Rural Microenterprise Transformation Project (RMTP)

Sectoral Impact Study (SIS)
of
Fisheries and Aquaculture Sector



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CONTENTS

GLOSSARY

AIGA	Alternative Income Generating Activity
AOS	Annual Outcome Survey
BSFL	Black Soldier Fly Larvae
BDT	Bangladeshi Taka (Bangladesh Currency)
DANIDA	Danish International Development Agency
DO	Dissolve Oxygen
FY	Fiscal Year (July to December (in case of Bangladesh)
GDP	Gross Domestic Product
GAqP	Good Aquaculture Practices
IDI	In depth Interview
IoT	Internet of Things
IFAD	International Fund for Agricultural Development
LSP	Local Service Provider
MT	Metric Ton
NGO	Non-Government Organization
PMU	Project Management Unit
PKSF	Palli Karma-Sahayak Foundation
POs	Partner Organizations
PL	Post Larvae (shrimp/prawn)
RMTP	Rural Microenterprise Transformation Project
R2E	Ready to Eat
SIS	Sectoral Impact Study
ToR	Terms of References
VC	Value Chain
VCF	Value Chain Facilitator

EXECUTIVE SUMMARY

The sectoral Impact study (SIS) was conducted to assess the performance of the sector in improving the socio-economic conditions of the project participants through a pre-set questionnaire. The SIS was conducted by PMU with the support of POs staffs (VCFs) and applied individual in-depth interviews for data collection.

The study was conducted throughout the project area covered by the 20 sub-projects of Fisheries and Aquaculture sector and the sample size was 83. The collected data was analyzed in line with: changes in productivity, product quality and mortality of fish/shrimp; change in income and assets of households; employment generation; change in sales volume and market system; changes in the enterprise & consumer level; changes in technology adoption; environment & climate issues, and changes in gender & social issues.

The data analysis report showed that more than 95% respondents reported to increase production ranging from 15 to 30 percent. The participants also reported to reduce the use of chemicals due to use of aerator and applying GAqP. Most of the participants reported to reduce the mortality rate of fish fry & PL at 10 to 15 percent in comparison with the previous rate and reduced disease occurrences about 20 to 25 percent. The respondents from BSFL producers reported for producing 10-50 Kg larvae daily which replaced the commercial feed. In case of `Ready to Cook' and `Ready to Eat' fish products, the interviewee reported to increase the products quality due to capacity building effort and using the quality raw fish and maintaining cool chain during transportation.

There was a mixed response found regarding the production cost. About 80% respondents reported to increase the production cost of 10-15 percent due to intensification in cultured system i.e., higher stocking density, more feed requirement and cost of aerator/electricity, other management practices etc. On the other hand, 20% respondents reported to reduce the production cost or remain the same as previous in spite of intensification in culture system due to good management practices of feed, fertilizer and aqua chemicals/drugs. But all the respondents were reported to increase the production of fish and shrimp.

The collected data claimed that the average income increased 0.3- 1.6 lac taka in all cases of technology and/or activity. Most of the participants reported that they had purchased productive assets such as aerator, water pump, land, net, etc. from the income of the aquaculture related interventions. These assets would contribute for increasing the production and product quality.

From the study it was found that RMTP supported interventions created new employment opportunities ranging from 40-240 Man-day. The collected data showed that the sales volume was increased in 20-25% due to increase in production and/or delivery of embedded services and the producers were started selling their products in nearby market, arat and even distance market/places in comparison with the previous year. Also, some participants started selling their products through online/social media platform.

The respondents from the demo plot holder of improved extensive/semi-intensive technology reported that every day, 3-4 neighbor producers had come to know about the technology and showed interest to implement. The analysis showed that the adoption rate of the technology/activity is remarkable and would capitalize at the ratio of 1:2 to 1:3. Ther collected

data showed that 17 new entrepreneurs started to produce black soldier fly larvae mostly collecting pupae from demo plot holders and 14 neighbor fish producers bought aerator and used their ponds by knowing the benefits of the technology.

The collected data showed the environmental consequences were mitigated by making the embankment of pond/farm stronger, use of fencing net, used environment friendly inputs & technology, etc. The data claimed that the workers used protective cloths, hand gloves and sun glasses while applying chemical fertilizer, lime, aqua chemicals etc.

The respondents informed that both male and female were engaged in economic activity. From the collected data, it was found that the male counterpart supported some of the activities but not limited to- pond/farm preparation, fry/fingerling stocking, fish harvesting, selling of fishes/products etc. and female counterpart mainly responsible for low labor intense activities such as fertilize/feed management, post- harvest management, packaging etc. The respondents also said that they helped each other in performing household activities.

There had been a positive change in case of household nutrition, child education, received better treatment and control over resources. In case of decision making (family expenditure, children's education, marriage etc.) data showed that they took decisions jointly with mutually respect.

The PMU team is recommended the following things for the sustainability of the technology/activities as well as to capitalize the greater impact:

1. It is the prime requirement to increase the number of demonstrations by allocating more budget. Also recommended to implement a bridge project to continue the technical back-stopping to the participants for the sustainability of the technology.
2. For the greater impact and sustainability of the BSFL technology, larger producers and inputs/feed market giants needed to come forward to adopt the technology. Hence, a separate project may be design to commercialize this technology through private company.
3. To capitalize the greater impact and sustainability of the R2C and R2E products, larger producers/entrepreneurs & processing company are needed to come forward to popularize promotion & branding activities. Hence, project need to focused on private sector engagement or a separate project may be design to commercialize these products through private company.
4. The sub-projects had a positive and significant impact on semi-intensive farming practice, increasing household incomes and assets, which have arguably played an important role both in improving production and revenues. However, the impacts that the sub-project created are still in virgin stage. So, extended supports were needed for the maturity i.e., more expansion of the technology.

5 More digital devices should be introduced in the fish farm for measuring PH, DO, ammonia (NH3) etc. through IoT system.

1. INTRODUCTION

1.1 Country Context:

Cultivation and catching of fish are an integral part of the Bangladeshi rural livelihood, given the climatic conditions and rich prevalence of water bodies in the riverine nation. Fish has long been a cornerstone of Bengali cuisine and is considered a prominent non-vegetarian source. This dietary tradition has earned Bengalis the nickname "Mache Bhate Bengali". Given that 60 percent of the total animal-sourced protein requirements of the country are coming from fish. Moreover, the fisheries sector in Bangladesh is a crucial contributor to the country's economy, not only meeting a significant proportion of the nation's non-vegetarian food needs but also generating substantial income. In the fiscal year 2021-22, Bangladesh was ranked third globally in terms of capture fisheries from inland open waterbodies and 4th largest producer of aquaculture products amounting 4.76 million MT and contributing 3.57 percent to the country's GDP and 26.5% of agricultural GDP. Additionally, Bangladesh has been exporting fish and fish-related products to over 50 countries worldwide, earning a total of $533 million in FY 2021-22, which is more than 1 percent of the country's total export earnings.

