT), sensors, robotics, data storage and transmission will become more compact and cheaper thus encouraging their use.

**Keywords:** Assam; Fish production; Livelihood; Technology intervention.

## Introduction

Agriculture is the major source of livelihood in developing countries. The State of Assam is located in northern India and is the largest northeastern state in terms of population while ranking second in terms of land size. Assam, the centre of North-East India, is situated between latitudes 24°08'N and 27°59'N and longitudes 89°42'E and 96°01'E (Chutia *et al.*, 2018). Assam has a land area of 78,438 km<sup>2</sup> holding a population of 31,169,272 as per the 2011 Census. In the last ten years, the state's overall population has expanded by 16.93%, from 26,638,407 to 31,169,272. Assam's total population is predicted to be 34.18 million by 2021 and 35.60 million by 2026. Thereby the need of food grows as well. Agriculture is the most important domestic sector of the state, accounting for more than a third of the state's income and employing over 69% of the workforce. Specifically, the severely poor rely mostly on agriculture and allied occupations. Moreover, farm households have been shown to be diverse, with allied activities and several extra off-farm activities. But it could be a significant contributor to the GDP (Haque *et al.*, 2021).

Among the allied sectors, the state of Assam significantly receives enormous attention to the Fisheries sector. Interestingly India is one of the world's largest fish producers, accounting for 7.58% of global output. Fishing is a form of economic activity that involves catching fish or other aquatic organisms in the wild (capture fishing) or rearing them in captivity (aquaculture/culture fishing) (NFDB, 2022). Traditional/Small-scale (SSF) fishing for a living or large-scale/ commercial fishing for profit is two possible scenarios (Bhutia *et al.*, 2021).

The fisheries sector tends to be one of the major livelihood options globally (Osepchuk *et al.* 2024 and also in the state of Assam. The fish production is primarily conducted through two modes of production- Capture Fishery<sup>1</sup> and Culture Fishery<sup>2</sup> (NFDB, 2022). The livelihood engagement indicates that there is ample opportunity to generate income, create jobs, expand ancillary industries, and engage in international trade to earn foreign currency with the sector (Saikia and Das, 2023). The data for Assam was 417.000 thousand Tonnes in 2022. With respect to 2021, this represents an increase from the previous figure of 393.000 thousand Tonnes (CEIC). The major objectives of the study are:

1. To study the prospect of technology intervention in the Fishery sector of Assam
2. To study the livelihood aspects of the Fishery Sector of Assam
3. To study the current trend of Fish Production in the state of Assam

## Methodology

This study is extensively conducted based on secondary data sources. Secondary sources are collected from the Statistical Handbook, NFDB; Handbook on Fisheries Statistics, peer-reviewed Journals and Government reports. And then the results are analysed through descriptive statistics using tabular and diagrammatic presentation.

### Fisheries Resources of Assam

Table 1 depicts the availability of fisheries resources area in Assam. The floodplains of the Brahmaputra and Barak river basins are significant habitat resources, and fishing is still a traditional source of income with a significant impact on the rural economy. (Gogoi *et al.*, 2015). Fish has long been a staple food and part of social life for people in Northeast India, particularly in Assam. (Bhuyan *et al.*, 2017). Indigenous people still engage in the long-standing tradition of fishing today. Even though it is primarily used for food and recreation, community fishing has had a significant impact on the local festivals, customs, and culture of traditional communities in Northeast India. Some of these, many times show a negative impact on the environment (Dubey and Gogoi, 2023).

### Contributions of the Fisheries Sector

The fishing industry makes up 5.23% of the agriculture sector's GDP and makes up 0.91% of the nation's overall GDP. Currently, about 1.1% contribution to the state's economy is of the Fisheries sector (NFDB, 2023). India currently contributes 6.3% to world fish output and 5% to world fish trade. Compared to 1,134,948 MT and USD 5.78 billion a year earlier, India exported 1,377,244 MT of fish and fisheries products in 2017–18, indicating a remarkable growth of over 20% (NFDB, 2023). According to a fast estimate for 2015–16, the contribution of the fishing industry to the state's gross domestic product (SGDP) was Rs. 472119 Lakh, growing at a 4.68 per cent annual rate (Economic Survey, Assam 2016–17). Moreover, India ranks 3<sup>rd</sup> in fish exporting among all the countries in the world).

<sup>1</sup>Capture Fishery- Capturing of Wild fish from marine and freshwater

<sup>2</sup> Culture Fishery- Also known as Aquaculture.

