

# Climate Smart Fishery: A Case of Kalong Kapili, Assam, India

Deepak Chamola<sup>1</sup>, Pradeep Mishra<sup>2</sup> and Arun Sahay<sup>3</sup>

## ABSTRACT

North Eastern Region of India faces both natural and manmade challenges threatening livelihoods. Severe floods, soil erosion, landslides, and sand deposition, causing loss of huge areas of valuable agricultural land, is threat to livelihood security. Increasing population due to rehabilitation of thousands of immigrants in last four decades, further, intensifies the problem.

The Kalong Kapili, an NGO has been working with fish farmers of Assam since 2007. It has organized fish farmers to adopt climate-smart fishery approaches that address the challenges of fishery sector like lack of awareness among local farmers on scientific fish farming practices, non-availability of quality seeds, inadequate marketing linkages and lack of credit support. The fish farmers who were earlier getting Rs. 50,000 to 60,000 per year from one-acre pond are now getting Rs. 0.15 to 0.16 million per year. Seeing the success of fellow farmers, new farmers have come forward to adopt fishery. Over 1000 farmers have received bank loan from Regional Rural Bank for inland fishery.

The paper brings out the issues of livelihood challenges in Assam and how the same can be addressed through the climate-smart fishery model.

**Keywords:** Fish Farming, Climate-smart Fishery, Livelihoods, Pond

## 1. INTRODUCTION

Strategically located, Assam is called as the gateway to North-East India, covers an area of 78,438 km<sup>2</sup> (30,285 sq. miles). The state is bordered in the North and East by Arunachal Pradesh, while Nagaland, Manipur, and Mizoram lie towards the South. Meghalaya lies to the South-West of the state.

Share of agriculture and allied sector, with an annual growth rate of 6.89%, hovers around 19% to the state gross domestic product. However, 53% of the state population depends on agriculture and allied activities (NABARD, 2019).

<sup>1</sup> Birla Institute of Management Technology (BIMTECH), India; e-mail: deepakchamola@gmail.com

<sup>2</sup> Xim; e-mail: pradeepmishra.irma@gmail.com

<sup>3</sup> Birla Institute of Management Technology (BIMTECH), India; e-mail: arun.sahay@bimtech.ac.in

*Disclaimer: This case has been developed for classroom discussion and is not intended to illustrate either effective or ineffective handling of an administrative situation or to represent successful or unsuccessful managerial decision making or endorse the views of the management.*

The state has been endowed with natural water bodies in the form of beel, pond, tank along with two major river systems (the Brahmaputra and the Barak) with their tributaries. Assam is a place of fish-eaters where 90% of population consume fish. According to state fishery department, the state produced 0.332 million tonnes of fish in 2018-19, whereas the demand for fish in the same year was 0.352 million tonnes. The gap between demand and supply is being largely met by import of fish from Andhra Pradesh.

The challenge as observed in the fish supply chain in Assam is lack of good quality fish seeds, lack of awareness among farmers on good agricultural practices, low productivity, increasing cost of inputs and weak market linkages. Due to low profitability of the sector, bankers perceive fishery as risky activity so are reluctant to give loan to fish farmers. Climate-induced extreme events such as flash floods during monsoon seasons deluge the agriculture land in low lying area of Assam, further impacts the livelihoods.

Kalong Kapili, an NGO registered under the Societies Registration Act, is based in Assam and it operates in six districts of the State. Since its establishment in 2007, it has been engaged in pisciculture, agriculture and allied activities. One of its primary activities is natural resource management (NRM) in some of the most underdeveloped and remote areas in Karbi Anglong, Kamrup, Nagaon, Morigaon and Hojai districts of Assam. Kalong Kapili works with traditional fish farmers engaging them in scientific cultivation of fish and increasing productivity. With support of National Bank of Agriculture and Rural Development (NABARD) and the Fishery Department of state government, the organization has so far supported 0.1 million farmers in 6 districts of Assam. In the year 2010, NABARD sanctioned Rs 0.80 million to Kalong Kapili for replacement of bottom-dweller fish by freshwater prawn. This pilot project was a great success in terms of increasing productivity of pond and income of farmers.

Seeing the success of this programme, many farmers have come forward to adopt this business model. Due to the construction of climate-resilient pond structure in the project area, problem of flash floods due to heavy rainfall in monsoon season has been reduced significantly. The model provides a platform for learning for various stakeholders. The insights would be useful when replicating such initiatives. This paper is an effort to analyse the project interventions and document its learning.