Bangladesh ranks first in the world in fish production, but still lags behind in increasing vertical production using modern technologies and techniques and above all in producing safe fish and diversified fish products. On the other hand, as there is no or very little supply and demand for frozen and processed fish products in the national market, the processors are running their business only depending on the international market. If the supply of value-added fish products is not increased in the national market, it will be difficult to achieve the sustainability of this activity in addition to increasing dependence on the international market. Therefore, in order to increase the supply of safe and quality fish products in the national market, it is the need of the hour to develop value-added (Ready to Cook and Ready to Eat) fish products and marketing system of these products through the cooperation of producer, service provider, different stakeholders, exporters and small-scale processors.

In addition, fish producers are unable to make expected profit from the business due to lack of technical know-how, use of obsolete technology, use of low-quality inputs, fluctuation in input price, lack of knowledge & awareness of inputs quality issue, and knowledge on market of their produce. Moreover, we can't say their products is 'safe' due to the indiscriminate application of fertilizer, antibiotics, chemical pesticide, feed etc. by fish farmers. Although the farmers cultured fish in high density but the fish mortality is as high as 20% and production cost is higher as they don't follow the modern fish farming technology (semi-intensive & intensive) properly. So, there is a possibility to increase 'safe fish' production considerably by motivating farmers to apply modern fish farming technologies and/or good aquaculture practices (GAqP). Also, there is a possibility for branding and marketing of the fish & fisheries products through traceability and certification.

1.2 RMTP's Sector Contest:

PKSF is implementing a project titled Rural Microenterprise Transformation Project (RMTP) jointly financed by PKSF, International Fund for Agricultural Development (IFAD), and Danish

International Development Agency (DANIDA). The goal of RMTP is to sustainably increase the income, food security, and nutrition of marginal and small farmers and micro-entrepreneurs across selected value chains. The development objective is the sustainable growth of selected rural commodity value chains with comparative advantage, market demand, growth potential, and backward linkages to small farmers and micro-entrepreneurs.

RMTP is making value chain (VC) interventions in different agricultural sectors to enhance efficiency in different stages of value chains from input suppliers to consumers. The Fisheries and Aquaculture sector of RMTP is supporting to generate revenue for the rural micro-economy in the country through implementing market-based solutions of aforesaid constraints exist in Aquaculture sector. An increasing number of fish farmers and other relevant actors in Bangladesh are engaging themselves in this potential sectoral activity. Recognizing the importance of this sector, PKSF has been implementing twenty VC sub- projects titled 'Production and Marketing of Safe Fish and Fish Products' since July 2022 through its twenty partner organizations (POs). A total of 52,772 farmers were getting support from the sector across 72 upazilas from 23 districts of Bangladesh. The farmers are receiving various technical, technological, and marketing support under these VC sub-projects.

2. OBJECTIVES AND SCOPE OF THE STUDY

2.1 Objectives:

The main objective of this assignment, as mentioned in the terms of reference (ToR) for this assignment, was to assess the performance of the sector in improving the socio-economic conditions of the project participants. To attain this objective, the present socio-economic conditions of the farmers and other project participants need to be compared with the baseline information. The baseline information of the participants was collected at the beginning of the sub-projects. The SIS measured changes in productivity, sales, income, assets, etc. of the participants and the creation of new employment in the sector through a pre-set questionnaire. The SIS was conducted to attain the following specific objectives:

a) To assess the increase in productivity of the IGA/Intervention of the project participants
b) To measure the increased income of specific IGA due to the project interventions
c) To assess the profitability of that specific intervention/technology
d) To assess the technology adoption by the farmers and the secondary adopter.
e) To assess the synergic effect of the technology demonstration plots.
f) To assess the Gender and Youth impact on the "Participation & Empowerment" status of project beneficiaries through/by project interventions.

2.2 Scope:

The scope of the current study as stipulated in the ToR was to collect first hand data from the participants of the value chain sub-project area staying through its' field force. The scope includes the interaction with different farmers, local service providers, backward and forward market actors, and representative/s from private sector entities. Thus, the scope of this study can

be rearticulated as an attempt to obtain a snapshot assessment of the current economic and social conditions of the actors who took part in various activities of value chain sub-project so that the changes related to the project interventions can be assessed to evaluate project impact. The review of the baseline report and annual outcome study reports was helpful to construct a clear picture of the project performance. The project document was the core material for this study.

3. APPROACH AND METHODOLOGY

The SIS was conducted by PMU following the qualitative approach. The PMU applied individual in-depth interviews for data collection. The required data from the interviewees was collected by Value Chain Facilitator (VCFs) of the sub-project using the previously developed qualitative data collection tool. The collection of data was underway after a hands-on orientation to the VCFs. It is mentionable that the quantitative data was gathered from the annual outcome study (AOS) that was collected simultaneously. The PMU compared changes in VC project participants' present status with the RMTP baseline information. The purposive sampling method was used to conduct the study.

4. STUDY AREA AND SAMPLE SIZE

The study was conducted throughout the project area covered by the 20 sub-projects of Fisheries and Aquaculture sector. The interviewee was selected considering about one year of involvement with the project initiative and received support from the project. The representation of the context of regional representation was considered while selecting sample. The most significant changes methodology was used for this study. The sample size was determined by the following technologies/initiatives.

SL	Technology/Initiatives	Pop.	Method	Tools	Sample
1.	Production technologies (Improved extensive/ semi-intensive/ intensive)	190	Qualitative Data Collection	IDI Checklist	18
2.	Farm mechanization (use of Aerator/ IoT etc.)	69	Qualitative Data Collection	IDI Checklist	6
3.	BSFL production & use	71	Qualitative Data Collection	IDI Checklist	6
4.	Local service providers (LSP)	125	Qualitative Data Collection	IDI Checklist	8
5.	Supply of quality spawn and fry/fingerlings (fish hatchery/nursery)	82	Qualitative Data Collection	IDI Checklist	10
6.	Private sector representative (dealer/ sub-dealer)	75	Qualitative Data Collection	IDI Checklist	8
7.	Small-scale entrepreneurs of processed fish products (Ready to Cock/Ready to Eat/ Dried fish)	67	Qualitative Data Collection	IDI Checklist	13
8.	Fisherman/ Fishers	56	Qualitative Data Collection	IDI Checklist	7
9.	Forward market actors (aratder/depot owner etc.)	51	Qualitative Data Collection	IDI Checklist	7
Total					**83**

5. DATA COLLECTION TOOLS

A data and information collection tool (structured questionnaire) was developed by PMU for conducting the sectoral impact study. The qualitative information was gathered from field through in-depth interview (IDI) of the sampled participants ranging from producers, service providers, input & output market actors. The data collection tool is presented in Annex-I.

6. EVALUATION ISSUES

The ToR that is developed for this analysis contained several issues to measure the impact such as- changes in productivity, product quality and mortality of fish/shrimp; changes in income and assets of households; employment generation; changes in sales volume and market system; changes in the enterprise & consumer level, changes in technology adoption, environment & climate issues and changes in gender & social issues. The PMU reviewed these in light of the stated objectives of the impact study stated in the ToR.

