E-ISSN: 2347-5129
P-ISSN: 2394-0506
(ICV-Poland) Impact Value: 76.37
(GIF) Impact Factor: 0.549
IJFAS 2024; 12(4): 35-41
© 2024 IJFAS
www.fisheriesjournal.com
Received: 05-04-2024
Accepted: 04-05-2024

Swagat Ghosh
Research Associate, Sasya Shyamala Krishi Vigyan Kendra, Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI) Arapanch, P.O. Sonarpur Dist. South 24, and Kolkata, West Bengal, India

Anju P
Research Associate, Sasya Shyamala Krishi Vigyan Kendra, Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI) Arapanch, P.O. Sonarpur Dist. South 24, and Kolkata, West Bengal, India

Rajib Pattanayak
Research Associate, Sasya Shyamala Krishi Vigyan Kendra, Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI) Arapanch, P.O. Sonarpur Dist. South 24, and Kolkata, West Bengal, India

Corresponding Author:
Anju P
Research Associate, Sasya Shyamala Krishi Vigyan Kendra, Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI) Arapanch, P.O. Sonarpur Dist. South 24, and Kolkata, West Bengal, India

Production of catfish and prawn pickles to improve the livelihood of Marginalized communities of Kheyadaha Wetlands of West Bengal, India

Swagat Ghosh, Anju P and Rajib Pattanayak

DOI: https://doi.org/10.22271/fish.2024.v12.i4a.2941

Abstract
Aquaculture, particularly in West Bengal's Kheyadaha Wetlands, is a significant economic activity, offering livelihood opportunities through the cultivation of catfish and prawns. This study explores the potential of value addition in aquaculture products, specifically focusing on the production of catfish and prawn pickles, to enhance market competitiveness and sustainability. A number of training programs conducted by Sasya Shyamala Krishi Vigyan Kendra (SSKVK), has equipped SC/ST fish farmers with skills in pickle production, emphasizing sustainable practices. The organoleptic evaluation revealed high-quality products with excellent sensory attributes. The SWOT analysis highlighted strengths such as local knowledge and economic potential, while identifying weaknesses like limited infrastructure. The initiative resulted in improved economic conditions, gender empowerment, and social cohesion among participants. Enhanced branding, packaging, and market strategies increased the value and marketability of the pickles. Despite challenges like seasonal supply variations, the project demonstrated that value-added aquaculture products could significantly boost local incomes and contribute to sustainable development. This study underscores the importance of supporting local communities through innovative, sustainable approaches, ensuring the preservation of wetland ecosystems while fostering economic growth.

Keywords: Catfish pickle, prawn pickle, value addition, rural sustainable development, community empowerment

Introduction
Aquaculture is the activity of cultivating aquatic creatures such as fish, prawns, and mollusks. It has grown to be a major business in the global food supply process. Since 2000, aquaculture has assiduously integrated into the world food chain. Inland aquaculture accounts for the majority of aquaculture production in Asia and Africa (Verdegem *et al*., 2023) [30]. Aquaculture is a major economic driver in West Bengal, India, especially in its distinctive wetland habitats like the Kheyadaha Wetlands, where it sustains several populations (Ghosh *et al*., 2022; Ghosh and Goswami, 2022) [11, 12]. In addition to being highly prized treats in West Bengal, catfish and freshwater prawns provide the local community significant economic opportunities (Singh, 2019; Goswami *et al*., 2023) [27, 14]. When managed sustainably and with care, the cultivation and harvesting of these aquatic plants can offer a lifeline to the populations living in and around the wetlands (Nandi, 2023; Ghosh and Goswami, 2022; Gardner and Finlayson, 2018) [20, 12, 9]. However, the idea of "value addition" may greatly improve the aquaculture industry's sustainability and profitability. In aquaculture, value addition is the act of making aquatic products more valuable economically by improving their quality or making them more appealing to consumers (Gonçalves and Kaiser, 2011) [13]. This might involve tasks including packing, branding, processing, and preservation. A number of important reasons are driving the growing demand for value addition in aquaculture products in West Bengal and its wetlands. Aquaculture has a long history in West Bengal, especially in the freshwater wetlands of East Kolkata, such as the Kheyadaha Wetlands, and the brackish water parts of the Sundarbans. Numerous varieties of fish and prawns may be found in these places (Nandi, 2023) [20].

