



Mid-Term Evaluation Report of the Safe Aqua Farming for Economic and Trade Improvement (SAFETI)

United States Department of Agriculture (USDA)

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Acronyms

ADO	Aquaculture Development Officer
AFF	Aquaculture Field Facilitator
BB	Bagda Bagda
BBS	Bangladesh Bureau of Statistics
BCR	Benefit-Cost Ratio
BDT	Bangladesh currency (Taka)
BFRI	Bangladesh Fisheries Research Institute
BG	Bagda Golda
BMP	Best Management Practice
BSFF	Bangladesh Shrimp and Fish Foundation
CAPI	Computer Aided Personal Interview
CATI	Computer Aided Telephonic Interview
CBO	Community Based Organization
CBSG	Capacity Building Service Group
CODEC	Community Development Centre
DFID	Department for International Development
DoF	Department of Fisheries
FGD	Focus Group Discussion
FIQC	Fish Inspection of Quality Control
GTZ	Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation Agency)
GP	Golda Carp Polyculture
IEC	Information Education and Communication
IFP	Increasing Farming Productivity
INGO	International non-governmental organization
KII	Key Informants Interview
LGD	Local Government Development
MEL	Monitoring, Evaluation and Learning
MoC	Ministry of Commerce
MoFL	Ministry of Fisheries and Livestock
MoU	Memorandum of Understanding
MTE	Mid-Term Evaluation
NBR	National Board of Revenue
NGO	Non-Governmental Organization
PCR	Polymerase Chain Reaction
PI	Program Indicator

PL	Post Larvae
PM	Project/Program Manager
PSM	Propensity Score Matching
SAFETI	Safe Aqua Farming for Economic and Trade Improvement
SDC	Swiss Agency for Development and Cooperation
SPF	Specific Pathogen Free
SPSS	Statistical Package for the Social Sciences
STATA	Software for Statistics and Data Science
TMSS	Thengamara Mohila Sabuj Sangha
UAEM	Upazila Aquaculture Extension Manager
USA	United States of America
USDA	United States Department of Agriculture
USG	United States Government
WSSV	White spot syndrome virus

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Executive Summary

Background

Agriculture in the lower coastal belt of Bangladesh is centered on shrimp/prawn-based aquaculture which include the Black Tiger Shrimp (*Penaeus monodon*, locally referred to as 'bagda') and the Giant Freshwater Prawn (*Macrobrachium rosenbergi*, locally referred to as 'golda'). This sub-sector provides livelihood to about 0.8 million people and contributes to the fifth highest export earnings. In spite of right edaphic and climatic conditions, shrimp/prawn productivity has become stagnant and external trade has declined in recent years.

In the above context, Safe Aqua Farming for Economic and Trade Improvement (SAFETI) project was developed in 2016 with \$15.70 million funding from the United States Department of Agriculture (USDA) to address the ongoing issues related to productivity, farm incomes, trade, and food safety across the shrimp/prawn value chains in Bangladesh. The life of the project was set for five years (October 2016 – September 2021), though field activities were delayed by one year due to funding complexities. Two broad objectives of the project are: (i) to increase agricultural productivity by improving production and management of hatcheries and farms in the shrimp and prawn value chains; and (ii) to expand trade of agricultural products by improving handling and sanitary controls, reducing unnecessary layers in the value chain, promoting extension services, and building the capacity of trade associations and government trade promotion bureaus.

The Mid-Term Evaluation

The mid-term evaluation (MTE) was commissioned in August 2019 to (i) assessing the effectiveness of SAFETI project activities; (ii) looking at the project's critical interventions and accomplishments against the mid-term targets; (iii) assessing and recommending any successful (pilot) interventions that could be scaled up for greater impact in the future across the specific activity or sector; and (iv) discussing the obstacles and challenges SAFETI had been facing, and how these could through learning, be adapted and addressed during implementation for the remainder of the project.

The MTE followed inclusive, participatory and transparent exercises to gain insights and alternative perspectives. Methodologies included document review (project documents and secondary literature) quantitative sample survey, qualitative data collection such as Key Informants' Interview with stakeholders, Focus Group Discussion with both control group and direct project farmers, and consultative meeting and workshop with the project team and other stakeholders such as associations related to shrimp industries. MTE used multiple primary and secondary information sources and stakeholder perspectives to validate as well as triangulate key issues and findings.

SAFETI engaged shrimp and prawn farmers in several manners as follows: demonstration farmers who were selected from groups of 25 farmers referred to as 'demo' farmers and other farmers in those groups referred to as 'direct' farmers. Both demo and direct farmers received various types of assistance directly from the project. A third group of farmers drawn from the overall farming sector in SAFETI's operational areas were those who SAFETI engaged through indirect mechanisms such as farmer field days, communication activities, etc. and are referred to as 'indirect' farmers. More specific definitions of how farmers were classified and credited to SAFETI's targets can be found in the project's Performance Monitoring Plan (PMP). Farmers denoted as 'non-beneficiaries' are those who have not received any direct or indirect assistance from SAFETI and are not counted as demo, direct or indirect

farmers/beneficiaries. Farmers included in the control group engaged¹ during the mid-term evaluation are classified as non-beneficiaries.

Progress Achieved and Issues

The SAFETI planning and monitoring framework provided both mid-term and end of project targets on all key indicators. The MTE evaluated project progress against 16 specified targets including issues, challenges and scope for scale up. The following summary provides key accomplishments as well as issues:

- i. SAFETI has been promoting its trademark '6-Steps Towards IFP' (improving farming practices) procedure among the farmers to invigorate shrimp/prawn farming practices and enhance productivity and income with emphasis on shrimp/prawn high-health PL, biosecurity, disease management, pond preparation, water quality management and postharvest management. Overall, the project exceeded its mid-term target for Indicator 1 by about 10% as 11,163 direct farmers had so far adopted and applied various steps of SAFETI prescribed procedures in farm management. However, it is important to note that not all farmers adopted all the 6-steps, or to the same extent. Adoption varied with farmers' perception on individual technologies and individual capability to adopt those.
- ii. Among the four key technology pillars in '6-Steps Towards IFP', the biosecurity measures were those adopted most widely by the farmers; 87% by SAFETI demonstration ('demo') farmers and 79% by non- demonstration farmers who were directly assisted by the project (referred to as 'direct' farmers'). The recommended shrimp/prawn high-health 'Post Larvae' (PL) practices were most commonly adopted, followed by disease and water quality management related practices. In contrast, harvest and postharvest management procedures were the least frequently adopted technology. The low frequency of harvest and postharvest technology may have been caused in part by the strategic approach of SAFETI to first emphasize technologies to increase production, and later concentrate on postharvest quality improvement issues. SAFETI's two project partners, CODEC and TMSS, offered micro-financing opportunities to the farmers to allow them to invest in and apply SAFETI-promoted improved farming methods and technology. To date, TMSS and CODEC have provided 1421 loans (44% of the total number of loans disbursed), while the remaining 1833 loans (56%) were provided by five other MFIs. The farmers received a combined total of \$1,342,109 in loans from the partners and MFIs, which was more than double the mid-term target. The average loan amount was slightly more than \$400, which exceeded the average amount that the project had initially estimated, thereby resulting in overachievement of the loan value target but underachievement of the target for number of loans. The primary reason for the shortfall in number of loans was that TMSS and CODEC did not have the institutional capacity to expand their loaning activities into SAFETI areas that are outside of their current geographical area of operations. Other MFIs were able to service some additional areas/farmers, but the majority (82%) of SAFETI-assisted farmers were unable to access loaning services.
- iii. The productivity of SAFETI-assisted bagda and golda farmers exceeded that of non-beneficiary farmers. The project also exceeded the cumulative mid-term targets for production volume and sales. The cumulative production volume for the two species combined was 3,445 MT, which is 9% more than the mid-term target. The cumulative value of sales was 1% above the mid-term

¹ Control group famers were selected from non-project Upazilas (sub-districts) who possessed similar socio-economic characteristics of direct project farmers when the baseline survey was conducted.

target of \$28,756,403. When disaggregated by species, the cumulative value of sales was nearly equal for bagda and golda, with both species contributing equally to the mid-term target. However, with respect to production, golda exceeded its mid-term sub-target by 33%, whereas bagda fell short of its sub-target by 8%.

- iv. SAFETI investment has been benefiting farmers and market actors (inputs suppliers, feed sellers, hatchery and nursery operators and processors). Farmers realized Benefit-Cost-Ratios (BCR) of 1.9 to 3.8 per annual cycle, depending on the type of culture system (i.e., mono-/polyculture; single/multiple crop) and farmer (demonstration, direct, non-beneficiary). Moreover, gross margins of SAFETI-assisted demo and direct farmers increased over non-assisted control farmers (Bagda monoculture systems: demo farmers received BDT 491,344 ha⁻¹, direct farmers BDT 328,568 ha⁻¹ and control farmers BDT 268,458 ha⁻¹; Bagda-golda rotational system: demo farmers received BDT 572,869 ha⁻¹, direct farmers BDT 383,052 ha⁻¹ and control farmers BDT 505,248 ha⁻¹; Golda-carp polyculture system: demo farmers received BDT 747,766 ha⁻¹, direct farmers BDT 652,619 ha⁻¹ and control farmers BDT 322,102 ha⁻¹).
- v. PL stocking density affects productivity, with low density stocking being preferable to high densities. In line with SAFETI recommendations, project-assisted direct farmers stocked lower PL densities than the non-assisted control farmers, but not as low as the project-assisted 'demo' farmers.
- vi. Harvest size is an important factor in sale price, with large shrimp/prawn generally fetching higher prices than smaller animals. Harvest frequency affects size in that more frequent (multiple) harvesting within an annual growing cycle reduces the period of growth, the size the animal can attain and thereby reduces the price. However, harvest frequency is also linked to risk management, i.e., production losses. Demo and direct farmers had considerably reduced harvest frequencies in comparison with control farmers.
- vii. The project reached 17,950- direct beneficiary farmers (about 97% of the mid-term target) with variety of inputs and services. Training was one of the most important support services. Farm management technologies had been disseminated mainly through training and information dissemination based on '6-Steps Towards IFP' approach. The project so far trained 31% more farmers than the planned. Most of the additional training went to the 'golda' farmers and to the women beneficiaries. However, the project has yet to complete the all the expected number of trainings to stakeholders - government officials, industries, processors, service providers and input dealers.
- viii. On the policy and regulatory front, the project achieved policy stages 1 and 2 for all 5 targets and stage 3 for 4 of the 5 policy targets. SAFETI is on schedule for achieving the remaining stages that are scheduled for Years 4 and 5. It may be noted that the project supported drafting the "*Development of SPF Black Tiger Shrimp's Hatchery Protocol*" and submitted to the Ministry of Fisheries and Livestock (MoFL).
- ix. Capability building of the Fish Inspection of Quality Control (FIQC) laboratory of DoF with training and equipment is an important ongoing project activity that will ultimately allow the Government to help provide training to the farmers and business owners on food safety.
- x. The average farm productivity project farmers (demo and direct) exceeded the mid-term target. The MTE estimated production of 664 kg ha⁻¹ and 724 kg ha⁻¹ per annum for bagda and golda, respectfully, against the mid-term target of 450 kg ha⁻¹ for each species.
- xi. Among the three culture systems, bagda monoculture proved to be most productive for the project farmers followed by bagda-golda rotation and golda-carp polyculture systems. The demo farmers outperformed the project farmers achieving 80% of the bagda monoculture and bagda-

- golda rotation production target and 70% the golda-carp polyculture system target. The performance of the demo farmers proved the potential of the SAFETI farming technology.
- xii. The MTE noted that in the bagda monoculture farms, when two crops were run, productivity was lower in the second crop. The team also noted that the productivity of bagda in the bagda-golda rotational farms was lower than in the bagda monoculture farms. Additionally, that the productivity of golda in the golda-carp polyculture farms was higher than in the bagda-golda rotational farms. The likely reasons for these differences are: the lower water salinities due to monsoon rains in the second crop in each case; inadequate pond preparation for the second crop that increased biosecurity risk; unavailability of good quality feed and other inputs; and, the shorter duration of the second crop. The project should consider the relevance of the production environment when recommending production systems.
 - xiii. Among other factors, increased production was made possible due to the availability of high-health PL produced from Specific Pathogen Free (SPF) bagda broodstock, through active SAFETI motivation and support to hatcheries. On the other hand, production of improved high-health golda PL was not always possible due to failure of ensuring disease-free PL from natural broodstock, given that most golda PLs are still sourced from nature.
 - xiv. Demo farms provide examples of new technologies and help promote sustainability in technology adoption. However, there remains a mixed perception on the potential and effectiveness of new technology and farm practices among the demo farmers. In some instances, demo farms did not play their extension role as effectively as they could. Although demo farms performed better than direct farmers, some demo farms lacked the comprehensive farm management practices being promoted in SAFETI's '6-StepsTowardsIFP'.

Key Issues and Way Forward

SAFETI project has made good progress on many fronts but can also adapt based on what it has learned, to help meet its targets. The MTE identified key learning points that can help SAFETI more fully attain its targets. The following summary provides key lessons learned from the mid-point implementation of the SAFETI project and suggests ways forward for the remainder of project implementation.

- i. SAFETI always discourages multiple stocking and multiple harvest, and suggests that farmers harvest above 40-g sized shrimp. However, not all project beneficiaries are following this advice. Therefore, the project should continue its campaign and re-emphasize the benefits of delaying harvest to larger-sized shrimp to all beneficiaries including demo farmers.
- ii. The second crop with bagda has not been always successful even when stocked with SPF PLs, due to increased biosecurity risks during the rainy season, water quality and environmental changes (compared with the dry-season crop). SAFETI may suggest an alternate to bagda (e.g. growing rice instead of bagda) for the farmers, because the yield from the second crop of bagda is lower and disease outbreaks are more pronounced than then first crop. MTE understands that SAFETI is working on promoting this initiative.
- iii. However, in some areas where salinity remains high, a second crop of bagda has the potential to perform better than in areas where rain reduces salinity. This would require the adoption of appropriate farming technology adoption; SAFETI may explore this opportunity.
- iv. The golda crop in the bagda-golda' rotational culture is below par resulting from the remnant salinity in the soil and water and shortened duration of the production cycle. Tidal flushing of pond water prior to stocking golda may prove effective, but may not be feasible in many cases.
- v. In complex multiple-cropping situations, SAFETI should promote practical approaches such as strictly following black soil removal, pond drying where applicable, liming and beaching.

- vi. Reduction of harvesting frequency of animals (i.e., increasing the growing period) would likely result in increased size of the products and attract higher selling price and thereby impact profitability - assuming the risk of crop failure during the extended time period can be minimized. The project should consider sending this message to the farmers.
- vii. SAFETI should identify a small number of high performing demo farmers who can serve as champions, form linkages with direct and indirect farmers, and help demonstrate and promote their successful farming methods.
- viii. Among the indicators of new technology adoption, postharvest operations remained poorly adopted by the farmers; this is because SAFETI's priority was to address the issue of low productivity first, then looking into postharvest issues. SAFETI should emphasize promoting improved post-harvest technology in the rest half of the project.
- ix. SAFETI needs to determine if the farmers who have not yet been able to access loan services desire loans, and if so, attempt to facilitate an expansion of loan services to their areas.

1 Introduction

1.1 Background of the Problem

Bangladesh is considered as one of the most suitable regions for fisheries in the world, with the world's largest flooded wetland and the third largest aquatic biodiversity in Asia after China and India (Shamsuzzaman *et al.*, 2017). The fisheries in the country can broadly be classified into three categories: inland capture fisheries, inland aquaculture and marine fisheries, of which the inland aquaculture sector is contributing more than 55% of the total production (DoF, 2016). Two types of aquaculture practices are going on in Bangladesh - freshwater and coastal aquaculture. The 'Chingri'-based (shrimp locally called 'bagda', *Penaeus monodon* and prawn locally called 'golda', *Macrobrachium rosenbergii*) coastal aquaculture, practiced in 'ghers' (coastal ponds or enclosures), has significant social and economic importance in Bangladesh. About 15 million people are directly or indirectly engaged in shrimp/prawn related activities in hatchery, nursery, farming, processing industry, depot, landing centre, feed industry and transportation (MoFL, 2014). Livelihoods of about 800,000 environmentally vulnerable smallholders largely depend on this industry. Shrimp is one of the major valuable export items and ranking as the fifth largest source of earning foreign currency in the country (BBS, 2018). Small-scale commercial shrimp/prawn farming started in Bangladesh in the 1980s. Since then, it has gradually spread to larger areas. Initially, this farming spread was unplanned by releasing seeds in the gher and raising with home-sourced feed; the same practice is still being practiced by many smallholders. Coastal Bangladesh has right conditions (soil, salinity and climate) for this farming in more than 275,000 pond/gher areas, and in a position to be the next country making a major jump in commodity productivity (SAFETI Document 02). Bangladesh is one of the most suitable countries in the world for freshwater prawn farming, because of its favorable biophysical resources (Ahmed *et al.*, 2008). In spite of this potential, production remains almost unchanged and export volume has been declining since 2011 (SAFETI Document 02 and 03). This is because, in recent years, the industry has encountered challenges that include disease, compliance with quality standards in exporting markets, and inequitable terms of exchange among value chain actors (Belton *et al.*, 2011).

1.2 The SAFETI Project

The Safe Aqua Farming for Economic and Trade Improvement (SAFETI) project was developed to address the ongoing critical issues of constraining productivity, farm incomes, and trade and food safety across the shrimp/prawn value chains in Bangladesh. The United States Department of Agriculture (USDA) funded \$15.70 million for the project to carry out in five years (October 2016 – September 2021) (Award Agreement #: FCC-388-2016/004-00). SAFETI set two broad objectives to achieve outcomes; those are to:

- i. Increase agricultural productivity by improving production and management of hatcheries and farms in the shrimp and prawn value chains to contribute to both improved incomes, food quality and safety, as well as to improve livelihoods and environmental sustainability in the Bangladesh prawn and shrimp industry; and
- ii. Expand trade of agricultural products by improving handling and sanitary controls, reducing unnecessary layers in the value chain, promoting extension services, and building the capacity of trade associations and government trade promotion bureaus.