**Table 1-** Fisheries Resource-wise Area in Assam

Resources	Area
Registered Beel Fisheries (in nos)	2072
Area under Registered Beel Fisheries (in Hect.)	71843.50
Ponds and Tanks (in Nos.)	547237
Area under Ponds and Tanks (in Hect.)	92386.22
Area under River Fisheries (in Hect.)	11060.60
Area under Forest Fisheries (in Hect.)	6990.90
Area under Derelict Water Bodies/ Swamps (in Hect.)	83555.26
Area under Reservoir Fisheries (in Hect.)	3096
Nos. of Hatcheries [Govt.+Private]	564
Production of Fish Seeds [Govt. +Private] (Million Nos.)	18218.70
Production of Fish [Raw+Dry] (in Tonne)	416915

Source- Statistical Handbook, 2022, Department of economics and statistics, Government of Assam

### Prospects of technology utilization and method advancement in fisheries sector of Assam

A well-structured plan of futuristic world fisheries technologies and aquaculture prospects has yet to be accomplished. This may focus on local-global policies & species-specific strategic issues. Till the present date, there are a number of collaborative technologies that involves more than single stakeholder groups through the value chain or non-collaborative technologies that are set by governments to check and monitor the sector directly. This includes computerization of handheld devices, extensive use of GPS (Global Positioning System) and GNSS (Global Navigation Satellite Systems) applications etc.; BIG- DATA technology incorporations for storage, sharing and analysis; use of Drones and RADAR facilities (Hussain *et. al.* 2021); accessibility to satellite data and imagery; advancement of on-board digital cameras and recorders; AIS (Automatic Identification Systems) and VMS (Vessel Monitoring Systems) etc. (Hentry *et. al.*, 2011). Moreover, the expanded use of Artificial Intelligence and Machine Learning in the fisheries sector will help to harness the utmost potential of the sector. Major technological engagements in fisheries involve cover deign and improvement of processing equipment and machinery, solar dryers, fuel-efficient vessels, water quality measuring kits etc (Ole *et. al.*, 2014).

There is a new type of technologies implemented like Recirculatory Aquaculture System (RAS), Biofloc, and Construction of Fin-fish Hatchery along with scientific fish farming are going on under the Fishery Department in Assam which may be considered as a revolutionary project in the field of fisheries. Infrared/ electrical backup heating systems, fish de-scaling machines, freshness sensors, LPG dryers etc. are also in the pipeline of advancements these days.

### Current fishery Schemes in Assam

1. Rural Infrastructure Development Fund (RIDF) - The government established the RIDF in 1995–1996 to provide funding for continuing rural infrastructure initiatives. The National Bank for Agriculture and Rural Development (NABARD) manages the fund.
2. Kisan Credit Card (KCC) – To fulfil the short-term financing requirement for raising livestock, poultry, fisheries, etc. Farmers that operate dairy, poultry, inland fisheries, aquaculture, or marine fisheries as individuals, joint liability groups, or self-help groups are eligible to apply for loans under this programme.
3. Pradhan Mantri Matysa Sampada Yojana (PMKSY) – A plan to improve India’s fishing industry in a way that is socially inclusive, economically viable, and ecologically sound.
4. Mission Blue Revolution-The Honourable Prime Minister called for a “Blue Revolution” in 2016 after recognising the enormous potential in the fishing sector. In order to carry out this vision, the Department of Animal Husbandry, Dairy, and Fisheries introduced the “Blue Revolution: Integrated Development and Management of Fisheries” programme with a total central budget of Rs. 3000 crores in the same year. To maintain relevance in the context of change.
5. NFDB Scheme- The National Fisheries Development Board is an autonomous board established in 2006, under the administrative supervision of the Ministry of Agriculture and Farmers Welfare’s Department of Animal Husbandry, Dairy, and Fisheries. The organization’s mission is to accelerate the nation’s overall economy while also enhancing the nation’s health, economy, exports, employment, and tourism. It accomplishes this goal by developing the fisheries sector holistically by increasing fish production and productivity.
6. RashtriyaKrishiVikas Yojana (RKVY)-The National Development Council (NDC) and the Ministry of Agriculture & Farmer Welfare of the Government of India jointly announced the RashtriyaKrishiVikas Yojana (RKVY), a State Plan Scheme of Special Additional Central Assistance. During 2016-17, out of the approved allocation of Rs. 3300.00 Lakh under RKVY, an amount of Rs. 203.00 Lakh was sanctioned. (Directorate of Fisheries).