Even though many households receive money from aquaculture, there is a significant chance to increase economic empowerment (Williams, 1999) [32]. Value addition can result in a significant increase in the market price of aquaculture products, providing producers with a higher yield (Bush *et al*., 2019) [4]. This is especially important in areas where there aren't many other options for making a living. Due to the growing demand for their products internationally, West Bengaly aquaculture farmers face competition in both home and international markets. Adding value to aquaculture products is essential to keeping a competitive edge. Value-added items, such as processed fish fillets and prawn pickles, not only fetch higher prices but also cater to a wide variety of consumer tastes (Datta, 2015) [6]. The aquaculture industry in West Bengal has to enhance its branding, packaging, and marketing in order to draw in more customers. Sustainability of resources is a major issue in wetland environments like Kheyadaha. Value addition is consistent with prudent resource allocation. It minimizes waste by making ensuring that every portion of the aquatic creatures gathered is used effectively. For example, prawn shells may be turned into chitin, a valuable substance used in many sectors, while fish by-products can be utilised to make fish meal.

To maintain its biodiversity and ecological services, West Bengal's wetlands, especially the ecologically delicate East Kolkata Wetlands, need to be managed sustainably. By encouraging the adoption of ethical and environmentally sustainable processing methods, value addition can lessen the negative effects of aquaculture production on the environment. Additional manufacturing phases, such packing and processing, are a part of the value addition process. These steps generate jobs for the local workforce. This promotes local employment and increases income, both of which advance economic growth. Specifically focusing on wetland regions in West Bengal, this research explores the several facets of value addition in aquaculture products. While offering suggestions for sustainable value addition techniques started by Sasya Shyamala' Krishi Vigyan Kendra (SSKVK), Ramakrishna Mission Vivekananda Education Research Institute (RKMVERI), it also examines the possibility of improving economic growth, market competitiveness, and environmental sustainability. West Bengal can more effectively use its aquatic resources to support its populations and conserve its distinctive wetland ecosystems by adding value to its aquaculture crops.

Materials and Methods

Study Area

The area of research Nestled in the eastern suburbs of Kolkata, the Kheyadaha Wetland (22°29'50"N 88°27'24"E) is part of a collection of man-made and natural wetlands. Wetlands are made up of farms, settling ponds, and sewage farms (Fig. 1). The wetlands in Kolkata's lateral region provide nutrients for agricultural and fish aquaculture in addition to managing the city's sewage. The Kheyadaha Wetlands, which are located in the centre of West Bengal, India, are a special and biologically valuable habitat that have long provided the nearby populations with food and a means of subsistence. The delicate balance of the ecosystem is at risk because of the various environmental difficulties that the wetlands have faced over time, such as habitat deterioration, water pollution, and over-exploitation of natural resources. In response to these challenges, innovative approaches are needed to ensure the sustainable development of the region while preserving its natural resources and unique biodiversity.