With a particular focus on impacts related to activities concerning safe fish & fish products development and marketing, the main issues and the sub-questions categories in the Table-1

Table- 1: List of project impact issues and sub-questions

Main Study Issues and Questions	Sub-questions
1.What changes have occurred in productivity, product quality and mortality of fish/shrimp?	• Is there any change occurred in production practices? • Is there any change occurred in production after using the technology? • Is there any change occurred in the quality of produces? • Is there any change in mortality of fish/shrimp during culture? • Is there any change in the occurrence of disease in fish/shrimp?
2.What changes have occurred in income and assets?	• What effects have been observed in the production cost? • What have been the changes in income of entrepreneur? • What have been the changes in landholding pattern? • Have there been any significant changes in material possessions and their uses?
3. What changes have occurred in employment opportunity?	• Is there any new employment opportunity created by the activity/technology practices? • Is any change occurred in work hours due to use of the technology?
4.What changes have occurred in sales volume and market system?	• Is there any change in sales volume of the produces? • Is there any change in market system (sales in distance market, online marketing etc.)? • What are the problems encountered during marketing of the products? • Is there any change occurred in backward/input market segment? • Is there any change occurred in forward/output market segment?

5.What are the changes occurred in the enterprise & consumer level?	• What is expression of other enterprises about the technologies/activities? • What is the ideology of consumer/receiver of the products or services?
6.What changes have occurred in technology adoption?	• What has been the rate of adoption of modern technology? • Is there any replication/synergic effect of the technologies promoted by the project, what percentages?
7.What are the environmental & climatic consequences of the technology or activity/ processing?	• Is there any impact of the technologies/activities in the wild source of fish/shrimp fry/PL? • Is the environmental & climate change issues impacted on the production? • Is the processing activity adversely affect the environment?
8.What is the gender related changes occurred due to the project activity implementation?	• Is there any change in work segregation/cooperation? • Is any change in work load/burden due to engage in project supported activity? • Is there any new window created for women/youth engagement?
9.What are the changes occurred in social and other cross cutting issues (nutrition, education control over resources etc.) due to the project implementation?	• Is there any change occurred in nutrition, education, medication etc. due to implement of project supported activities? • Is there any change occurred in social status, decision making process etc. due to involved in project supported activities?

7. FINDINGS

7.1 Changes in productivity, product quality and mortality

Fisheries and Aquaculture sector supported fish producers are practicing improved extensive/semi-intensive/intensive) production technologies at different geographic locations by partner organizations. By the use of aerator (s) and good aquaculture practices (GAqP) in cultured pond/gher, production has increased as though they performed only partial harvest reported by more than 95% of the interviewee. The producers expected to increase production ranging from 15 to 30 percent irrespective of production technologies used and received services from Lead farmer/LSP. The participants also reported that the use of chemicals (such as dissolve oxygen enhancer, different aqua chemical etc.) reduced drastically due to use of aerator and applying GAqP in the production ponds/ghers.

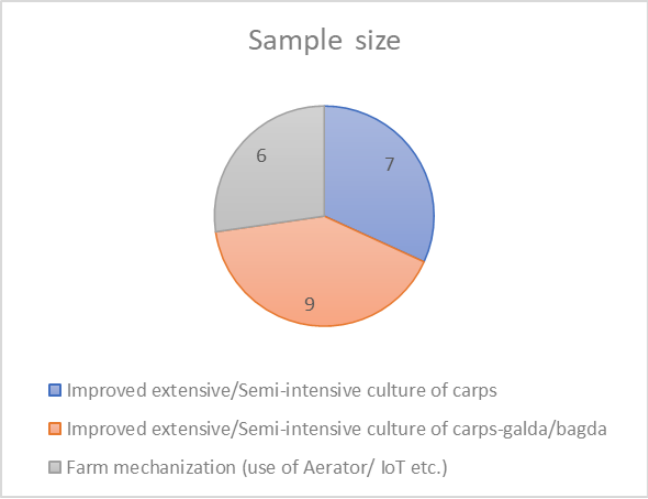

Figure-1: Sample size

Most of the participants reported to reduce the mortality rate i.e., increased the survival rate of stocked fry and PL in the pond/gher. After applying the technologies, the mortality rate of fish fry & PL reduced by 10 to 15 percent in comparison with the previous rate and reduced disease occurrences about 20 to 25 percent. This is due to the use of quality fry/fingerlings & probiotics, water & soil quality test, used fencing net around the production area that reduced the movement of disease carriers and so on. Increasing of aeration in the water and movement of fish/shrimp increased their growth & reduced the chances of disease infestation among cultured species. Based on the respondent's information and field visit observation the fish production related information is presented in the graph 1.

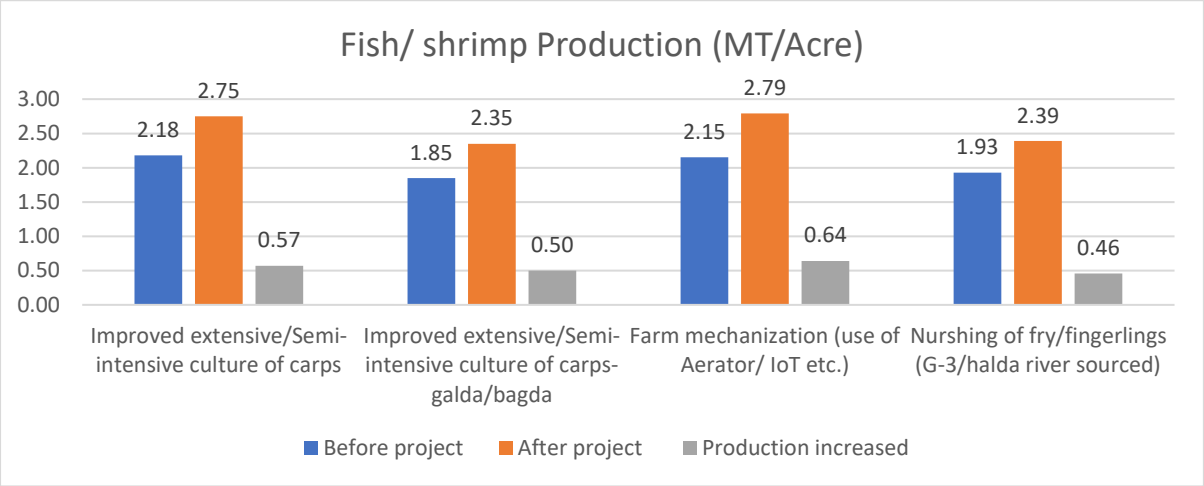

Figure-2: Fish/Shrimp production (MT/Acre)

Project supported 71 entrepreneurs has started to produce BSFL as a supplementary feed for fish and poultry. Among them relatively larger entrepreneurs were performing greatly and producing 10-50Kg larvae daily. On an average, 100-350Kg daily producing larvae of the project replaced the commercial feed. As the technology was new and beneficial to both the environment and the fish producers, hence the neighbor farmers has interested and some started to culture by collecting pupa from the demonstration plot holders.

In case of `Ready to Cook' and `Ready to Eat' fish products, the interviewee reported to increase the products quality due to the capacity building of the entrepreneurs and using the quality raw fish and maintaining cool chain during transportation, preservation and demonstration during selling.

