



# Empowerment of Fisherfolk through Entrepreneurial Capacity Building of Self-help Groups in Marine Sector

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## ABSTRACT

The investigation was conducted during July, 2019 to March, 2022 at ICAR-Central Marine Fisheries Research Institute (CMFRI) in Ernakulam District, Kerala, India to empower Scheduled Caste (SC) fisherfolk by promoting entrepreneurial capacity building and fostering sustainable fishery-based micro-enterprises through training programmes. It was funded by the Department of Science and Technology (DST) under the Scheduled Caste Sub-Plan (SCSP) scheme. A total of 10 Self-Help Groups (SHGs) consisting of 102 SC members were involved. The project focused on identifying location-specific fishery-based micro-enterprises and enhancing entrepreneurial skills in the SHGs through training on four key technologies: Cage culture, Pearl spot seed production, Fish value addition, and Fish fertilizer production. The SHGs, which included an equal number of men and women to promote gender equality, were mobilized with the help of the Krishi Vigyan Kendra (KVK) of CMFRI. The project also addressed gender-related challenges in the fisheries sector, ensuring the inclusion and empowerment of women. Financial assistance was provided under the DST project, while KVK offered technical support. The project's outcomes included performance evaluations, an empowerment index, and economic analyses such as break-even points and payback periods for the technologies. Success stories were documented through ICT modules and videos. These case studies served as practical models for sustainable SHG mobilization, offering valuable lessons for broader community empowerment in the fisheries sector.

**KEYWORDS:** Empowerment, self-help group, capacity building, fisherfolk

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**Data Availability Statement:** Legal restrictions are imposed on the public sharing of raw data. However, authors have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

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## 1. INTRODUCTION

Kerala's marine fisheries sector, with a coastline of 590 km and an Exclusive Economic Zone (EEZ) of 218,536 sq. km, is a vital source of livelihood for coastal communities. Approximately 3.1% of Kerala's population are fisherfolk, residing in 222 marine and 113 inland fishing villages. Of the 10.24 lakh fisherfolk, 7.88 lakh are in the marine sector and 2.36 lakh in the inland sector (Anonymous, 2015). Despite the sector's importance, the socio-economic conditions of fisherfolk remain distressed, marked by survival struggles and indebtedness. The fisheries sector plays a crucial role in addressing Kerala's high unemployment by generating direct and indirect jobs.

With global marine fisheries in decline, adopting sustainable practices is necessary to protect marine resources and secure livelihoods. Many traditional fishermen, especially from marginalized communities, remain illiterate and lack access to modern fishing technologies. Their occupations are limited to the traditional way of fishing, fish marketing, drying, net making, and producing value-added products due to unsuitable agricultural conditions.

Scheduled Castes (SCs) constitute 9.8% of Kerala's population (3,123,941), with 53 recognized sub-castes (Anonymous, 2015; Varghese and Jaimol, 2022). According to Aparna and Rajasenan (2019), the Pulayan sub-caste is prominent in Ernakulam, Thiruvananthapuram, and Thrissur districts and SC fisherfolk face marginalization due to mechanization, unemployment, debt from motorized boat investments, loss of traditional skills, and migration. Many SC families work as daily wage labourers, masons, or head-load workers. With minimal dependence on agriculture, fishing and allied activities are their main income source, with an average household income of only Rs. 26,000.

Self-help Groups (SHGs) have emerged as a key approach in rural development and poverty alleviation (Srivastava and Mondal, 2023). An SHG is an informal, self-regulated group formed by individuals with shared socio-economic backgrounds and common goals (Farsana and Annie, 2021; Lakshmi et al., 2023). SHGs aim to promote financial inclusion, skill development, and social support (Sajesh et al., 2011). They have significantly improved socio-economic conditions by enabling self-employment, increasing income, and improving rural living standards (Sujith et al., 2023; Gupta et al., 2020). Ample studies proved that SHGs through Microfinance facilitate savings, provide access to credit, and substantial income-generating activities (Dawane and Gore, 2016; Bhattacharjee, 2016; Mathur and Agarwal, 2017; Nagaraj and Sundaram, 2017; Bali and Wallentin, 2009; Harikrishnan and Karuppasamy, 2017).

In Kerala, SHGs are instrumental in empowering coastal communities by enhancing disaster resilience, addressing unemployment, and promoting environmental sustainability (Zainuddin, 2018). They foster entrepreneurship and community solidarity (Sangeeta and Patel, 2014; Sangvikar et al., 2019). SHGs strengthen social mobility through networks and mutual support (Kumar et al., 2019). A study by Dawane and Gore (2016) in twelve villages of Latur district found that 63.34% of women SHG members achieved a medium level of economic empowerment. Microfinance institutions (MFIs) working alongside SHGs have further improved women's empowerment and poverty reduction (Jamaludeen and Alam, 2022). Similarly, it was found that, bivalve mariculture, promoted through SHGs, offers profitable supplementary income for coastal women (Vipinkumar, 2023).

Supported by government bodies, NGOs, and educational institutions, SHGs have successfully encouraged micro-enterprises through collective savings and credit (Shweta et al., 2011). They offer platforms for community participation and problem-solving, helping fisherfolk confront economic and social marginalization. Against this backdrop, the present study aimed to build the entrepreneurial capacity of SC fisherfolk by mobilizing SHGs and training them to adopt sustainable micro-enterprises in fisheries and allied sectors through need-based Entrepreneurship Capacity Building (ECB) programmes.

## 2. MATERIALS AND METHODS

The study was conducted during July 2019 to March 2022 at central Kerala, specifically in Ernakulam district (Figure 1). Situational analysis through Participatory Learning and Action (PLA) in the selected potential maritime locations in Ernakulam district of Kerala state of South India among Scheduled Caste fisherfolk and mobilizing and strengthening them into Self Help Groups through appropriate interventions was the first step. The preference of SC stakeholders for fishery-based micro enterprises catering to the location-specific needs was assessed, and training on ECB to the SHGs through the adoption of sustainable income-generating micro enterprises was undertaken by the project staff and concerned subject matter experts. A total of 10 SHGs with 102 SC members participated, and received training in four key technologies: cage culture, pearl spot seed production, fish value addition, and fish fertilizer production. The locations identified for mobilising the SHGs with these interventions were Edavanakkad, Manjanakkad, Cherai, Puthuvypu, Vallarpadam, Thngathara, Paravur, Ezhikkara, and Arakkunnam.