Given the substantial potential for shrimp/prawn industry to positively impact smallholder producers and other direct and indirect beneficiaries, SAFETI, in collaboration with project partners, has been implementing activities to address issues of related to under production and food safety and working to expand trade of shrimp and prawn. Elements of these project activities include investing in quality

production inputs, promoting good aquaculture and hygienic practices, facilitating quality improvement and working with processors to expand trade.

Initially, the Cooperative Agreement with USDA lists 11 Activities for SAFETI. However, with USDA approval, portions of Activity 8 were either discontinued or merged with Activity 7. Thus, incorporating 10 activities (as per the Cooperative Agreement with USDA), SAFETI addressed three critical issues in relation to boosting shrimp-prawn industry in Bangladesh: Critical Issue 1 (CS-1) - productivity and farm income; Critical Issue 2 (CS-2) - food safety; and Critical Issue 3 (CS-3) - trade. The 10 activities are – (A1) Inputs: Develop Agro-dealers and/or other Input Suppliers- to improve shrimp and prawn quality, increase hatchery efficiency and reduce the incidence of disease in hatcheries; (A2) Financial Services: Facilitate agricultural lending through financial services to support adoption of project-promoted inputs, practices and technologies; (A3) Training: Improved agricultural production technologies extend to shrimp-prawn producers, hatcheries and processors; (A4) Capacity Building of Government (GOB) Institutions: Build the capacity of government extension agents and testing laboratories and more importantly to support industry certification efforts; (A5) Capacity Building to Promote Improved Policy and Regulatory Framework: Support GOB efforts to rigorously establish food safety in the shrimp/prawn value chain; (A6) Training on Sanitary and Good Practice Standards and Certification: Primarily for selected processors; (A7) Training on Post-harvest Handling: Primarily for processors; (A8) Training on Improved marketing and branding: Working with selected processors to provide support to help them identify and access markets, meet quality requirements of buyers, and strengthen their company brands as names recognized for reliable quality; (A9) Market Access to Facilitate Buyer-seller Relationships: Work with agro-based service centers who will coach farmers on pursuing market opportunities while assisting lead intermediary and end market firms to develop sustainable business models; and (A10) Capacity Building to Trade Associations: Strengthen capacity of key export trade facilitators (government agencies, trade associations) through organizational capacity building and strategic market development training. MTE observed direct linkage of four activities (A1, A2, A3 and A9) related to increasing productivity and farm income (CS-1), two (A4 and A5) to ensuring food safety (CS-2) and four (A6, A7, A8 and A10) to expanding trade (CS-3). However, a number of activities cross-linked to CS1 and CS2.

SAFETI focused on development of three shrimp/prawn ‘semi-intensive’ culture systems for the smallholders in coastal Bangladesh: (i) Bagda monoculture; (ii) Bagda-Golda rotational culture; and (iii) Golda-Carp polyculture. The ‘semi-intensive’ culture system is defined as maintenances of stocking density @ 3-4 for bagda and 2-3 for golda PL per square meter with no use of aerator, and providing regular and partial feeding emphasizing on natural productivity, proper pond preparation, water quality and biosecurity management. This system is similar to the ‘improved extensive system’, defined by DoF. In doing so, the project has promoted six steps aimed at increasing farm productivity, referred to as the ‘6-StepsTowardsIFP’ of bagda and golda in the three culture systems. These are (i) Maintaining optimum water depth of 3–5 feet and cleaning (i.e., removing mud, and drying) pond bottom; (ii) Disinfecting water and removing all potential threats for disease (iii) Stocking appropriate density with high-health (SPF) or PCR tested PL for bagda and healthy PL for golda; (iv) Ensuring appropriate biosecurity to prevent cross- contamination by outside disease carriers; (v) Using good quality feed administered on an optimum feeding schedule; and (vi) Ensuring good water quality and shrimp/prawn health management.

In implementing its activities, the SAFETI partnered with BSFF (regarding policy and regulations), Auburn University USA (regarding golda seed and feed technology), WorldFish (regarding disease investigation and feed technology), and TMSS and CODEC (to work with farmers and facilitate microfinancing). Additionally, intense collaboration was established with DoF and BFRI, formalized through MoUs.

For field implementation of the productivity-related activities, SAFETI organized beneficiary farmers into ‘groups’. Each group numbered around 25 farmers, one being the demo farmer and the rest direct

farmers. The concept of demo farmer was designed to peer leadership, whereas the rest of the group to be the followers. Each demo farmers received in-kind need-based support from the project worth around BDT 20,000. The groups of demo and direct farmers were trained on the basics of SAFETI promoted technologies (three modules) by the Upazila Aquaculture Extension Manager (UAEM). Following this, they were further trained, coached and supervised by Aquaculture Field Facilitators (AFFs), the lowest-tier field staff of the two partner organizations. Each AFF was responsible to look after, on average, 10 groups, who himself/herself was supervised by the UAEM. The technical assistances were delivered to beneficiary farmers via UAEM by the Aquaculture Development Office (ADO), the core SAFETI staff stationed at district-level. The ADO was also responsible for capability development of aqua-inputs dealers in the district.

1.3 Purpose of the Evaluation

The purpose of this mid-term evaluation (MTE) was to

- i. assess the effectiveness of programmatic approaches of SAFETI project activities carried out so far;
- ii. explore and look at the project's key critical interventions and accomplishments against the mid-term project targets;
- iii. assess and recommend any successful (pilot) interventions that can be scaled up for greater impact in the future across the specific activity or sector; and
- iv. Discuss the obstacles and challenges SAFETI faces, and how these can through learning, be adapted and addressed during implementation for the remainder of the project.

In addition, the evaluation intended to give the SAFETI team and partners, collaborating institutions, USDA, and other stakeholders (e.g., Solidaridad, World Bank, DFID, Netherlands, SDC and GTZ) who had worked in this sector an understanding of:

- i. progress on the implementation of activities and key interventions;
- ii. project performance with respect to intermediate results and indicator targets to date;
- iii. key implementation gaps if they exist and what causes them;
- iv. evidence of where project human, financial, and material resources are being deployed efficiently and effectively and where adjustments may be appropriate;
- v. unforeseen opportunities or challenges that may require revisions of the project strategy or redirection of project resources; and
- vi. Implementation strengths and what they mean for the underlying project logic and for ongoing implementation.

1.4 The Evaluation Questions

The MTE addressed six salient evaluation questions, as defined below.

Relevance: The alignment of project interventions to the needs of the project beneficiaries, the country's agriculture and/or development investment strategy, and with USDA and the USG's development goals, objectives, and strategies.

Effectiveness: The extent the project had achieved its objectives according to the results of program indicators.

Efficiency: How the project resources (inputs) had led to the desired results (outcomes) by investigating insights into efficiency of resources in achieving desired results by looking at the cost-benefit of the interventions and activities.

Impact: The radiation of effects beyond outcome targets, i.e., beyond targeted direct beneficiaries and/or beyond pre-projected results.

Sustainability: The likelihood that the benefits of the project would endure over time after completion of the project by addressing sustainability by looking at what measures had been taken to ensure project impacts would endure after end of the project ended.

Learning: Knowledge, skills and lessons gained from project implementation by evaluating how the SAFETI MEL system allowed for project learning loops and continuous improvement and innovation.

1.5 Limitations of the Study

The evaluation had to be completed in a tight timeframe. The team needed to spend considerable time in identifying and selecting control farmers. The baseline data (e.g., production per unit area) from the original survey in 2017-2018 were developed looking at intensive (aerated) and semi-intensive farms - but separately. The adjustment was then made only to the semi-intensive data set, eliminating a few outliers like 400 ha farms in Chattogram with very low productivity. However, eliminating outlier values associated with very large farms with profiles that did not match those of SAFETI-targeted farmers, and whose production greatly exceeded that of the usual small farmer and therefore skewed the data and sample statistics. While the MTE provides a recommendation for this baseline data, we recognize the limitations in making this determination.

1.6 Report Structure

Apart from the executive summary, this report consists of five parts:

Introduction: Encompasses the background of the study, overview of the SAFETI project, assessment context, assessment questions, and study limitation(s).

Evaluation methodology: Provides a short description of principles of data collection and tools, estimation of sampling and sample size, implementation of assessments, and techniques of data banking and analysis. It also presents the characteristics of the surveyed households, in particular their income and educational status.

Findings: Presents (i) the key findings of the evaluation with respect to the project performance indicators and system productivity; (ii) overall assessment of the project in relation to relevance of the project to context, project design, activities and implementation and to gender; SAFETI's effectiveness in the line of program indicators; efficiency of the project; impact of SAFETI quantifying how the project meeting its targets; and sustainability highlighting how the impacts would endure after end of the project.

Learning: Points out the issues and lessons so far learned on project activities and implementation.

Conclusions and Recommendations: Contains summary of the SAFETI's performance followed by recommendations.

In addition to those sections, this report presents several reference documents and analysis tables in the annex. These annexes contributed to a deeper analysis allowing for more accurate evidence-based conclusions and recommendations.

2 Evaluation Methodology and Implementation

MTE followed inclusive, participatory and transparent exercises to gain insights and alternative perspectives in the study. The following methodologies were adopted in the evaluation processes; the details are presented in Annex-6.

Document Review: This included project reports, communication and training materials, monitoring data on quality and outputs of activities, baseline survey and other available study data. In addition, research and other related documentation were reviewed. The list of the documents reviewed is presented in the 'Reference' section (Section 6).

Quantitative Sample Survey: The evaluation carried out a sample survey to ascertain program effectiveness on the key participants i.e. farmers. The survey was implemented on three 'Farmer-types': 'demo', 'direct' and 'control' farmers. Demo farmers were direct SAFETI project beneficiary farmers who received 'inputs-support' in addition to training and technical support. Direct farmers received training and technical supports, but not 'inputs-support', whereas, control farmers did not receive any support from SAFETI. Furthermore, the 'control' farmers were out of SAFETI locations, but in ecologically similar areas with respect to soil, water and environmental conditions.

Qualitative Data Collection: The evaluation adopted qualitative methods including Focus Group Discussion (FGD), in-depth Key Informants Interview (KII) and Direct Observation methods to collect qualitative information from a wide range of project participants and stakeholders. The list of meetings and meeting participants is presented in Annex-1.

Consultative Meeting and Workshop: The evaluation team arranged a consultation meeting cum workshop with the participation of project management and important stakeholders (of both treatment and control areas) to validate and further generate recommendations.

Table-1: Sample size by data collection methods				
Category of Farmer	Bagda Mono	Bagda-Golda Rotational	Golda-Carp Poly	Total
Sample Survey Respondents				
Demo	9	7	7	23
Direct	164	190	5	525
Control	74	65	64	203
Total	247	262	242	751
Focus Group Discussions (FGD): Project (Treatment)-6; Control-3				
Key Informants Interview (KII): Hatchery-4; Nursery-2; DoF officials-13, Partners NGO-2, Other stakeholders - 14				

Table 1 presents the sample size for the field survey, FGDs and KII (details of the specific locations are appended in Annex-2). The sample survey questionnaire was developed based on SAFETI project result framework and outcome indicators as well as applicable Food for Progress indicators. The questionnaire was field tested and refined as needed. The questionnaire was setup in the SurveyCTO platform for recording data electronically. Data collection was carried out by 24 professional enumerators who have prior and reliable experience with similar studies in the fisheries sector. The KII and FGDs were conducted by the senior consultants of CBSG, while an international consultant conducted a few strategic KIIs and FGDs. The field data collection was carried out between September 4 and 17,

2019. CBSG used SPSS, STATA, and MS Excel for data analysis.

For the characteristics of the surveyed households (i.e., the best or most relevant units related to the Pond/Gher information summarized in Table 2), the average land size of the respondent farmers was 91 decimals, of which 12.3% was dyke area (Table 2). The demo farmers had smaller gher (59 decimals) than direct

Pond / Gher information	Farmer-type			
	Demo	Direct	Control	All
Land size (decimal)	59	92	92	91
Dyke area (% of land area)	9	12	12	12
Water depth main area (feet)	4	3	3	3
Water depth canal (feet)	6	5	5	5
Leasing land size (decimal)	49	89	102	91
Leasing cost (BDT decimal ¹)	755	612	365	551
Tenure of lease (year)	3	2	2	2

or control farmers (92 decimals). Interestingly, the proportionate dyke area for demo farmers was 9% compared with 12% for direct farmers. Overall, farmers maintained 3-foot water depths in main production areas and 5-foot depths in the canals. Demo farmers maintained relatively deeper water depths (4 feet) in comparison with the project and control farmers. On average, the lease tenure of the ghers was 2 years, but longer (3 years) for demo farmers for the reported ghers. The leasing cost - on average BDT 551 for the duration of leasing - varied according to farmer type: BDT 755, BDT 612 and BDT 365 for demo, direct and control farmers, respectively. In terms of physical condition, the quality of

the ghers operated by the control farmers was not as good as that of the demo and direct farmer ghers.

Table 3: Share of annual income of demo, direct and control farmers from various income-sources

Annual household income source (%)	Farmer-type		
	Demo	Direct	Control
Crops	17.4	12.8	14.8
Bagda	24.6	28.2	27.6
Golda	15.4	16.5	10.0
Other fish	6.6	13.4	15.0
All fish	46.6	58.1	52.5
Livestock	6.8	5.8	10.6
Service	10.8	5.8	5.2
Remittance	10.7	1.0	1.8
Others	7.6	16.5	15.1

Across the survey respondents, the average annual income was BDT 415,092 per household; by farmer type it was BDT 406,691, BDT 390,953 and BDT 478,471, respectively for demo, direct and control farmers. The average national rural household income of Bangladesh is BDT 202,724 (BBS, 2019) indicating the survey respondents were much higher income earners than the national

average. Farmers earned major share of income from fisheries sector (46.6% for demo, 58.1% for direct and 52.5% for control farmers, (Table 3). The source of income from crop sector was 17.4%, 12.8% and 14.8% for demo, project and control farmers, respectively. Percent share of rural household income from agriculture (crop, livestock and fisheries sectors) nationally stands as 38.2% compared with 76.9% for the respondents, indicating the farmers in the study area were heavily involved in agricultural

Table 4: Education level of respondent demo, direct and control farmers in the study area

Education level of respondent (%)	Farmer-type		
	Demo	Direct	Control
Primary	8.7	25.3	22.2
Secondary	78.3	48.4	44.8
Higher secondary	4.3	10.1	6.9
University	4.3	6.5	13.3
Religious	0.0	1.5	0.0
No	4.3	8.2	12.8

activities. Also, among the three types of farmers, demo farmers had high proportion of income from services and remittance (21.5%) compared with 6.8% for direct farmers and 7.0% for control farmers.

Therefore, the demo farmers should have better opportunities than other farmers for investing in improved shrimp/prawn farming and/or coping with adversities in shrimp/prawn farming such as natural shocks and unanticipated mortality.

About 96%, 92% and 87% of demo, direct and control farmers, respectively, received some sort of formal

education (Table 4); the literacy rate of all farmer-type was greater the national average of 70.2% (BBS, 2019). A higher number of respondents from control group (13.3%) attended university compared to direct (6.5%) and demo (4.3%) farmers. However, a reverse trend was observed in the farmer-type who attended or completed secondary education (school-years 6-10). In general, the absolute majority of the respondents under the three types of farmers were almost equally educated. About 75% of the respondent demo and direct farmers enrolled as SAFETI project beneficiaries in 2017-18 production season and the remainder enrolled in 2018-19 production season.

3 Findings

The findings of this MTE are presented under three broad headings : (i) Key Findings and Performance Analysis, which critically investigated and evaluated the performance of SAFETI against set ‘performance indicators’; the performance of bagda monoculture, bagda-golda rotational culture and golda-carp polyculture; adoption of SAFETI promoted management steps (6-StepsTowards IFP); and, farmers’ benefit-cost in shrimp/prawn cultivation; (ii) Project Management and Implementation pointing out issues of concern; and, (iii) Overall Assessment highlighting the evaluation questions of effectiveness, relevance, impact and sustainability.

3.1 Key Findings and Performance Analysis

3.1.1 Achievements in performance indicators

The SAFETI project has 16 PMP performance indicators concentrated in two broad areas – farm productivity and income, and trade; food safety is embedded on both the areas. This section of the report describes the status of each indicator in relation to set target for mid-term period (the compilation is attached in Annex-3).

Performance indicator 1: Number of individuals who have applied new techniques or technologies.

Figure 1 shows that against the set target of 10,128 individual who applied new techniques or technologies, MTE found the achievement be at 11,163 individuals, which was around 10% above the target. This indicator was further disaggregated in adoption categories by gender, shrimp/prawn high health PL, biosecurity, disease management, and other issues such postharvest. The participation and adoption of new technologies by women remained satisfactory, MTE estimation found it to be around 69 percent more (856) than the set target (507) for mid-term (Table 5, Annex-5). This indicator reflected the adoption and practice of six steps recommended and

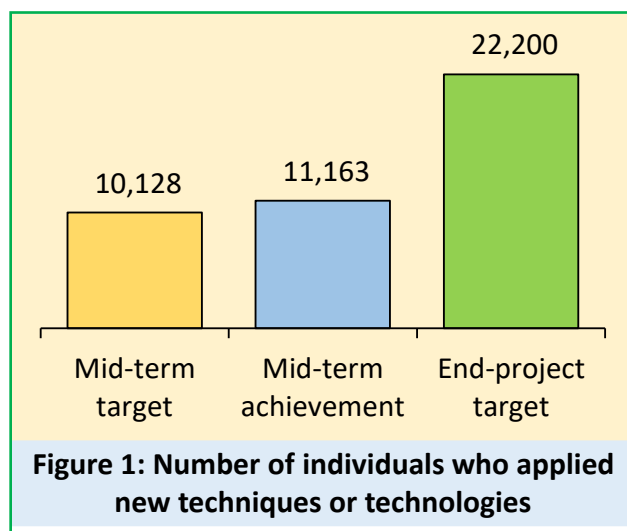


Table 5: Number of individuals who applied improved techniques or technologies on genetics, biosecurity, disease management and others			
Program indicator	Mid-term target	Mid-term achievement	End-project target
Shrimp/Prawn genetics	1,300	4,879	4,800
Biosecurity management	8,096	9,185	17,150
Disease management	8,096	8,132	17,150
Others (Water treatment and harvesting-post harvesting)	2,032	1,978	5,050

promoted by SAFETI ('6-StepsTowardsIFP'), which remained as the core of the intervention. Maintaining required pond depth was the first and foremost step among all other steps, but MTE found around 20% of the demo and direct farmers still did not maintain the recommended 3-5 feet pond depth, and cases were observed where the demo farmers still did not, or could not meet the criteria.