7. State-Owned Priority Development Programme (SOPD)-SOPD is a state-funded scheme in Assam. The scheme consists of various dimensions which are related to fisheries-

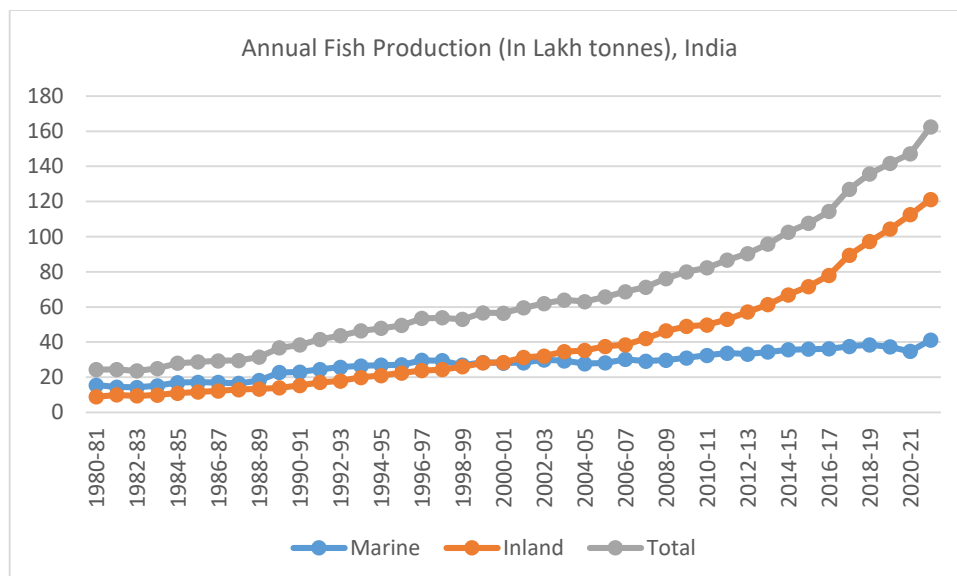
- Matsya Jagaran: targeting those who are considering starting a fish farm by building a new pond
- Matsya Jagaran: implementing Ghare Ghare Pukhuri Ghare Ghare Maach
- Seed Bank Programme: construction of a new rearing pond for fish seed rearing.
- Majuli Development Programme:
- Assistance to women SHGs for the production of value-added fish products.
- Training of Beneficiary and farmers: Around 450 farmers are targeted by the programme, which aims to enhance the ability of the farmers and beneficiaries while supporting the use of scientific practises.

## Results and Discussion

This growing volume of food requirements necessitates sustainable production and distribution of food items from various sources. The world's population is projected to rise from 7.7 billion people today to 9.7 billion in 2050. The average per capita daily calorie intake has increased by 9% globally in the last two decades. Currently, 17% of all animal protein consumed comes from fish. It has been observed that average total fish consumption increased by about 3.1% annually over the past 60 years, which is significantly more than the 1.6% population growth rate.

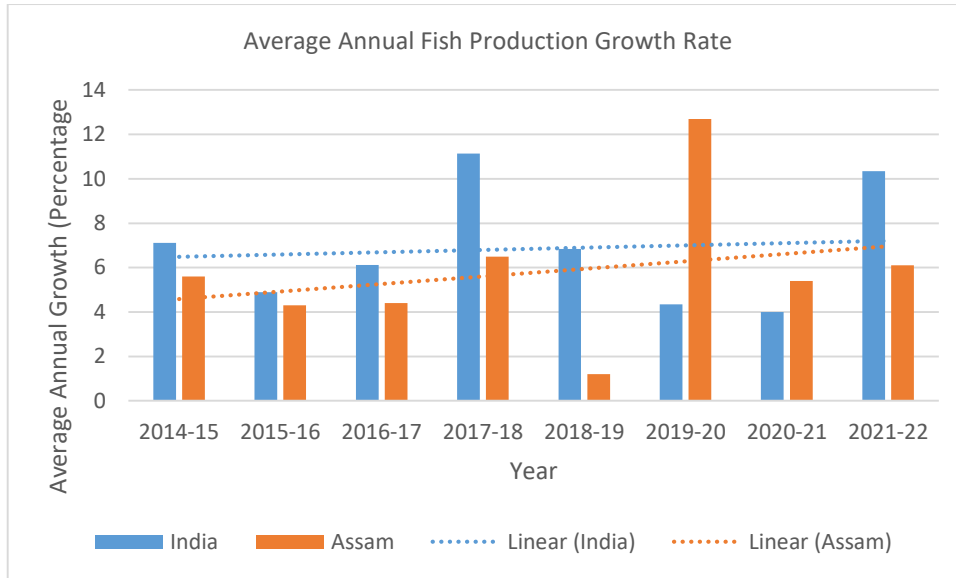
In the above figure, it can be seen that fish production in India as a whole shows an upward trend in the recent years. Promotional and developmental programmes like infrastructure development, promotion, and subsidy support programmes were primarily responsible for the inland fisheries' faster growth introduced for fish farming, price realignment, and extension services, among other things. Fish in India both marine and inland have greater scope for productivity and production. (NABARD, 2020). The average annual fish production has an upward trend in Assam against a stagnant trend for overall fish production in India. Despite this scenario, the demand for fish is yet to be met. Every year, a sizeable number of fish is imported from other States to satisfy economic demand. The government conceptualised a mega project in 2017–18 for the fishery department to increase local fish production and employment opportunities for rural youth, known as Ghare Ghare Pukhuri Ghare Ghare Maach.