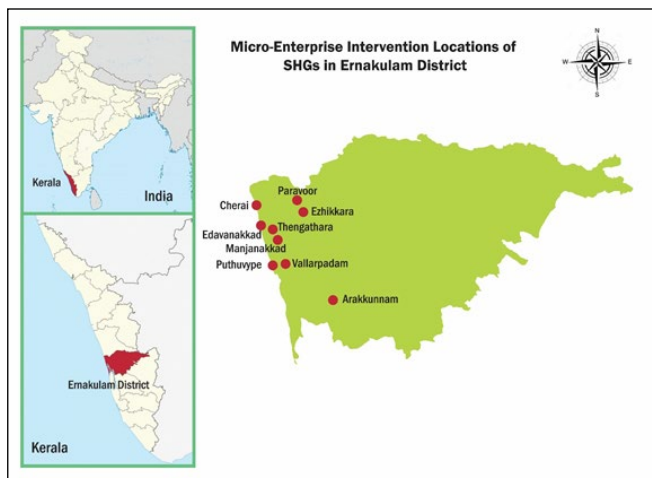


Figure 1: Location map of the target area

### 2.1. Empowerment index

The impact of interventions was assessed through gender analysis, the performance level of SHGs, and through the Empowerment Index. To evaluate various aspects of gender mainstreaming, such as equity and equality in access to resources, participation profiles, decision-making roles, and gender needs analysis (Daly, 2005), the male and female counterparts of the households were interviewed separately. Empowerment Index was quantified based on 8 dimensions (Meena et al., 2012) such as confidence building, Self-esteem, decision making pattern, capacity building, psychological empowerment, social empowerment, economic empowerment, and political empowerment. The extent of empowerment was quantified as the difference between the scores obtained as per the perception of the SHG members before and after joining the SHG. For computing the Empowerment Index, the scores obtained for each dimension were first made uniform, and that was multiplied by the weightages assigned by the judges while relevancy rating for ascertaining the content validity of the scale through scale product method. Each of the dimensions of empowerment index was computed by the scores of the sub-dimensions coming under the categories of these 8 dimensions. Data for the calculation of the empowerment index and level of performance of SHGs were collected with the standardized interview schedules (Shalumol et al., 2017).

### 2.2. Economic analysis

Gross revenue, net profit, benefit-cost ratio, and Payback period are the major economic aspects covered based on the following equations (Acharya and Agarwal, 1987).

1. Net income=Gross income-Total expenditure
2. BCR=Benefit/Total annual operating cost
3. Pay back period=(n-1) yrs+ cumulative net flow of (n-1) Period/ net flow of n<sup>th</sup> year

$$4. \text{Break even point} = \text{Total fixed cost} / \text{Unit price}$$

## 3. RESULTS AND DISCUSSION

In the present study, four interventions, including four cage culture units, three pearlspot seed production units, one fish fertiliser unit, and two value-added fish production units, were established for 10 SHGs with 102 beneficiaries. The respondents were from two castes, Pulaya and Vettuva, with representations of 80% and 20%, respectively (Figure 2). In terms of land ownership, 78% of the beneficiaries possessed land ranging from 0 to 5 cents, while just 1% owned land in the 21 to 25 cent range, and another 1% owned land between 26 and 30 cents (Figure 3). Of the selected beneficiaries, 51% were male, 49% were female, and 32% fell into the youth category (Figure 4). In the analysis of annual income trends, the cage culture unit exhibited the highest percentage increase at 30.56%, while the fish fertilizer production unit recorded the lowest at 15% (Figure 5).

The level of performance and empowerment of SHGs were included in Table 1. Among the 10 SHGs studies, the highest performance and empowerment levels were observed in the pearlspot seed production unit at Vallarpadam, while the lowest were recorded in the unit at Thengathara. This variation highlights the role of contextual and management factors in influencing SHG outcomes. This study recommended that, the formation of SHGs in the fisheries sector could contribute to the socio-economic advancement of both families as well as the community, and it could also be considered a poverty eradication tool. The study results were aligned with the findings of Malik and Kirmani (2021), who emphasized the transformative impact of SHGs on rural livelihoods. A notable outcome of the interventions was an increase in family income by 15–30.56% across the four fishery-based businesses analyzed.