Among the six steps, SAFETI was extremely successful on adopting shrimp/prawn high-health PLs, in prima facie view MTE found that the achievement reached to 275% above the set target for mid-term (adoption target 1,300 individuals *versus* achievement 4,879). However, careful analysis of this set target revealed that the SAFETI project had assumed that only about 13% of the targeted project beneficiaries would have access to and/or adopt high-health PLs of bagda/golda. This notable performance achievement was due to the support and collaboration of SAFETI with two hatcheries – ‘MKA’ and ‘Desh Bangla’ – which had resulted in a marked increase in SPF bagda PL production. In contrast to the adoption of high-health PLs, looking carefully at other areas of new technology adoption, in none of the cases were the demo and direct farmers found to have fully accepted all of the new technologies being promoted by SAFETI. Among the four indicators of new technology adoption, postharvest operations remained poorly adopted by the farmers, due in part to SAFETI’s strategic decision to address production constraints as a priority during the first half of the project.

SAFETI directed its beneficiary farmers to hatcheries to receive supplies of SPF golda PL. However, production of golda PLs has not been widely established in Bangladesh yet, with farmers still relying on supplies of PLs captured in the wild. Given this situation, SAFETI advocated and campaigned on the use of ‘healthy’ golda PLs. However, the judgement of what constitutes a ‘healthy’ golda PL still remains based on subjective visual observation.

The farmers were highly receptive to the importance of biosecurity management which is evidenced by the target of SAFETI for this category was exceeded by 13.46% (target 8,096 *versus* achievement 9,185). Regarding addressing the disease problem, the project was on-target for the mid-term figure. SAFETI was not fully successful in attracting farmers on other management issues such as prescribed method of pond preparation. The reason for this was grounded in some structural and behavioral practices such as by land owners preventing farmers from deepening their ponds (to allow later culture of rice) and traditional practices involving shallow pond depths. Regarding this issue, farmers had been cultivating mostly on leased land for a duration of 2-3 years, and some farmers were evaluating the benefit-cost for investing in the deepening of ponds.

Performance indicator 2: Number of individuals receiving financial services.

The project fell short of the Mid-term target (3,750) for the indicator by 13.2%. According to the most recent data available from SAFETI MEL and partner organizations, TMSS provided 1246 (38% of total who received) and CODEC 175 (5% of total who received) loans to individuals. The remaining 1,833 loans (56% of total who received) were received from other MFIs. The MTE noted from FGDs that many farmers who received loans from MFIs had prior contract with loan-providing institutions prior to their involvement with SAFETI. The KII with TMSS and CODEC revealed that both partners were less interested in distributing loans to project farmers in areas outside of TMSS and CODEC traditional areas of loaning operations, but were willing to support farmers’ on-ground production related activities. MFIs operate under the principle that the client should be permanently residing within 10 kilometers of MFIs’ service stations to facilitate collection of loan installment payments. Also, TMSS and CODEC did not have sufficient loaning services based in the SAFETI project areas. The overall figure for loan recipients indicates that total loan-receiving farmers represented only 18.0% of the demo and direct farmers (considering the total of 17,950) (Table 6).

Table 6: Number of individuals receiving loans and number of loans disbursed			
Program indicator	Mid-term target	Mid-term achievement	End-project target
Number of loans receiving	3,750	3,254	6,000
Number of loans disbursed	3,750	3,254	6,000
Value of loans provided	\$656,250	\$1,342,109	\$1,050,000

Performance indicator 3: Number of loans disbursed.

The SAFETI MEL PMP has established the same target for this indicator as for the previous one (Indicator 2). There would have been a different result if the project partners had a dedicated program of loan disbursement to the beneficiary farmers.

Performance indicator 4: Value of loans provided.

According to SAFETI MEL information, the loans provided to beneficiary farmers were valued \$1,342,109 against the mid-term target of \$656,250, which was more than double the target. The share of the value by TMSS was \$481,862 (36% of the total number of loans disbursed), CODEC was \$69,463 (5% of the total number of loans disbursed), and other MFIs was \$790,884 (59% of the total number of loans disbursed). SAFETI’s mid-term loan value target (\$656,250) was exceptionally low compared to what farmers received (\$1,342,109). SAFETI most likely underestimated the value of the loan amounts needed by individual households. The average value of the loans that farmers received was \$387, \$397 and \$431 from TMSS, CODEC and MFIs, respectively. Also, once the farmers received their required amount of loan from MFIs, they would generally continue to seek loans from them because they are already in the MFIs’ systems and thereby were able to avoid going through the formal eligibility review process. The two MFIs that have been working with SAFETI need to customize their loan packages in accordance with the needs of smallholder farmers. Otherwise, the goal of ensuring access to adequate finance for the smallholder farmers may not be fully achieved.

Performance indicator 5: Number of private enterprises, producer organizations, water users, women’s groups, trade & business associations, & community-based organizations (CBOs) that applied improved techniques and technologies.

Several distinct components are aggregated under this performance indicator, but are disaggregated by types of techniques or technologies. According to SAFETI MEL data, as of the mid-term period, achievement was 951 against set target of 1023, which was 7.04% less than the mid-term target (Figure 2). Given the current momentum of the project’s progress, it seems that when it concludes the project will be able to achieve the life-of-project target.

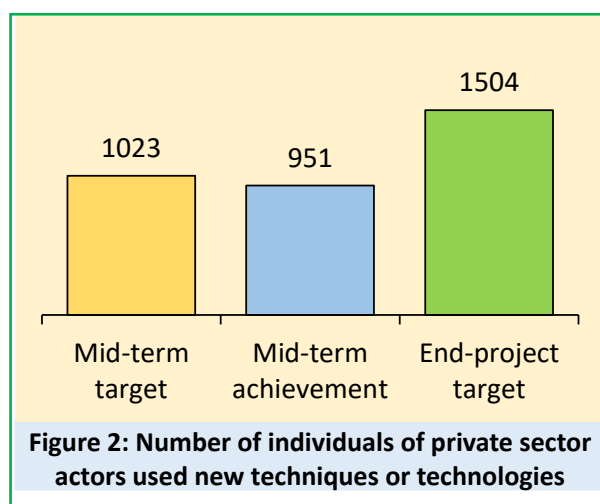


Table 7: Number of individuals of private sector actors used new techniques or technologies			
Program indicator	Mid-term target	Mid-term achievement	End-project target
Private enterprises	300	228	500
Producer organizations	720	718	1000
Trade & business associations	3	5	4

Performance indicator 6: Value of sales by project beneficiaries.

MTE found that value of sales by the project beneficiaries increased by 1% compared to the mid-term target. The project projected the yearly target of sales value at \$28,556,599, whereas MTE empirical estimation showed the worth value \$28,756,403 (Table 8). For the two species, a

Program indicator	Mid-term target	Mid-term achievement	End-project target
Sale value of 'Bagda' and 'Golda'	\$28,556,599	\$28,756,403	\$88,240,810
Sale value of 'Bagda' only	\$19,037,733	\$14,178,727	\$58,827,207
Sale value of 'Golda' only	\$9,518,866	\$14,577,676	\$29,413,603

downward achievement was observed for bagda, and an upward achievement for golda. The probable reason could be the higher number of training the farmers received from the project on bagda compared to golda (note performance indicator 8). The annual sales value for bagda was \$14,178,727 compared with the mid-term target of \$19,037,733 (25.52% shortfall), and for golda it was \$14,577,676 compared with the mid-term target of \$9,518,866 (53.15% over-achievement). Based on the overall achievement for this indicator, the MTE assumes that SAFETI's intervention had been fully working.

Performance indicator 7: Volume of commodities sold by project beneficiaries.

As with the increased value of sales, MTE estimated an increase in the volume of bagda and golda sold by beneficiary (demo and direct) farmers against the mid-term target of 3,173 metric tons; the MTE calculated the value

Program indicator	Mid-term target	Mid-term achievement	End-project target
sold volume of 'Bagda' and 'Golda'	3,173	3,445	9,805
sold volume of 'Bagda' only	1,903	1,754	5,881
sold volume of 'Golda' only	1,270	1,691	3,924

of sales to be 3,445 metric tons (Table 9), an over-achievement of 8.59%. However, when disaggregated by species, production volume showed a shortfall for bagda and an over-achievement for golda. The annual production value for bagda was 1,754 MT compared with the mid-term target of 1,903 MT (7.81% shortfall), and for golda was 1,691 MT compared with the mid-term target of 1,270 MT (33.16% over-achievement).

Performance indicator 8: Number of individuals who have received short-term agricultural sector productivity or food security training.

Table 10: Number of individuals received short term agricultural sector productivity or food security training

Program indicator	Mid-term target	Mid-term achievement	End-project target
Producers- farmers	18,000	23,876	25,000
'Shrimp/Bagda' Producers-farmers	10,800	10,700	15,000
'Prawn/ Golda' Producers-farmers	7,200	13,149	10,000
Input dealers	300	233	500
Polycymaker	60	38	300
NGOs	110	100	500

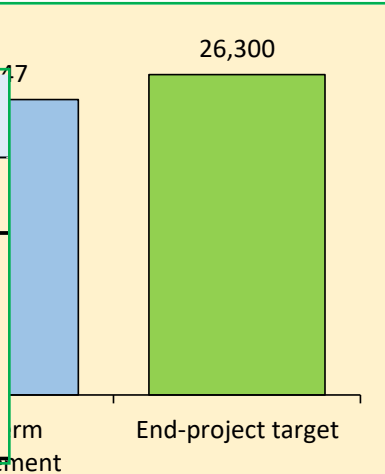


Figure 3: Number of individuals received short term agricultural sector productivity or food security training

With SAFETI’s rigorous activities, this indicator achieved more than the mid-term target (31.28% over-achievement) (Figure 3). The related technologies were predominantly related to farm management (‘6-StepsTowardsIFP’). When disaggregated, the over-achievement was observed more with females (98.41%) than males (27.75%) (Table 10). SAFETI training offered to golda farmers exceeded the midterm target by 82.83%, whereas the project was a little below the target (by 0.68%) for bagda farmers. The project was unable to provide training, due to engaging manpower more on capacity building of project (demo and direct) farmers, to expected number of governments, industries and organizations (36.67% shortfall), people in firms - processors, service providers, input dealers (22.33% shortfall) and academic institutions (9.09% shortfall). However, the project was able to provide training to the targeted number of farmers who were the prime focus of the current intervention, and with the current momentum of the project, it seems the project should meet the life-of-project targets during its remaining time.

Performance indicator 9: Number of individuals benefiting directly.

Achievement of this indicator lagged slightly behind the mid-term target, with 17,950 enlisted beneficiaries (demo and direct farmers) against the mid-term target of 18,470 beneficiaries (Figure 4). A detailed analysis showed that the beneficiary women in this sector exceeded the mid-term target, with about 49% more women benefitting than targeted.

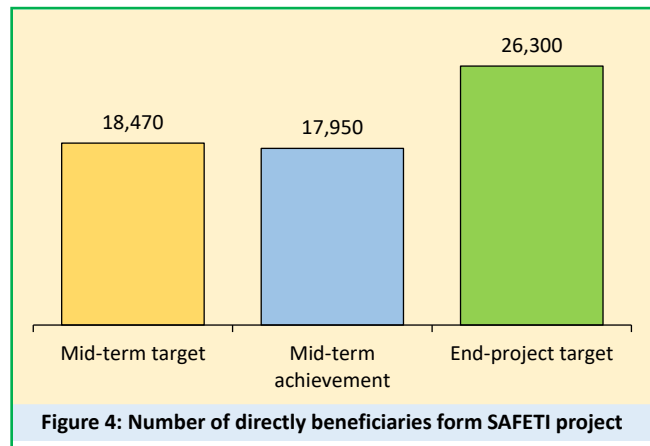
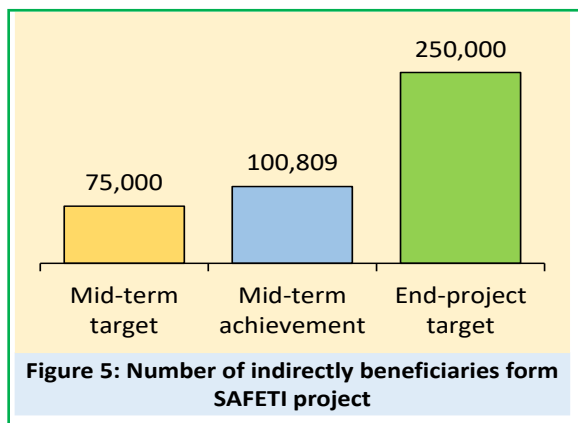


Figure 4: Number of directly beneficiaries form SAFETI project

Performance indicator 10: Number of individuals benefiting indirectly.



This indicator measures the unassisted scaling effect of the project. For this indicator, SAFETI exceeded by 34% the number of targeted indirect project beneficiaries; target 75,000 versus achieved 100,809 (Figure 5). This resulted mainly from distribution of posters highlighting management issues ('6-StepsTowardsIFP'), dissemination of SAFETI key messages through SAFETI-trained private organizations (such as feed companies), and interactions with agro-dealers and input suppliers. It is to be noted that the 'shrimp app' that is under development had not been released to the public; this would likely have increased the number of indirect beneficiaries.

Performance indicator 11: Number of policies, regulations and/or administrative procedures in each of the following stages of development.

The project achieved its mid-term target for formulating policies, regulations and/or administrative procedures. In relation to this indicator, BSSF-led and SAFETI-facilitated the 'Development of SPF Black Tiger Shrimp's hatchery Protocol' was finalized and waiting for formalizing by the ministry, thereby reaching Stage 3 of the FFPr Policy Indicator' (detailed in Annex-5). This protocol will guide production quality of PLs by hatcheries. The project greatly contributed to capability building of the Fish Inspection of Quality Control (FIQC) laboratory of DoF through human resource development and improved equipment. In turn, this helped provide more training (i.e., trainers) to farmers and shrimp/prawn related businesses owner on food safety. Disease diagnostics at the field level gained momentum led by WorldFish and collaborating partners – BFRI, DoF and Auburn University in the USA. Auburn had also been helping to improve feeding systems for bagda. The policy entitled 'Amendment of Access to Institutional Finance for Shrimp and Fish Farmers through Amendment of Bangladesh Bank Agricultural and Rural Credit Policy and Program 2018-19' achieved Stage 4 of the FFPr Policy Indicator. The policy entitled 'Study of the Present Status of SPF Black Tiger Shrimp Hatcheries in Bangladesh' achieved Stage 3 of the FFPr Policy Indicator. The policy entitled 'Develop Methodologies for Data Collection and Dissemination of Official Data to Facilitate the Availability of Key Market Information to Producers and Exporters' achieved Stage 3 of the FFPr Policy Indicator. And, the policy entitled 'Improvement of Fish Hatchery Acts 2010 and Rules 2011' achieved Stage 2 of the FFPr Policy Indicator. Details of the policies are attached in Annex-5.

Performance indicator 12: Average production of targeted commodities in kg per hectare in the targeted areas.

Table 11: Average production of bagda and golda (kg ha ⁻¹)			
Program indicator	Mid-term target	Mid-term achievement	End-project target
Average production of bagda and golda	450	696	500
Average production of bagda only	450	664	500
Average production of golda only	450	724	500

The MTE-estimated the productivity, on an annual cycle, of bagda at 664 kg ha⁻¹ and for golda at 724 kg ha⁻¹, i.e. 47.60% and 60.65% (and on average 54.73%) more than the mid-term target) (Table 11). The SAFETI MEL

data showed this achievement in Year 2 (2017-18) to be 405 kg ha⁻¹ and 626 kg ha⁻¹, respectively for bagda and golda. The MTE measured (figures cited above) the bagda productivity in the bagda monoculture system and the golda productivity in the golda-carp polyculture system. The high performance of bagda was achieved through farming of a second crop during the annual cycle that was practiced by 69% of the respondent farmers. Similarly, the high performance of golda was achieved through farming a second crop during the annual cycle that was practiced by almost all the respondent farmers. Although as has been previously noted, farming a second crop of bagda or golda comes with risks and also requires harvest of the first crop at smaller sizes, this result underlines the fact that when proper farming practices and management are exercised, a second crop can make an important contribution to the overall annual productivity of a farm.

Performance indicator 13: Number of Specific Pathogen Free (SPF) and PCR screened Shrimp/PLs sold by hatcheries.

Program indicator	Mid-term target	Mid-term achievement	End-project target
SPF and PCR tested PLs	500	738	1,235
SPF PLs	400	703	1,100
PCR tested PLs	100	35	135

For bagda, disease is one of the major factors for low productivity. The risk of disease can be reduced by through the use of SPF PLs and/or PCR screened quality PLs. The data for this indicator revealed that hatcheries sold 738 million SPF and PCR-screened PLs against the mid-

term target of 500 million, despite the price of SPF PLs being considerably higher than non-SPF PLs (Table 12). This was made possible because of SAFETI’s support, through advisory and connecting to government officials, to hatcheries, primarily MKA and Desh Bangla, who produced 340 million more SPF PLs in their most recent production cycle compared with the preceding cycle (i.e., prior to SAFETI interventions, as determined by KIIs).

Performance indicator 14: Number of input suppliers/dealers that sell or supply improved inputs/services because of USDA assistance.

As promoted by the SAFETI project, the number of input sellers selling and/or supplying improved inputs/services (e.g., bleaches, feed etc.) increased in the market (Table 13). This increase was 98% more than the mid-term target. Adoption of SAFETI activities triggered the increased demand from farmers, and in parallel, improved the understanding of the input sellers through SAFETI-delivered training that motivated service providers to sell improved inputs.