Classifying the number of fishermen involved in Inland fisheries activities as Full-time, part-time, occasional and unspecified. In all the categories, the number of women engaged in marginally less than men. Data is not available for the unspecified category. In India, in the year 2020, it was estimated that 58.5 million people were employed as full-time, part-time, occasional, or unspecified workers in fisheries and aquaculture and among them 21% are female (FAO, 2022) thus indicating a large platform for the higher scope of employment generation by the fishing Industry.

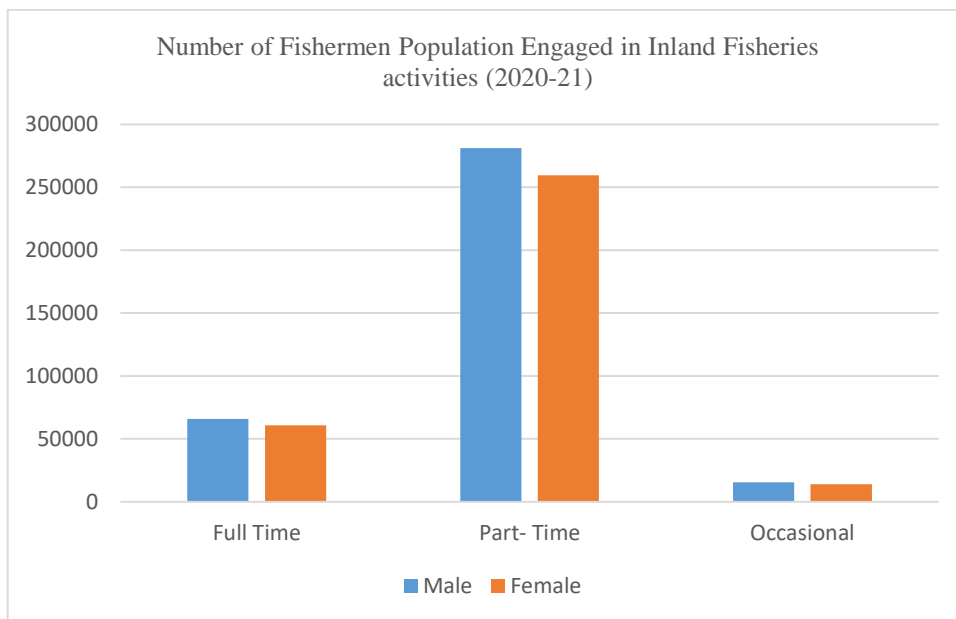


**Fig-1:** Annual Fish Production (In Lakh Tonnes), India

Source: Handbook on Fisheries, 2022, Department of Fisheries. Ministry of Fisheries, Animal Husbandry & Dairying. Government of India, New Delhi