7.2 Changes in income and assets

There was a mixed response found regarding the production cost. About 80% respondents reported to increase the production cost by 10-15 percent due to intensification in cultured system i.e. maintaining proper stocking density, adequate feed supply, cost of aerator/electricity and other management practices. On the other hand, 20% respondents reported to reduce the production cost or remain the same as previous in spite of intensification in culture system due to good management practices of feed, fertilizer and aqua chemicals/drugs. But all the respondents had reported to increase the production of fish and shrimp.

The production of black soldier fly larvae (BSFL) is new intervention has promoted by RMTP in the working area, hence more data are not available in this case. But the demonstration plot holders said that the feed cost of 01-kilogram BSFL production would be 5-7 taka depending on the source & distance of kitchen/vegetable wastes collected from the household, restaurant & market. Adding the labor and depreciation costs of production room & other productive inputs, the production of 01-kilogram BSFL would not be exceed BDT 10. RMTP has supported small-scale entrepreneurs for the production and marketing of `Ready to Cook (R2C)' and `Ready to Eat (R2E)' fish products. The entrepreneurs claimed that the production cost of R2C & R2E has increased by15 to 20 percent due to mechanization in processing, maintaining cool chain for products, packaging and storage of finished products etc. As a result, the quality of processed products increased and ultimately increased the sales and prices of the products.

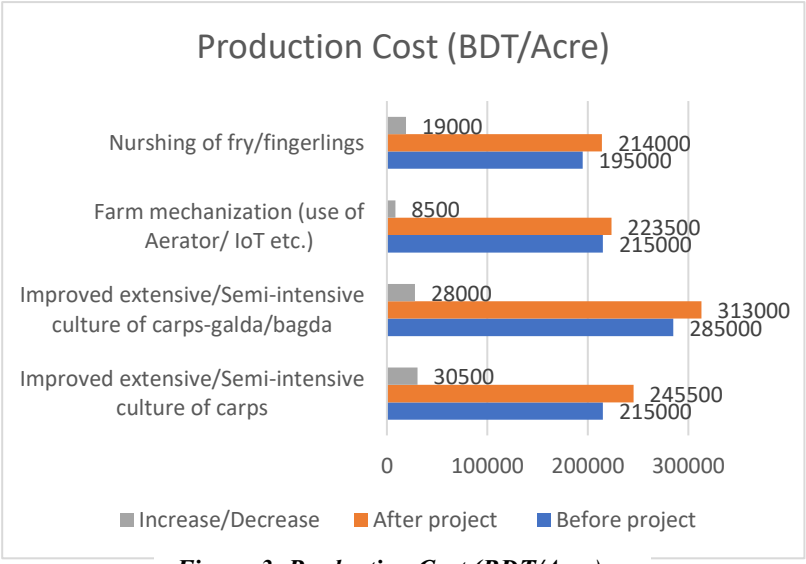

Figure-3: Production Cost (BDT/Acre)

The respondents said that the average income in carps poly culture, carp-galda poly culture, fry/fingerlings nursing were 3.50 Lac, 3.75 Lac & 3.40 Lac Taka respectively from how much waterbodies. The collected data claimed that the average income increased 0.3- 1.6 lac taka in all cases of technology and/or activity from how much waterbodies. The summery of the income are shown in the following graph.

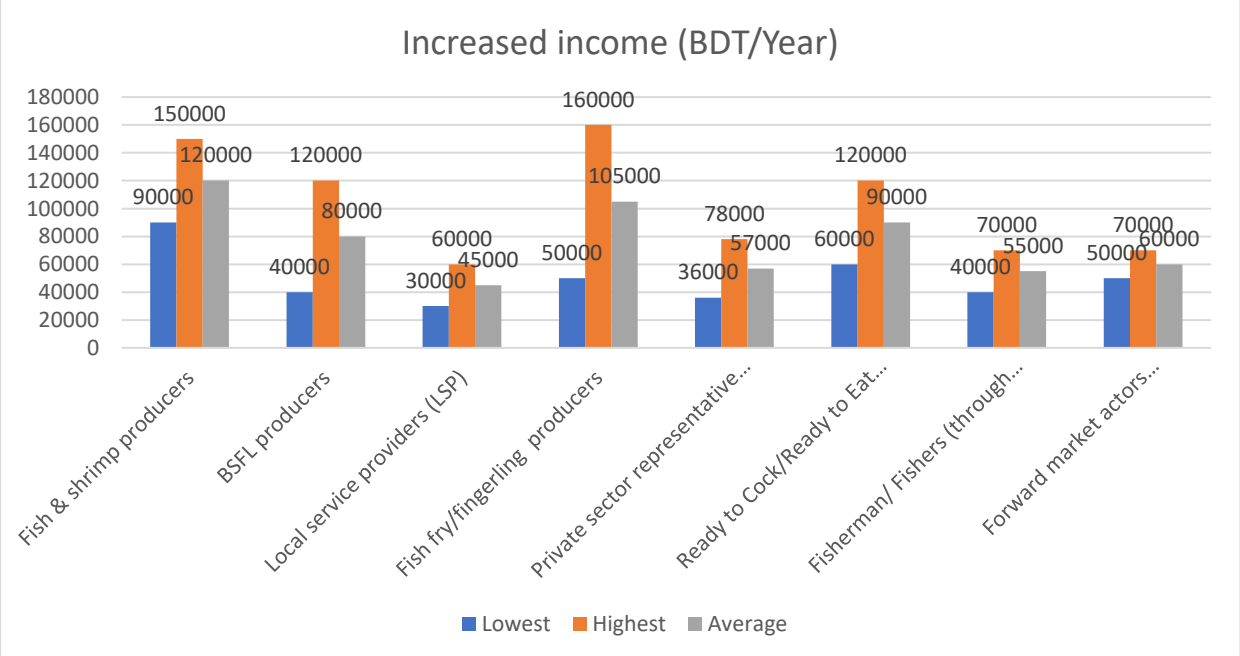

Figure-4: Increased income (BDT/Year

The project supported 56 fishermen/ fish fry or crablet collectors were started alternative income generating activities (AIGA) such as fishing net making, nursing of fry, fish culture in small pond, echo-tourism etc. The respondents reported that this income generating avenue is additional source of income and increased their earning on an average 10 to 15 percent.

The collected data showed that the trained Lead farmers/ LSPs were facilitating `Good aquaculture Practices (GAqP) sessions among the producers' received honorarium from the project. The LSPs who were operating `Service & Information Center' for fish farming, provided technical services and water & soil testing services to the fish/shrimp producers. Initially they providing these services with the aim of creating awareness among the fish farmers on good culture practices and didn't receive any charge for these services. Later on it creates more demand for these service at field level and the income of LSP's ultimately increased.

The sales volume of inputs (feed, fertilizer, lime & other aqua chemicals) of private sector representative (dealer/retailer) increased due to engaged in project activities and delivering technical support to the project participants. That contributed to increase their income. Again, the forward market actor's income has increased due to increase sale in the market/ arat/ depot.

The collected data claimed that, fish landing center has improved by ensuring proper hygiene & sanitation of fish market/arat/depot. This has enabled to increase the supply of safe fish and their sales volume that proportionately increased the income of the forward market actors.

Due to the intervention of RMTP, there had been observed the changes in household and productive assets based of the participants. Most of the participants reported that they had purchased productive assets such as aerator, water pump, land, net, etc. from the income of the aquaculture related interventions. These assets would contribute for increasing the production and product quality.