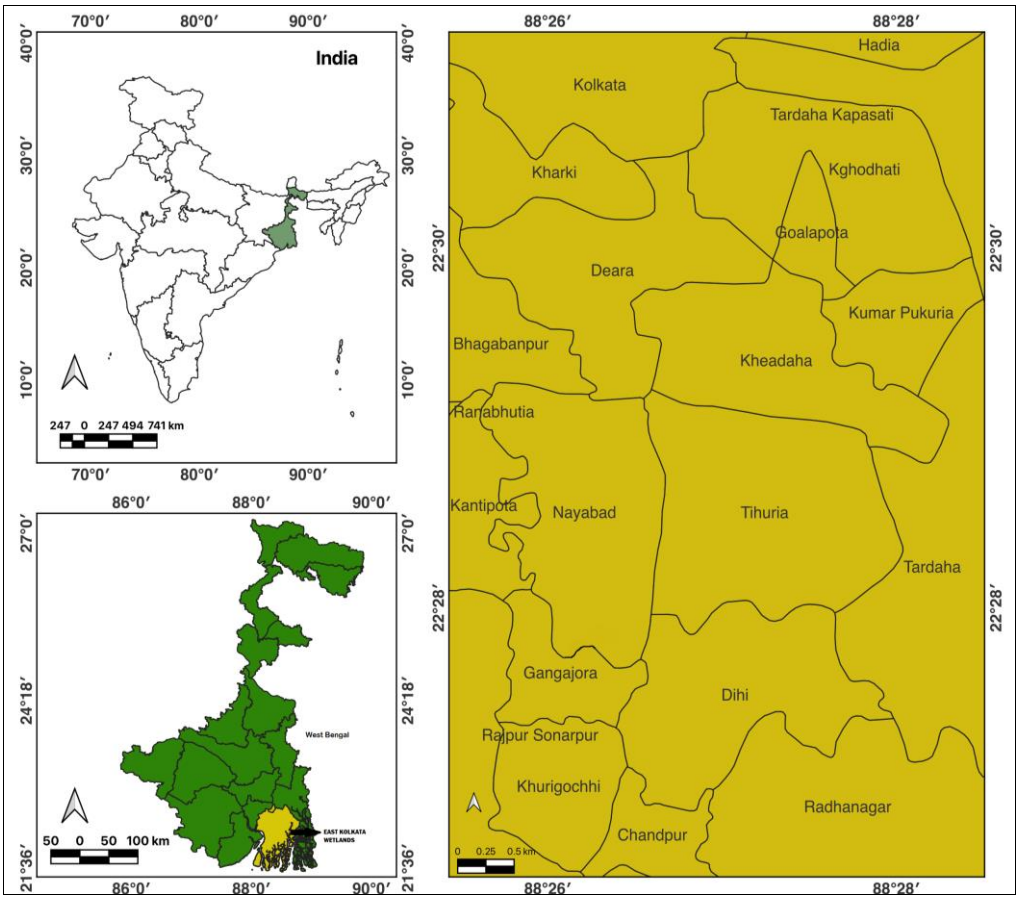

Fig 1: Study Area - Kheyadaha Wetland, Eastern Suburbs of Kolkata

Training program for wetlanders

A pre-survey was carried out to ascertain the target group's particular needs and areas of ignorance with relation to the creation of fish and prawn pickles. Determine the group's level of resources and skills in the pre-survey. 150 Scheduled Caste/Scheduled Tribe (SC/ST) fish farmers benefited from six training programme on fish and prawn pickle manufacturing that conducted by Krishi Vigyan Kendra (KVK). The initiative sought to provide these underprivileged communities with the know-how needed to generate revenue from the processing of fish and prawns. A well-organized curriculum including subjects like raw material selection, processing methods, cleanliness, packaging, quality control, and marketing strategies was part of the programme. One important element that guaranteed attendees acquired useful expertise was practical hands-on workshops. Raw materials such as giant river prawn (*Macrobrachium rosenbergii*) and walking catfish (*Clarias batrachus*), and spices were procured from farmers of Kheyadaha wetland. Catfish is a popular choice for making Indian pickles due to its unique flavor, firm texture, and ability to absorb the flavors of the pickling spices and seasonings. It's worth noting that the choice of fish for pickling can vary depending on regional preferences and personal tastes. Our experienced trainers, with expertise in both pickle production and working with SC/ST communities, facilitated the program. Their guidance and mentorship played a pivotal role in enhancing participants' learning. KVK remains committed to supporting the SC/ST fish farmers in their post-training journey. We are actively exploring opportunities for market linkages, offering ongoing guidance, and fostering a supportive network for these individuals.

Organoleptic evaluation

Representative pickle samples were placed on plates and examined by a panel of five experts from the Sasya Shyamala' Krishi Vigyan Kendra (SSKVK), Ramakrishna Mission Vivekananda Education Research Institute (RKMVERI), to assess the sensory properties, such as overall look, color, aroma, taste, and texture. To maximise the value from them by comparing the outcomes, the following set of recommendations has been created. Defect points in prawn and catfish pickles were assessed in accordance with Pervin *et al*. (2010) [22].

SWOT Analysis

A SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis was conducted to evaluate the viability and sustainability of catfish and prawn pickle production as a means of livelihood in the Kheyadaha Wetlands (Mindtool, 2023) [18].