The paper examines the successful approaches and interventions under the fishery model that have been adopted by Kalong Kapili to address the challenges of the fishery sector. The paper has following objectives:

- To study climate-smart fishery implemented by Kalong Kapili.
- To examine how climate-smart fishery leads to environmental, economic and social sustainability.

## **2. LITERATURE REVIEW**

Fishery sector in India generates livelihood for approximately 10 million people. In Assam, the fishery sector is an important source of livelihood that contributes more than 2% of Gross State Domestic Product (GSDP) to the state economy (Gogoi et al, 2015). Tropical climatic conditions

in plain areas of Assam favours the cultivation of freshwater fish. However, despite the vast aquatic resources, fish production of Assam could not match the demand for fish which is growing steadily.

Several studies observe challenges of fishery in Assam. A study conducted in two districts of central Assam, viz., Nagaon and Morigaon revealed poor productivity (1.8 tonnes/ha/pond/year) of fish in the area. The major constraints observed were lack of knowledge, skills, and experience for fish farming, lack of quality fish seeds for stocking in ponds, lack of capital, lack of support from government agencies. As per the study, there is an excellent opportunity for the development pond-based enterprise at village level with provision of good quality fast-growing fish seeds (Das, 2006). According to Swargiary (2015), fishery in Assam has been adversely impacted by low production, lack of finance, low level of public participation, diseases, natural calamities, distress sell.

Only 10% farmers receive bank loan due to lack of collaterals, high risk nature of the fishing business which can wipe out entire investments during natural calamities like floods and droughts or due to poaching, insecure property rights in case of leased out ponds, high transaction costs, cumbersome banking procedures, which discourage farmers to take bank loan (Ghosh and Indu, 2006).

Das (2006) examines the outcome of a pilot project on small scale fishery in three villages of Nagaon district under Assam Rural Infrastructure and Agriculture Service Project (ARIASP, World Bank). He found out that integrated use of locally available biological resources in small seasonal homestead ponds could produce 1800 Kg fish per ha in a year. Literature review reveals that the fishery sector is a growing sector with great potential to enhance well-being of small-scale fish farmers (Gogoi et al., 2015; Swargiary, 2015). The sector faces challenges as highlighted by many studies. There is a need to study models and approaches which addresses the challenges and are successful in creating impact at farmer level.

### **3. METHODOLOGY**

The study follows a case study method to gather in-depth data and acquire a holistic perspective of the context and conditions under which Kalong Kapili support small and marginal fish farmers.

The case study attempts to investigate a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003). A field visit was made in the project area of Kalong Kapili in the year 2018. The data has been collected through interviews from multiple stakeholders to verify the validity. Following data collection methods had been undertaken during the field visit.

- Interview with Secretary of Kalong Kapili was conducted to collect data about the organizational genesis, structure, activities, outreach, convergence with government programme. The interview was lasted for around one hour.
- Interview with two senior team members are working in the area of production and marketing was conducted to collect data on climate-smart fishery interventions including construction of pond, plantation on embankments, input procurement & management, fish cultivation, marketing. The interviews with team members lasted for two hours.

- Interview with the manager of regional rural bank was conducted to understand challenges and opportunity of financing of fishery in Assam. The interview with manager lasted for half an hour.
- Ten interviews with fish farmers to understand the activities undertaken by farmers on the climate-smart fishery, support received from Kalong Kapili, collective action by farmers and impact of climate-smart fishery in their lives. The interview with farmers lasted half an hour per farmer.
- Along with interviews, reports and published news on Kalong Kapili were studied to get additional information about projects and activities carried out by the organization and their impact.

The interviewee was not comfortable with audio recording, hence, notes were taken during interviews.

#### **4. ANALYSIS AND RESULTS**

In the year 2011-12, the NGO received support from Rural Innovation Fund (RIF) of NABARD for a pilot project on replacement of bottom-dweller fish with prawn. This was followed by a full-scale programme, namely, Umbrella Programme of Natural Resource Management (UPNRM) in 2014-15. The UPNRM, an Indo-German programme of NABARD, KfW (German development bank) and GIZ (German development agency), facilitated conversion of conventional fishery activity into climate-smart fishery model. The programme provided financial assistance of Rs. 2.16 million. Of the total amount, the loan was Rs 2.0 million and the rest Rs. 0.16 million was grant. The loan was used by farmers in construction and de-siltation of ponds, feed management, and disease management. The grant amount was used by Kalong Kapili for capacity building of farmers in good fishery practices and meetings administration cost.