7.3 Changes in employment opportunity

The most of captured data from the in-depth interview (IDI) showed that the RMTP supported interventions created opportunities for employment. This is due to increase in farm management practices, product diversification, catching of fish/shrimp, selling of products, transportation, delivery of services etc. These activities increased the cost of business that was reasonable in regards of production increased. The new employment opportunity created in the form of productive labor, transporter and processing labor, service provider etc. On the other hand, a few respondents (5% respondents) reported to create no external employment opportunity due to intensification of their own labor in their business. The summary of job creation opportunities is shown in the graph 3.

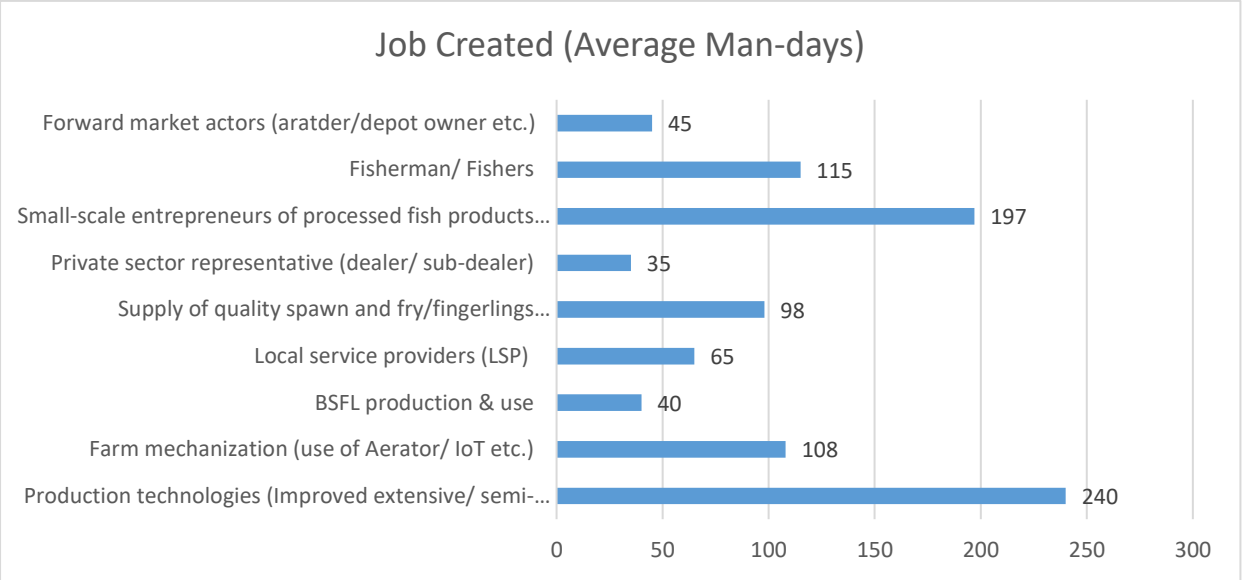

Figure-5: Job Created (Average Man-days)

7.4 Changes in sales volume and market system

The collected data showed that the sales volume has increased by 20-25% due to increase in production and/or delivery of embedded services. Among the participants, 83 producers has started selling their products in nearby market, arat and even distance market/places in comparison with the previous year. Also, 19 participants started their products selling through online/social media platform.

The consumers psychology regarding the test & preferences about R2C and R2E are changing positively. Families having working women were comparatively more interested to buy ready to cook fish products. Some non-working/housekeeper women also bought ready to cook fish product because of avoiding the hustle of fish dressing, cutting into pieces, washing etc. Similarly, the consumption behavior of working people, young & children were changing and being eaten R2E fish products such as fish singara, fish roll, fish cutlet, fish ball, fish Barbe-Q etc. The consumers who ate R2E products for once, gave quite positive views and responses but a large portion of the consumers were still reluctant about ready to eat products. Finally, it could be concluded that the market of R2C and R2E fish products are increasing in trends and new entrepreneurs are coming to the market.

The collected data showed that the existing fisheries inputs sellers were started to sell fish feeds, aqua chemicals/drugs, probiotics etc. which were not available locally and previously these were collected from upazilla/other distance market. The collected data showed that one inputs company developed 4 dealers in the project area where as other company supplied more inputs (aqua products, feed etc.) through their existing marketing channel as demand increased due to project interventions.

In case of forward market, the market actors were sensitized about the safe fish & shrimp. The large traders started to buy quality products from the project area and some cases the traders placed their demand in online. Also, a remarkable changed were occurred in service delivery

system. The respondents said that 4-5 fish/shrimp producers come to service center for testing water & soil quality in what intervale, received technical advice and in many cases embedded services. This is the indication of increasing service market.

7.5 Changes in the enterprise & consumer level

There are a positive change occurred among the enterprise and consumer level as a result of the implementation of technologis/activities with the support of RMTP. In case of improved extensive/semi-intensive technology demonstration, the respondents (demonstration plot holder) reported that each day 3-4 neighbor producers had come to know about the technology, showed interest and started to implement the technology. Also, the neighbor farmers are interested to culture the G-3/Halda river sourced fry/fingerlings seeing the productivity and quality of the products. The customers took `Ready to Cook' and `Ready to Eat' fish products and the demand are increasing gradually. It could be concluded that the consumers showed positive response about the project activities/technologies and even the products produced with the intervention of project.

7.6 Changes in technology adoption

There have been a positive change occurred among the other producers/entrepreneurs about the technologies /activities. In spite of short period of implementation, the adoption rate of the technologies/activities is remarkable. The ratio of demonstration and replication has increased from 1:2 to 1:3 due to project intervention. The collected data from 6 interviewee showed that 17 new entrepreneurs has started to produce black soldier fly larvae mostly collecting pupae from them. In case of farm mechanization (aerator use), the 6 respondents claimed that 14 fish producers bought aerator and used their ponds by knowing the benefits of the technology from them.

Technology/activity	**Project support**	**Adoption**
Production of black soldier fly larvae (BSFL)	6	17
Farm mechanization (use of aerator)	6	14
Improved extensive/ semi-intensive culture technology	18	May be 2-to-3 times.

7.7 Environmental & climatic consequences

The project supported technologies or activities have no or less impact on the environment. The collected data showed the environmental consequences were mitigated by the enterprise itself by applying some measures. The respondents said that they made the embankment of pond/farm stronger, use of fencing net, used environment friendly inputs & technology, etc. In spite of no/less environmental impact of aquaculture activities, there was a possibilities of health hazards of workers as chemical fertilizer, lime, aqua chemicals & instruments are used in fish farming. These are mitigated by wearing protective cloths, hand gloves and sunglass during the application of chemicals. The engagement of children or vulnerable women labor are strictly avoided in the project intervention areas.

Activity having Environmental impact	Mitigation way
Fish/shrimp culture needed underground water	Reduced the use of underground water. and Promoted GAqP
Hatchery operation	Use approved chemicals in appropriate dosages
Black soldier fly larvae (BSFL) production	Established the farm away from the community and used electric bulb & fan during excessive cold & hot weather
`Ready to Cook' and `Ready to Eat' products	The solid wastes were collected and put under the soil and stock raw materials.