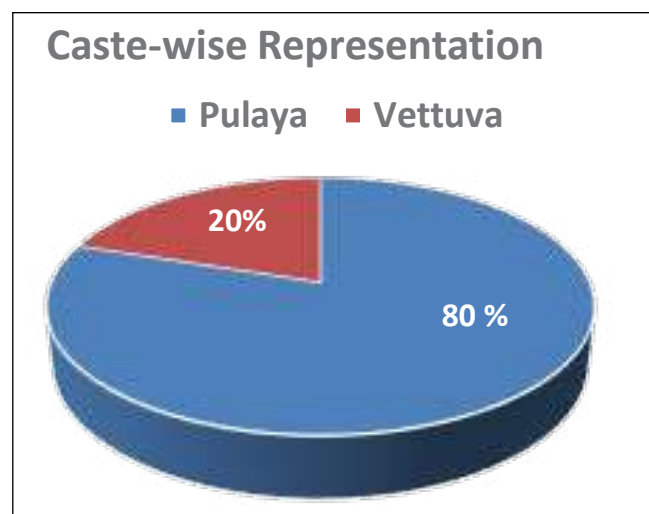


Figure 2: Caste-wise Representation of target group

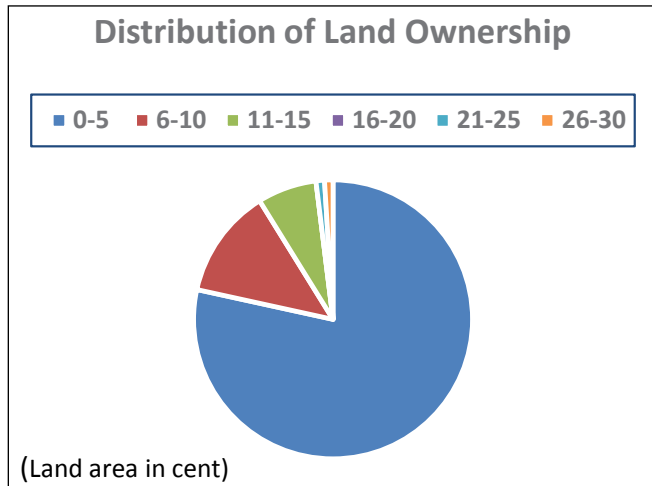


Figure 3: Distribution of land ownership of target group

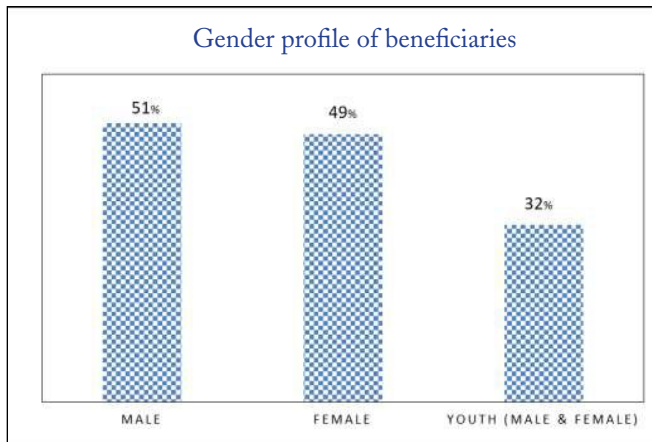


Figure 4: Gender profile of target group

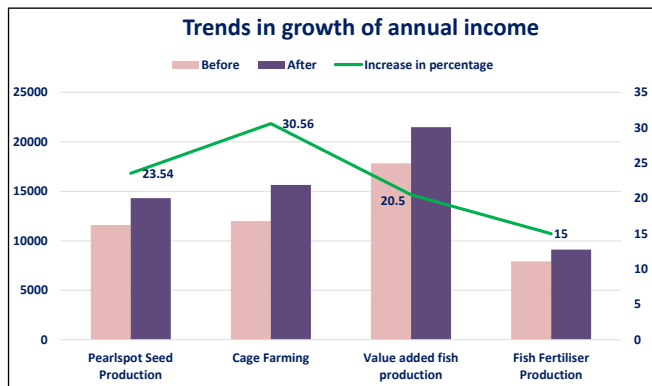


Figure 5: Trends in the growth of annual income of four interventions

This income enhancement reinforces the findings of Rupa and Agesty (2024), who reported that SHG members were better positioned to generate income through their group-based activities, thereby improving the financial resilience of their households. Income diversification emerged as a critical strategy for fisherfolk, given the fluctuations in fish availability caused by environmental, climatic, and market-

Table 1: Level of performance and empowerment of selected SHGs

| Sl. No. | SHG                                     | Level of Performance (%) | Empowerment index |
|---------|-----------------------------------------|--------------------------|-------------------|
| 1.      | Cage culture, Edavanakkad               | 62.30                    | 0.7180            |
| 2.      | Cage culture, Manjananakkad Unit 1      | 60.80                    | 0.7124            |
| 3.      | Cage culture, Manjananakkad Unit 2      | 59.80                    | 0.7050            |
| 4.      | Cage culture, Ezhikkara                 | 60.80                    | 0.7150            |
| 5.      | Pearl spot seed production, Vallarpadam | 75.61                    | 0.9856            |
| 6.      | Pearl spot seed production, Paravoor    | 72.64                    | 0.8291            |
| 7.      | Pearl spot seed production, Thengathara | 54.80                    | 0.6250            |
| 8.      | Fish fertiliser, Cherai                 | 61.57                    | 0.7052            |
| 9.      | Value-added fish products, Puthuvype    | 69.32                    | 0.7865            |
| 10.     | Value-added fish products, Arakkunnam   | 68.52                    | 0.7532            |

related factors.

The fishery-based enterprises promoted under the study, such as ornamental fish production, seed rearing units, and value-added fish products, proved to be viable supplementary income sources. Shyam et al. (2017) similarly emphasized the importance of diversifying income streams in the fisheries sector to ensure economic stability. The global gender profile in the fisheries sector reported by FAO is 46% female participation (Anonymous, 2016). In contrast, the present study recorded a slightly higher percentage of 49%, although it was still lower than India's reported 72% participation of women in the fisheries sector.

### 3.1. Economic analysis of enterprises

#### 3.1.1. Case study 1: Fish cage farming success story of SHGs in Edavanakkad, Manjanakkad, and Ezhikkara

Cage fish farming technology ensured an exemplary

entrepreneurial venture for the utilization of public water bodies for the livelihood enhancement of coastal fisherfolk. The open water resources of our country were widely utilized for fish production by establishing location-specific cage culture systems. CMFRI, the leading Fisheries Research Institute of the Indian Council of Agricultural Research played a vital role in disseminating the cage fish culture technology throughout the coastal belt of the country. As a part of the project, successful cage culture ventures were undertaken in Edavanakkad, Manjanakkad and Ezhikkara villages of Ernakulam district of Kerala state by mobilizing 4 SHGs. One SHG consisting of 10 members with an equal proportion of men and women mobilized for doing cage fish culture in Veerampuzha backwater at Edavanakkad, Vypin Island, Ernakulam (10.0929° N, 76.2045° E). Similarly, 2 SHGs with an equal proportion of men and women were mobilized in Manjanakkad (10.0467° N, 76.2321° E). Another SHG of 10 members (5 men and 5 women) was systematized at Ezhikkara (10.1053° N, 76.2392° E). The technical assistance was provided by the experts from Krishi Vigyan Kendra (KVK) of CMFRI, and KVK played a pivotal role in the practical implementation of the project. A series of training programmes, including the theoretical aspects and practical demonstrations on cage fabrication and management, was undertaken with the subject matter experts from KVK. Interaction meetings for imparting awareness among fisherfolk beneficiaries were organized in the sites, and training programmes, including cage installation along with fish seed selection, grading, and feeding, were successfully carried out for the SHGs. A training pamphlet in vernacular was distributed to the SHG members as a ready reckoner for convincing the cage culture technology. A floating cage made using Galvanized Iron (GI) frame of 4×4×2 m<sup>3</sup> was fabricated, and 800 Asian seabass fingerlings of 10 cm size seeds were stocked in the cage established in Edavanakkad.

Similarly, in Manjanakkad, two floating cages were fabricated, and 400 each of Asian seabass seeds of 10 cm size and 500 each of Pearl spot seeds of 7 cm size were stocked in these cages. The grading process, as per the size, was done systematically after 1–2 weeks. The aftercare was undertaken scientifically up to the appropriate marketable size. The linkage established benefited the beneficiaries through the provision of a deep freezer from CMFRI under the NICRA, along with seed and solar spot lights in the cages. Another intervention on Cage culture of Seabass for an SHG of 10 members (5 women and 5 men) in Veeranpuzha lake of Palliyakkal location in Ezhikkara in a cage of 20×15 ft<sup>2</sup> with 400 seabass juveniles and 500 pearl spot seeds, and the intervention was a great success.

The gender analysis, performance level of SHG, Empowerment index, and economic feasibility analysis

were assessed with socio-economic surveys undertaken in the selected localities. The male and female counterparts of the families were separately interviewed to determine the gender mainstreaming aspects in terms of equity and equality in access to resources, participation profile, decision-making aspects, gender need analysis, etc.