Program indicator	Mid-term target	Mid-term achievement	End-project target
Input suppliers/dealers	60	179	100
Aqua Input suppliers	50	179	85
Shrimp PL nurseries	10	2	15

Performance indicator 15: Number of events to improve linkage between Buyers and Sellers.

The farmers maximize their benefits when they can sell their products directly to the buyers. The SAFETI project has

Program indicator	Mid-term target	Mid-term achievement	End-project target
Improve linkage between Buyers and Sellers	4	4	10
Capacity building events for trade associations	4	2	10

successfully conducted four events to meet the mid-term target, but more such events are required (Table 14). As part of SAFETI

advocacy, a processing plant – Crimson Rosella - has agreed to collect shrimp/prawn directly from the farmers as long as the farmer (groups) can provide at least 100 kg from a single (group) location.

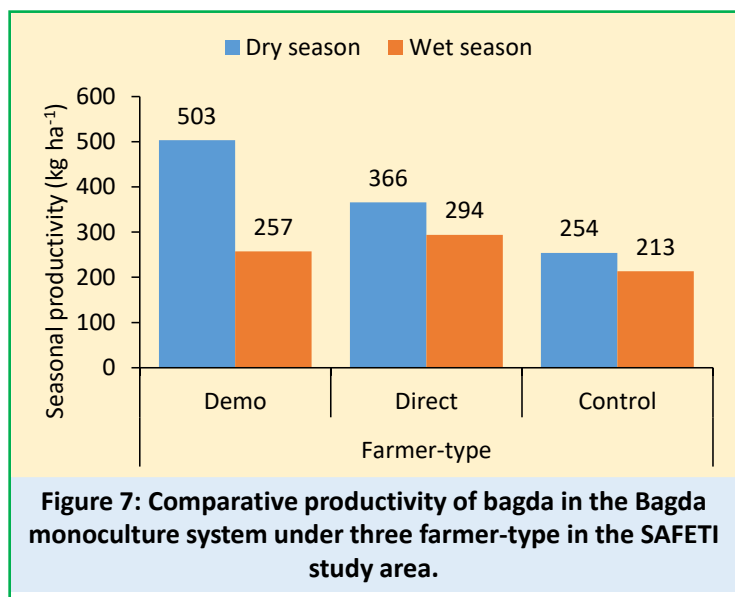
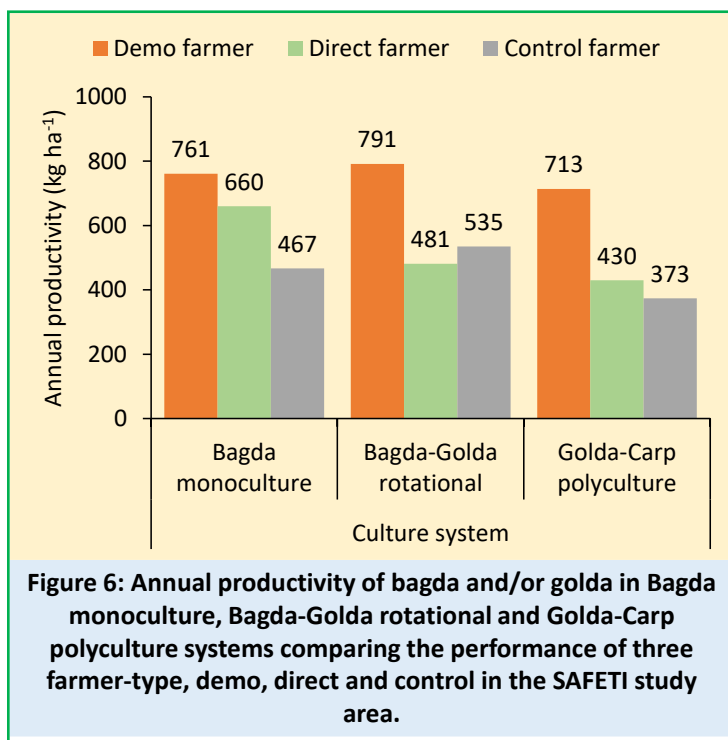
Performance indicator 16: Number of capacity building events for trade associations.

The trade associations are tertiary-level beneficiaries of the project. As of the mid-term period, the project had only conducted two capacity-building events with the trade associations against the mid-term target of four events. Regarding, arranging capacity-building events for trade associations, the project needs to take rapid actions given that only half of the target has been achieved.

3.1.2 System productivity

Figure 6 shows that there was a 193 and 57 kg ha⁻¹ productivity increase by direct farmers in bagda monoculture, and golda-carp polyculture system, respectively, over the control farmers. However, in one instance, the project's direct farmers showed lower productivity by 54 kg ha⁻¹ for the bagda-golda rotational system in comparison with the control farmers. This unexpected result dictates a follow-up investigation to determine why (i.e., causes for) the production of the direct farmers was less than the control farmers.

The performance of the demo and direct farmers considerably exceeded the overall mid-term target of average 450 kg ha⁻¹ production (for individual and combined species) for all three production systems. In contrast, with the exception of the bagda-golda rotational system, the production of control farmers was always lower than that of the demo and direct farmers. As a result, SAFETI has been able to show the potential for smallholder farmers of Bangladesh to increase the productivity of shrimp/prawn following the project-promoted semi-intensive cultivation system.



The MTE analyses demonstrated consistently lower productivity with bagda during the wet season (213 – 294 kg ha⁻¹) in the bagda monoculture system across all farmer-types (Figure 7). The common reason was that it was more likely that low water salinity prevailed during the wet season as a result of the monsoonal rains adding freshwater to the farming system. The SAFETI 5th Semi-Annual Report (SAFETI Document 08) also suggested this correlation. Bagda does not grow well in a low-saline water environment. In addition, other causes such as improper pond preparation inviting biosecurity risk, lack of availability of good quality

feed and other inputs, and shorter duration of the second crop in the systems might have impacted bagda productivity.

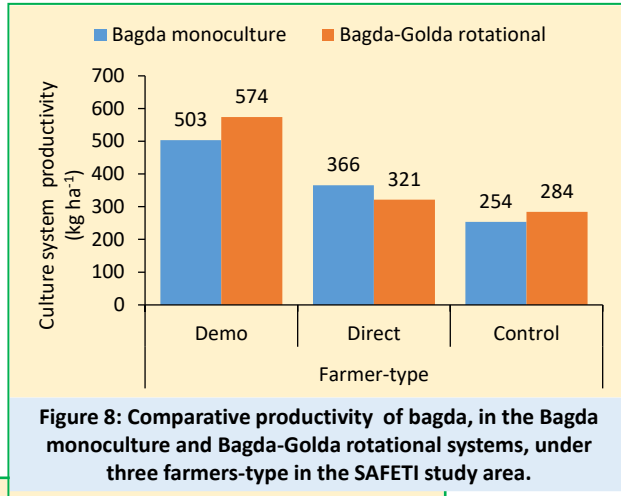


Figure 8: Comparative productivity of bagda, in the Bagda monoculture and Bagda-Golda rotational systems, under three farmers-type in the SAFETI study area.

The productivity of bagda under bagda monoculture and bagda-golda rotational systems varied, with higher productivity achieved in the latter system (Figure 8); the reason is likely due to the production environment having low salinity that was not suitable for bagda culture. As noted above, these results warrant further investigation.

Golda performed much better in golda-carp polyculture compared to the bagda-golda rotational system for all three farmers-types (Figure 9). The reason might be due to the production environment having a level of salinity that is not suitable for golda culture, as well as a reduced duration of the cropping period.

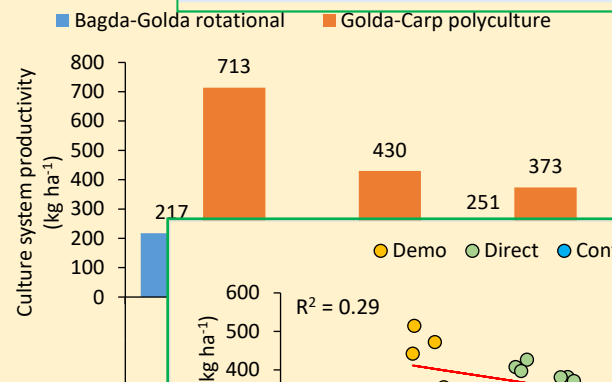


Figure 9: Comparative productivity of Golda rotational and Golda-Carp polyculture under three farmer-types in the SAFETI study area.

In general, the ranking of productivity performance of shrimp/prawn under the three farmer-type was demo > direct > control.

3.1.3 Management

Adoption of farm management practices was more intense with demo farmers, followed by direct and lastly control farmers. This was probably reflected on productivity performance achieved by the farmer-categories (reference Table 12). The MTE indexed the adoption of SAFETI promoted management ('6-StepsTowardsIFP') under four groups – biosecurity, disease, water, and harvest and postharvest. These steps accommodated nine issues in biosecurity management, five issues in disease management, 10 issues in water management and five issues in harvest and postharvest management. Each issue was given a maximum score of 100, and the index for each management group under each farmer-type was calculated as the ratio of summation of the percent respondent's affirmation of each issue by the summation of the maximum score of each issue. The indices for all management parameters was calculated in the same manner. The maximum index for individual and across all management groups was set as 1 (one). It may be noted that understanding the perceptions and priorities of the demo, direct and indirect farmers will help SAFETI

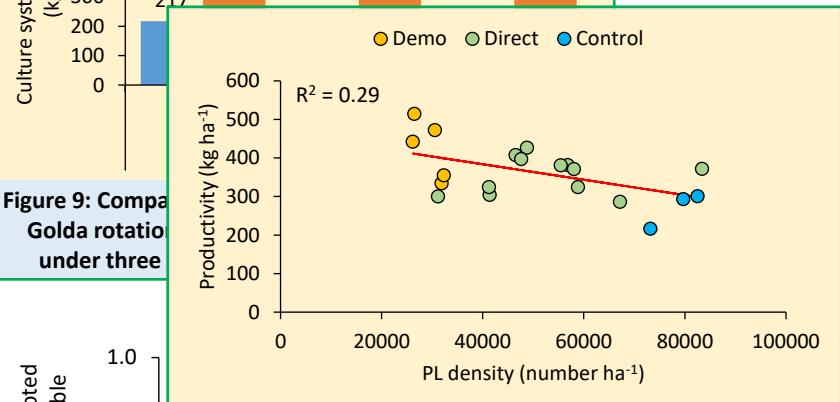


Figure 11: Relationship between PL density and productivity in bagda and golda, in the Bagda monoculture and Bagda-Golda rotational systems, under three farmers-type in the SAFETI study area.

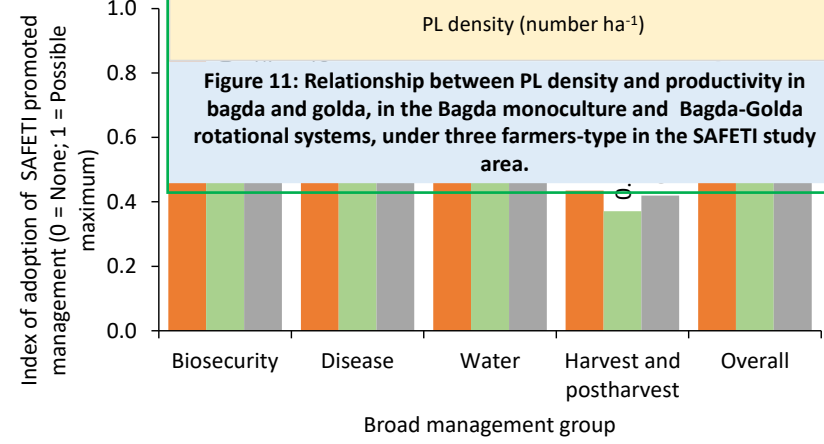


Figure 10: Adoption of SAFETI promoted management issues on four broad aspects – biosecurity, disease, water, and harvest and post-harvest – indexing 0 (none) to 1 (maximum) under three farmer-type in the SAFETI study area.

determine what underrated elements of the six-step need to be emphasized during the remainder of the project

Across the three farmer-type, the adoption of biosecurity issues indexed the highest, followed by disease and water, and interestingly, the lowest on harvest and postharvest issues (Figure 10). This is likely because the farmers were at early stage of exposure of SAFETI technologies and concentrated on productivity rather than postharvest quality improvement issues. Results indicate around half of the control farmers had been considering SAFETI recommended farming practices in their farm management. It would be worth investigating the extent to which they have incorporated these measures.

Table 15: Perception of smallholder farmers on SAFETI promoted steps towards increased shrimp/prawn productivity in the field surveyed area

SAFETI promoted Steps	Farmer-type and respondent (%)		
	Demo	Direct	Control
Good water quality and healthy PL	34.8	14.1	24.6
Optimum depth and cleaning pond bottom	26.1	40.2	14.3
Stocking density and healthy PL	21.7	28.4	36.5
Quality feed	13	4.4	3.9
Prevent cross-contamination by outside disease carriers	4.3	4.8	14.8
Disinfecting water and removing potential threats of diseases	0	7.4	2

Regarding the current perception assessed by MTE, none of the farmer-types put priority weight on any one of the ‘6-StepsTowardsIFP’ (See Table 15). The demo farmers gave highest priority to the maintenance of good

water quality and healthy shrimp/prawn (34.8% of the respondents), while for the direct farmers ensuring optimum water depth and cleaning the pond bottom was the most important of the six steps (40.2% of respondents). The control farmers rated stocking density and healthy PL as the prime method of productivity improvement (36.5% of respondents)..

Surprisingly, preventing cross-contamination by outside disease carriers was rated low in relative

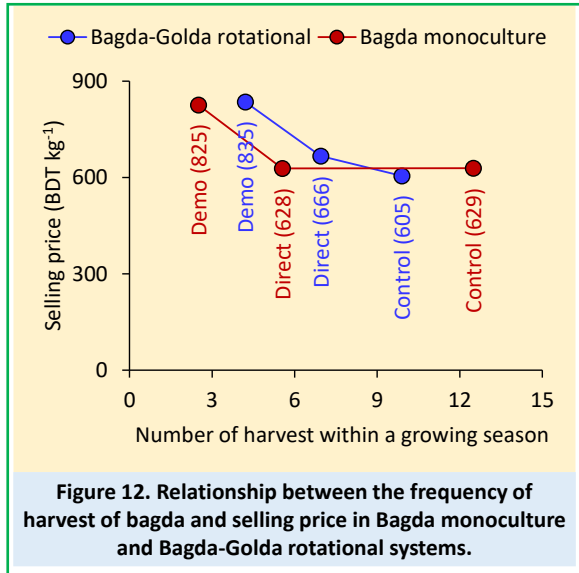
Table 16: Difficulties on adopting SAFETI promoted by smallholder farmers in the field surveyed area.

SAFETI promoted steps	Farmer-type and respondent (%)		
	Demo	Direct	Control
Good water quality and healthy PL	34.8	34	54.9
Optimum depth and cleaning pond bottom	21.7	14	15.4
Stocking density and healthy PL	17.4	16.5	13.8
Quality feed	17.4	8.8	3.1
Prevent cross-contamination by outside disease carriers	4.3	15.2	8.7
Disinfecting water and removing potential threats of diseases	0	6.9	4.1

importance by demo and direct farmers ($\leq 7.8\%$). SAFETI, on the other hand, remained quite certain that beneficiary farmers were aware of the threats from cross-contamination of diseases, and surprised

that few interviewed farmers interviewed was aware of this. SAFETI needs to address this concern.

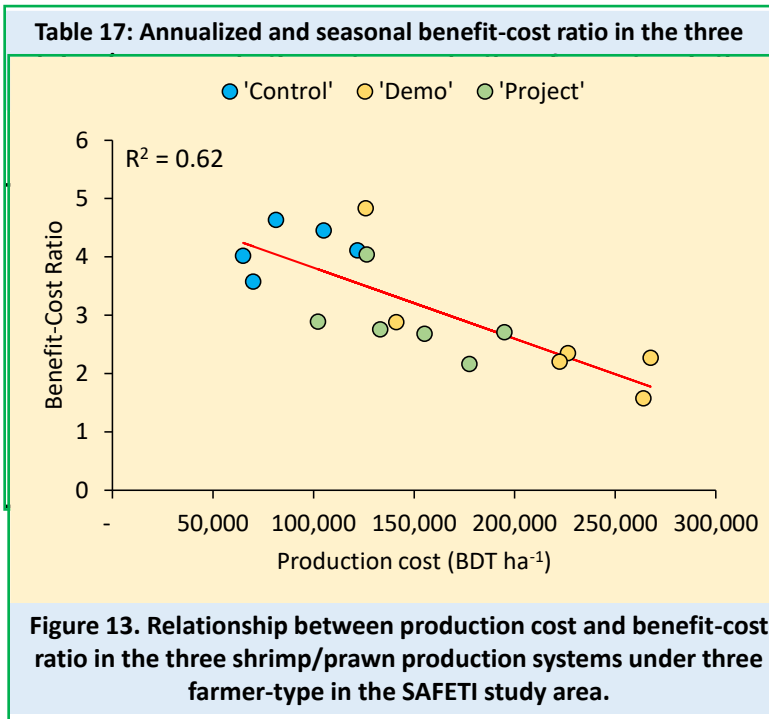
The most difficulty the farmers experienced with the field application of the ‘6-StepsTowardsIFP’ was with the stocking density and healthy PL (expressed by 38.4%, 34.0% and 54.9% of demo, direct and control farmers, respectively) (Table 16). The next highest difficulty they encountered was related to biosecurity (i.e., prevent cross-contamination by outside disease carriers) and maintenance of good water quality and healthy shrimp/prawn. A few farmers also faced the problem of quality feed as well.



The productivity of bagda and golda is related to PL stocking density; the higher the density stocked by the farmers using semi-intensive farming techniques, the lower productivity they achieved (Figure 11). In general, the control farmers stocked the highest density followed by direct then demo farmers. The SAFETI promoted management was semi-intensive and it recommended a stock density of around 140 PL per decimal, which was largely adopted by the demo farmers. It appears SAFETI, for smallholders farming environments, rightly recommended this PL density.