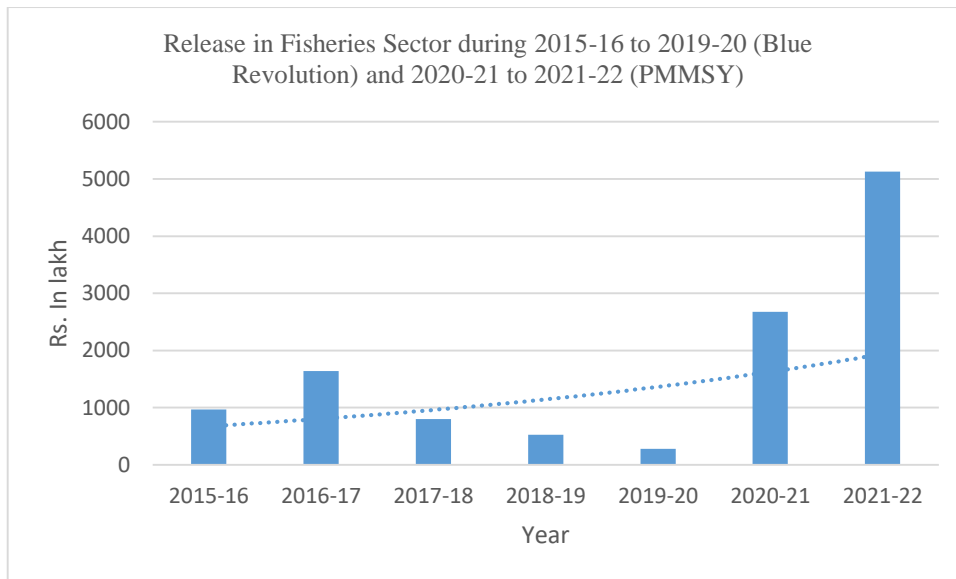


**Fig-2:** Growth Rate of India and Assam for Average Annual Fish Production  
 Source: Statistical Handbook Assam (2022). Directorate of Economics and Statistics. Government of Assam, Guwahati-28.



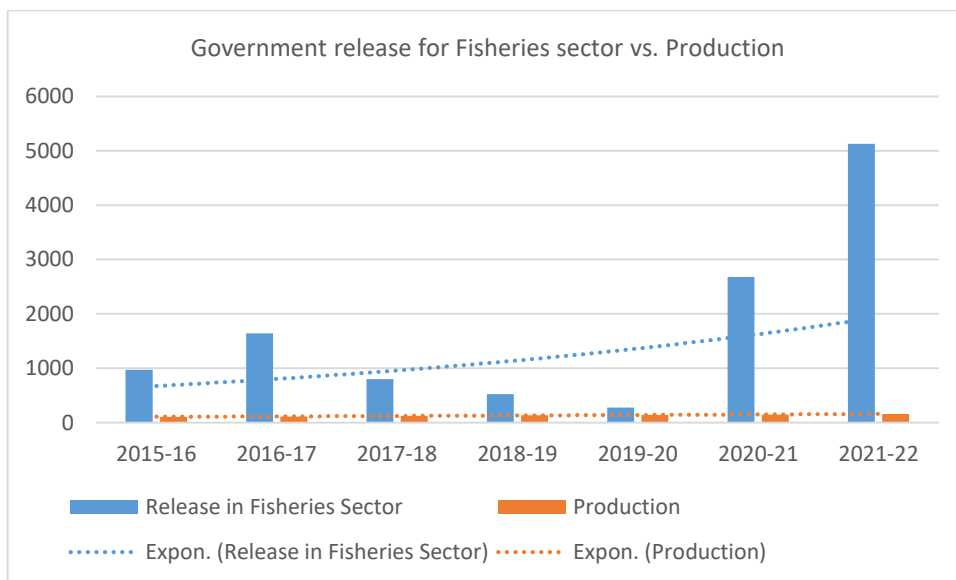
**Fig-3:** Number of Fishermen Population Engaged in Inland Fisheries Activities of Assam. (2020-21)  
 Source: Handbook on Fisheries, 2022, Department of Fisheries. Ministry of Fisheries, Animal Husbandry & Dairying. Government of India, New Delhi

Under the Blue Revolution, the release of funds was reduced. With the introduction of PMMSY in 2020, heavy funds were released to the state for the Fisheries sector. The trend line shows that there is a sharp increase after 2020. The PMMSY was introduced by the GoI as an umbrella programme to aid the Blue Revolution. By 2024–2025, the programme aims to sustainably increase fish production to 220 lakh metric tonnes. The scheme is anticipated to cost INR 20,050 crore, of which the Centre will invest INR 9,407 crore. In five years (from 2020–2021 to 2024–2025), state governments and recipients will each contribute INR 4,880 crore and INR 5,763 crore, respectively.