Results

A ground-breaking programme called Sustainable Livelihoods through value addition of aquaculture products (Catfish and Prawn Pickles) (Fig. 2) by SSKVK in Kheyadaha Wetlands aims to empower the wetland residents in Kheyadaha, West Bengal, India. This programme, which primarily focuses on the manufacturing of pickles made from catfish and prawns, aims to improve the quality of life for the local population by offering assistance and instruction in sustainable pickling methods. The ultimate objective is to produce goods with value additions that will increase market pricing and improve the local economy. Value addition is acknowledged by the programme as being essential to securing improved market pricing. Wetland communities may charge more for their goods by turning prawns and catfish into pickled items. In addition to conventional pickles, the programme invites participants to experiment with various tastes and kinds of prawn and catfish pickles. With this variety, a wider range of customer tastes may be satisfied. The SSKVK programme assists locals in developing a distinctive brand for their pickles, allowing them to stand out in a crowded market. To obtain a greater price, this branding is necessary. By helping participants connect with local and regional markets, the training programmes guarantees a consistent and dependable market for their products. Residents get education on pricing tactics that include the cost of manufacturing, demand in the market, and quality of the product. This gives them the ability to charge reasonable and aggressive rates for their pickles.

Fig 2: Prawn and fish pickle produced by SSKVK

Procedure of cat fish pickle

Mix the catfish with salt and turmeric powder, allowing it to marinate for two hours. Fry the marinated catfish in mustard oil until it turns crisp. In the same oil, after frying the catfish, add mustard seeds, fenugreek seeds, curry leaves, chopped green chilies, garlic pieces, and ginger pieces, and deep fry them until aromatic. Reintroduce the fried catfish to the pan and cook for a while, ensuring all ingredients are well combined. Next, incorporate turmeric powder, nutmeg powder, Kashmiri chili powder, and vinegar, and bring the mixture to a boil for two minutes. Adjust the salt to taste. Finally, add powdered sugar to balance the sourness. The pickle is now ready to be bottled. Store the pickle in a glass jar and consume it within three months for the best flavor and freshness (Table. 1).

Table 1: List of ingredients for cat fish pickle

Ingredients	Quantity
Cat Fish (Dressed and cut to small pieces)	1000 g
Mustard seed	10 g
Green chillies (Cut to pieces)	50 g
Garlic pieces	2 cups
Ginger pieces	1 cup
Kashmiri Chilli powder	35 g
Turmeric powder	1 tbsp.
Fenugreek seeds	2 g
Mustard oil	500 ml
Vinegar	500 ml
Salt	15 g (According to taste)
Sugar	10 g
Curry leaf	20 g
Nutmeg powder	2 g

Procedure of prawn pickle

Mix the prawn pieces with 30 g salt and turmeric powder keep it for 2 hours. Fry the mass in minimum quantity of mustard oil. In the left over oil after frying fish add Mustard

seed, Black pepper, Curry leaf, Green chillies (cut to pieces), whole Garlic, Ginger pieces and deep fry. Once all the items are fried add fried prawn and fry together for some time. Then add Turmeric powder, Kashmiri Chilli powder and Vinegar boil for 2 minutes and add salt. In the end add powdered sugar to balance the sourness. The pickle is now ready to be bottled. Keep the pickle in glass jar (Table. 2). After opening the seal, it is recommended to use it within 3 months.

Table 2: List of ingredients for prawn pickle

Ingredients	Quantity
Prawn peeled and deveined and cut in to equal sizes	1000 g
Mustard seed	10 g
Green chillies (Cut to pieces)	50 g
Whole Garlic	2 cup
Ginger pieces	1 cup
Kashmiri Chilli powder	35 g
Turmeric powder	1 tbsp.
Gingely oil	500 ml
Vinegar	500 ml
Salt	15 g (According to taste)
Sugar	10 g
Black pepper	2 g
Curry leaf	20 g

Training sessions covered a wide range of topics related to the production of pickles made from catfish and prawns, such as: innovative methods for preparing pickles made from catfish and prawns; quality control measures to guarantee that the pickles meet safety and hygienic standards; and improving the presentation of pickles to increase consumer appeal (Appropriate packaging methods).