The harvest done just before Christmas on 22<sup>nd</sup> December, 2020, in Edavanakkad brought out a bumper output of 600 kg of sea-bass with an approximate weight of 1 to 1.5 kg fish<sup>-1</sup>. The SHG leader, Sri. Devadas says, “The first harvest was commenced with the intention of utilizing the marketing opportunity at the time of Christmas and New year, and the harvest was undertaken as per the demand of the consumers.” The market promotion was essentially accomplished through social media like Facebook, WhatsApp, etc., and the entire attempt was a remarkable accomplishment. The social and economic empowerment dimensions and capacity-building aspects achieved the highest score in the empowerment index. Table 2 shows the economic feasibility analysis of cage culture, giving an average benefit cost ratio for cage culture as 2.5:1 in the first year. Even though, the similar harvest results were achieved in Manjanakkad SHGs also, this case became relevant and conspicuous because, the SHG leader Gopi reveals the incident of a heavy loss he met with in cage farming, a couple of years back due to water pollution and therefore, this success story was a triumph over the tragic episode that happened in the past. He articulated the practical lessons learned in cage culture. The loss he met with in cage culture in Chittoor areas, because of pollution of water bodies due to effluent discharge, was quite notable through print and visual media. From the practical lessons learned, he came out in flying colours with a bumper harvest in the SHG. The Ezhikkara SHG also had a solid harvest, bringing out fabulous economic empowerment, and these success stories of SHGs elucidated could be used as case models and practical manuals for promoting group action for mobilizing SHGs on a sustainable basis in similar future endeavours. The cage culture technology introduced was economically viable, technically feasible, ecologically sound, environmentally friendly, socially acceptable, and hence a sustainable option for enhancing fish production, providing an alternative livelihood option, creating employment opportunities for fisher youth, improving the fishers’ income, and effective utilization of hitherto unused water resources. Similar results were reported by Pandit et al. (2021). It was found in their study that cage fish farming in Indian reservoirs significantly contributes to enhanced fish production and rural livelihoods, generating approximately 7.5 lakh man-days of employment and accounting for 16% of reservoir fish yield through about 14,000 installed cages. Unnikrishnan and Dinesh (2020), Imelda et al. (2022), and

Table 2: Economic analysis of cage culture of fin fish in brackish water pond

| Particulars                                                           | Economic analysis of cage culture of fin fish (Cost or price in ₹) |                   |              |             |                   |              |                                              |                   |              |
|-----------------------------------------------------------------------|--------------------------------------------------------------------|-------------------|--------------|-------------|-------------------|--------------|----------------------------------------------|-------------------|--------------|
|                                                                       | First year                                                         |                   |              | Second year |                   |              | Third year                                   |                   |              |
|                                                                       | Units                                                              | Unit Price (in ₹) | Price (in ₹) | Units       | Unit Price (in ₹) | Price (in ₹) | Units                                        | Unit Price (in ₹) | Price (in ₹) |
| Fixed expenditure                                                     | 10                                                                 | 80000             | 800000       |             |                   |              |                                              |                   |              |
| Cage 10×5 m <sup>2</sup> with GI frame                                |                                                                    |                   | 800000       |             |                   |              |                                              |                   |              |
| Variable expenditure                                                  |                                                                    |                   |              |             |                   |              |                                              |                   |              |
| Asian Seabass seed                                                    | 10000                                                              | 40                | 400000       | 10000       | 40                | 400000       | 10000                                        | 40                | 400000       |
| Pearl spot seed                                                       | 2000                                                               | 10                | 20000        | 2000        | 10                | 20000        | 2000                                         | 10                | 20000        |
| Seabass feed                                                          |                                                                    |                   | 1344000      |             |                   | 1344000      |                                              |                   | 1344000      |
| Pearl spot feed                                                       |                                                                    |                   | 20000        |             |                   | 20000        |                                              |                   | 20000        |
| Total variable cost                                                   |                                                                    |                   | 1784000      |             |                   | 1784000      |                                              |                   | 1784000      |
| Depreciation on capital investment, at 20%                            |                                                                    |                   | 160000       |             |                   | 160000       |                                              |                   | 160000       |
| Insurance premium at 2% of the capital investment                     |                                                                    |                   | 16000        |             |                   | 16000        |                                              |                   | 16000        |
| Interest on 75% of the capital investment at 12% annum <sup>-1</sup>  |                                                                    |                   | 72000        |             |                   | 72000        |                                              |                   | 72000        |
| Administrative or Other expenses at 1% of 75% capital investment      |                                                                    |                   | 6000         |             |                   | 6000         |                                              |                   | 6000         |
| Total annual operating cost (Rs.)                                     |                                                                    |                   | 2038000      |             |                   | 2038000      |                                              |                   | 2038000      |
| Income from seabass production (6400 Kg at ₹ 500 kg <sup>-1</sup> )   | 6400                                                               | 500               | 3200000      | 6400        | 500               | 3200000      | 6400                                         | 500               | 3200000      |
| Income from pearl spot production (240 Kg at ₹ 600 kg <sup>-1</sup> ) | 240                                                                | 600               | 144000       | 240         | 600               | 144000       | 240                                          | 600               | 144000       |
| Gross return (in ₹)                                                   |                                                                    |                   | 3344000      |             |                   | 3344000      |                                              |                   |              |
| Net returns (in ₹)                                                    |                                                                    |                   | 1306000      |             |                   | 1306000      |                                              |                   | 1306000      |
| BC ratio                                                              |                                                                    |                   | 1.64         |             |                   |              |                                              |                   |              |
| Average annual net return (in ₹)                                      |                                                                    |                   |              |             |                   |              |                                              |                   | ₹ 1306000    |
| The total fixed cost (in ₹)                                           |                                                                    |                   |              |             |                   |              |                                              |                   | ₹ 800000     |
| The break-even point (BEP)                                            |                                                                    |                   |              |             |                   |              | 3616 kg of Seabass at ₹ 500 kg <sup>-1</sup> |                   |              |
| Pay back period (PBP) (Years)                                         |                                                                    |                   |              |             |                   |              |                                              |                   | 0.61 years   |
| Price product <sup>-1</sup> (P) (in ₹ kg <sup>-1</sup> )              |                                                                    |                   |              |             |                   |              |                                              |                   | ₹ 500        |
| Cost unit <sup>-1</sup> (C) (in ₹ kg <sup>-1</sup> )                  |                                                                    |                   |              |             |                   |              |                                              |                   | ₹ 278.8      |
| P-C (in ₹ kg <sup>-1</sup> )                                          |                                                                    |                   |              |             |                   |              |                                              |                   | ₹ 221.3      |

Shilta et al. (2023), reported similar results in their studies.