Kalong Kapili instead of doing activities in different villages, concentrated its effort in a village Bagibari of Kamrup metro district, which is 60 Km from Guwahati airport, following area-based approach.

In this model, five farmers who have contiguous patch of land formed a big size pond under Joint Liability Group. Alongside embankment, horticulture crops such as banana were planted to check soil erosion. Local people were engaged in identification of pond site and construction planning. The height and width of embankments of ponds were designed to reduce force of water during flash floods. The architecture of pond helped in mitigating climatic risks like flash floods. Plantation around embankments became carbon sink and acted as wind-breakers to check soil erosion.

##### **Economic Sustainability**

The model has multiple revenue streams in terms of fish from three different layers of a pond and also from horticulture crop planted in along the embankment of ponds.

- Fish available in the top layer of the pond like silver carp and Catla (Rs. 150 – Rs. 350 per kg)
- Fish cultivated in the middle layers (rohu and grass carp – Rs. 150 – Rs. 350 per kg)

- Prawns which are cultivated in the lowest layer(Rs. 500 per kg)
- Also, horticultural crops were planted along the pond banks – and this has the potential to fetch an annual revenue of around Rs. 15000 (sale of lemon and banana)

The cost of fish production and income for freshwater fish and prawn cultivation in one-acre pond are illustrated in table 1 and table 2 respectively.

**Table 1: Cost of Fish Production in 1-acre Pond (0.4 Ha) (Amount in Rs)**

SN	Particulars	Quantity	Unit	Cost/Unit	Cost
A	Capital Cost				
i	Pond Construction	Lumpsum			25000
ii	Weed eradication by 5 labours	3	Mandays	200	3000
iii	Dewatering	Lumpsum			3000
				Sub Total	31000
B	Operation Cost				
i	Lime	150	Kg	12	1800
ii	Cowdang	3000	Kg	0.5	1500
iii	Single Super Phosphate	150	Kg	8	1200
iv	Urea	150	Kg	8	1200
v	Fish Seed Approx. 4 Cm	1500	No	3	4500
vi	Prawn Seed	3000	No	4	12000
vii	Fish Feed @2% body weight for 10 months (FCR 1:1:3)				
	Rice bran	1125	Kg	10	11250
	Mustard oil cake	1125	Kg	12	13500
viii	Pelleted prawn feed FCR 1:1:5	315	Kg	45	14175
ix	Harvesting - labours	5	Mandays	200	1000
x	Prophylactic measures	Lumpsum			1000
				Subtotal	63125
	Grand Total (A+B)				94125

**Table 2: Income from fish farming (amount in Rs.)**

SN	Component	Quantity	Price	Income
	Income			
i	Fish	800 kg	150/kg	120000
ii	Prawn	250 kg	400/kg	100000
iii	Horticulture – Banana	Lum sum		10000
			Subtotal	230000
	Grand Total			230000

The total benefits received by farmers from a one-acrepond(0.4 Ha) is 0.13 million.

Seeing the success of this programme, many farmers have come forward to adopt this business model. Over 200 farmers have received a bank loan from Regional Rural Bank. Along with bank

mainstreaming, success of programme also resulted in convergence with other government schemes. Fishery Department regularly supports Kalong Kapili in conducting technical training to fish farmers. Five-kilometre pucca road has been developed under MGNREGA scheme, which has connected the local market with the village. Irrigation Department has also financed construction of Pucca canal that now helps in filling pond and irrigate nearby land around the year. This model has great potential to be replicated within and outside state.

The ponds were created in areas which many regarded as 'wastelands,' areas which were not being used for any productive purpose. The villagers had at their disposal a source of water that was available round the year.

### **Environmental Sustainability**

In environmental terms, it had deeper implications. The groundwater was getting recharged due to the creation of large ponds. There is evidence of water levels in wells rising after the ponds were developed.

The other advantage that the project brought in was that stakeholders became environmentally aware and responsible. Once Kalong Kapili introduced this climate-smart fishery model, the dependence of villagers on local resource use came down. In many a village, people who were reliant on extracting fuelwood from forests stopped doing so, because they had a livelihood that provided them with other alternatives.