Organoleptic characteristics of pickles

The sensory properties of the pickles were evaluated immediately after processing by a panel of four experts. The evaluation focused on general appearance, color, flavor, texture, taste, and overall quality. The organoleptic assessments of catfish and prawn pickles are presented in Tables 3 and 4. Both products exhibited a bright and shiny general appearance with a reddish-brown color. The flavor was described as natural. According to the panel members, the taste of the products was very good after chewing. The flesh of the pickles remained firm and elastic, maintaining consistency even after 120 days.

Table 3: Organoleptic characteristics of catfish and prawn pickle

Product	General appearance	Colour	Flavour	Taste	Consistency of flesh	Grade	Overall quality
Catfish Pickle	Bright shining	Reddish-Brown Colour	Natural colour	Feeling very good after mouth chewing	Firm and elastic	A	Excellent
Prawn Pickle	Bright shining	Reddish-Brown colour	Natural colour	Feeling very good after mouth chewing	Firm and elastic	A	Excellent

Table 4: Organoleptic quality assessment of catfish and prawn pickle under different storage condition.

No.	Product	Characteristics (Colour, flavour, taste, texture)	Storage time in days						
			0	30	60	90	120	180	240
1	Catfish Pickle	Colour	Excellent	Excellent	Excellent	Good	Good	Dark Brown	Dark Brown
		Flavour	Excellent	Excellent	Excellent	Good	Good	Good	Good
		Taste	Excellent	Excellent	Excellent	Good	Good	Average	Average
		Texture	Excellent	Good	Good	Good	Soft	Soft	Soft
		Over All Quality	Excellent	Excellent	Excellent	Good	Good	Acceptable	Acceptable
2	Prawn Pickle	Colour	Excellent	Excellent	Excellent	Good	Good	Dark Brown	Dark Brown
		Flavour	Excellent	Excellent	Excellent	Good	Good	Average	Average
		Taste	Excellent	Excellent	Excellent	Good	Good	Average	Average
		Texture	Excellent	Excellent	Good	Good	Soft	Soft	Soft
		Over All Quality	Excellent	Excellent	Excellent	Good	Good	Acceptable	Acceptable

The value addition program goes beyond technical training. It strives to empower the wetland community in various ways by offering training and support in catfish and prawn pickle production, the program enables residents to generate their own income, reducing their dependence on external sources. The program actively involves women, who play a significant role in pickle production. This empowerment contributes to gender equality and financial autonomy. Residents are educated on the importance of preserving the Kheyadaha Wetlands. The program promotes sustainable practices that help maintain the ecological balance of the wetlands.

SWOT Analysis

Local knowledge and tradition, economic potential, and environmental sustainability were identified as strengths via the SWOT analysis. One identified weakness was the restricted availability of infrastructure and resources. Possibilities included diversifying product offerings and growing markets. Environmental dangers and the requirement for suitable infrastructure were among the threats.

- The results of the study confirm that, in order to ensure the sustainability of these livelihood projects, specific investments in market linkage, finance access, and infrastructure development are required.

- To ensure the long-term health of the ecosystem, policymakers should think about creating regulations that encourage sustainable wetland use and assist locally owned businesses like prawn and catfish pickles.
- The significance of ongoing environmental monitoring and conservation efforts in the wetlands was stressed.