Harvest size of shrimp/prawn is an important factor for attracting increased unit prices for the product. The frequency of harvest, within a growing season, likely affects the harvest size. Increased frequency of harvest results in smaller size at harvest, resulting in a

reduced unit price. MTE observed this pattern in bagda selling price for both bagda monoculture and bagda-golda rotational culture (Figure 12). The demo farmers practiced less frequent harvests than direct farmers, and the control farmers harvested more frequently than the project farmers. In the bagda monoculture and bagda-golda rotational culture systems, the average frequency of harvest by the control farmers was alarmingly high at 12.5 and 9.9 harvests per cropping season, respectively (Figure 12). Control farmers harvested this frequently mainly due to avoid the risk of crop failure, which was not uncommon due to the prevalence of diseases in farmed bagda.



3.1.4 Benefit-cost

SAFETI promoted production technologies ('6-StepsTowardsIFP') need more investment from farmers in their production units. In return, the technology-adopting farmers can expect increased benefits from their investment. MTE analysis revealed that SAFETI benefitted farmers (both demo and direct farmers) exceeded benefits over costs (benefit-cost ratio, BCR >1) (Table 17). However, in both bagda monoculture and bagda-golda rotational systems, the BCR was lower for demo farmers than for direct farmers. Moreover, SAFETI demo and direct farmers had smaller BCRs than control farmers.

Further analysis of these findings revealed that production cost largely related to, and explained the variation in the BCR (Figure 13). The demo farmers invested more, followed by direct farmers and then control farmers, whereas the exactly

reverse occurred with the BCR. This suggests that SAFETI-supported farmers should try to achieve further improvements in their production efficiency (i.e. increased productivity) to realize increased benefits from their investment.

However, investments of demo and direct farmers yielded more gross return compared with control farmers. In the bagda

Table 18: Gross margin income in the three shrimp/prawn production systems under three farmer-type in the SAFETI study area

Culture type	Farmer-type		
	Demo	Direct	Control
Bagda monoculture	491344	572869	747766
Bagda-Golda rotational	328568	383052	652619
Golda-Carp polyculture	268458	505249	322102

monoculture system, demo farmers received a gross margin of BDT 491,344 ha⁻¹, compared with BDT 328,568 ha⁻¹ by direct farmers and BDT 268,458 ha⁻¹ by control farmers. In the bagda-golda rotational system, demo farmers received a gross margin of BDT 572,869 ha⁻¹, compared with BDT 383,052 ha⁻¹ by direct farmers and BDT 505,248 ha⁻¹ by control farmers. In the golda-carp polyculture system, demo farmers received a gross margin of BDT 747,766 ha⁻¹, compared with BDT 652,619 ha⁻¹ by direct farmers and BDT 322,102 ha⁻¹ by control farmers (Table 18).

Table 19: Sale Price (BDT kg⁻¹) of fish species in dry and wet seasons in three shrimp/prawn production systems under three farmer-type in the SAFETI study area

Culture type	Season	Farmer-type		
		Demo	Direct	Control
Bagda monoculture	Dry season	825	628	629
	Wet season	651	623	571
Bagda-Golda rotational	Dry season	835	666	605
	Wet season	597	677	687
Golda-Carp polyculture	Dry season	676	702	664
	Wet season	159	154	180

The selling price of bagda differed between farmer-type, with demo farmers receiving a much higher price (+197 BDT kg⁻¹) than direct and control farmers for bagda monoculture, because of size of the produce. A similar pattern of selling price variation for bagda was observed in the bagda-golda rotational system, benefitting demo farmers (+169 BDT kg⁻¹ more than direct farmers and +230 BDT kg⁻¹

more than control farmers).

The bagda price was lower in the wet-season culture than during dry-season culture (Table 19). This situation was probably due to restricted growth (echoed by the farmers in FGDs) because of a less than optimal environment due to reduced salinity level in the ponds. This may pose a question regarding the sustainability of wet-season bagda culture in such environments. One mitigative response might be not growing bagda in the season and delaying the dry-season crop to avoid disease risk.

The variation in the price of golda by farmer-type or growing season was small, suggesting that demo farmers could not attract higher prices for this commodity than direct farmers.

3.2 Project Management, Partnership and MEL

3.2.1 Project Management

The Winrock International offices in the USA oversee the SAFETI project implementation and provides necessary guidance, concurrences and approvals to support the project's central office based in Dhaka. An expatriate CoP leads the project team from the Dhaka office supported by a national deputy CoP, an expatriate Aquaculture expert, and a Director for Finance and Administration. Additionally, there are

few program support professionals and a Monitoring, Evaluation and Learning Specialist. The SAFETI project has been implementing 10 different activities in association with implementation partners including NGOs, Worldfish, and Auburn University, USA.

SAFETI has separate project implementation and technical support partners. Two implementation partners, TMSS and CODEC are responsible for field level implementation in two regions though their technical and implementation capacity varies. CODEC is a regional NGO with organizational experience mainly in working with fisherman in the coastal areas while TMSS is a national organization implementing multi-dimensional projects all over the country. TMSS operates in about 70% of the project areas. Each implementing partner has a Project Manager (PM) who is fully responsible for the SAFETI field activities; the PM has vehicle support (motorbike and fuel expenses) and mobile phone bill support. The staff member at the upazila level (UAEM) level also has a similar logistic support. The AAFs distributed in the upazilas are provided with bicycles and mobile phone bill support. The AFFs need to travel about 25-30 km to project areas. CODEC has two-day weekend, whereas TMSS has one-day weekend.

The field staff turn-over rate observed was high (about 40% in the last one year) for both the implementing partners, which resulted in time and costs needed to hire and train new staff on a regular basis. However, TMSS and CODEC Project Managers felt this rate of turnover was not unexpected, given the circumstances in the current job market for project-based staff. It takes about 25-30 days to recruit, train and complete a staff position replacement.

SAFETI has partnerships with DoF, BFRI, Worldfish and Auburn University, USA for technical support including disease diagnosis. The evaluation team is aware of the technical collaboration but it seemed too early to assess collaboration effectiveness. It should be noted that the project greatly contributed to capability building of the Fish Inspection of Quality Control (FIQC) laboratory of DoF through human resource development and improved equipment.

The project signed collaboration MoUs with the DoF and BFRI in 2018. SAFETI has also Work Plans that are reviewed quarterly by a Project Technical Committee appointed by DoF and BFRI. At the field level, DoF official participates in farmers' training program and provides technical assistance on requests.

3.2.2 Monitoring, Evaluation and Learning (MEL)

SAFETI uses a framework for conducting monitoring and evaluation activities. The project has 16 specific indicators for performance assessment, and therefore, a routine function of the MEL team is to keep track on project progress across these 16 indicators. To do so, SAFETI conducts annual sample surveys, as well as compiling data from partner progress reports.

During the process of activity implementation, a large volume of data is generated at various levels. Demo farmers are required to maintain a record book that they update with the assistance of the field staff when needed. Direct farmers are also provided with a record book, but maintaining it is not mandatory but rather intended simply to introduce them to record-keeping and encourage them to do so by providing them with the template that the demo farmers are using. The evaluation team observed that a large number of direct farmers are not aware of what is documented in the farmer's record book which is quite comprehensive, and provides scope for self-check on farm activities. According to SAFETI plan, direct farmers are not required to maintain a record book – primarily because SAFETI does not have a sufficient number of field staff to help 25,000 farmers do this.

Training is one of the main activities of the project. It provides step-by-step technical training to the farmers over a period of six months. As part of the training evaluation, farmers provide feedback based on which follow-up trainings are planned and implemented. The evaluation team observed that the

farmer feedback had not been stored in the SAFETI database. The evaluation team expects that SAFETI would preserve this feedback as data for future reference.

3.3 Overall Assessment

This section analyzes/synthesizes the findings and assesses the project performance in terms of effectiveness, relevance, impact and sustainability.

3.3.1 Effectiveness

The SAFETI project was launched in a time when the prawn/shrimp industry of Bangladesh was struggling in comparison with the progress made in freshwater fish production. The project assessed relevant stakeholders who had direct or indirect effect on the overall contribution of this sector in the economy. The project identified the factor that application of science in the production of shrimp/prawn would be a prime solution, and subsequently developed six steps that would help drive farmers towards more optimal productivity. Through both qualitative and quantitative surveys, the MTE found that the farmers have generally accepted the idea of six steps – although the adaptation rate by each category (i.e. farmer-type) is not uniform. There are several reasons for the less than full and disparate adoption of these six steps: among them, control over the pond and access to cash are impediments for the small holding farmers. Farmers appeared convinced that ensuring SPF PL was the primary factor for getting more production, and in this regard, the technical support of SAFETI two hatcheries had been able to increase their production of SPF PL. However, still some direct farmers were stocking more PLs than the recommended density of 100-120 PLs per decimal for reasons based on anticipated mortality. The project engaged MFI-based project partners to ensure access to cash for the farmers, but the result was only partially successful. MTE data showed that the production of both golda and bagda has exceeded the mid-term targets, and based solely on the production of the demo farmers, it shows that achieving the project LOP target of 500 kg ha is likely and that in some cases (farms) 1,000 kg ha might be achievable. The project was able to reach to the indirect farmers mainly through BCC and IEC materials. As a result of SAFETI activity, demand for quality input-items has increased and more suppliers were found to be selling items of SAFETI-recommended quality. The project emphasized capacity-building of both farmers and other actors in the value chain. Farmers were found to be attending the training sessions, but MTE observed that some of them were unable to grasp the essence of the training up to the desired level of comprehension; examples of this were direct farmers who did not fully understand what was recorded in their log books.

3.3.2 Relevance

Relevance to context: Shrimp and prawn farming significantly contribute to Bangladesh's national economy. But in recent years, the productivity of the sector has stagnated and external trade has declined. Bangladesh Government initiatives to address these concerns are reflected in the National Shrimp Policy (DoF, 2014), which clearly identifies the need to address pressing issues impeding improved productivity, ensured food safety and expanded trade.

USDA's 'Program and Services' emphasize on helping developing countries improve their agricultural systems and build their trade capacity. Its 'Food for Progress Program' has been designed to help developing countries and emerging democracies to modernize and strengthen their agricultural sectors by adopting two principal objectives: to improve agricultural productivity and to expand trade of agricultural products (<https://www.usda.gov/our-agency/about-usda>).

The SAFETI project is thus fully in line with Bangladesh government's policy plan and USDA's broad strategy and objectives.

Relevance to project design, activities and implementation:

The field survey conducted by MTE, and validated in FGDs,

revealed that the shrimp/prawn farmers were in dire need of receiving information related to their farming. This was because only few of them had previous had opportunity to undertake training on this topic (Table 20). Under these circumstances, the SATETI promoted '6-StepsTowardsIFP' was fully relevant. Given the present-day economic circumstances of the smallholder shrimp/prawn farmers, introducing and practicing expensive high-tech technologies such as mechanical aeration systems in small ponds would be a cost-burden. Thus, adoption of semi-intensive farming, as promoted by SAFETI, was the correct initial step under the conditions of limited information, training, techniques and capacity to adopt high-end (expensive) farming technology.

The MTE, in consultation with the beneficiary farmers during FGDs, received feedback that the field implementation structure of the SAFETI activities was relevant to socio-environmental circumstances of marginal landholders. The SAFETI activities include, but are not limited to: gaining and exchanging knowledge within the peer 'group' rather than waiting for the extension agents to help them; receiving technical help within the group rather than waiting for external help; and, and buying PLs under the banner of the 'group'. The number of government fisheries extension agents serving at upazila level is very limited and hinders frequent Government door-step services to farmers. This limitation on service delivery by Government extension agents is compounded in remote locations where travelling is not difficult and time consuming.

Of the three critical issues (CS) that SAFETI addressed, this evaluation understood that productivity and farm income (CS-1) and food safety (CS-2) would potentially contribute to trade (CS-3); whereas CS-2 would have impact on CS-1. Recognizing the weak shrimp/prawn industry of Bangladesh, MTE believes that the three critical issues pillared in the SAFETI design were fully relevant. However, in SAFETI's short timeframe, it was impossible to achieve all targeted results, especially from CS-3. MTE noted that the while the project began in October 2016, field activities did not commence until September 2017, which left four-years (out of five) to produce the expected outputs. The outcome from CS-3, notably with respect to trade outside Bangladesh as emphasized by USDA, relies on CS-1 and significantly, on CS-2, which will require adequate transitional time. MTE feels that SAFETI should, in parallel, emphasize trade expansion within Bangladesh (internal trade).

Relevance to gender: The MTE estimated women's representation in the SAFETI project as direct beneficiaries at 7.7% (Table 17). This figure is similar to SAFETI MEL records ('Program Indicator' # 9, Annex-2). On the national scale, rural women own about 4% of the holdings, and the share of farm-holding rural women (in proportion to men) engaged in agricultural work is reported as 27% (BBS, 2010). These figures for women's representation are likely to be much smaller, compared with the national average, in shrimp/prawn farming communities. Therefore, the proportional benefits of SAFETI to women were reasonable. Furthermore, the evaluation did not find any evidence that project benefits were male-biased i.e. intentionally accruing differently to women.

3.3.3 Efficiency

In achieving its goal, SAFETI invested resources on in four areas: (i) general training and supply of training and technology materials; (ii) on-site technical support; (iii) assessment and monitoring of water quality and diseases; and (iv) connection with inputs and marketing. Those investments have mutually benefitted farmers and market actors (inputs suppliers, seed sellers, hatchery and/or nursery owners

Background capacity and Women beneficiaries (%)	Farmer-type		
	Demo	Project	Control
Farmer training received other than offered by the SAFETI project	0.0	16.4	6.4
Direct project beneficiaries - Women of total beneficiaries	8.7	7.6	9.4

and processor). Qualitative results, through KIIs of input suppliers and seed sellers, fully justified resources expended on them, notably through training, which helped them gain modern knowledge on the appropriate kinds and items that should be for shrimp/prawn culture. This resulted in win-win situation for them (i.e., their businesses) and for farmers (i.e., their commodity productivity). Processors, as revealed in KIIs, lacked a sufficient supply of raw shrimp/prawn in their factories to fill-in their unused production capacity; increased productivity in farming ponds is required to fill-in this gap.

The approved budget of SAFETI, which includes administrative (non-program) and program expenditures is USD 15,894,260.80. The administrative budget is 26.39% of the total budget. The administrative budget is paid for in part, from the CCC contribution to the budget. Because the administration of the project will run for 5 full years, the originally scheduled budget for administrative costs remains valid. The total expenditure up to June 30, 2019 was USD 7,484,231.13 resulting in a burn ratio of 47.07%. Therefore, at the mid-term stage, the project's expenditure was on track, and the investment of project money resulted in a USD 3,607,791 return to beneficiary farmers.

3.3.4 Impact

By the end of the project, SAFETI has targeted engaging 25,000 demo and direct beneficiaries, which would cover about 3% of the estimated 800,000 extensive shrimp/prawn farmers of Bangladesh. Changes in the productivity in those project beneficiary farms would have only a small impact on increased national production for the industry and expanded trade. However, a large-scale expansion of the adoption of SAFETI methods and selected activities could make a measurable difference at a national level. For example, the 250,000 indirect beneficiaries, combined with the 25,000 demo and direct beneficiaries would account for about 28% of the estimated total number of farmers, which with respect to their contribution to the sector and the project's outcome, could be significant. Ensuring the sustainability of SAFETI's initiative could help make that happen.

3.3.5 Sustainability

Ensuring sustainability should encompass two primary elements: (i) sustainable methods, and (ii) sustainable partnerships. Sustainability of the methods will depend on two main aspects: (i) perception of the farmers, and (ii) financial capacity of the farmers to implement. Farmers' current perception on weighing the '6-StepsTowardsIFP' was confusing. Neither the demo nor the direct farmers fully understood the importance of the holistic view of the SAFETI-promoted steps on improving on-farm shrimp/prawn productivity. Demo farmers believed that 'good water quality and healthy shrimp/prawn' should be the best management option, followed by 'optimum water depth and cleaning pond bottom', and 'stocking density and healthy PL'. In contrast, few direct farmers thought maintenance of 'good water quality and healthy shrimp/prawn' would help boosting their shrimp/prawn productivity. Biosecurity and 'disinfecting water and removing potential threats of diseases' were poorly rated in relative importance by both demo and direct farmers. Based on these observations, MTE believes that the farmers' perception of factors affecting farm productivity of shrimp/prawn may still not be clear to them. If this is the case, then it would raise serious concerns related to the sustainability of farm productivity. SAFETI needs to address this concern.

The demo farmers demonstrated the potential for improved productivity for both bagda and golda cultivation using SAFETI promoted science-based production activities ('6-StepsTowardsIFP'). Those farmers could be the potential future leaders at the cessation of the project. How to continue the role of the demo farmers in the absence of the project support is a future planning issue of SAFETI in the post-mid-term stage.

The study found, through field survey, FGDs and KIIs, the trust level of farmers to market actors – hatchery, nursery, PL trader, input retailer, feed seller, ‘aratder’, and processor – was extremely high (90-100% affirmation from respondents). The project has contributed building this trust by connecting the stakeholders through series of meetings and trainings. Ensuring good information and/or inputs flow from those actors will help build the sustainability of SAFETI’s methods. This will require continued and increased partnerships with private sector, notably inputs and feed suppliers, hatchery owners and processors

On the issue of partnership, building and leaving strong partnerships with government (DoF and BFRI) when SAFETI concludes will also be a strong pillar of sustainability. This is especially important for diagnostic and disease management services, and channeling extension services to SAFETI built-up ‘groups’.

4 Lessons Learned and Way Forward

Bangladesh has made phenomenal success in production of fresh water fish production during 2008-2017 period, whereas the marginal gain in the production of shrimp and prawn is minimal with exports declining during the 2017-18 period. The SAFETI project embarked on its activities when Bangladesh was in need of supporting the sector, particularly the small holder farmers whose livelihood is largely dependent on shrimp and prawn. Similar favorable climatic, soil, salinity condition, and geometric progression in our neighboring country India gives Bangladesh hope.