**Fig-4:** Release in the Fisheries Sector during 2015-16 to 2019-20 (Blue Revolution) and 2020-21 to 2021-22 (PMMSY) (Rs. In lakh)

Source: Handbook on Fisheries, 2022, Department of Fisheries. Ministry of Fisheries, Animal Husbandry & Dairying. Government of India, New Delhi

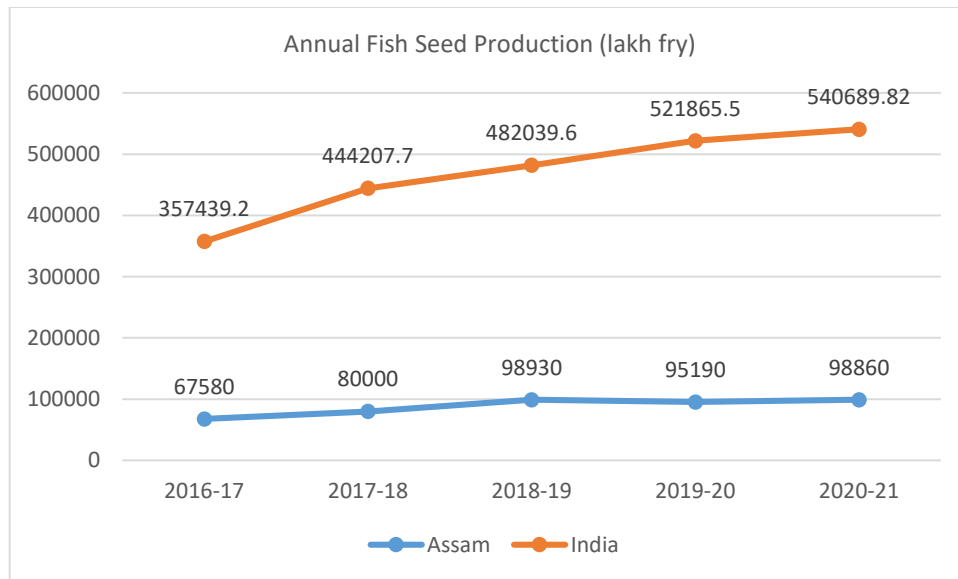


**Fig-5:** Government release for Fisheries sector against Production

Source: Statistical Handbook Assam (2022). Directorate of Economics and Statistics. Government of Assam

Under the Blue Revolution, government releases were reduced. Heavy funds were released under the PMMSY in 2020-21 and 2021-22. This is shown by the trend line for Release in the Fisheries Sector. However, production has remained quite stagnant. The correlation between the fund releases and production is positive.

The market for fish seed in India is profitable and the demand for fish seed is currently high and expected to increase. (Bisht *et al.*, 2013) In India, the trend of fish production has shown remarkable growth as well and Assam has also shown significant growth over time. The wider use of these technologies is still limited by their cost, increasingly complex data requirements, challenges in sharing such data among fisheries management authorities and the limited numbers of individuals trained to use these tools. Aquatic food plays a key role in food security and nutrition by means of a profound source of protein. The growing need for food has ultimately elevated the calls for an immediate shift of our agrifood ecosystem to ensure food security, improvised nutrition and secure but affordable healthy diets in contrast to the present growing population while safeguarding the livelihood and our natural resources.



**Fig-6: Annual Fish Seed Production (lakh fry)**

Source: Handbook on Fisheries, 2022, Department of Fisheries. Ministry of Fisheries, Animal Husbandry & Dairying. Government of India, New Delhi

### Conclusion

In India, 12 million people are thought to be directly involved in fishing, while 60 million depend entirely on it for their livelihood (Gogoi *et al.*, 2015). More than 90% of the population in Assam prefers fish as part of their diet (Deka, 2021). Fisheries and aquaculture continue to be a major source of food, nutrition, income, and livelihood for millions of people, contributing 1.24% of India's GVA and 7.28% of agricultural GVA (2018-19) (NFDB, 2023). Fish can generate employment, and empowerment for women and many more. River Brahmaputra and Barak along with all their tributaries make the state of Assam a potential region for the development of fishing and fisheries activities e.g.: highly intensive fish farming, craft and gear development, processing industry development etc. Proper utilization of all the resources may ultimately lead to a higher growth rate in terms of the sector in the country in the near future.

### Conflict of Interest acknowledgement:

The authors of the particular manuscript don't have any conflict of interest.

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