The introduction of prawns has reduced siltation of ponds, which was earlier caused by carps which were replaced.

All the bordering and adjacent areas of water bodies now have some form of cultivation, predominantly banana and lemon. This practice has resulted in the protection of soil cover by preventing surface runoff that occurs in areas without green cover.

People engaged in the cultivation of freshwater prawn follow a definite protocol. No chemicals are added to the waterbody, the entire process from start to finish is organic. There is no environmental damage while the economic process is being carried out.

In a way, that was not foreseen, all the projects of Kalong Kapili have created awareness at places where literacy and education levels have been low. People in the districts where they have been successfully implemented have shared their stories with their near ones, as a result of which our economically and environmentally sound models centered on pisciculture, agriculture and horticulture have been replicated in many parts of Assam.

### **Social Sustainability**

The climate-smart fishery model led to significant social impact in villages. Migration to nearby towns has reduced 50 to 60% because of this project as they now find gainful employment in their village itself. By providing training, women were supported for greater participation in pond and feed management which enhanced their social standing and decision making in the household. Women farmers contribute financially to their family, this has elevated their social status in society as entrepreneurs.

Another direct fallout of this project is the construction of pucca roads and irrigation canals in the region due to increase in interests in the district administration, which has seen positive impacts of fishery interventions of Kalong Kapili. Because of this, incidents of waterlogging and inundation in this village which was flood-prone have significantly reduced. Five-kilometer pukka (not a road with a surface of mud) road has been developed under MGNREGA scheme, which has connected the local market with the village. Irrigation Department has also financed construction of a pukka canal that now helps in filling water in ponds during winter season and irrigates nearby land around the year. As an indirect effect, farmers have started taking boro paddy during winter due to availability of water for irrigation. Water drainage during dewatering is now channeled to irrigation canal. The pond water contains silt that acts as manure increases agricultural productivity by 25% when used for irrigation. People used to face great hardships earlier, especially during the marriage season, which has reduced due to good connectivity of villages.

### Testimonials of Beneficiaries

“I do not have to depend on my husband for money. From fishery activity, I am earning almost equal to my husband and now I am able to support construction of my house and higher education of my daughter who is staying in hostel in Guwahati” *Renu Talukdar, 52, women fish farmer.*

“Through JLG meetings that happen every month, I have learned many things not only about good package of practices of fishery and its market but also about external world outside our village. I feel happy when I able to spend on food and clothes of my grandchildren when they visit me during festival time. All credit goes to this programme”. *Dinfuli Das, 65, women fish farmer.*

“Now in our village marriages can happen in the rainy season, unlike in past, because of Pucca road and good connectivity. Thanks to UPNRM which brought development to our village and made our life easier.” *Bishnu Joshi, 40, fish farmer.*

Government of Assam has included this model as a sustainable income opportunity under Rashtriya Krishi Vikas Yojana (RKVY) scheme of Assam. Fish farmers across the state have been demonstrated on this model to start or scale-up freshwater aquaculture. Realizing the economic benefits for the farmers, the Government of Assam has established a prawn seed hatchery named Ulubari Fish seed farm to supply quality seeds to the farmers. Kalong Kapili provides its technical assistance to the concerned officers involved with this scheme.

## 5. DISCUSSIONS

Under RIF and UPNRM financing, a pilot on fishery model was implemented by Kalong Kapili. The financing comprised loan for business activity and grant for an extension. Such type of blended financing products is needed for creating models that have larger impact on ground. Many times, commercial financing to agriculture fails or does not yield intended results because of non-existence of support activities like capacity building, training, and demonstration.

In the case of fishery, Kalong Kapili is the intermediary organization which provided support to farmers throughout the project period. This approach can be applied for agriculture financing where banks may take support of NGOs to build capacity of farmers and local enterprises

whom banks are planning finance. These intermediary organizations which closely work with farmers may reduce risk of bank finance. Repayment from the farmers may also be supported by intermediaries and thus, reduce the chances of turning loan portfolio into non-performing assets.

The case shows how the integration of various supplementary and complementary activities such as pond construction and renovation, fish cultivation, plantation, capacity building can be developed as a robust fishery model which can address challenges of fishery sector including climate vulnerabilities.