At the midpoint of the project, SAFETI has produced some good examples of progress towards improved productivity in the shrimp/prawn farming for smallholders in coastal Bangladesh. Notable ones are:

- i. Raising the hopes of farmers that improved productivity of shrimp/prawn farming in smallholdings could become a reality.
- ii. Upgrading farmers’ knowledge on avenues for increasing shrimp/prawn productivity through various methods and technology.
- iii. Experiencing the mutual benefits of solving difficulties of farming activities through group-environment (‘groups’).
- iv. Achieving the target of 500 kg ha⁻¹ annual bagda and golda productivity under semi-intensive (synonymous with ‘improved extensive’ system defined by DoF) culture system.
- v. Quantifying the adoption rate of SAFETI-promoted farm management (production activities (‘6-StepsTowardsIFP’) among farmer-types (demo, direct and control).
- vi. Highlighting the importance of local service providers in disseminating knowledge and supplying appropriate inputs to farmers.
- vii. Increasing SPF PL production by hatcheries.
- viii. Promoting mutual benefits of farmers and market actors through improved farm productivity activities.

Based on overall observations, the MTE suggest the following points as ways forward during the remaining period of project implementation:

- i. Control of stocking is a critical factor and multiple stocking in the same pond should be discouraged. For a given pond infrastructure and practices, a stocking density of 100-120 PL per decimal should be emphasized.
- ii. In the bagda monoculture system, the second (wet-season) bagda crop was not productive even with SPF stocks; this is due to a not-fully-favorable environment for bagda growth and increased

biosecurity risk in the rainy season. Under such circumstances, failures with SPF seed could affect the credibility of SPF concept. SAFETI might suggest alternate cropping for the farmers in this season, such as growing rice.

- iii. The first crop of bagda could begin from March, because high temperatures would provide natural protection against White Spot disease, assuming other environmental conditions are satisfactory.
- iv. The SPF bagda nursery supported by SAFETI helped minimize linkages and ensure supply of genuine SPF bagda seed to farmers. However, biosecurity in the nurseries needs strengthen and should be structure as an independent activity; duration of PLs in the nursery needs to be increased. Nurseries are an integral element of farming, but if nursery biosecurity is compromised, it can have devastating effects on the supply of SPF seeds to farmers.
- v. Partial harvests are done at 25 g and onwards and at multiple times. SPF bagda grow best after 30 g and coupled with low stocking density and a single harvest at > 40 g provides the best output and financial returns. SAFETI could make this a part of the BMP, where risk is not a serious issue.
- vi. Farming a second crop with bagda is not as productive as the first crop, even with SPF stocks, due to increased biosecurity risk in the rainy season. SAFETI should suggest alternate crops (such as rice) for the farmers, given that the second crop yield is reduced and disease outbreaks are more pronounced.
- vii. The golda crop in bagda-golda rotational farming is below par. This may be caused by residual salinity in the soil and water. Tidal flushing of pond water prior to stocking golda may prove effective. Where tidal flushing is not possible, SAFETI should explore other practical options, such as strictly following the practices of black soil removal, drying ponds as much as possible, liming and bleaching.
- viii. Several products are currently suggested to the farmers to improve pond water quality. In the current farming system only feed, seed and water quality management should be promoted; there is a need to avoid introducing products that only drain the farmer's finances. SAFETI could incorporate this in the BMP.
- ix. Currently, there is no comprehensive quality control mechanism at the hatcheries. There is a need to establish 'Process Controls' and verification at the hatcheries for seed quality assurance up to the point of stocking in the farms.
- x. To reduce production costs, SAFETI, along with BSFF and other organizations involved in shrimp market development, should continue dialogue with government (MoFL, DoF, NBR, and MoC) to (i) reduce import tax on feed and feed ingredients, machinery and other inputs used in shrimp and prawn hatcheries and farms; and (ii) synchronize shrimp/prawn farm electricity prices with prices in other agricultural sectors.
- xi. The project should continue to facilitate and encourage establishment of local supplies of high-quality shrimp feed to reduce the cost and dependency on imported feed.
- xii. The SPF bagda nursery, promoted by SAFETI, will act as intermediary between hatcher and farmer, and ensure supply of genuine SPF 'bagda' seed to farmers. However, biosecurity in the nurseries should be improved, maintained and promoted as an essential independent entity. Nursery duration should be 30-40 days for both shrimp and prawn. Farmers themselves should adopt nursery practices, if facilities are available to them.

- xiii. SAFETI would attract more indirect farmers by arranging more field days, vitalizing hatchery service for supplying SPF and PCR-tested PLs (validated through KII), and building the capacity of DoF extension staff.
- xiv. The project could establish a learning laboratory for case-based scientific investigation of both successes and failures, with all the demo farms serving as a learning unit.
- xv. SAFETI should organize groups of farmers to consolidate and sell their product directly to the buyers, through which the role of intermediaries will decline and farmers will obtain more benefit by saving time and transport costs.
- xvi. Among the indicators of new technology adoption, postharvest operations remained poorly adopted by the farmers; SAFETI should emphasize disseminating this technology in the rest half of the project.
- xvii. SAFETI should encourage its partners to develop a dedicated loaning program and increased areas of operations to allow more farmers to access loans.
- xviii. SAFETI can encourage the Government to ensure 'Process Controls' and verification in hatcheries for seed quality assurance up to the point of stocking in the producer's farms.
- xix. Farmer training through the use of audio-visual aids could be more effective, given the farmers' habitual weakness in reading.
- xx. Given the high turnover of field-based staff, SAFETI should encourage its partners, TMSS and CODEC to improve their strategies for retaining field staff.
- xxi. According to SAFETI plan, direct farmers are not required to maintain a record book – primarily because SAFETI does not have a sufficient number of field staff to help 25,000 farmers do this. But, SAFETI certainly can look at ways of expanding or encouraging direct farmers to use the book. For example, SAFETI can ask the demo farmers to promote this use and use them as trains for their group of direct farmers. If done, these data can easily be entered to the project monitoring system.
- xxii. SAFETI should encourage project partners to engage fisheries-educated individuals as Aquaculture Field Facilitators (AFFs).
- xxiii. The SAFETI project might initiate dialogue with local government (LGD) on creating and/or developing local water supplies and drainage facilities.
- xxiv. SAFETI project partners should involve LEAFs located near project areas. The LEAFs may be trained on SAFETI technologies to support local farmers in concert with the AFFs.

5 References

- Aakkula J, Artell J and Heini T. 2013. Strengths and weaknesses of Counterfactual Evaluation. MTT Agrifood Research Finland. INEA, ROME: ENVIEVAL Grant Agreement Number 312071.
- Ahmed N, Demaine H and Muir JF. 2008. Freshwater prawn farming in Bangladesh: history, present status and future prospects. *Aquacult. Res.* 39, 806–819.
- Alauddin M and Hamid MA. 2014. Shrimp Culture in Bangladesh with Emphasis on Social and Economic Aspects. <https://www.researchgate.net/publication/43483037>.
- Ayaz M, Sumara K, Vadher KH and Ishakani AH. 2015. Effect of higher salinities on growth and survival of pacific white shrimp, *Litopenaeus vannamei* (Boone, 1931). *Journal of Applied and Natural Science*, 7: 885 – 888.
- Belton B, Karim M, Thilsted S, Murshed-E-Jahan K, Collis W and Phillips M. 2011. Review of aquaculture and fish consumption in Bangladesh. *Studies and Reviews 2011-53*. The WorldFish Center. November 2011.
- BBS 2010. Census of Agriculture 2008 Structure of Agricultural Holdings and Livestock Population Volume-1. Bangladesh Bureau of Statistics Division, Ministry of Planning Government of The People’s Republic of Bangladesh Dhaka, Bangladesh.
- BBS 2018. Bangladesh Statistics 2018. Bangladesh Bureau of Statistics Division, Ministry of Planning Government of The People’s Republic of Bangladesh Dhaka, Bangladesh.
- BBS 2019. Report on Agriculture and Rural Statistics 2018. Statistics and Informatics Division, Bangladesh Bureau of Statistics, Ministry of Planning, Government of Peoples Republic of Bangladesh.
- BOBP 1992. Feeds for artisanal shrimp culture in India Their development and evaluation. Studies conducted in collaboration with Central Institute of Brackishwater Aquaculture, Madras, and Directorate of Fisheries, Andhra Pradesh. Bay of Bengal Programme (BOBP). Madras, India.
- Broju GP and Vogl CR. 2011. Impacts of Shrimp farming in Bangladesh: Challenges and Alternatives. *Ocean and coastal Management*, 54: 201-211.
- Chowdhury MA and Khairunb Y. 2014. Farmers ‘Local knowledge in Extensive Shrimp Farming Systems in Coastal Bangladesh. *APCBEE Procedia*, 8:125-130.
- CIBA 2011. Better Management Practices (BMPs) and Group Management for Empowering Small Scale Farmers: Scaling Up Strategies. National Workshop Report - EU-FP7 Project “ASEM Aquaculture Platform” ICAR/MPEDA/MOA/EU-ASEM/NACA. Network of Aquaculture Centers in Asia-Pacific. Central Institute for Brackish water Aquaculture (CIBA), Chennai, India.
- DoF 2016. National fish week, compendium (In Bengali). Dhaka: Department of Fisheries, Ministry of Fisheries and Livestock, Government of Bangladesh.
- DoF 2018a. Year Book of Fisheries Statistics of Bangladesh 2017-18. www.fisheries.gov.bd.
- DoF 2018b. Annual Report 2017. Department of Fisheries, Ministry of Livestock and Fisheries, Bangladesh. www.fisheries.gov.bd .
- MoC 2018. Export Policy, 2018. Ministry of Commerce. <https://mincom.gov.bd/>
- MoFL 2011. Fish Feed Rules, 2011. Ministry of Livestock and Fisheries, Bangladesh. <https://mofl.gov.bd/>
- MoFL 2017. Fish and Fish product (inspection and quality control) Ordinance, 1983. Ministry of Fisheries and Livestock. <https://mofl.gov.bd/>
- MoFL 2011. Fish hatchery Rules, 2010. Ministry of Fisheries and Livestock. Ministry of Fisheries and Livestock.
- MoFL. 1950. Fish Protection and Conservation Act, 1950 and rules 1985. Ministry of Fisheries and Livestock. Ministry of Fisheries and Livestock. <https://mofl.gov.bd/>

- MoFL.2018.Fisheries Quarantine Act, 2018. Ministry of Fisheries and Livestock. Ministry of Fisheries and Livestock. <https://mofl.gov.bd/>
- MoFL.2014. National Shrimp Fish Policy, 2014. Ministry of Livestock and Fisheries, Bangladesh. <https://mofl.gov.bd/>
- European Commission. 2013. Design and Commissioning of Counterfactual Impact Evaluations - A Practical Guidance for ESF Managing Authorities. Directorate General for Employment, Social Affairs and Inclusion Unit A3. European Commission. <http://europa.eu>.
- Khan Firoz AKM, Mustafa MG and Naser MN. 2016. Effective Supervision Inland captures fisheries of Bangladesh and its hurdles in managing the resources. *Bandung Journal the Global South*, 3:17.
- Kumar B, Sharma R, Lakra WS, Sharma A, Prakesh S and Sharma MM. 2016. Economic Assessment of Shrimp Farming (*Litopenaeus vannamei*) in Gujarat - A Profitable Venture. *International Journal of Innovative Research in Science, Engineering and Technology*, 5:15334-15342.
- Nesar A and Diana JS.2015. Coastal to inland: Expansion of Prawn farming for adaptation to climate change in Bangladesh. *Aquaculture reports*, 2: 67-76.
- Nesar A, Troell M, Allison EH and Muir JF.2010. Prawn post larvae fishing in coastal Bangladesh: challenges for sustainable livelihoods. *Marine Policy*, 34:218-227.
- Paul AK and Roskaft E. 2013. Environmental degradation and loss of traditional agriculture as two causes of conflicts in shrimp farming in the southeastern coastal Bangladesh: present status and probable solutions.
- SAFETI Document 01: Planning documents for reaching indirect farmers, Supplied by SAFETI project.
- SAFETI Document 02: Power Point Presentation 1 for MTE team, Supplied by SAFETI project.
- SAFETI Document 03: Power Point Presentation 2 for MTE team, Supplied by SAFETI project
- SAFETI Document 04: Power Point Presentation for CBSG enumerators, Supplied by SAFETI project.
- SAFETI Document 05: Project Mid-Term Evaluation-SOW, Supplied by SAFETI project.
- SAFETI Document 06: Project Performance Indicators with Annual Targets, Supplied by SAFETI project.
- SAFETI Document 07: SAFETI Project Evaluation Plan, Supplied by SAFETI Project.
- SAFETI Document 08: 5th Semi-Annual Performance Report (October 1 – March 31, 2019), Supplied by SAFETI Project.
- Shamsuzzaman MM, Islam MM, Tania NJ, Al-Mamun MA, Barman P and Xu X. 2017. Fisheries resources of Bangladesh: present and future direction. *Aquaculture and Fisheries*, 2: 145-156.
- Srinivas D, Venkatrayulu C and Swapna B. 2016. Sustainability of exotic shrimp *Litopenaeus vannamei* (Boone, 1931) farming in coastal Andhra Pradesh, India: Problems and Issues. *European Journal of Experimental Biology*, 6:80-85. www.pelagiaresearchlibrary.com.
- The Daily Star. 2014. New shrimp farming system to boost yields. <https://www.thedailystar.net/new-shrimp-farming-system-to-boost-yield>.
- The WorldFish Centre.2013. Greater Final Program Performance Report on Harvest and Economic Returns from Shrimp (GHERS). worldfishcenter@cgiar.org
- The WorldFish Center.2011. Review of aquaculture and fish consumption in Bangladesh. worldfishcenter@cgiar.org
- USDA. 2018. USDA Strategic goals and their objectives. <https://www.usda.gov/our-agency/about-usda>.

Annexure

Annex-1: List of persons met and/or consulted during mid-term evaluation of the SAFETI project

[list can be made available to USDA upon request to Winrock International]

Annex-2: Distribution of sampling units, used for field data collection for mid-term evaluation of SAFETI, across unions and upazilas in the SAFETI operated areas.

District	Upazila	Union	Environment	Culture system	Demo farmer	Project farmer	Control farmer
Khulna	Dumuria	Rudaghara	Fresh water - Low saline	BB	1	0	
Khulna	Dumuria	Sobhana	Saline	BB	1	17	
Khulna	Paikgachha	Chandkhali & Laskar	Saline	BB	1	17	
Satkhira	Assasuni	Budhhata	Fresh water - Low saline	BB	1	23	
Satkhira	Assasuni	Budhhata	Brackish water - Medium saline	BB	1	23	
Satkhira	Debhata	Noapara	Fresh water - Low saline	BB	0	1	
Satkhira	Debhata	Noapara	Brackish water - Medium saline	BB	2	40	
Satkhira	Kaliganj	Nalta	Brackish water - Medium saline	BB	1	22	
Satkhira	Shyamnagar	Shyamnagar	Saline	BB	1	21	
Bagerhat	Mongla	Chandpai & Mithakhali	Dry medium saline, wet rainwater low saline	BB			41
Satkhira	Satkhira Sadar	Dhulihor	Brackish water - Medium saline	BB			33
Bagerhat	Bagerhat Sadar	Shat Gambuj	Brackish water - Medium saline	BG	2	42	
Bagerhat	Rampal	Ujalkur	Fresh water - Low saline	BG	0	2	
Bagerhat	Rampal	Rampal	Saline	BG	1	22	
Khulna	Dumuria	Rudaghara	Brackish water - Medium saline	BG	1	22	
Khulna	Dumuria	Sobhana	Saline	BG	0	5	
Khulna	Paikgachha	Chandkhali & Laskar	Saline	BG	1	27	
Satkhira	Assasuni	Budhhata	Brackish water - Medium saline	BG	1	21	

District	Upazila	Union	Environment	Culture system	Demo farmer	Project farmer	Control farmer
Satkhira	Debhata	Noapara	Brackish water - Medium saline	BG	0	4	
Satkhira	Debhata	Noapara	Fresh water - Low saline	BG	0	1	
Satkhira	Kaliganj	Nalta	Brackish water - Medium saline	BG	1	21	
Satkhira	Kaliganj	Nalta	Fresh water - Low saline	BG	0	23	
Bagerhat	Mollarhat	Udaypur	Very low saline	BG			2
Bagerhat	Mongla	Chandpai &Mithakhali	Dry medium saline, wet rainwater low saline	BG			17
Khulna	Batiaghata	Jalma	Dry medium to low saline, wet rainwater low saline	BG			22
Satkhira	Satkhira Sadar	Dhulihor	Dry medium to low saline, wet rainwater low saline	BG			24
Bagerhat	Bagerhat Sadar	Kara Para	Fresh water - Low saline	GP	1	24	
Bagerhat	Chitalmari	Chitalmari	Fresh water - Low saline	GP	1	20	
Bagerhat	Rampal	Ujalkur	Fresh water - Low saline	GP	1	19	
Jashore	Abhaynagar	Sundoli	Fresh water - Low saline	GP	2	46	
Khulna	Dumuria	Rudaghara	Fresh water - Low saline	GP	0	22	
Satkhira	Assasuni	Baradal	Fresh water - Low saline	GP	1	21	
Satkhira	Debhata	Noapara	Fresh water - Low saline	GP	1	19	
Bagerhat	Mollarhat	Chunkhola &Udaypur	Very low saline	GP			64
Total					23	525	203

Annex-3: Status on the progress of program indicators of the SAFETI project as evaluation by the mid-term evaluation team.