Discussion

The Fish and Prawn Pickle Production Training initiative in the Kheyadaha Wetlands, spearheaded by the SSKVK, has proven to be a game-changer, encouraging individuals to embrace environmentally sound methods, social cohesion, and economic empowerment. In this description, we examine the outcomes and implications of this training course, particularly as they pertain to enhancing lives and increasing market prices via value addition. One of the primary accomplishments of the training programme is the notable rise in the economic well-being of the wetland's inhabitants. Through the production of prawn and catfish pickles, participants have diversified their revenue streams and reduced their economic risk by earning 10000 extra in every month. The scheme has raised each participant's income since it provides a vital extra source of income. Participating households' living conditions have really improved as a result of this increase in earnings. Pickling is among the oldest methods for preserving food, especially fish. It has mostly continued to exist in India as a native art form. Pickling contributes to the food's wholesomeness and nutritional value while preserving it for an extended amount of time. There are a number of recorded methods for producing fish pickles (Chandrasekhar *et al*., 1978, Vijayan *et al*., 1982, Muraleedharan *et al*. 1982) [5, 32, 19]. The results of this study corroborated those of Erichsen and Molin (1964) [8], who observed that foods with acetic and citric acids, such as pickles and fish marinades, have a longer shelf life because various bacteria are easily destroyed in high acidity conditions (pH less than 4.5). Fish pickle production and quality issues in fish and small aquatic organisms have been the subject of numerous research studies, including those on *Pangasianodon hypophthalmus* (Rahman *et al*., 2019; Shikha *et al*., 2018) [23, 25], *Nemipterus japonicus* (Chandrashekar *et al*., 1978) [5], *Orutosquilla nepa* (Squilla) (Tanuja and Hameed, 1996) [28], shrimp (*Metapenaeus* spp.) (Tanuja *et al*., 2022) [29], clam pickles (Vijayan *et al*., 1982) [31], *Amblypharyngodon mala* (Pervin *et al*., 2010) [22], *Channa striatus* (Sahu *et al*., 2012) [24], *Anchovie*s (*Stolephorus* sp) (Shirikar *et al*., 2009) [26] and *Macrobrachium dayanum* (Dhar, and Karthikeyan, 2014) [7].

The economic empowerment gained via this initiative not only offers immediate financial comfort but also creates the foundation for a more sustainable economic future (Adema, *et al*., 2015). Many residents have reported that, because to financial constraints, they can now more readily access healthcare, education, and other requirements that were previously beyond of reach. The overall well-being of families in the neighborhood is greatly impacted by these positive improvements. In addition to the quick cash rewards, the training has yielded benefits. The acquisition of wealth and financial stability is a crucial component of long-term economic development, as seen by the investments made by certain individuals in better houses and other assets. The value addition component of the programme is critical to enhancing the economic prospects of the wetland communities. The value of the commodities grown by the people has improved significantly by canning catfish and prawns. By using this process, the catch is not only preserved but also made more marketable, allowing them to charge higher rates. Throughout the seminar, broadening your pickle product range was one strategy that was emphasised. It has made it possible for participants to cater to a wider range of customer preferences (OSU, 2023). It is now possible to effectively target a variety of market segments by introducing new varieties and tastes of catfish and prawn pickles. This diversity not only increases sales but also helps locals be paid more for their items. Additionally, the trainings emphasises efficient branding and marketing strategies that have set the pickle products apart from the competition and helped them stand out in a congested market (Martinez, 2022) [17]. This branding and marketing expertise is necessary to secure a premium price since it raises the things' perceived value.

Developing connections with local and regional markets ensures a steady market for pickle products, which is necessary for sustained profitability and sales expansion (Gelato, 2023) [10]. The program's established market ties have given residents access to marketplaces that were previously inaccessible on their own. Locals may guarantee they receive a better price for their pickles by setting reasonable and competitive prices by being aware of pricing strategies (Hinterhuber and Snelgrove, 2021) [15]. This clever pricing strategy promotes their economic growth and success. Brennan (2023) [3] and Bhattacharyya (1995) [2] claim that these programmes have enhanced people's economic opportunities while also encouraging a sense of community and teamwork among participants. Women have made important contributions, in particular, to the pickle business, which has enhanced neighbourhood social cohesiveness and female empowerment. The cooperative approach has strengthened social bonds by encouraging resource and knowledge sharing among community members.

The catfish and Prawn Pickle Production Training initiatives of the SSKVK has significantly raised the living standards of the residents of the Kheyadaha Wetlands. By adding value to their aquaculture goods, participants have experienced economic empowerment and improved price for their commodities. The project has also encouraged female empowerment and communal collaboration. The program's outcomes show how these initiatives may be advantageous when social advancement, economic expansion, and environmental preservation are combined.

Conclusion

The SSKVK programme provides the wetland people of Kheyadaha with the knowledge and skills necessary to produce catfish and prawn pickles and is a ray of hope for them. In the Kheyadaha Wetlands, the manufacturing of pickled catfish and prawns has become a feasible source of revenue for the nearby villages. Most of the households that participated said that their financial situation had improved. The pickle sales have created an additional source of income and lessened the local population's economic vulnerability. For certain households, pickle manufacturing income has increased access to healthcare, education, and better housing. The supply of catfish and prawns varies seasonally, which might affect pickle production and cause differences in revenue. Obstacles related to marketing and distribution, such as the requirement for enhanced transportation networks and increased market accessibility, were seen as impediments to optimizing earnings. Through encouraging women to take a major part in communal collaboration, the programme

promotes social cohesiveness and gender empowerment.