### 3.1.2. Case study 2: Pearl spot seed production technology: case studies of SHG entrepreneurs in Vallarpadom

Being recognized as the state fish of Kerala, Pearl Spot has a profound significance. The seed production technology of Pearl Spot ensured an admirable entrepreneurial venture for the livelihood enhancement of fisherfolk in the productive backwaters. As a part of the project entitled “Empowerment of scheduled caste fisherfolk through entrepreneurial capacity building of Self-help groups in marine sector” funded by the Department of Science and Technology (DST), New Delhi under the Scheduled Caste Sub-Plan (SCSP) scheme, a successfully operating pearl spot seed production unit was established in Vallarpadom of Ernakulam district of Kerala State by mobilizing Self Help Groups (SHGs) with the assistance of the Krishi Vigyan Kendra (KVK) of CMFRI. The SHG consisted of an equal proportion of men and women to ensure equity and equality, as the essence of the gender mainstreaming perspective.

A pragmatic and utilitarian combination of extension research and practical extension was adopted for conducting this study. The project team of CMFRI visited the Vallarpadom location twice a month for two years and conducted communication conclaves and interaction programmes for the fisherfolk on Pearl Spot seed production units. A series of farmer collaboration conclaves were organized for these SHGs. The technical assistance was provided by the professionals from KVK of CMFRI, who played a fundamental role in the practical implementation of the project. Interaction meetings for imparting awareness among fisherfolk beneficiaries were organized on the site, and training programmes, including broodstock release and feeding, were successfully carried out. A training pamphlet in vernacular was distributed to the SHG members as a ready reckoner for convincing the seed production technology of pearl spot.

A pond of 50 cents area was prepared primarily, and 200 pearl spot brooders were stocked in the pond and looked after till the fish attained an appropriate marketable size within a couple of months. The linkage established gave the benefit of the provision of a pump set from KVK-CMFRI. Stage-by-stage video documentation in the various segments of the activities of SHG in seed production was done. The practical extension part for the present study consisted of Awareness and Entrepreneurial Capacity Building (ECB) Training programmes systematically executed, and then the extension research part focused on socio-economic surveys with a pre-tested and structured data gathering protocol with standardized scales and indices. The extent of involvement in various phases of the entrepreneurial activity showed that maximum participation of the members and families was

during pond preparation, fertilization of the pond, feeding, maintenance of juveniles, oxygen filling and packing of fish seed, marketing, account and record-keeping, arrangement of other inputs, etc. Though the majority of activities such as pond preparation, fertilization of the pond, broodstock collection or purchase, transportation of broodstock, the introduction of broodstock, fixing of egg-laying surfaces and water management were male-dominated, the female counterparts of the households also played a definite role in the activities like feeding, maintenance of juveniles, oxygen filling and packing of fish seed, marketing, account and record-keeping and arrangement of other inputs. The opinions of men and women in the above aspects were found to be similar without any significant difference. However, differential gender response was observed among SHGs.

The Economic Feasibility Analysis of the Pearl Spot seed production units of SHGs was undertaken using the data collected for the last four years on cost and earnings of the farming activities, and by using indicative economics (Table 3). For a production unit of 50 cents, in 12 months, the break-even point was estimated to be 8,008 seeds at the rate of ₹ 10 seed<sup>-1</sup>. The payback period, the amount of time taken to recover the cost of investment of the venture, was computed as within one year. The enthusiasm exhibited by the Scheduled Caste fisherfolk boosted their confidence to such an extent that they enhanced the seed production unit further to 2 acres. The harvest results brought bumper output, and the juveniles were sold at ₹ 11.50 piece<sup>-1</sup>. The first sale was accomplished amid the acute COVID-19 pandemic and the associated lockdown period. The social and economic empowerment dimensions and capacity-building aspects achieved the highest score in the Empowerment Index analysis. The benefit-cost ratio for the pearl spot seed production technology was 2.5. Two more SHGs have established similar seed production units as subsequent ventures under the DST project in Narakkal and Karumaloor locations. The success case study elucidated can be used as a case model and practical manual for promoting group action for mobilizing SHGs on a sustainable basis.

The commercial viability of the seed production unit of pearl spot, the State fish of Kerala, was a major aspect determining its adoption in the selected location. The technology played a significant role in enhancing fish production stock replenishment, providing an alternative livelihood option, creating employment opportunities for fisher youth, improving the fishers' income, and effective utilization of hitherto underutilized water resources. Similar results were observed by Vikas and Subramannian (2023). A video documentary was developed on Pearl Spot seed production, projecting the replenishment of fish stock and creating fish abundance based on the activities under the project, which can be used as an eco-friendly, practical manual for

Table 3: Economic analysis of pearlspot seed production unit (Cost or price in ₹)

| Particulars                                                                 | First year |                   |              | Second year |                   |                                                         | Third year |                   |              |
|-----------------------------------------------------------------------------|------------|-------------------|--------------|-------------|-------------------|---------------------------------------------------------|------------|-------------------|--------------|
|                                                                             | Units      | Unit price (in ₹) | price (in ₹) | Units       | Unit price (in ₹) | price (in ₹)                                            | Units      | Unit price (in ₹) | price (in ₹) |
| <u>Fixed expenditure</u>                                                    |            |                   |              |             |                   |                                                         |            |                   |              |
| Seed collection unit and egg depositors                                     | 1          | 75000             | 75000        |             |                   |                                                         |            |                   |              |
| Packing unit                                                                | 1          | 20000             | 20000        |             |                   |                                                         |            |                   |              |
| Bird fencing net                                                            | 1          | 75000             | 75000        |             |                   |                                                         |            |                   |              |
| Total fixed cost                                                            |            |                   | 170000       |             |                   |                                                         |            |                   |              |
| <u>Variable expenditure</u>                                                 |            |                   |              |             |                   |                                                         |            |                   |              |
| Pond preparation cost                                                       |            |                   | 100000       |             |                   | 100000                                                  |            |                   | 100000       |
| Pearl spot brood fish                                                       | 100        | 1250              | 125000       | 100         | 1250              | 125000                                                  | 100        | 1250              | 125000       |
| Pearl spot pellet feed                                                      | 40         | 300               | 12000        | 40          | 300               | 12000                                                   | 40         | 300               | 12000        |
| Seed collection charges                                                     | 1          | 150000            | 150000       | 1           | 150000            | 150000                                                  | 1          | 150000            | 150000       |
| Happa net and packing items                                                 |            | 50000             | 50000        |             | 50000             | 50000                                                   |            | 50000             | 50000        |
| Total variable cost                                                         |            |                   | 437000       |             |                   | 437000                                                  |            |                   | 437000       |
| Depreciation on capital investment, at 20%                                  |            |                   | 34000        |             |                   | 34000                                                   |            |                   | 34000        |
| Insurance premium at 2% of the capital investment                           |            |                   | 3400         |             |                   | 3400                                                    |            |                   | 3400         |
| Interest on 75% of the capital investment at 12% annum <sup>-1</sup>        |            |                   | 15300        |             |                   | 15300                                                   |            |                   | 15300        |
| Administrative/Other expenses at 1% of 75% capital investment               |            |                   | 1275         |             |                   | 1275                                                    |            |                   | 1275         |
| Total annual operating cost (Rs.)                                           |            |                   | 490975       |             |                   | 490975                                                  |            |                   | 490975       |
| Gross return (Pearl spot seed sale 150000 nos. at ₹ 10 seed <sup>-1</sup> ) | 150000     | 10                | 1500000      | 150000      | 10                | 1500000                                                 | 150000     | 10                | 1500000      |
| Net returns (in ₹)                                                          |            |                   | 1009025      |             |                   | 1009025                                                 |            |                   | 1009025      |
| BC ratio                                                                    |            |                   | 3.06         |             |                   |                                                         |            |                   |              |
| Average annual net return (in ₹)                                            |            |                   |              |             |                   |                                                         |            |                   | ₹ 1009025    |
| The total fixed cost (in ₹)                                                 |            |                   |              |             |                   |                                                         |            |                   | ₹ 170000     |
| The break-even point (BEP)                                                  |            |                   |              |             |                   | 23989 Pearl spot seeds sold at Rs.10 seed <sup>-1</sup> |            |                   |              |
| Pay back period (Years)                                                     |            |                   |              |             |                   |                                                         |            |                   | 0.17 years   |
| Price product <sup>-1</sup> (P) (in ₹ kg <sup>-1</sup> )                    |            |                   |              |             |                   |                                                         |            |                   | ₹ 10         |
| Cost unit <sup>-1</sup> (C) ((in ₹ kg <sup>-1</sup> )                       |            |                   |              |             |                   |                                                         |            |                   | ₹ 2.9        |
| P-C (in ₹ kg <sup>-1</sup> )                                                |            |                   |              |             |                   |                                                         |            |                   | ₹ 7.1        |