#	Result Reference	Performance Indicator	Mid-term project target	MTE measured achieved target	Progress (%)	MTE measurement source (s)
1	FFPr 1.2	Number of individuals who have applied new techniques or technologies as a result of USDA assistance	10,128	11,163	10.22	Sample field survey
		<i>Number of individuals who have applied new techniques or technologies as a result of USDA assistance (Male)</i>	9,617	10,307	7.17	Sample field survey
		<i>Number of individuals who have applied new techniques or technologies as a result of USDA assistance (Female)</i>	507	856	68.88	Sample field survey
		<i>Number of individuals who have applied new techniques or technologies as a result of USDA assistance (Shrimp/Prawn genetics)</i>	1,300	4,879	275.32	Sample field survey
		<i>Number of individuals who have applied new techniques or technologies as a result of USDA assistance (Biosecurity management)</i>	8,096	9,185	13.46	Sample field survey
		<i>Number of individuals who have applied new techniques or technologies as a result of USDA assistance (Disease management)</i>	8,096	8,132	0.44	Sample field survey
		<i>Number of individuals who have applied new techniques or technologies as a result of USDA assistance (Other)</i>	2,032	1,978	-2.68	Sample field survey
2	FFPr 1.2.3	Number of individuals receiving financial services as a result of USDA assistance	3,750	1,421	-62.11	SAFETI MEL & KII (TMSS and CODEC)
3	FFPr 1.2.3	Number of loans disbursed as a result of USDA assistance	3,750	1,421	-62.11	SAFETI MEL & KII (TMSS and CODEC)
4	FFPr 1.2.3	Value of loans provided as a result of USDA assistance	\$656,250	\$551,325	-15.99	SAFETI MEL
5	FFPr 1.4.4 & 2.4.4	Number of private enterprises, producer organisations, water users, women's groups, trade & business associations, & community-	1023	951	-7.04	SAFETI MEL

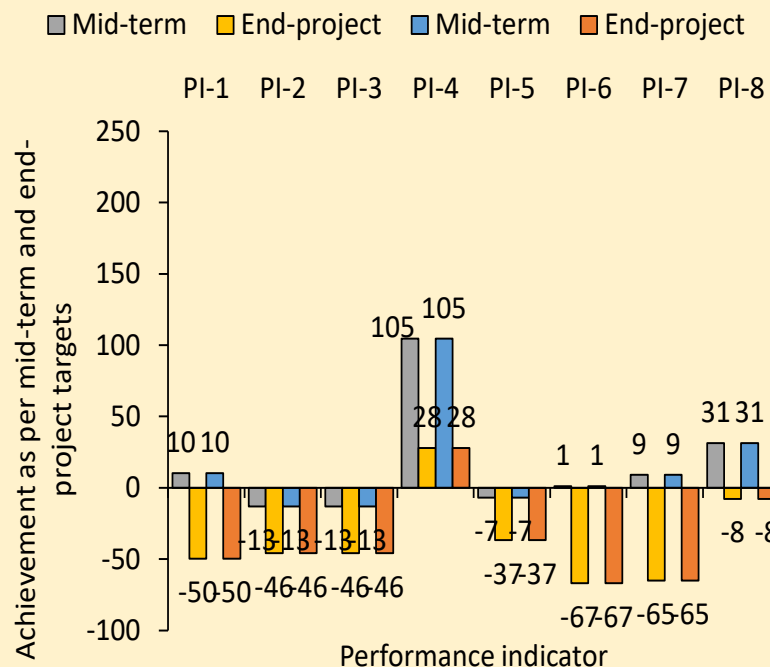
#	Result Reference	Performance Indicator	Mid-term project target	MTE measured achieved target	Progress (%)	MTE measurement source (s)
		based organizations (CBOs) that applied improved techniques and technologies as a result of USDA assistance				
		<i>Number of private enterprises, producer organizations, water users, women's groups, trade & business associations, & community-based organizations (CBOs) that applied improved techniques and technologies as a result of USDA assistance (Private Enterprises)</i>	300	228	-24.00	SAFETI MEL
		<i>Number of private enterprises, producer organizations, water users, women's groups, trade & business associations, & community-based organizations (CBOs) that applied improved techniques and technologies as a result of USDA assistance (Producer Organizations)</i>	720	718	-0.28	KII (TMSS and CODEC)
		<i>Number of private enterprises, producer organizations, water users, women's groups, trade & business associations, & community-based organizations (CBOs) that applied improved techniques and technologies as a result of USDA assistance (Trade and Business Associations)</i>	3	5	66.67	SAFETI MEL
6	SO2	Value of sales by project beneficiaries [yearly value]	\$28,556,599	\$28,756,403	0.70	Sample field survey & SAFETI farmers' registration data
		<i>Value of sales by project beneficiaries (Shrimp/Bagda)</i>	\$19,037,733	\$14,178,727	-25.52	Sample field survey & SAFETI farmers' registration data
		<i>Value of sales by project beneficiaries (Prawn/Golda)</i>	\$9,518,866	\$14,577,676	53.15	Sample field survey & SAFETI farmers' registration data

#	Result Reference	Performance Indicator	Mid-term project target	MTE measured achieved target	Progress (%)	MTE measurement source (s)
7	SO1	Volume of commodities (metric tons) sold by project beneficiaries (MT)	3,173	3445	8.59	Sample field survey & SAFETI farmers' registration data
		<i>Volume of commodities (metric tons) sold by project beneficiaries (Shrimp/Bagda) (MT)</i>	1,903	1,754	-7.81	Sample field survey & SAFETI farmers' registration data
		<i>Volume of commodities (metric tons) sold by project beneficiaries (Prawn/ Golda) (MT)</i>	1,270	1,691	33.16	Sample field survey & SAFETI farmers' registration data
8	SO1	Number of individuals who have received short-term agricultural sector productivity or food security training as a result of USDA assistance	18,470	24247	31.28	SAFETI farmers' registration data
		<i>Number of individuals who have received short-term agricultural sector productivity or food security training as a result of USDA assistance (Male)</i>	17,547	22416	27.75	SAFETI farmers' registration data
		<i>Number of individuals who have received short-term agricultural sector productivity or food security training as a result of USDA assistance (Female)</i>	923	1831	98.41	SAFETI farmers' registration data
		<i>Number of individuals who have received short-term agricultural sector productivity or food security training as a result of USDA assistance (Producers- Farmers)</i>	18,000	23876	32.64	SAFETI farmers' registration data & SAFETI MEL
		<i>Number of individuals who have received short-term agricultural sector productivity or food security training as a result of USDA assistance (Shrimp/Bagda Producers- Farmers)</i>	10,800	10727	-0.68	SAFETI farmers' registration data & SAFETI MEL
		<i>Number of individuals who have received short-term agricultural sector productivity or food</i>	7,200	13149	82.63	SAFETI farmers' registration data & SAFETI MEL

#	Result Reference	Performance Indicator	Mid-term project target	MTE measured achieved target	Progress (%)	MTE measurement source (s)
		<i>security training as a result of USDA assistance (Prawn/ Golda Producers- Farmers)</i>				
		<i>agricultural sector productivity or food security training as a result of USDA assistance (People in Firms - Processors, Service Providers, Input Dealers)</i>	300	233	-22.33	SAFETI farmers' registration data & SAFETI MEL
		<i>Number of individuals who have received short-term agricultural sector productivity or food security training as a result of USDA assistance (People in Government- extension workers, policymakers)</i>	60	38	-36.67	SAFETI farmers' registration data & SAFETI MEL
		<i>Number of individuals who have received short-term agricultural sector productivity or food security training as a result of USDA assistance (People in Civil Society - NGOs staff, Academic Institutions)</i>	110	100	-9.09	SAFETI farmers' registration data & SAFETI MEL
9	SO1 + SO2	Number of individuals benefiting directly as a result of USDA assistance	18,470	17950	-2.82	KII (TMSS and CODEC)
		<i>Number of individuals benefiting directly as a result of USDA assistance (Male)</i>	17,547	16573	-5.55	KII (TMSS and CODEC)
		<i>Number of individuals benefiting directly as a result of USDA assistance (Female)</i>	923	1377	49.16	KII (TMSS and CODEC)
10	SO1 + SO2	Number of individuals benefiting indirectly as a result of USDA assistance	75,000	100,809	34.41	SAFETI MEL & KII with DoF and Hatchery Owner (MK & Desh Bangla)
11	FFPr 1.4.2 & 2.4.2	Number of policies, regulations and/or administrative procedures in each of the following stages of development as a result of USDA assistance	1	1	0.00	

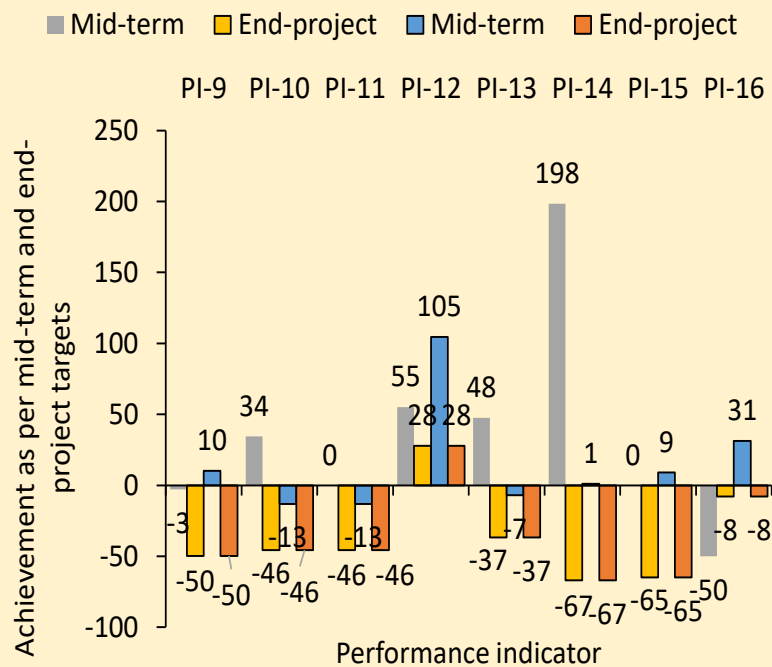
#	Result Reference	Performance Indicator	Mid-term project target	MTE measured achieved target	Progress (%)	MTE measurement source (s)
		<i>Stage 1: Underwent the first stage of the policy reform process i.e. analysis (review of existing policy/ regulation/ administrative procedure and/or proposal of new policy/regulation/administrative procedure.)</i>	0	1	0.00	
12	SO1	Average production of targeted commodities in kg per hectare in the targeted areas	450	696	54.73	Field survey data
		<i>Average production of targeted commodities in kg per hectare in the targeted areas (Shrimp/Bagda)</i>	450	664	47.60	Field survey data
		<i>Average production of targeted commodities in kg per hectare in the targeted areas (Prawn/ Golda)</i>	450	724	60.95	Field survey data
13	SO2	Number of Specific Pathogen Free (SPF) and PCR screened Shrimp/PLs sold by hatcheries (Million)	500	738	47.60	SAFETI MEL
		<i>Number of Specific Pathogen Free (SPF) Shrimp/PLs sold by hatcheries (Million)</i>	400	703	75.75	SAFETI MEL
		<i>Number of PCR screened Shrimp/PLs sold by hatcheries (Million)</i>	100	35	-65.00	SAFETI MEL
14	SO2	Number of input suppliers/dealers that sell or supply improved inputs/services because of USDA assistance.	60	179	198.33	SAFETI MEL
		<i>Aqua Input suppliers (Feed, fertilizer and other inputs suppliers)</i>	50	179	258.00	SAFETI MEL
		<i>Shrimp PL nurseries</i>	10	2	-80.00	SAFETI MEL
15	SO2	Number of events to improve linkage between Buyers and Sellers	4	4	0.00	SAFETI MEL
16	SO2	Number of capacity building events for trade associations	4	2	-50.00	SAFETI MEL

Annex-4: Mid-term and end-project targets achieved by the SAFETI project as evaluated in the mid-term evaluation



- PI-1: Number of individuals who have applied new techniques or technologies
- PI-2: Number of individuals receiving financial services
- PI-3: Number of loans disbursed
- PI-4: Value of loans provided
- PI-5: Number of private enterprises, producer organizations, water users, women’s groups, trade & business associations, & community-based organizations (CBOs) that applied improved techniques and technologies
- PI-6: Value of sales by project beneficiaries [yearly value]
- PI-7: Volume of commodities (metric tons) sold by project beneficiaries (MT)
- PI-8: Number of individuals who have received short-term agricultural sector productivity or food security training
- PI-9: Number of individuals benefiting directly
- PI-10: Number of individuals benefiting indirectly
- PI-11: Number of policies, regulations and/or administrative procedures in each of the following stages of development
- PI-12: Average production of targeted commodities in kg per hectare in the targeted areas
- PI-13: Number of Specific Pathogen Free (SPF) and PCR screened Shrimp/PLs sold by hatcheries (Million)
- PI-14: Number of input suppliers/dealers that sell or supply improved inputs/services
- PI-15: Number of events to improve linkage between Buyers and Sellers
- PI-16: Number of capacity building events for trade associations

Figure A-4.1: Mid-term and end-project targets achieved by the SAFETI program indicators – indicators 1-8.



- PI-1: Number of individuals who have applied new techniques or technologies
- PI-2: Number of individuals receiving financial services
- PI-3: Number of loans disbursed
- PI-4: Value of loans provided
- PI-5: Number of private enterprises, producer organizations, water users, women's groups, trade & business associations, & community-based organizations (CBOs) that applied improved techniques and technologies
- PI-6: Value of sales by project beneficiaries [yearly value]
- PI-7: Volume of commodities (metric tons) sold by project beneficiaries (MT)
- PI-8: Number of individuals who have received short-term agricultural sector productivity or food security training
- PI-9: Number of individuals benefiting directly
- PI-10: Number of individuals benefiting indirectly
- PI-11: Number of policies, regulations and/or administrative procedures in each of the following stages of development
- PI-12: Average production of targeted commodities in kg per hectare in the targeted areas
- PI-13: Number of Specific Pathogen Free(SPF) and PCR screened Shrimp/PLs sold by hatcheries (Million)
- PI-14: Number of input suppliers/dealers that sell or supply improved inputs/services
- PI-15: Number of events to improve linkage between Buyers and Sellers
- PI-16: Number of capacity building events for trade associations

Figure A-4.2: Mid-term and end-project targets achieved by the SAFETI program indicators – indicators 9-16.

Annex-5: Targeted policies and stages of development of SAFETI project's program indicator 11

Sl. No.	Policy works	Status	Follow-Up
01	Development of SPF Black Tiger Shrimp's hatchery protocol.	The assessment and recommended processes constitute guidelines and administrative processes that qualify this as a policy instrument. We have a letter from BSFF dated 13 July 2018 that formally submits these recommended protocols to DoF. Therefore, it has reached Stage 3 of the FFPr Policy Indicator <u>Year/Stage achieved</u> Baseline=2; Y1=0; Y2=0; Y3=3; Y4=4; Y5=0	DOF has initiated the Government approval process. SAFETI will monitor ongoing progress.
02	Amendment of access to institutional finance for shrimp and fish farmers through amendment of Bangladesh Bank Agricultural & Rural Credit Policy and Program 2018-19.	Amendment done by the Bangladesh Bank as documented on 25 July 2018. Therefore, it has reached Stage 4 of the FFPr Policy indicator. Therefore, it has reached Stage 4 of the FFPr Policy Indicator <u>Year/Stage achieved</u> Baseline=2; Y1=0; Y2=0; Y3=3&4; Y4=0; Y5=0	Need to arrange dissemination and awareness programs in the project region. Need further improvement in Business plan for the access to finance from Bank.
03	Study of the present status of SPF Black Tiger Shrimp's hatcheries in Bangladesh.	The assessment and recommended processes constitute guidelines and administrative processes that qualify this as a policy instrument. We have a letter from BSFF dated 4 February 2019 that formally submits the report to DoF. Therefore, it has reached Stage 3 of the FFPr Policy Indicator <u>Year/Stage achieved</u> Baseline=2; Y1=0; Y2=0; Y3=3; Y4=4; Y5=0;	Finalization activities are in progress and will continue in Year-4 for submission to Govt. for amendment.
04	Develop methodologies for data collection and dissemination of the official data to facilitate the availability of key market information to producers and exporters.	The assessment and recommended processes constitute guidelines and administrative processes that qualify this as a policy instrument. A SAFETI-hired consultant presented his findings and recommendations on this subject to DoF at a workshop on April 11, 2019. We have a letter from BSFF dated 10 June 2019 that formally submits the recommended methodologies and procedures to DoF. Therefore, it has reached Stage 3 of the FFPr Policy Indicator. <u>Year/Stage achieved</u> Baseline=2; Y1=0; Y2=0; Y3=3; Y4=4; Y5=5	Based on the recommendations from the study, follow-up with DoF on further formulation of this as a policy instrument is needed.

Sl. No.	Policy works	Status	Follow-Up
05	Improvement of “Fish Hatchery Acts 2010 and Rules 2011”	<p>The recommended improvements have been reviewed and discussed with DoF. This has reached Stage 2.</p> <p><u>Year/Stage achieved</u> Baseline=2; Y1=0; Y2=0; Y3=0; Y4=3&4; Y5=5</p>	Finalization activities are in progress and will continue in Year-4 for submission to Govt. for amendment.

Annex-6: Details Methodology adopted in the mid-term evaluation of the SAFETI project.

Evaluation Approach and Methodology

The SAFETI Mid-term evaluation followed inclusive, participatory and transparent exercises to gain insights and alternative perspectives. As much as possible, existing program data sources and analysis was used from available documentations, surveys and MEL systems. Data audit and quality checks were done. Additional data were collected following quantitative and qualitative methods. The following methodologies were adopted in the evaluation processes:

- i. **Document Review:** This included project reports, communication and training material, monitoring data on quality and outputs of activities, and other study data (as available). In addition, research and other documentation of similar projects were reviewed as necessary.
- ii. **Quantitative Sample Survey:** The evaluation undertook a sample survey to ascertain program effectiveness on the key participants i.e. farmers. Primary data were collected from them based on SAFETI program result framework as well as Food for Peace program indicators. The survey was implemented on both the treatment group (project direct beneficiaries) and control group (non-beneficiaries).
- iii. **Qualitative Data Collection:** We adopted various qualitative methods to collect qualitative information from a wide range of project participants and stakeholders. Specifically, Focus Group Discussion, In-Depth Interview and Direct Observation methods will be adopted for the qualitative information.
- iv. **Consultative and Dissemination Workshop:** MTE arranged a consultation cum dissemination workshop with the participation of project management and important stakeholders to generate recommendations. Data triangulation was an important element of the workshop.

Detail Plan on Evaluation and Impact Study

The evaluation planned and implemented in systematic and inclusive manner following fixed approach that include both quantitative and qualitative research methodologies, as detailed below.