Acknowledgements: We extend our heartfelt gratitude to the Department of Science and Technology (DST) - SEED (Science for Equity, Empowerment and Development) and the Government of India for their unwavering and timely support, which has been instrumental in the success of our project. We are profoundly thankful to Mr. Shankar Middya and Mr. Harashit Mandal for their invaluable technical assistance and guidance. Our deepest appreciation goes to the dedicated wetland communities in East Kolkata, whose collaboration and commitment have been pivotal to this endeavor. Your collective efforts have greatly enriched this research, and we are deeply grateful for your contributions.

Funding Sources: The study was funded by department of science and technology for DST-SEED project namely ‘’Establishment of indigenous fish and ornamental fish hub for sustainable livelihood development of local SC/ST fisher folks of wetland.

Conflict of Interest: I declare the manuscript is original. No part of the manuscript has been published before, nor is any part of it under consideration for publication at another journal. There are no conflicts of interest to disclose. The authors declare no conflict of interest.

Authors' contributions: Swagat Ghosh- Conceptualization (Lead), review and editing (Equal) Anju P- writing – original draft (Lead), Rajib Pattanayak -Review and editing (Equal) are the authors of the paper. All the authors are in agreement with the content of the manuscript.

Data Availability Statement: The manuscript incorporates all datasets produced or examined throughout this research study. Other data and materials supporting the findings of this study are available upon request from the corresponding author.

Reference

1. Adema W, Ali N, Frey V, Kim H, Lunati M, Piacentini M, *et al*. Enhancing Women’s Economic Empowerment through Entrepreneurship and Business Leadership in OECD Countries. Curr. Res. Nutr. Food Sci. J. 2015;3(1):1-42.
2. Bhattacharyya J. Solidarity and agency: Rethinking community development. Hum Organ. 1995;54(1):60-69.
3. Brennan M. Importance of Incorporating Local Culture into Community Development. The Pennsylvania State University; c2023. p. 1-3. Available from: https://extension.psu.edu/importance-of-incorporating-local-culture-into-community-development
4. Bush SR, Belton B, Little DC, Islam SM. Emerging trends in aquaculture value chain research. Aquaculture. 2019;418:428-434. doi:10.1016/j.aquaculture.2018.08.077
5. Chandrashekar TC, Rudrasetty TM, Lakshman RPT, Aswathnarayana C. Utilization of trash fish for human consumption. Fish. Technol. 1978;15:125-128. Available from: http://hdl.handle.net/1834/33409
6. Datta S. Prospects of Value added Fish Products & its future in Indian Market; c2015. p. 1-33. DOI: 10.13140/RG.2.1.3911.1525
7. Dhar B, Karthikeyan M. Functional relationship between storage time and quality parameters of prawn pickle from Macrobrachium dayanum (Henderson, 1893). Indian J. Fish. 2014;61(4):112-117.
8. Erichsen I, Nlolin N. The microflora of semi-preserved fish products II. The effect of the quality of raw materials, added materials, and storage conditions. Antonie van Leeuwenhoek. 1964;30(1):197-208.
9. Gardner R, Finlayson M. Global Wetland Outlook: State of the World’s Wetlands and Their Services to People; Ramsar Convention: Gland, Switzerland; c2018. p. 1-89.
10. Gelato. Localized marketing: How to connect with local audiences; c2023. Available from: https://www.gelato.com/blog/localized-market
11. Ghosh S, Bhattacharya M, Rahman FH. Socioeconomic Study of Prospective of Probiotics, Prebiotics, and Symbiotic for Sustainable Development of Aquaculture in Indian Sundarbans. Springer Nature; c2022. p. 253-273.
12. Ghosh S, Goswami B. Present Status of Pond-Based Integrated Farming on Selected Blocks of South 24 Parganas, India. Int J Sci Res (IJSR). 2022;11(5):1288-1293.
13. Gonçalves AA, Kaiser C. Value-added Products from Aquaculture: A Global Trend. World Aquaculture. 2011;43(4):48-67.
14. Goswami B, Ghosh S, Sayantan B. Evaluation of stocking of two small indigenous fish, pabda (Ompok pabda) and gulsha tangra (*Mystus cavasius*) with Indian major carps in composite fish culture system. J Exp Zool India. 2023;26:967-971.
15. Hinterhuber A, Snelgrove TC. Value First, Then Price: Building Value-Based Pricing Strategies. Taylor and Francis. 2021;2:1-268. doi:10.4324/9781003177937
16. Kumar V. RETRACTED ARTICLE: Seven spices of India-from kitchen to clinic. J Ethn Food. 2020;7:23. Available from: https://doi.org/10.1186/s42779-020-00058-0
17. Martinez A. Building a brand strategy: Essentials for long-term success; c2022. Available from: https://martech.org/building-a-brand-strategy-essentials-for-long-term-success/
18. MindTools. SWOT Analysis: Understanding Your Business, Informing Your Strategy; c2023. Available from: https://www.mindtools.com/amtbj63/swot-analysis
19. Muralcedharan V, Joseph KG, Devadasan K. Pickled products from green mussel. Fish. Technol. 1982;19:41.
20. Nandi NC. Aquaculturable fishery resources in wetlands of West Bengal. J Aquac Mar Biol. 2023;12(1):80-84.
21. OSU. Strategy and Strategic Planning; c2023. Available from: https://open.oregonstate.education/strategicmarketing/chapter/chapter-4-strategy-and-strategic-planning/
22. Pervin KM, Nayeem A, Newaz AW, Kamal M, Yeasmine S, Nurullah M. Production and quality assessment of fish pickles from mola (Amblypharyngodon mala) fish. Bangladesh J Sci Res. 2010;14(1-2):87-96.
23. Rahman MA, Hossain MI, Shikha FH. Changes in the Nutritional Composition of Fish Pickle Prepared from Thai Pangus (*Pangasianodon hypophthalmus*) during Longer Storage at Low Temperature. J Food Sci Nutr Res. 2019;2:299-308.
24. Sahu BB, Kumar K, Sahu AK, Kumar R, Mohanty UL, Maji UJ, *et al*. Quality and storage stability of low acid