mobilizing similar SHG ventures on a sustainable basis.

### 3.1.3. Case study 3: Value addition enterprise: success stories of Puthuvyppe and Arakkunnam

As a part of the study objectives, two successfully operating value-added fish production units were established in Puthuvypu and Arakkunnam of Ernakulam district of Kerala state by mobilizing SHGs for the production of fish pickles, fish chutney powder, and such ready-to-eat value-added fish products. Two Self Help Groups, containing 10 members each, were mobilized for fish pickle production in each panchayath. Women's participation was ensured in the mobilization phase onwards. The technical assistance was provided by the experts from Krishi Vigyan Kendra (KVK) of CMFRI, and KVK played a pivotal role in the practical dissemination of technologies. A training pamphlet in vernacular was distributed to the SHG members as a ready reckoner for convincing the value-added fish production technology. The study results revealed that though the

majority of activities were female-dominated, the male counterparts of the households also have a definite role in decision making, arranging raw materials, management, sales, and marketing of the value-added products, etc.

The Economic Feasibility Analysis of the Fish value addition production units of SHGs was undertaken by gathering data for the last 3 years on expenditure and returns to project the indicative economics. The average operating cost and average net returns were worked out, and the significant components assessed were the Break Even Point and Pay Back Period of these enterprises. The results are presented in Table 4. From the table on economic feasibility analysis, it could be observed pragmatically that the Average Annual Net Return was found to be Rs. 205270/- The total fixed cost for the value-added fish production enterprise was Rs. 75000/-. The Break Even Point (BEP) = Fixed Asset / (Profit unit<sup>-1</sup>—Variable cost unit<sup>-1</sup>) = 340 kg of fish pickle at Rs 700/- kg<sup>-1</sup>. The Pay Back Period was found to be just 1 year, indicating the profitability of the enterprise.

Table 4: Economic analysis of the fish pickling unit established by the SHGs (Cost or price in ₹)

| Particulars                                     | First year |                   |              | Second year |                   |              | Third year |                   |              |
|-------------------------------------------------|------------|-------------------|--------------|-------------|-------------------|--------------|------------|-------------------|--------------|
|                                                 | Units      | Unit price (in ₹) | Price (in ₹) | Units       | Unit price (in ₹) | Price (in ₹) | Units      | Unit Price (in ₹) | Price (in ₹) |
| <b>Fixed expenditure</b>                        |            |                   |              |             |                   |              |            |                   |              |
| Packing machine                                 | 1          | 20000             | 20000        |             |                   |              |            |                   |              |
| Commercial stove                                | 1          | 10000             | 10000        |             |                   |              |            |                   |              |
| Big vessel                                      | 1          | 12000             | 12000        |             |                   |              |            |                   |              |
| Frying pan                                      | 1          | 2000              | 2000         |             |                   |              |            |                   |              |
| Containers                                      | 1000       | 15                | 15000        |             |                   |              |            |                   |              |
| Small stove                                     | 1          | 4000              | 4000         |             |                   |              |            |                   |              |
| Electronic weighing machine                     | 1          | 8000              | 8000         |             |                   |              |            |                   |              |
| Mixer grinder                                   | 1          | 4000              | 4000         |             |                   |              |            |                   |              |
| Total fixed cost                                |            |                   | 75000        |             |                   |              |            |                   |              |
| <b>Variable expenditure</b>                     |            |                   |              |             |                   |              |            |                   |              |
| Rent for building (₹ 5000 month <sup>-1</sup> ) | 12         | 5000              | 60000        | 12          | 5000              | 60000        | 12         | 5000              | 60000        |
| Electricity charges year <sup>-1</sup>          |            |                   | 2400         |             |                   | 2400         |            |                   | 2400         |
| Fish (kg)                                       | 800        | 350               | 280000       | 800         | 350               | 280000       | 800        | 350               | 280000       |
| Salt (kg)                                       | 50         | 24                | 1200         | 50          | 24                | 1200         | 50         | 24                | 1200         |
| Masala powder (kg)                              | 60         | 466               | 27960        | 60          | 466               | 27960        | 60         | 466               | 27960        |
| Green chilly (kg)                               | 20         | 40                | 800          | 20          | 40                | 800          | 20         | 40                | 800          |
| Garlic (kg)                                     | 50         | 70                | 3500         | 50          | 70                | 3500         | 50         | 70                | 3500         |
| Curry leaf (kg)                                 | 2.5        | 40                | 100          | 2.5         | 40                | 100          | 2.5        | 40                | 100          |

Table 4: Continue...