Inception and Preparation

CBSG consultants familiarized themselves with the project concept, stakeholders, activities, result frameworks and monitoring and control processes. Main objective was to prepare evaluation design including detail methodologies, tools, implementation approach and action plans. Inception and preparation processes included the following sub-activities.

Consultation and document review

The evaluation work kicked off through an introductory meeting with the concerned SAFETI project team. In addition, we reviewed key project documents and other relevant research and project documents. These activities provided the following results:

- i. Finalization of evaluation methodologies for both quantitative and qualitative approaches;
- ii. Sampling design including the process of respondent identification and selections per research approaches;
- iii. Finalization of the extent of quantitative sample survey as well as applicable quantitative research approach for the Impact Study;
- iv. Coordination mechanism and progress reporting;
- v. Implementation process and steps of data collection.

Reconnaissance Mission

MTE undertook a reconnaissance visit at the project sites and met few farmers, visited demonstration farms and consulted project stakeholders to have a first-hand understanding on the evaluation context and research participants. That helped the team to fine tune evaluation planning, prepare risk management, establish logistical arrangements in place, prepare contingency planning and establish a coordination mechanism with local partners.

Designing Impact Study Framework – Counterfactual sample survey

In consultation with the SAFETI project team, MTE designed the counterfactual sample survey including sample selection both for the treatment group as well as the control group. The counterfactual is what would have happened – what the outcome would have been for a program participant in the absence of the program. At a given moment in time, a unit (here beneficiary farmers) either participated in the program or did not participate. The unit cannot be observed simultaneously in two different states (control and treatment). This is called the counterfactual problem - since we cannot directly observe the counterfactual, we must estimate it. Solving the counterfactual problem largely depend on finding a “perfect clone” for the treatment. Specifically, the treatment and control groups must be the same in at least three ways.

- Firstly, the average characteristics of treatment group and control group must be identical in the absence of the program. Although, it is not necessary that individual units in the treatment group have “perfect clone” in the control group, on average the characteristics of the treatment and control group should be the same. For instance, the average pond size of the farmers should remain same in treatment and control group.
- Secondly, the treatment should not affect the comparison group either directly or indirectly. For instance, farmers of treatment group should not transfer resources that they get as part of program intervention.
- Thirdly, outcomes of units in the treatment should change the same way as outcomes in the control groups, if both groups were given the program intervention.
- When these three conditions are met, the evidence/existence of program intervention will explain any differences in the outcome between the two groups.

MTE worked with SAFETI on identifying best matching variable that explains better homogeneity between treatment and control groups.

We gave maximum attention to make sure that key background features of the treatment group and the control group respondents remained similar and comparable i.e. socio economic condition, aquatic asset, occupational and geographical context, and so on. In addition, we finalized sample size for the treatment group and the control group (*we proposed 700 HHs – 500 treatment group and 200 for control group*) and detail processes to select and identify the ultimate sample unit.

Empirical Data Collection for Impact Study

In accordance with the evaluation SOW, we conducted the sample survey with the program beneficiaries and the control group to collect additional data on key project outcome indicators. In addition, applicable standard Food for Peace program indicators value were collected through the survey. Details of the sample survey are provided below.

Sample Survey Design

The sample survey was designed to gauge the impact of SAFETI project on the direct beneficiaries mainly farmers following a counterfactual sample design i.e. sample survey on the treatment group as well as a

control group in the same project area to make comparisons between what happened as a result of the project interventions, and what would have happened in their absence. The comparisons were to offer a measurement of the project's contribution to improvement of technical and economic knowledge, production, income and other relevant factors and linkage/access of the direct farmers (may be indirect/neighbor) as a result of SAFETI's activities, and adoption rate.

The following five standard tool box are commonly used in estimating impact:

- i. Random Assignment
- ii. Random Promotion
- iii. Discontinuity Design
- iv. Difference in Differences (Diff-in-diff)
- v. Matching (Propensity score matching)

The program intervention type as well as condition of prime target beneficiary (the farmers) showed that we could either use Random Assignment (after one/two stage stratification) or Matching (propensity score matching - PSM). Application of PSM method has specific data requirements (need to run logistic regression). Therefore, CBSG consulted with SAFETI regarding selection of method.

Approach for setting baseline data for control group

We collected midline data for the control group and estimated Propensity Score of each unit (i.e. farmer), and we estimated Propensity Score for baseline units under treatment, contingent upon receiving the raw dataset could allow the requirement to run the regression. Without the raw dataset, we could follow random assignment process.

Approach for handling baseline data

To bring adjustment in baseline data, we used Trimean as per the status of dataset SAFERI had for baseline. Statistically Trimean is more appealing.

Sample Size Estimation

Our understanding about prime intervention units (farmers) dictated to use two stage group sampling. Other intervention groups (hatcheries, feed mills) were evaluated qualitatively through KILs.

Sample size of farmers for treatment area

We assumed

Level of significance, $\alpha = .05$

Power of the test, $(1-\beta) = 90\%$

Known population proportion (number of sample farmers), $p = 0.7$

Effect size variability, $\delta = 0.05$

So, the number of sample size would be= 361

To bring rigor in estimation we will factor a design effect of 1.40 say 500

Sample size for control area

We didn't have baseline data for control area, therefore as starting point we simply considered 40% of the sample size we estimate for treatment which was 200, agreed by SAFETI management

Both "treatment" and "control" group was categorized in 'Bagda' monoculture, 'Bagda'-'Golda' rotation and 'Golda'-Carp polyculture production systems by the ratio of 5:6:8, respectively. During the inception

and preparatory phase, the exact survey extent (both for the treatment and the control group) was finalized. The final sample size undertaken is shown below.

District	Upazila	Union	Environment	Culture system	Demo farmer	Project farmer	Control farmer
Khulna	Dumuria	Rudaghara	Fresh water - Low saline	BB	1	0	
Khulna	Dumuria	Sobhana	Saline	BB	1	17	
Khulna	Paikgachha	Chandkhali & Laskar	Saline	BB	1	17	
Satkhira	Assasuni	Budhhata	Fresh water - Low saline	BB	1	23	
Satkhira	Assasuni	Budhhata	Brackish water - Medium saline	BB	1	23	
Satkhira	Debhata	Noapara	Fresh water - Low saline	BB	0	1	
Satkhira	Debhata	Noapara	Brackish water - Medium saline	BB	2	40	
Satkhira	Kaliganj	Nalta	Brackish water - Medium saline	BB	1	22	
Satkhira	Shyamnagar	Shyamnagar	Saline	BB	1	21	
Bagerhat	Mongla	Chandpai & Mithakhali	Dry medium saline, wet rainwater low saline	BB			41
Satkhira	Satkhira Sadar	Dhulihor	Brackish water - Medium saline	BB			33
Bagerhat	Bagerhat Sadar	Shat Gambuj	Brackish water - Medium saline	BG	2	42	
Bagerhat	Rampal	Ujalkur	Fresh water - Low saline	BG	0	2	
Bagerhat	Rampal	Rampal	Saline	BG	1	22	
Khulna	Dumuria	Rudaghara	Brackish water - Medium saline	BG	1	22	
Khulna	Dumuria	Sobhana	Saline	BG	0	5	
Khulna	Paikgachha	Chandkhali & Laskar	Saline	BG	1	27	
Satkhira	Assasuni	Budhhata	Brackish water - Medium saline	BG	1	21	
Satkhira	Debhata	Noapara	Brackish water - Medium saline	BG	0	4	
Satkhira	Debhata	Noapara	Fresh water - Low saline	BG	0	1	
Satkhira	Kaliganj	Nalta	Brackish water - Medium saline	BG	1	21	
Satkhira	Kaliganj	Nalta	Fresh water - Low saline	BG	0	23	
Bagerhat	Mollarhat	Udaypur	Very low saline	BG			2
Bagerhat	Mongla	Chandpai & Mithakhali	Dry medium saline, wet rainwater low saline	BG			17
Khulna	Batiaghata	Jalma	Dry medium to low saline, wet rainwater low saline	BG			22
Satkhira	Satkhira Sadar	Dhulihor	Dry medium to low saline, wet rainwater low saline	BG			24
Bagerhat	Bagerhat Sadar	Kara Para	Fresh water - Low saline	GP	1	24	
Bagerhat	Chitalmari	Chitalmari	Fresh water - Low saline	GP	1	20	
Bagerhat	Rampal	Ujalkur	Fresh water - Low saline	GP	1	19	
Jashore	Abhaynagar	Sundoli	Fresh water - Low saline	GP	2	46	
Khulna	Dumuria	Rudaghara	Fresh water - Low saline	GP	0	22	
Satkhira	Assasuni	Baradal	Fresh water - Low saline	GP	1	21	
Satkhira	Debhata	Noapara	Fresh water - Low saline	GP	1	19	
Bagerhat	Mollarhat	Chunkhola & Udaypur	Very low saline	GP			64
Total					23	525	203

Sample Survey Questionnaire

The sample survey questionnaire was prepared based on SAFETI project result framework and outcome indicators as well as applicable Food for Peace indicators.

We reviewed baseline survey tools and included key variables that were useful to measure impact. However, after the review of project documents we will come-up with specific variables for data collection.

Experiences from the reconnaissance mission brought valuable inputs for the sample survey questionnaire. We pre-tested the questionnaire with the potential survey participants at the project site where at least 20 interviews were conducted. Pre-testing ascertained relevance and adequacy of the survey questionnaire including sequence of the questions, suitability of the language, and appropriateness of the skip instructions and the comprehensiveness of issues to address the objectives of the study. Afterward, MTE organized a workshop to analyse pre-test results where SAFETI project team and the implementing partners attended.

CAPI Development

The sample survey was conducted through Computer Aided Personal Interview (CAPI). We used SurveyCTO platform for the survey data collection with concurrence from SAFETI project team. We included main features of the electronic survey platform such as survey recording, on and offline, store image and identify GPS coordinates.

Hiring and Training Enumerator Team

We deployed Field Coordinator and Survey Supervisors from CBSG staff. Enumerators were hired from our roster of over 300 survey enumerators. We made sure that the field staff had appropriate sectorial expertise preferably in shrimp and prawn sector surveys. Particularly, we hired highly experienced KII and FGD facilitators with relevant sectorial expertise. We set special specifications for the survey to assess and hire them through in-person interview. We hired 20% more enumerators and provided them training.

The underwent Enumerators three-day (31 August – 02 September 2019) training. The training was attended by the COP, DCOP and MEL Coordinator of SAFETI.

Survey Quality Assurance

MEL developed a survey guidelines and protocol for survey management and quality control. Supervisors were trained to ensure validity and reliability of survey data. They kept track of all the errors and how they had corrected those and submit the record to CBSG Head quarter. Following provides the detail measures for survey quality control.

- Use survey protocol to guide and control respondent's selection, proper replacements, tracking and reporting on errors and corrective measures
- Site level daily review meetings to share problems and seek solutions in coordination with central office.
- At least 20% interviews will be spot-checked by supervisors and additionally 20% of them validated by back-checks in the field.
- Centrally, CBSG used Computer Aided Telephonic Interview (CATI) for back checks under the supervision of central survey team.

SAFETI Mid-Term Evaluation

The mid-term evaluation reviewed and assessed the project results and impact with reference to the SAFETI project as well as Peace for Food program "**Result Framework**" while the counterfactual quantitative survey complemented project evaluation with required empirical data and evidences. Specifically, the evaluation will look into the following aspects of the project:

- Relevance:** Is there adequate evidence on the ground that shows the need for such a project persists and that the project has targeted the right beneficiaries and undertaken appropriate and adequate plan of actions to address the beneficiary needs.
- Efficiency:** How the project resources are used to implement the project activates; any gap in activity implementation and the reason, quality of project staff and management; M&E systems and its utilization, partner agencies capacity and motivation remain at par with the plan, contingency planning and action steps.
- Effectiveness:** Assess activity quality and their effect across the value chains and their short term and intermediate effect on the direct participants i.e. productivity, production volume, technology adaptation, farmers and other stakeholders, quality and appropriateness of training and capacity building program.
- Sustainability:** Assess systems and processes that the project has been established like market systems and institutional support systems that institutionalize new and improved practices towards sustained productivity? Is there any missing opportunity along the project implementation? Assess stakeholder's role and participation in promoting sustainability.

- v. **Learning:** How the project management has installed and practice knowledge management and record and incorporate learnings on an ongoing basis; what are learning so far in the project and how the learnings can be institutionalize and scale up along the value chains.

Evaluation Methodology

We adopted mainly qualitative research methods for the project evaluation. Detail data, information, opinion and perspectives were collected from all relevant stakeholders and project participants including Farmers, Nursery and Hatchery Owners, Feed Manufacturers, Input Dealers, Depot Owners, Shrimp and Prawn Processors, Trade Association Leaders, and Government Officials. Specifically, following methodologies were used for the evaluation exercise.

- i. **Focus Group Discussion:** FGD was used to complement quantitative sample survey and mainly be used with the direct beneficiaries including farmers of the demonstration firm. FGDs also probed key issues including potentials, constraints and challenges of project activities and key performance indicators. Learnings, insights and sustainability will be the key issue to explore in the FDGs.
- ii. **In-Depth Interview:** In-depth interview was used to interact with a wide range of stakeholders to gain their respective achievements, experiences, perspectives, as well as expectations from the SAFETI project. There were a variety of respondent groups for the In-Depth interview and thus brought in wide range of information, technical insights and most importantly, ideas for future course of actions.
- iii. **Direct Observations:** We undertook direct observation methods at the project site to assess adaptation of new technologies, challenges and limitations. However, direct observation was complemented by informal and unstructured discussion with project participants and direct beneficiaries.
- iv. **Internal Self-Assessment:** We facilitated an Internal Self-Assessment workshop with all consortium partners (SAFETI project and partners) to critically review and analyse program strategies and activities and drew lessons learnt, challenges and best practices, and importantly, draw way forwards for potential future actions.

Evaluation Study Extent

Evaluation data gathering were done from all related project participants and stakeholders. Additional qualitative data gathering were done from the quantitative survey respondents for data corroboration and triangulation. Following matrix provide our tentative plan and execution of qualitative evaluation data gathering which, however, was finalized during the preparatory period and in consultation with the SAFETI project management.

SAFETI endorsed qualitative study extent and respondents

Methods	Quantity	Respondent
FGD	9	6 with beneficiary (treatment) farmers of 3 different farming methods (Bagda monoculture, Bagda-Golda rotational, Golda-Carp polyculture) 3 with non-beneficiary (control) farmers of the same farming methods
KII- Hatchery	5	With hatchery owner (mainly by Ram Raj along with senior local team member) 3 Bagda hatchery in Cox’s Bazar and Khulna (2 SPF, 1 Conventional)- “Aung”

Methods	Quantity	Respondent
		2 Golda in Khulna/Bagerhat, 1 BRAC, 1 private “Sukumar”
KII- Nursery	2	With nursery owner in Satkhira
KII-Feed manufacturer	2	With national level feed manufacturer (Agata, Quality/Mega) 1 with Bagda feed importer like either CP or UNI president (Consult with Anis, SAFETI)
KII-Aqua input trader	3	In 3 districts (Khulna, Bagerhat, Satkhira)
KII-Depot	3	With depot holders (Khulna, Bagerhat, Satkhira)
KII-Processor	2	With fish processing plant managers (Satkhira, Khulna) “Gaffar”
KII-Trade association leaders	2	1 with President or general secretary of BFFEA (Khulna or Dhaka) and 1 with SHAB (Cox’s Bazar) “Ram Raj”
KII-Govt officials	13	DoF- Each with 10 Upazila Fishery officials, 1 with high officials in HQ, and 1 with DD (Khulna) BFRI- 1 with DG and Senior officials (mainly by Ram Raj along with senior local team member-Bagerhat BFRI)
KII- Partner NGO	2	2 with partner NGO officials (TMSS and CODEC) –PM must (supervisor can accompany) Mobilizing and organizing farmers and financial services
Total: 9 FGDs and 34 KIIs		

Features of Qualitative tools and processes:

- Tools was made more focused and performance indicator oriented.
- We brought some information to triangulate with qualitative data and/or for interpretation of quantitative findings.
- We emphasized on SAFETI designed 4 types of support of productivity improvement in terms of their importance to the stakeholders. They include:
 - General Training, and training and communication materials
 - Technical Assistance to the Farmers at field level
 - Management, Monitoring and Quality assurance
 - Backward and Forward lineage (Financing, Input dealer and Output marketing)
- We included them in the quantitative part with preselected response layout.
- Linkage with Government and Private sector organizations/departments - through KII from supply side, through FGD from demand side
- We also included elements of six steps or by all six steps to get their priority importance from FGDs and difficulties as well.

Data Triangulation, Analysis and Reporting

- Both quantitative and qualitative data will be analyzed and triangulated adequate used various sources and points of data gathering and then synthesize for evaluation conclusion. Multiple data sources, cohesion and consistency was main checkpoints for triangulation.
- Debriefing session:** Evaluation team shared preliminary findings with the SAFETI project consortium partners and facilitate partner discussion to formulate recommendations for future programming and sustainability.

- iii. **Feasibility testing:** All prospective recommendations were assessed and tested against criteria including *relevance, do-ability, and economic viability* to be put forward for a follow-on project consideration.
- iv. **Narrative Report:** An informative and analytical narrative report will be produced first as draft report for review and comments from the SAFETI project. Final report will incorporate and address issues and comments made on the draft.

Method wise sample distribution

Data collection tool / Shrimp-prawn culture system	Sample number
Field Survey	
<u>'Bagda' monoculture</u> 'Demo' farmer	9
'Project' farmer	164
'Control' farmer	74
Total	247
<u>'Bagda-Golda' rotational culture</u> 'Demo' farmer	7
'Project' farmer	190
'Control' farmer	65
Total	262
<u>'Golda-Carp' Polyculture</u> 'Demo' farmer	7
'Project' farmer	171
'Control' farmer	64
Total	242
Focus Group Discussion (FGD)	
Treatment Group	6
Control Group	3
Total	9
Key Informants Interview (KII)	
KII- Hatchery	4
KII- Nursery	2
KII-Feed manufacturer	3
KII-Aqua input trader	3
KII-Depot	3
KII-Processor	3
KII-Trade association leaders	2
KII-Govt. officials	13
KII- Partner NGO	2
Total	35