Engagement of local people in planning and implementation and making community institutions (Joint Liability Group) to run the enterprise has been a success factor of this model of Kalong Kapili. This is a learning for developmental projects and programmes to include local people in all stages of the project.

Collectivization process through Joint Liability Groups helped in reducing input costs such as feed, seed and land preparation cost. The increased scale of production enhanced bargaining power of farmers in the market. Joint monitoring reduced chances of poaching and theft, whereas harvesting of fish by JLG members collectively reduced labour cost. Kalong Kapili may also think to form farmer producer organization (FPO) by federating JLGs to reap the benefit of legal structure. By creating an FPO, it will be easier to get credit from banks. A number of state government and central government schemes support FPO mobilization and business, which can be leveraged by the Kalong Kapili.

Apart from fish farmers, people belonging to different backgrounds such as scientists, researchers, and young administrative officers have been acquainted with the climate-smart fishery model, its impacts and what sustainable livelihood means in the context of Assam.

The climate-smart fishery model may be transformed into aqua tourism as it has potential to attract tourists who would be interested in water sports, ecotourism, local cuisine and relaxation amid nature. Some of the eco-tourist would be interested in knowing about scientific, innovative and comprehensive fish farming.

Timely repayment of the loan by Kalong Kapili has enhanced its creditworthiness, now regional rural bank has come forward to support new farmers who want to take loan for fishery activity. Similar financial discipline should be followed by development organizations who are, at present, are not familiar with doing business through bank loans.

Kalong Kapili has been able to establish effective and strong networking with various institutions for seeking their expertise for capacity building of the fish farmers. The fish farming programme has seen a solid convergence outcome with MGNREGA, Irrigation Department and local banks through the construction of roads, canals and credit financing for fisheries sector in the state. Other fishery and social enterprise may follow similar approach to bring in convergence with government schemes and programmes to attain synergistic effect of partnerships.

Most of the selling of fish occurred in the nearby village market and dhabas (roadside eating joints)/ restaurants in Sonapur 10 km away where the prices are slightly lower compared to the fish market in Ganeshguri, Guwahati which is around 45 km away. This is one aspect of forward linkage which the organization can work. Also, online sale of fish through e-commerce portal



can be looked at in future. Cold storage vans or mini-trucks would also help the organization in reaching out to a wider customer base in the city of Guwahati in the form of door-to-door (direct pond-to-plate) delivery and boost revenues significantly.

## **6. THEORETICAL CONTRIBUTION AND MANAGERIAL IMPLICATION**

The case will guide policymakers, researchers, academia, multilateral, bilateral agencies, development banks, and resource institutions to support fishery sector in India and abroad. It will help farmer producer organization, community-based institutions to facilitate small and marginal farmers to enhance their income. It is a great opportunity for the state government to promote fish farming as an effective livelihood option for achieving the larger national objective of “doubling farmers income”.

The findings of the research will provide insights to scholars, researchers, and organizations wishing to conduct further studies on sustainable aquaculture and its success factors.

## **7. CONCLUSION**

Kalong Kapili has made a significant difference in the lives of the community by creating a sustainable business model for small fish farmers. It has transformed the economy of villages to a more sustainable level. It has built capacities of group members to do business, formulated community organization to make decentralized decision-making and creating transparency. The organization has set an example not only for other NGOs but for all other stakeholders who are working in an area of sustainable and climate-smart fishery. In order to increase employability and income through fish farming the government, as well as the policy makers, have to devise ways to tackle the issues related to supply chain, farmer skills and access to finance. The government needs to design the number of projects and programmes similar to UPNRM where loan and grant assistance was provided for business enhancement and capacity building as a bundled product.

## **REFERENCES**

- Das, S. K. (2006). Small-scale rural aquaculture in Assam, India– A case study. *NAGA, World Fish Center Quarterly*, 42-47.
- Gogoi et al. (2015). Fishery based livelihood approaches and management of fishery resources in Assam, India. *International Journal of Fisheries and Aquatic Studies*, 327-330.
- NABARD. (2019). State Focus Paper Assam.
- Swargiary, P. (2015). Growth of Fisheries and Its Significance-A Micro Level Study in Baksa District of Assam State (India). *Journal of Economics and Finance*, 12-17.
- Yin, R. (2003). *Applications of case study research* (2nd ed.). Thousand Oaks, CA: Sage.