| Particulars                                                  | First year |                   |              | Second year |                   |              | Third year |                   |                                                 |
|--------------------------------------------------------------|------------|-------------------|--------------|-------------|-------------------|--------------|------------|-------------------|-------------------------------------------------|
|                                                              | Units      | Unit price (in ₹) | Price (in ₹) | Units       | Unit price (in ₹) | Price (in ₹) | Units      | Unit price (in ₹) | Price (in ₹)                                    |
| Ginger (kg)                                                  | 50         | 38                | 1900         | 50          | 38                | 1900         | 50         | 38                | 1900                                            |
| Gingelly oil (kg)                                            | 110        | 296               | 32560        | 110         | 296               | 32560        | 110        | 296               | 32560                                           |
| Mustard seeds (kg)                                           | 15         | 50                | 750          | 15          | 50                | 750          | 15         | 50                | 750                                             |
| Vinegar                                                      | 100        | 80                | 8000         | 100         | 80                | 8000         | 100        | 80                | 8000                                            |
| Sugar (kg)                                                   | 12.5       | 44.8              | 560          | 12.5        | 44.8              | 560          | 12.5       | 44.8              | 560                                             |
| Labour charge (at ₹ 600 Man days <sup>-1</sup> )             | 50         | 600               | 30000        | 50          | 600               | 30000        | 50         | 600               | 30000                                           |
| Packing charge                                               | 4000       | 2                 | 8000         | 4000        | 2                 | 8000         | 4000       | 2                 | 8000                                            |
| LPG                                                          | 10         | 600               | 6000         | 10          | 600               | 6000         | 10         | 600               | 6000                                            |
| Packing material                                             |            |                   | 4000         |             |                   | 4000         |            |                   | 4000                                            |
| Labelling                                                    | 4000       | 3                 | 12000        | 4000        | 3                 | 12000        | 4000       | 3                 | 12000                                           |
| Total variable cost                                          |            |                   | 479730       |             |                   | 479730       |            |                   | 479730                                          |
| Interest on fixed cost (10% annum <sup>-1</sup> )            |            |                   | 7500         |             |                   | 7500         |            |                   | 7500                                            |
| Depreciation (10% annum <sup>-1</sup> )                      |            |                   | 7500         |             |                   | 7500         |            |                   | 7500                                            |
| Total operating cost (₹)                                     |            |                   | 494730       |             |                   | 494730       |            |                   | 494730                                          |
| Gross return (Selling pickle at ₹ 700 kg <sup>-1</sup> )     | 1000       | 700               | 700000       | 1000        | 700               | 700000       | 1000       | 700               | 700000                                          |
| Net returns (₹)                                              |            |                   | 205270       |             |                   | 205270       |            |                   | 205270                                          |
| Average annual net return (in ₹)                             |            |                   |              |             |                   |              |            |                   | ₹ 205270                                        |
| The total fixed cost (in ₹)                                  |            |                   |              |             |                   |              |            |                   | ₹ 75000                                         |
| The break-even point (BEP)                                   |            |                   |              |             |                   |              |            |                   | 340 kg of fish pickle at ₹ 700 kg <sup>-1</sup> |
| Pay back period                                              |            |                   |              |             |                   |              |            |                   | 0.37 years                                      |
| Price product <sup>-1</sup> (P) (₹ (in ₹) kg <sup>-1</sup> ) |            |                   |              |             |                   |              |            |                   | ₹ 700                                           |
| Cost unit <sup>-1</sup> (C) (in ₹)                           |            |                   |              |             |                   |              |            |                   | ₹ 479.7                                         |
| P-C (in ₹)                                                   |            |                   |              |             |                   |              |            |                   | ₹ 220.3                                         |

#### 3.1.4. Case study 4: Fish fertiliser production unit: success story of Cherai SHG

One successfully operating fish fertiliser production unit was established in Cherai of Ernakulam district of Kerala state by mobilizing one SHG for the production of fish fertiliser under this study. The Self-help group, containing 10 members, was mobilized, and the women's participation was ensured in the mobilization phase onwards. The technical assistance was provided by the experts from Krishi Vigyan Kendra (KVK) of CMFRI, and KVK played a major role in the practical dissemination of technologies. A series of training programmes, including the theoretical aspects and practical demonstrations on fish fertilizer production and management, were undertaken with the subject matter experts from KVK. The gender analysis,

performance level of SHG, Empowerment Index, and economic feasibility analysis were assessed with socio-economic surveys undertaken in the locality. Though the majority of activities were female-dominated, the male counterparts of the households also have a certain role in decision making, arranging raw materials, management, sales, and marketing of the fish fertiliser, etc. The sale of the fish fertiliser in attractive packaging was arranged in the ATIC (Agriculture Technology Information Centre) Sales counter of ICAR-CMFRI. The average operating cost was Rs 215066, and the average annual net return was Rs 57859/-. The total fixed cost was Rs 203450, and the Break-Even Point (BEP) was 313 number of 5 kg packets at Rs. 1800 each, and the Pay Back Period was observed as 3.61 years. (Table 5)

Table 5: Economic analysis of fish fertilizer SHG units

| Particulars                                       | First year |                      |                 | Second year |                      |                 |
|---------------------------------------------------|------------|----------------------|-----------------|-------------|----------------------|-----------------|
|                                                   | Units      | Unit price<br>(in ₹) | Price<br>(in ₹) | Units       | Unit price<br>(in ₹) | Price<br>(in ₹) |
| Fixed expenditure                                 |            |                      |                 |             |                      |                 |
| FRP cans                                          | 10.00      | 5200.00              | 52000.00        |             |                      |                 |
| Plastic sheet                                     | 5.00       | 1250.00              | 6250.00         |             |                      |                 |
| Sieve                                             | 1          | 750.00               | 750.00          |             |                      |                 |
| FRP tank                                          | 3.00       | 45000.00             | 135000.00       |             |                      |                 |
| Weigh balance                                     | 1.00       | 6000.00              | 6000.00         |             |                      |                 |
| Sealing machine                                   | 1.00       | 3000.00              | 3000.00         |             |                      |                 |
| Trays                                             | 3.00       | 150.00               | 450.00          |             |                      |                 |
| Miscellaneous                                     |            |                      | 500             |             |                      |                 |
| Total fixed cost (₹)                              |            |                      | 203450.00       |             |                      |                 |
| Variable expenditure                              |            |                      |                 |             |                      |                 |
| Raw fish (kg)                                     | 1000.00    | 18.00                | 18000.00        | 1000.00     | 17.20                | 17200.00        |
| Fish waste (kg)                                   | 1000.00    | 2.00                 | 2000.00         | 1000.00     | 2.00                 | 2000.00         |
| Coir pith (kg)                                    | 600.00     | 20.00                | 12000.00        | 600.00      | 16.67                | 10002.00        |
| Jaggery (kg)                                      | 2000.00    | 25.00                | 50000.00        | 2000.00     | 20.00                | 40000.00        |
| Rent month <sup>-1</sup>                          | 10.00      | 1500.00              | 15000.00        | 10.00       | 1500.00              | 15000.00        |
| Labelling (Sheets)                                | 160.00     | 30.00                | 4800.00         | 160.00      | 30.00                | 4800.00         |
| Labour charge                                     |            |                      | 60000.00        |             |                      | 60000.00        |
| Transportation                                    |            |                      | 20000.00        |             |                      | 21000.00        |
| Miscellaneous                                     |            |                      | 2000.00         |             |                      | 1850.00         |
| Total variable cost (₹)                           |            |                      | 183800.00       |             |                      | 171850.00       |
| Interest on fixed cost (10% annum <sup>-1</sup> ) |            |                      | 20395.00        |             |                      | 20395.00        |
| Depreciation (10% annum <sup>-1</sup> )           |            |                      | 20395.00        |             |                      | 20395.00        |
| Total operating cost                              |            |                      | 224590.00       |             |                      | 212640.00       |
| Returns                                           |            |                      |                 |             |                      |                 |
| Fertifish (250 g)                                 | 2000.00    | 90.00                | 180000.00       | 1900.00     | 90.00                | 171000.00       |
| Fertifish (5 kg)                                  | 60.00      | 1800.00              | 108000.00       | 52.00       | 1800.00              | 93600.00        |
| Gross return                                      |            |                      | 288000.00       |             |                      | 264600.00       |
| Net returns                                       |            |                      | 63410.00        |             |                      | 51960.00        |