7.8 Gender related changes

Both male and female were engaged in production related activities. If the enterprise was leaded by the female counterpart, then the male counterpart assisted in some knots of the activities and vice-versa. About 49% of women assisted their husbands in the fisheries sector, they mostly engaged in activities such as fertilize/feed management, making fishing nets, repairing and maintaining other fishing equipment, post-harvest management, processing, packaging, etc. More specifically, 53% of women making fishing nets, repairing and maintaining other fishing equipment; 16% in marketing and 31% in processing & post- harvest activities. From the collected data, it was found that the male counterpart supported some of the activities but not limited to- pond/farm preparation, fry/fingerling stocking, fish harvesting, selling of fishes/products etc.

The respondents also said that they helped each other in performing household activities. More than 90% of respondents agreed that working together could improve family bonding, harmony, respect, and sincerity. Finally, the respondents answered that the female entrepreneurs didn't face any social barriers for engaging in economic activities but women still face obstacles such as limited access to training, finance, technology, and markets.

7.9 Social and other cross cutting issues (nutrition, education control over resources etc.) related changes

Due to the engagement in project supported technology/activities there had been a positive change in case of household nutrition, child education, received better treatment and control over resources. The majority of the respondents reported to increase their assets such as water pump, aerator, fishing net, processing materials etc. In case of decision making, 84% of respondents reported engaging in mutual decision-making regarding both household expenditures & income from aquaculture activities, children's education, marriage of children etc.The respondents reported that after attending training/orientation sessions consumption of fish products and nutritious food increased and by working with RMTP project and getting a demonstration plot their social acceptance among fish farmers increased.

8. RECOMMENDATION

The implementation period of the sub-project of Fisheries and Aquaculture sector ranges from 07 months to 12 months and most of the sub-project would be finished and at the phasing out of such an important VCD project, the issue of sustainability is of great importance. For the sustainability of the technology/activities as well as to capitalize the greater impact, the PMU team is recommended the following issues:

8.1 Fisheries and Aquaculture sector is promoting different modern technologies and inputs through demonstration & organizing learning sharing events, But the technology demonstration is not sufficient enough proportionate to the number of project participants. So, it is the prime requirement to increase the number of demonstrations by allocating more budget. Also recommended implement a bridge project to continue the technical back-stopping to the participants for the sustainability of the technology.

8.2 Black soldier fly larvae (BSFL) production technology has changed the mentality of fish producers as the commercial feed price is increasing day-night. It is very useful & suitable technology for the small producers. But for the greater impact and sustainability of the technology, larger producers, inputs/feed market giants needed to come forward to adopt the technology. Hence, a separate project may be design to commercialize this technology through private company.

8.3 The market of 'Ready to Cook' and 'Ready to Eat' fish products are increasing as the psychology of the customers about R2C & R2E is in changing mode. But for the greater impact and sustainability of the technology, larger producers/entrepreneurs, processing company are needed to come forward to popularize promotion & branding activities. Hence, project need to focused on private sector engagement or a separate project may be design to commercialize these products through private company.

8.4 The sub-projects had a positive and significant impact on semi-intensive farming practice, increasing household incomes and assets, which have arguably played an important role both in improving production and revenues. The sub-projects have created employment opportunity in the sub-sector. However, the impacts that the sub-project created are still in virgin stage. So, extended supports were needed for the maturity i.e. more expansion of the technology.

8.5 More digital devices should be introduced in the fish farm for measuring PH, DO, ammonia (NH_3) etc. through IoT system.

9. CONCLUSION

The sectoral impact study (SIS) results showed the positive changes have occurred in case of productivity, product quality and mortality of fish/shrimp, change in income and assets of households, employment generation, change in sales volume and market system, changes in the enterprise & consumer level, changes in technology adoption, environment & climate issues and changes in gender & social issues. Although the implementation period of these sub-projects was less than one year, the most of the technologies and/or activities implemented at field is considered as appropriate and posed a positive impact on production and marketing of safe fish & fish products. The project participants told *"RMTP project is doing very good job for awareness raising, capacity building, safe fish production, fish processing, farm mechanization and forward & backward market linkages for premium price"*.

Appendix-1: Terms of References (ToR) for Conducting SIS of the Fisheries and Aquaculture Sector

1. Background:

Palli Karma-Sahayak Foundation (PKSF) is an apex development organization established by the Government of Bangladesh in 1990 for poverty alleviation through employment generation. PKSF has been implementing various programs and projects for poverty alleviation since its inception. Currently, PKSF is implementing a project titled Rural Microenterprise Transformation Project (RMTP) jointly financed by PKSF, International Fund for Agricultural Development (IFAD), and Danish International Development Agency (DANIDA). The project is aimed at expanding agricultural microenterprises throughout the country. Apart from providing financial services, RMTP is providing technological and skills enhancement support through value chain approaches for promoting microenterprises.

RMTP is making value chain (VC) interventions in different agricultural sectors to enhance efficiency in different stages of value chains from input suppliers to consumers. The Fisheries and Aquaculture sector is generating revenue for the rural micro-economy in the country. An increasing number of farmers in Bangladesh are engaging themselves in potential export-oriented economic activity. Recognizing the importance of this sector, PKSF has been implementing twenty VC sub- projects titled 'Production and Marketing of Safe Fish and Fish Products' since July 2022 through its twenty partner organizations (POs). A total of 26145 farmers are getting support from the sector across 72 upazilas from 23 districts of Bangladesh. The farmers are receiving various technical, technological, and marketing support under these VC sub-projects. PKSF has taken the initiative to conduct a Sectoral Impact Study (SIS) by the PMU to measure the performance of the sector in achieving its goal and objectives.

Project Goal and Objectives: The goal of RMTP is to sustainably increase the income, food security, and nutrition of marginal and small farmers and micro-entrepreneurs across selected value chains. The development objective is the sustainable growth of selected rural commodity value chains with comparative advantage, market demand, growth potential, and backward linkages to small farmers and micro-entrepreneurs.

2. The objectives of the study:

The main objective of the study is to assess the performance of the sector in improving the socio-economic conditions of the project participants. To attain this objective, the present socio-economic conditions of the farmers and other project participants need to be compared with the baseline information[1]. The baseline information of the participants was collected at the beginning of the sub-project. The SIS should measure changes in productivity, sales, income, assets, etc. of the participants and the creation of new employment in the sector. The SIS will attain the following specific objectives:

a) To assess the increase in productivity of the IGA/Intervention of the project participants

b) To measure the increased income of specific IGA due to the project interventions

c) To assess the profitability of that specific intervention/technology

[1] The attribution of socio-economic condition will be simply compared with the baseline information.

d) To assess the technology adoption by the farmers and the secondary adopter.

e) To assess the synergic effect of the technology demonstration plots.

f) To assess the Gender and Youth impact on the "Participation & Empowerment" status of project beneficiaries through/by project interventions.

3) Scope of the work:

The PMU will have to collect primary data from the participants of the VC sub-project area staying through its' field force. There is scope to interact with different farmers, local service providers, backward and forward market actors, and representative/s from private sector entities. The review of the baseline report and annual outcome study reports will help to construct a clear picture of the project performance. The project document will be the core material for this study.