Murrel (*Channa striatus*) fish pickle at room temperature. IFRJ. 2012;19(4):1629-1632.
25. Shikha FH, Hossain MI, Akter K, Rahman MA. Development of pickle from Thai pangus (*Pangasianodon hypophthalmus*) muscle and changes in its nutritional composition during storage. J Bangladesh Agric Univ. 2018;16(3):545-552. doi:10.3329/jbau.v16i3.39453
26. Shirikar DA, Khedkar GD, Sudhakar NS. Preparation of pickle products from Anchovies (*Stolephorus* sp.) and studies on quality changes during storage. J Food Process Preserv. 2009;34:176-190.
27. Singh G. Shrimp farming proves a mixed blessing in West Bengal. 2019. Available from: https://thefishsite.com/articles/shrimp-farming-proves-a-mixed-blessing-in-west-bengal. Accessed on: [Access Date].
28. Tanuja R, Hameed SM. Preparation and storage studies of Squilla pickle; c1996 .p. 92-100.
29. Tanuja SJ, Jeeva C, Rout E. Comparative storage stability of shrimp (*Metapenaeus* spp.) pickle at room temperature and refrigerated temperature. Indian J Fish. 2022;69(4):88-94. doi:10.21077/ijf.2022.69.4.118423-11.
30. Verdegem M, Alejandro H, Buschmann U, Win L, Dalsgaard AJT, Lovatelli A. The contribution of aquaculture systems to global aquaculture production. Global Conference on Aquaculture Millennium+20: Aquaculture for Food and Sustainable Development - Thematic Reviews. 2023;54(2):206-250.
31. Vijayan PK, Perigreen PA, Surendran PK, Balachandran KK. Processing clam meat into pickles. Fish. Technol. 1982;19:25-28.
32. Williams MJ. The role of fisheries and aquaculture in the future supply of animal protein. In: Svennevig N, Reinertsen H, New M, eds. Sustainable Aquaculture: food for the future?; c1999. p. 5-18.