Table 5: Continue...

| Particulars       | Third year |                      |                 | Fourth year |                      |                 |
|-------------------|------------|----------------------|-----------------|-------------|----------------------|-----------------|
|                   | Units      | Unit price<br>(in ₹) | Price<br>(in ₹) | Units       | Unit price<br>(in ₹) | Price<br>(in ₹) |
| Fixed expenditure |            |                      |                 |             |                      |                 |
| FRP cans          |            |                      |                 |             |                      |                 |
| Plastic sheet     |            |                      |                 |             |                      |                 |
| Sieve             |            |                      |                 |             |                      |                 |
| FRP tank          |            |                      |                 |             |                      |                 |

Table 5: Continue...

| Particulars                                          | Third year |                      |                                                               | Fourth year |                      |                 |
|------------------------------------------------------|------------|----------------------|---------------------------------------------------------------|-------------|----------------------|-----------------|
|                                                      | Units      | Unit price<br>(in ₹) | Price<br>(in ₹)                                               | Units       | Unit price<br>(in ₹) | Price<br>(in ₹) |
| Weigh balance                                        |            |                      |                                                               |             |                      |                 |
| Sealing machine                                      |            |                      |                                                               |             |                      |                 |
| Trays                                                |            |                      |                                                               |             |                      |                 |
| Miscellaneous                                        |            |                      |                                                               |             |                      |                 |
| Total fixed cost (₹)                                 |            |                      |                                                               |             |                      |                 |
| Variable expenditure                                 |            |                      |                                                               |             |                      |                 |
| Raw fish (kg)                                        | 1000.00    | 17.40                | 17400.00                                                      | 1000.00     | 19.30                | 19300.00        |
| Fish waste (kg)                                      | 1000.00    | 2.00                 | 2000.00                                                       | 1000.00     | 2.00                 | 2000.00         |
| Coir pith (kg)                                       | 600.00     | 16.67                | 10002.00                                                      | 600.00      | 16.67                | 10002.00        |
| Jaggery (kg)                                         | 2000.00    | 20.00                | 40000.00                                                      | 2000.00     | 20.00                | 40000.00        |
| Rent month <sup>-1</sup>                             | 10.00      | 1500.00              | 15000.00                                                      | 10.00       | 1500.00              | 15000.00        |
| Labelling (Sheets)                                   | 150.00     | 30.00                | 4500.00                                                       | 125.00      | 30.00                | 3750.00         |
| Labour charge                                        |            |                      | 60000.00                                                      |             |                      | 60000.00        |
| Transportation                                       |            |                      | 18900.00                                                      |             |                      | 19000.00        |
| Miscellaneous                                        |            |                      | 2100.00                                                       |             |                      | 2500.00         |
| Total variable cost (₹)                              |            |                      | 169902.00                                                     |             |                      | 171552.00       |
| Interest on fixed cost (10% annum <sup>-1</sup> )    |            |                      | 20395.00                                                      |             |                      | 20395.00        |
| Depreciation (10% annum <sup>-1</sup> )              |            |                      | 20395.00                                                      |             |                      | 20395.00        |
| Total operating cost                                 |            |                      | 210692.00                                                     |             |                      | 212342.00       |
| Returns                                              |            |                      |                                                               |             |                      |                 |
| Fertifish (250 g)                                    | 1950.00    | 90.00                | 175500.00                                                     | 2060.00     | 90.00                | 185400.00       |
| Fertifish (5 kg)                                     | 44.00      | 1800.00              | 79200.00                                                      | 55.00       | 1800.00              | 99000.00        |
| Gross return                                         |            |                      | 254700.00                                                     |             |                      | 284400.00       |
| Net returns                                          |            |                      | 44008.00                                                      |             |                      | 72058.00        |
| The average operating cost (in ₹)                    |            |                      |                                                               |             |                      | ₹ 215066        |
| Average annual net return (in ₹)                     |            |                      |                                                               |             |                      | ₹ 57859         |
| The total fixed cost                                 |            |                      |                                                               |             |                      | ₹ 203450        |
| The break-even point (BEP)                           |            |                      | 313 (5 kg packets) at ₹ 1800 each Or 1565 kg at ₹ 360 kg-1313 |             |                      |                 |
| Pay back period (Years)                              |            |                      |                                                               |             |                      | 3.61 years      |
| Price (main product) <sup>-1</sup> (5kg pack) (in ₹) |            |                      |                                                               |             |                      | ₹ 1800          |
| Cost unit <sup>-1</sup> (in ₹)                       |            |                      |                                                               |             |                      | ₹ 1149.4        |
| P-C (in ₹)                                           |            |                      |                                                               |             |                      | ₹ 651           |

#### 4. CONCLUSION

SHGs served as crucial platforms for collective savings and facilitated access to formal credit systems and institutional grant-in-aid programs. This enhanced access to technical and financial resources proved instrumental in enabling members to adopt entrepreneurial ventures, significantly bolstering their economic resilience. The findings offered profound insights into the transformative

power of SHGs, highlighting their critical contribution to community development and the sustained economic empowerment of fisherfolk.

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