4) Methodology:

The PMU will have to conduct this SIS following the qualitative approach. The PMU may apply individual in-depth interviews for data collection. The Value Chain Facilitators (VCFs) will collect the data from the interviewees. Before collecting the data, the PMU will develop a qualitative data collection tool and will provide training to the VCFs. The quantitative data will be gathered from the annual outcome study (AOS) that will be collected simultaneously. The PMU will compare changes in VC project participants' present status with the RMTP baseline information. The purposive sampling method will be used to conduct the study. The sample size will be determined by the following technologies/initiatives.

SL	Technology/Initiatives	Pop.	Method	Tools	Sample
10.	Production technologies (Improved extensive/ semi-intensive/ intensive)	190	Qualitative Data Collection	IDI Checklist	18
11.	Farm mechanization (use of Aerator/ IoT etc.)	69	Qualitative Data Collection	IDI Checklist	6
12.	BSFL production & use	71	Qualitative Data Collection	IDI Checklist	6
13.	Local service providers (LSP)	125	Qualitative Data Collection	IDI Checklist	8
14.	Supply of quality spawn and fry/fingerlings (fish hatchery/nursery)	82	Qualitative Data Collection	IDI Checklist	10
15.	Private sector representative (dealer/ sub-dealer)	75	Qualitative Data Collection	IDI Checklist	8
16.	Small-scale entrepreneurs of processed fish products (Ready to Cock/Ready to Eat/ Dried fish)	67	Qualitative Data Collection	IDI Checklist	13
17.	Fisherman/ Fishers	56	Qualitative Data Collection	IDI Checklist	7
18.	Forward market actors (aratder/depot owner etc.)	51	Qualitative Data Collection	IDI Checklist	7
Total					**83**

The beneficiaries will be selected considering at least one year of involvement with the project initiative and received support from the project. The representation of the context of regional

representation will also be considered while selecting sample. The most significant changes methodology will be used for this study. These changes will be triangulated with the annual outcome study which will be parallelly conducted.

5) Timeline:

The total duration of the study is 45 days from the 10th day of August 2023. The detailed timeline is as follows:

Activities	Days	Aug-23				Sep-23	
		W-1	W-2	W-3	W-4	W-5	W-6
Sample Selection	3	3					
Questionnaire Preparation	5	5					
Training to Enumerators	1		1				
Data Collection	4			4			
Data Analysis	7			7			
Report Preparation	15				15		
Final report	10					10	
Total	45						

6) Reporting

The team lead will share the draft report with the PMU. The report will be finalized by incorporating feedback or comments from the PMU. The report will be constituted with the following template:

1. Cover Page
2. Table of content
3. Glossary
4. Executive Summary
5. Introduction
6. Scope of the Study
7. Methodology
8. Findings
9. Recommendations
10. Good practices and learnings
11. Appendix

7) Budget:

The sectoral impact study will incur no budget. The travel and other transport costs for the enumerators will be borne by the respective POs sub-project travel/transport budget head. Similarly, the PMU will visit as per the regular tour.

8) Conclusion:

The sectoral impact study findings will be fed into the project mid-term review data requirement. Eventually, it will measure the impact on the project participants. This arbitrary study will use the appropriate disaggregation where required. This study is a project demand and will be used for the project purpose.

Appendix-2: Data collection Tools

In-depth Interview (IDI) Questionnaire

সাধারণ তথ্য:

সংস্থার নাম: _____

উত্তরদাতার নাম: _____

পিতা/স্বামীর নাম: _____

প্রধান পেশা: _____ বয়স: _____

গ্রাম: _____, ইউনিয়ন: _____

উপজেলা:_____। জেলা:_____

মোবাইল নম্বর:_____।

১. আপনি Rural Microenterprise Transformation Project (RMTP)-এর কোন ধরণের প্রযুক্তি বা কার্যক্রম বাস্তবায়নের সাথে জড়িত?

(ক) উন্নত সনাতন/আধা-নিবিড় পদ্ধতিতে মাছ ও গলদা চিংড়ি চাষ ☐, (খ) নিবিড় পদ্ধতিতে নিরাপদ মৎস্য উৎপাদন ☐, (গ) দ্রুত বর্ধনশীল মাছ (যেমন- জি-৩ রুই/ হালদা নদী উৎসের পোনা) নার্সিং ☐, (ঘ) উচ্চ মূল্যমানের দেশীয় প্রজাতির/ উপকূলীয় প্রজাতির মাছের পোনা উৎপাদন ☐, (ঙ) কালো সৈনিক পোকা উৎপাদন ☐, (চ) প্রোবায়োটিক ব্যবহার ☐, (ছ) 'Ready to Cook' মৎস্য পণ্য উৎপাদন ও বাজারজাতকরণ ☐, (জ) 'Ready to Eat' মৎস্য পণ্য উৎপাদন ও বাজারজাতকরণ ☐, (ঝ) নিরাপদ শুটকী উৎপাদন ও বাজারজাতকরণ ☐, (ঞ) 'মৎস্য সেবা ও পরামর্শ কেন্দ্র' পরিচালনা (ট) অন্যান্য ☐ ……..(নির্দিষ্ট করুন)

২. RMTP এর আওতাধীন ভ্যালু চেইন উপ-প্রকল্প থেকে আপনি কি কি সুবিধা/সেবা পেয়েছেন যা প্রযুক্তি/কার্যক্রম বাস্তবায়নে অথবা সেবা প্রদানে সহায়তা করেছে?

৩. আপনি কত বছর যাবৎ এই প্রযুক্তি ব্যবহার করে উৎপাদন কার্যক্রম বাস্তবায়ন অথবা সেবা প্রদান করে আসছেন?

৪. প্রযুক্তি ব্যবহার বা কার্যক্রম বাস্তবায়নের ফলে পণ্যের উৎপাদন এবং উৎপাদিত পণ্যের গুণগতমানের ক্ষেত্রে কি কি পরিবর্তন এসেছে?

৫. ক) প্রযুক্তি ব্যবহার/সেবা গ্রহণের ফলে মাছের মৃত্যুহার, রোগ-বালাই ইত্যাদি ক্ষেত্রে কি কোন প্রভাব ফেলেছে?
হ্যাঁ ☐, না ☐।

খ) যদি হ্যাঁ হয় তবে তা উল্লেখ করুন।

৬. ক) প্রযুক্তিটির ব্যবহার বা কার্যক্রম বাস্তবায়ন মৎস্য পণ্যের উৎপাদন খরচের উপর কি কোন প্রভাব ফেলেছে?
হ্যাঁ ☐, না ☐।

খ) যদি হ্যাঁ হয় তবে তা উল্লেখ করুন।

৭. ক) উপ-প্রকল্পে সহায়তায় বাস্তবায়িত আপনার কার্যক্রমে কি কোন নতুন কর্মসংস্থানের সৃষ্টি হয়েছে কি?
হ্যাঁ ☐, না ☐।

খ) যদি হ্যাঁ হয়, তবে কত কর্ম দিবস তা উল্লেখ করুন।

৮. ক) প্রযুক্তিটি ব্যবহার বা কার্যক্রম বাস্তবায়নের ফলে আপনার আয় বৃদ্ধি পেয়েছে কি?

হ্যাঁ ☐, না ☐।

খ) যদি হ্যাঁ হয় তবে পূর্বের তুলনায় আনুমানিক কত টাকা বৃদ্ধি পেয়েছে?

৯. ক) প্রযুক্তিটি ব্যবহারের ফলে আপনার সম্পদের (যেমন-জমি, যন্ত্রপাতি, আসবাবপত্র, ইত্যাদি) ক্ষেত্রে কোন দৃশ্যমান পরিবর্তন এসেছে?

হ্যাঁ ☐, না ☐।

খ) যদি হ্যাঁ হয় তবে কি কি কিনেছেন তা উল্লেখ করুন?

১০. ক) উৎপাদিত পণ্য পূর্বে কোথায় বা কার নিকট বিক্রয় করতেন এবং বর্তমানে কোথায় বা কার নিকট বিক্রয় করেন?

পূর্বে কোথায় বা কার নিকট বিক্রয় করতেন	**বর্তমানে কোথায় বা কার নিকট বিক্রয় করেন**

খ) পণ্য বিক্রয়ের ক্ষেত্রে কি কি সমস্যা হচ্ছে তা উল্লেখ করুন।

১১. কার্যক্রমটি বাস্তবায়নের ফলে ব্যাকওয়ার্ড (উপকরণ সরবরাহ) মার্কেট সিস্টেমে কি কি পরিবর্তন এসেছে?

১২. কার্যক্রমটি বাস্তবায়নের ফলে ফরওয়ার্ড (উৎপাদিত পণ্য বিক্রয়) মার্কেট সিস্টেমে কি কি পরিবর্তন এসেছে?

১৩. ক) প্রযুক্তি/ কার্যক্রমটি সম্পর্কে অন্যান্য উৎপাদনকারীর ধারণা কি এবং তারা এটাকে কি ভালভাবে গ্রহন করেছে?

হ্যাঁ ☐, না ☐।

খ) যদি হ্যাঁ হয় তবে আপনার দেখা দেখি আরও কতজন তা গ্রহণ করেছে?

১৪. ক) মৎস্য সেবা বা প্রক্রিয়াজাত মৎস্য পণ্য ক্রয়/গ্রহণে সেবা গ্রহিতা/ভোক্তাদের আগ্রহ কেমন?

খ) এ পর্যন্ত কতজনের নিকট সেবা প্রদান বা পণ্য বিক্রয় করেছেন তা উল্লেখ করুন।

১৫. ক) দুর্যোগ এবং জলবায়ু পরিবর্তন **পণ্য উৎপাদনকে** কিভাবে প্রভাবিত করে বলে মনে করেন?

খ) উক্ত প্রভাব মোকাবেলায় কি কি পদক্ষেপ গ্রহণ করা প্রয়োজন বলে মনে করেন?

১৬. ক) PKSF দ্বারা বাস্তবায়িত RMTP প্রকল্পের কার্যক্রম সম্পর্কে আপনার ধারণা কি?

খ) আপনার ভবিষ্যত পরিকল্পনা সম্পর্কে কিছু বলুন।

১৭. ক) আপনি বা পরিবারের কোনো সদস্য কি কোন সমিতি, দল বা সমবায় সংগঠনের সাথে যুক্ত আছেন?

হ্যাঁ ☐, না ☐।

খ) হ্যাঁ হলে, সদস্য হিসেবে কি মতামত/সিদ্ধান্ত/পরামর্শ দিতে পারেন কি না তা উল্লেখ করুন।

১৮. ক) আপনি যে উৎপাদন/সেবা/পণ্য সরবরাহ করছেন/ব্যবসা পরিচালনা করছেন, এই কাজে আপনার স্বামী/স্ত্রী কি আপনাকে সহযোগিতা করে?

হ্যাঁ ☐, না ☐।

খ) করে থাকলে কি ধরণের সহযোগিতা করে থাকেন?

গ) এ কাজ/সহযোগিতার ফলে কি ঘর-গৃহস্থালীর কাজে অধিক চাপ পড়ে বলে আপনি মনে করেন?

হ্যাঁ ☐, না ☐।

ঘ) আপনার পরিবারে ঘর-গৃহস্থালীর কাজ নারীরা একাই করেন নাকি নারী-পুরুষ যৌথভাবে অংশগ্রহণ/সহযোগিতা করেন?

নারীরা একাই করেন ☐, নারী-পুরুষ যৌথভাবে করেন ☐।

ঙ) ঘর-গৃহস্থালীরসহ সকল কাজ নারী-পুরুষ যৌথ অংশগ্রহণে করার ফলে পারিবারিক সম্প্রীতি, শ্রদ্ধা এবং আন্তরিকতা বৃদ্ধি পায় বলে আপনি মনে করেন?

হ্যাঁ ☐, না ☐।

১৯. ক) কার্যক্রম বাস্তবায়নের ফলে আপনার পরিবারের পুষ্টি, শিক্ষা, চিকিৎসা, সামাজিক মর্যাদা, সম্পদ ইত্যাদি ক্ষেত্রে কি কোন ধরনের পরিবর্তন এসেছে?

হ্যাঁ ☐, না ☐।

খ) হ্যাঁ হলে, কি কি পরিবর্তন এসেছে তা উল্লেখ করুন।

২০. কার্যক্রম বাস্তবায়নের মাধ্যমে যে আয় হয় তা থেকে পরিবারিক ব্যয় নির্বাহের কাজে (পারিবারিক খরচ, সঞ্চয় করা, সম্পদ বৃদ্ধি করা ইত্যাদি) বিষয়ে আপনি একাই সিদ্ধান্ত নেন নাকি স্বামী/স্ত্রী যৌথভাবে সিদ্ধান্ত নেন?

আপনি একাই সিদ্ধান্ত নেন ☐, স্বামী/স্ত্রী যৌথভাবে সিদ্ধান্ত নেন ☐।

২১. ক) আপনার এলাকায় সাধারণত নারীরা উৎপাদন/প্রক্রিয়াজাতকরণ/বাজারজাতকরণ এর কোন ধরণের কাজের সাথে যুক্ত?

খ) নারীরা কি উৎপাদিত পণ্য উৎপাদন/আহরণোত্তর পরিচর্যা/প্রক্রিয়াজাতকরণ/বাজারজাতকরণ করতে যেয়ে পারিবারিক বা সামাজিক কোনো সমস্যা/প্রতিবন্ধকতার সম্মুখীন হন?

হ্যাঁ ☐, না ☐।

গ) হ্যাঁ হলে, কিভাবে এ সমস্যার সমাধান করে এই সেক্টরে নারীর অংশগ্রহণ বৃদ্ধি করা যায় বলে আপনি মনে করেন?

ঘ) না হলে, নারীর জন্য কি কি সুযোগ-সুবিধা/ব্যবস্থা আছে তা উল্লেখ করুন।

সহযোগিতার জন্য ধন্যবাদ

তথ্য সংগ্রহকারীর নাম ও স্বাক্ষর: সুপারভাইজার-এর নাম:

তারিখ: