



Government of the People's Republic of Bangladesh
National Agricultural Technology Program- Phase II Project
(NATP-2)

Ministry of Agriculture (MOA) &
Ministry of Fisheries and Livestock (MOFL)



NATP-2 ANNUAL PROGRESS REPORT 2020-2021



Project Management Unit (PMU)

AIC Building, 3rd Floor, BARC Complex, Farmgate, Dhaka-1215



**NATP-2 PROJECT ANNUAL PROGRESS REPORT
2020-2021**

**Government of the People's Republic of Bangladesh
National Agricultural Technology Program- Phase II Project (NATP-2)
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Ministry of Agriculture
AIC Building (3rd Floor), BARC Complex
Farmgate, Dhaka- 1215**

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Minister

Ministry of Agriculture

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Message

I am pleased to know that National Agricultural Technology Program-Phase II (NATP-2) project is publishing “NATP-2 Annual Progress Report 2020-2021”. It is the largest and multifaceted project of the Ministry of Agriculture and is playing a key role in productivity enhancement, agricultural diversification, food and nutrition security, market linkage and livelihood improvement of the small holder farmers. The project is also supporting agricultural research and institutional capacity development of the National Agricultural Research System (NARS) institutes and delivering extension services to the door step of the farmers through Common Interest Group (CIG) and Farmers Information and Advice Center (FIAC). The innovative windows of funding through competitive matching grants to CIGs and rural entrepreneurs mostly for farm machineries and vehicle support are directly contributing in timely performing and adopting good farming practices, easing labor shortage and market linkage.

Our engagement continues to be guided by our purpose and vision to advance innovation in agriculture for a sustainable future and play a leading role in realizing the dream of the Father of the Nation Bangabandhu Sheikh Mujibur Rahman to build a hunger and poverty free prosperous Bangladesh. Ministry of Agriculture is focusing on resilient food production and supply chain systems, facilitating access to safe & nutritious food and transferring improved technology practices at farm level to make agriculture more vibrant. We need to address new, complex and more interconnected challenges of achieving food and nutrition security.

Under the strong and farsighted leadership of Hon'ble Prime Minister Sheikh Hasina, the present Government is implementing various farmers' friendly policies for agricultural research and development. Bangladesh has achieved food self-sufficiency particularly in food grain in the midst of escalating population growth, declining agricultural land and the vulnerability of climate change. Food security has already been achieved for all and thus Bangladesh emerged as a development model to the world. Now, our goal is to move from semi-commercial to commercial agriculture and made it profitable. As we continue to adapt to the realities of COVID-19, we are committed to keep the agriculture moving.

The achievements of NATP-2 are now visible in research and extension activities. The project is validating 30 agricultural technologies generated from CRG and PBRG. It promotes innovation in both research and extension and looks for technological solution aiming at increasing farm productivity and improved market access. I am delighted to know that the project has employed digital technology for technology transfer, data collection, project management, training and knowledge management.

I believe that this “NATP-2 Annual Progress Report 2020-2021” has documented all the activities performed by the implementing organizations. It would be useful for policy makers, researchers, extension providers, development actors and academia of the country.

The output and outcome of NATP-2 are the concerted efforts of the project personnel and resilient farmers. I would like to thank the project team for publishing this valuable document.

Joy Bangla, Joy Bangabandhu
Long Live Bangladesh.

(Dr. Muhammad Abdur Razzaque, MP)



Minister

Ministry of Fisheries & Livestock

Govt. of the People's Republic Of Bangladesh
Bangladesh Secretariat, Dhaka.

Message

I am delighted to know that the Project Management Unit (PMU) of the National Agricultural Technology Program-Phase II (NATP-2) project is publishing the "NATP-2 Annual Progress Report 2020-2021". NATP-2 is the largest, most diversified and most strategic project of the Government of Bangladesh, being implemented jointly by the Ministry of Agriculture and the Ministry of Fisheries and Livestock. NATP was designed as a long-term program for implementation in three phases over 15-18 years. The second phase of the program, NATP-2 project is being implemented in 270 upazilas of 57 districts. This report focuses on the implementation progress of all Project Implementation Units including the activities being performed by the Department of Fisheries (DOF) and the Department of Livestock Services (DLS) of the Ministry of Fisheries and Livestock (MOFL).

Fisheries and Livestock are the two important sub-sectors which are the main sources of protein and also are significant contributors to GDP. The Ministry of Fisheries and Livestock has been working tirelessly to achieve the present government's 'Vision 2041' and goals of SDG under the dynamic leadership of the honorable Prime Minister **Sheikh Hasina**. The Sheikh Hasina Government is well known as the agriculture friendly government.

NATP-2 project has some unique activities like CIG formation, FIAC establishment, introducing Agricultural Innovation Funds (AIF-1, AIF-2 and AIF-3) for promoting agricultural researches and supporting farm mechanization and market access by the farmers and rural agro- entrepreneurs, etc. Besides, MOFL has taken manifold programs and initiatives to develop fisheries and livestock sub-sectors under NATP-2 project. Among those, some of the mentionable activities are: quality fingerlings production and supply, beel management, pure line brood development, sanctuary development, cage culture, community based fisheries management, vaccination and de-worming program of cattle and poultry, vaccine production for disease control and management, supply of day old chick and ducklings at reduced price, strengthening the artificial insemination program and farmers training. The extension service delivery system of FIAC is really unique through which community frontline extension providers, namely LEAF and CEAL are bringing the extension services at the farmers' doorsteps. The project is playing a vital role in addressing food and nutrition security and livelihood improvement of the farmers, particularly small, marginal and female farmers. Bangladesh now stands at 2nd position in freshwater fish production, 3rd position for the inland open water fisheries and 5th in pond aquaculture in the world, though all our potentials are yet to be exploited.

In spite of COVID-19 pandemic situations, there are many remarkable and visible achievements been made by NATP-2. PIU-DoF has developed online fish marketing website with mobile apps version and introduced mobile van for selling fish during COVID-19. PIU-DLS arranged mobile milk sale in their locality.

I believe, NATP-2 Annual Progress Report of 2020-2021 will serve as a knowledge reference to related stakeholders and would be of immense help to researchers, extension providers, policy makers, traders, students and academia.

I would like to congratulate the Project Team for publishing this important and informative document and wish their success.

Joy Bangla, Joy Bangabandhu
Long Live Bangladesh

(S M Rezaul Karim, MP)



Secretary

Ministry of Agriculture

Govt. of the People's Republic Of Bangladesh

Bangladesh Secretariat, Dhaka

Message

I am pleased to know that PMU of National Agricultural Technology Program phase II Project is publishing the Annual Progress report 2020-2021. The World Bank, International fund for Agricultural development, the United States Agency for international Development and the Government of Bangladesh funded the National Agricultural Technology Program. The objectives of the project are to improve national agricultural productivity, market linkage and farm income, with a particular focus on small, marginal and female farmers in 270 upazilas of 57 districts which are very much allied to SDGs.

This project has some distinctive activities like three Agriculture Innovation Funds (AIF-2 and AIF-3) for supporting farm mechanization and market access by the farmers and rural agro-entrepreneurs. The achievements of NATP-2 are now visible both for research and extension. The project has already generated 40 new technologies which are now being validated by the three extension components. The 139 project funded PhD scholars, who have been pursuing their degrees locally and abroad, will add on to the existing capacity of 13 NARS Institutes.

NATP-2 promotes innovation, both in research and extension and looks for technological solutions aiming at increasing farm productivity and reducing post-harvest losses through market access. The project uses holistic approach in generation and transferring technologies of crops, fisheries and livestock that would help in agricultural diversification and commercialization, increased farm income and livelihood improvements of farmers and rural agro-entrepreneurs.

I believe, Annual progress report of 2020-2021 of PMU, NATP-2 will serve as acknowledge reference to related stake holders and would be of immense help to researcher, extension people, policy maker, traders and academia.

I would like to congratulate the project team for publishing this important and informative document and I acknowledge the hard work of the NATP personnel to visualize the work through this report and wish all the success.

(Md. Sayedul Islam)



Secretary

Ministry of Fisheries & Livestock

Govt. of the People's Republic Of Bangladesh

Bangladesh Secretariat, Dhaka

Message

It gives me much pleasure to know that the National Agricultural Technology Program-Phase II Project (NATP-2) is going to publish its Annual Progress Report for FY 2020-2021. The National Agricultural Technology Program-Phase II Project (NATP-2) launched with the aim to increase agricultural productivity of smallholder farms and improve smallholder farmers' access to markets in selected districts. The World Bank, jointly with IFAD and USAID has provided financial support to implement National Agricultural Technology Program-Phase II Project (NATP-2).

The NATP-2 project is being implemented in 270 upazilas of 57 districts. The fisheries and livestock component of NATP-2 project have some exclusive program and activities having significant role in dissemination of improved technology to the fisheries and livestock farmers. The research program of NATP-2 project contributed to develop improved livestock and aquaculture technologies which have impact to increase fisheries and livestock productivity.

The NATP-2 project endeavors to develop the capacity of the livestock and fisheries farmer toward quality production of fish, milk, meat and egg including relevant value added product. Evidence of these activities has to be seen in the program of the NATP-2 project throughout the year 2020-2021. Farmer's Information & Advice Centre (FIAC) and Agricultural Innovation Fund (AIF and AIF-3) of NATP-2 facilitated to wider extension of improved fisheries and livestock technologies to the fisheries and livestock farmers. Also, quality Brood development, Beel management program of fisheries component and vaccination, deworming program have gained a lot of popularity among the fisheries farmers.

The program and activities of NATP-2 project under livestock and fisheries sector have contributed to improve the livelihood and ensure food and nutritional security of the fisheries and livestock farmers. My belief that the trend of this success will remain continue. I thank all, particularly our dedicated project team members of PIU-DLS and DOF, for their commitment to achieve the target toward reach of the goal of the project. I look forward to working with the NATP-2 project and provide continuous effort to achieve best success in upcoming year.

(Dr. Mohammad Yamin Chowdhury)

Foreword



The National Agricultural Technology Program Phase-II (NATP-2) is a multidimensional project that integrates research, extension, supply chain and marketing activities of crops, livestock, and fisheries in Bangladesh. The overall objective of the three-phased NATP program is to support the strategy of the Government of Bangladesh (GOB) for improving national agricultural productivity, market linkage, and farm income. The Project Development Objective (PDO) of NATP-2 is to increase the agricultural productivity of smallholder farms and improve smallholder farmers' access to markets in selected districts. The NATP-2 Project is financed jointly by the Government of

Bangladesh (GOB), the World Bank (through IDA credit), the International Fund for Agricultural Development (IFAD), and the United States Agency for International Development (USAID).

The NATP-2 Project is being implemented by the implementation unit of Bangladesh Agricultural Research Council (PIU-BARC), Department of Agricultural Extension (PIU-DAE), Department of Fisheries (PIU-DOF), Department of Livestock Services (PIU-DLS), and the Project Management Unit (PMU), in 270 upazilas of 57 districts in Bangladesh. PIU-BARC, in association with the NARS institutes and non-NARS organizations, is generating agricultural technologies on crops, fisheries, and livestock. PIU-DAE, PIU-DOF and PIU-DLS are providing necessary extension services and diffusing agricultural technologies aiming at increasing farm productivity, reducing post-harvest losses, and promoting the sustainability of farmer groups and producer organizations by facilitating linkages with markets. PMU is playing the overall management and coordination role and extending all necessary supports for the smooth and successful implementation of the project.

During the FY2020-21, implementation of some of the project activities suffered due to the prevailing COVID-19 pandemic situation. Farmers faced acute problems of low prices of vegetables, fishes, and milk; they also faced the problem of collecting seed, feed, and other agricultural inputs. However, NATP-2 has overcome the challenges of COVID-19 pandemic by using ICT in agriculture - virtually conducting meetings, workshops, trainings and integrating hundreds of officers of DAE (crops), DOF (fisheries) and DLS (livestock) of 270 upazilas, 57 districts and 08 divisions. NATP-2 also distributed critical inputs and provided other supports to the farmers through reallocating funds (US\$ 13.94 Million), introducing online fruits-vegetable marketing (by PIU-DAE/Hortex), online/mobile fish marketing (by PIU-DOF), and online/ mobile milk marketing (by PIU-DLS), etc.

In the year 2020-21, PMU conducted 3 studies/ assessments on gender and value chain, client satisfaction, balanced scored card-based detailed outcome assessment. PMU also developed and uploaded 10 field data collection formats in KoBo Toolbox. NATP-2 launched Project Management Information System (PMIS) Software for easy access to project information, Accounting System Software for keeping records of financial transactions, Knowledge Learning Platform System Software for sharing knowledge among the stakeholders. PMU also engaged a communication firm (Expressions Ltd) for developing communication and publicity materials (20 community videos, 16 radio programs, 4 audio-based programs, 4 magazine programs, 4 docudrama, leaflet, poster, sticker, and other communications materials. Among the other achievements in the financial year are: development and selection for validation of production technologies and registration of varieties with the National Seed Board. NATP-2

also awarded sub-projects under AIF-2 and AIF-3 that are eventually contributing to increased productivity, reducing post-harvest losses and better market access for marginal farmers.

DPP of NATP-2 has been revised with the no cost-extension, and more 80% additional farmers are expected to be benefited through the revised activities under NATP-2. In the FY2020-21, PMU had arranged 2 JPSC meetings (5th and 6th), 2 PIC meetings, and 11 Monthly Coordination meetings with the PIUs, and several others issue-based and problem solving meetings with the PIUs and outsourcing firms and companies. Most of the meetings were organized using the ZOOM Platform. PMU also successfully arranged two World Bank-IFAD joint Implementation Support Missions (ISMs).

The project has already mobilized over one million smallholder farmers and overachieved the target. NATP-2 undertook 241 research sub-projects against the DPP target of 133 (achieved 181%), imparted training of 3.9 million client days against the RDPP target of 4.0 million client days (achieved 97%). All-out efforts were put in the area of value chain and marketing in this financial year and achieved 91% of its RDPP targets. Implementation of AIF-2 and AIF- 3 sub-projects has also increased from 56% to 64%. A total of 634,851 CIG and non-CIG farmers (crop- 417,550, fisheries- 63,736, and livestock- 153,565) adopted the project promoted scalable technologies and achieved 93% of the RDPP target. As a result, farm productivity of 12 different crops have reached 80% to 88% of the project end targets; the livestock sector also has achieved over 91% and 90% of its cumulative targets for dairy and beef fattening respectively; the productivity for culture fish has reached to 4.94 t/ha against the target of 4.8 t/ha in the reporting year.

I would like to thank and express my gratitude to all personnel involved in NATP-2 activities from the farming community, PIUs, PMU, ministries, and donor agencies for their committed and sincere efforts for successfully implementing the project activities, even during the COVID-19 period. I also sincerely endorse the valuable inputs from the PIUs in preparing this report. I congratulate and thank all those who worked hard to compile and edit this report. We would continue our good works to make NATP-2 a great success and achieve the overall objectives of the project.



Md. Motiur Rahman
Project Director (Additional Secretary)
Project Management Unit (PMU)
National Agricultural Technology Program Phase II Project (NATP-2)

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A:	BARI Technologies identified for dissemination to the plain lands of Chattogram and Rangamati regions
B:	BARI Technologies identified for dissemination to the hill agriculture of Chattogram and Rangamati regions
C:	BRRRI Technologies identified for dissemination to Chattogram and Rangamati regions
D:	BINA Technologies identified for dissemination to Chattogram and Rangamati regions
E:	BFRI Technologies identified for dissemination to Chattogram and Rangamati regions
F:	BLRI Technologies Identified for Dissemination to Chattogram and Rangamati regions
G:	BSRI Technologies Identified for Dissemination to Chattogram and Rangamati regions
H:	BWMRI Technologies identified for dissemination to Chattogram and Rangamati regions
Annex- 9	Composition of JPSC, PIC, Project Management Team

Abbreviations and Acronyms

ADP	Annual Development Program
AEZ	Agro Ecological Zones
AIC	Agricultural Information Center
AIF	Agricultural Innovation Fund
AO	Appellate Officer
AWD	Alternate Wetting and Drying
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BAU	Bangladesh Agricultural University
BCR	Benefit Cost Ratio
BDT	Bangladesh Taka
BFRI	Bangladesh Fisheries Research Institute
BINA	Bangladesh Institute of Nuclear Agriculture
BJRI	Bangladesh Jute Research Institute
BLRI	Bangladesh Livestock Research Institute
BRRRI	Bangladesh Rice Research Institute
BSC	Balance Score Card
BSRI	Bangladesh Sugarcrop Research Institute
BTRI	Bangladesh Tea Research Institute
BWMRI	Bangladesh Wheat and Maize Research Institute
C&AG	Comptroller and Auditor General
CBO	Community-Based Organization
CCMC	Commodity Collection and Marketing Center
CDB	Cotton Development Board
CEAL	Community Extension Agent for Livestock
CG	Carp Galda
CGMC	<i>Carp-Galda Mixed Culture</i>
CHT	Chattogram Hill Tract
CIG	Common Interest Group
CONTASA	Convertible Taka Special Account
CP	Collection Points

CPC	Carp Poly Culture
CRDS	Centre for Resources Development Studies Ltd
CRG	Competitive Research Grants
DAE	Department of Agricultural Extension
DAS	Days After Spraying
DECC	District Extension Coordination Committee
DLS	Department of Livestock Services
DoF/DOF	Department of Fisheries
DOSA	Dollar Special Account
DPD	Deputy Project Director
DPP	Development Project Proposal
EC	Executive Committee
ECNEC	Executive Committee of the National Economic Council
ERD	Economic Relations Division
FAPAD	Foreign Aided Projects Audit Directorate
FCR	Feed Conversion Ratio
FGD	Focus Group Discussion
FIAC	Farmer's Information and Advice Center
FMD	Foot and Mouth Disease
FPOs	Fish POs
FY	Fiscal Year
FYM	Farm Yard Manure
GAP	Good Agricultural Practices
GAqP	Good Aquaculture Practice
GOB/GoB	Government of Bangladesh
GRM	Grievance Redress Mechanism
GRO	Grievance Redress Officer
HRD	Human Resource Development
HVC	High Value Crops
HYV	High Yielding Variety
ICT	Information and Communication Technology
IDA	International Development Association
IEC	Information Education and Communication

IFAD	International Fund for Agricultural Development
IGA	Income Generating Activities
IMED	Implementation Monitoring and Evaluation Division
INPM	Integrated Nutrient and Pest Management
IPM	Integrated Pest Management
ISM	Implementation Support Mission
IP	Indigenous People
IUFR	Interim Un-audited Financial Report
JPSC	Joint Project Steering Committee
KMC	Koi Monoculture
LBF	Local Business Facilitator
LEA	Limited Environmental Assessment
LEAF	Local Extension Agent for Fisheries
M&E	Monitoring and Evaluation
M&IE	Monitoring and Impact Evaluation
MIS	Management Information System
MMC	Market Management Committee
MOA	Ministry of Agriculture
MOFL	Ministry of Fisheries and Livestock
MST	Mono Sex Tilapia
MT	Metric Ton
NARI	National Agricultural Research Institute
NARS	National Agricultural Research System
NATP	National Agricultural Technology Program
NECC	National Extension Coordination Committee
NSB	National Seed Board
OFRD	On Farm Research Division
PAD	Project Appraisal Document
PBRG	Program Based Research Grants
PCR	Project Completion Report
PD	Project Director
PDO	Project Development Objective
PGMC	Pabda-Gulsha mixed culture

PhD	Doctor of Philosophy
PHI	Pre-Harvest Interval /Post Harvest Interval
PHM	Post-Harvest Management
PHSCs	Post-Harvest Service Centers
PI	Principal Investigator
PIC	Project Implementation Committee
PIU	Project Implementing Unit
PMC	Pangus Mono Culture
PMIS	Project Management Information System
PMP	Pest Management Plan
PMU	Project Management Unit
PO	Producer Organization
PPA	Public Procurement Act
PPR	Public Procurement Rules
RADP	Revised Annual Development Program
RDA	Rural Development Academy
RFQ	Request for Quotation
RPA	Reimbursable Project Aid
RDPP	Revised Development Project Proposal
SAAO	Sub-Assistant Agriculture Officer
SAFE	Special Account for Foreign Exchange
SMC	Shing Monoculture
SMMC	Shing and Magur Mixed culture
SOE	Statement of Expenditure
SRDI	Soil Resource Development Institute
STWs	Shallow Tubwels
TOT	Training of Trainer
TTMU	Technology Transfer and Monitoring Unit
UAO	Upazila Agricultural Officer
UECC	Upazila Extension Coordination Committee
UEFT	Union Extension Facilitation Team
UEMP	Union Extension Micro Plan
ULO	Upazila Livestock Officer

UMS	Urea Molasses Straw
UP	Union Parishad
URT	Upazila Resource Team
USAID	United States Agency for International Development
UTS	Urea Treated Straw
WB	The World Bank
YGM	Yield Gap Minimization

Executive Summary

The National Agricultural Technology Program Phase-II (NATP-2) Project *is an umbrella project in Agriculture Sector that supports research, extension, supply chain and marketing activities of crops, livestock and fisheries* The Project Development Objective (PDO) of NATP-2 is to increase agricultural productivity of smallholder farms and improve smallholder farmers' access to markets in selected districts. The Specific objectives of NATP-2 are i) strengthening the capacity of the NARS and the extension services to generate and diffuse agricultural technologies, ii) increasing farm productivity and reducing post-harvest losses; and (ii) promoting sustainability of farmer groups and producer organizations mobilized and formed under the project by facilitating their linkages with markets.

NATP-2 is financed jointly by the World Bank (IDA credit), International Fund for Agricultural Development (IFAD), the United States Agency for International Development (USAID), and the Government of Bangladesh (GOB). It directly works with over one million smallholder and marginal farmers in 270 selected upazilas of 57 districts. Of them 35% are female farmers. One CIG farmer is expected to motivate at least 1.8 non-CIG farmers to adopt the technologies promoted by the project and thus the number of total CIG and non-CIG beneficiaries may exceed 2.8 million.

NATP-2 comprised 5 inter-related components. Component-1 is the research component being implemented by PIU-BARC, Component II, III and IV are the crop, fisheries and livestock development components being implemented by PIU-DAE, PIU-DOF and PIU-DLS respectively. The management component of the project (PMU), i.e., Component V is responsible for coordination and overall implementation of the project activities and supports the realization of the project's development objective. NATP-2 Project has a grants program (Agricultural Innovation Fund- AIF) with three windows (AIF-1, AIF-2, AIF-3), each addressing complementary strategic objectives pursued under NATP-2 with the implementation of a more holistic approach to agricultural technology.

This report presents summary results achieved during the FY2020-2021 along with cumulative results and information since inception where necessary. Progress of the project activities and their outcome is very briefly summarized below.

II. Research Component

The Research Component is being implemented by the Project Implementation Unit of the Bangladesh Agricultural Research Council (PIU-BARC) in coordination and cooperation with NARS institutes and non-NARS organizations. The objectives of the research component are to: i) implement at least 190 Competitive Research Grant (CRG) sub-projects and 51 Program Based Research Grant (PBRG) sub-projects to generate technologies/new information on crops, livestock and fisheries; ii) implement 80 in-country and 60 foreign PhDs; iii) provide need based short term trainings to the scientists of NARS institutes and officers of extension components; iv) improve the research and training facilities; v) build functional relationship among the NARS institutes and research extension linkages.

CRG Sub-projects

PIU-BARC had completed implementation of 190 research sub-projects against the DPP target of 100 (in RDPP the target was changed to 190). Research and financial activities of all CRG sub-projects had been completed in September 2018. The Project Completion Reports (PCRs) are now available online at <http://www.natpbarc.gov.bd/>. Research Highlights of 190 CRG sub-projects were compiled and published

in printed form in June 2021. Technical factsheets of 69 selected technologies were developed, compiled and hosted in the website of PIU-BARC. Out of 69 identified technologies, 11 (06 for crops, 03 for livestock and 02 for fisheries) technologies were selected through discussion among PIUs (DAE, DoF & DLS) and PMU for validation trials.

PBRG Sub-projects

The Program Based Research Grant (PBRG) is the second research window of PIU- BARC to promote institutional research investment including research on cross cutting issues. Research sub-projects under PBRG were developed and are being implemented involving at least two research providers: collaboration can be inter-institutional or it can be interdisciplinary within an institute. In total, PIU-BARC awarded 51 PBRG sub-projects which are being implemented by 34 NARS Institutes, Public Universities and other organizations. From the on-going PBRG sub-projects 15 crops varieties have been registered in the National Seed Board (NSB) for cultivation in Bangladesh. Varieties are Banana (2 nos.): BAU Kala-1 (Kulpat) and BAU Kala- 2 (Gerasundhuri); Yam (5 nos.): BAU Yam -1 (Pesta Alu), BAU Yam -2 (Mete Alu), BAU Yam -3 (Pahari Dhusor Alu), BAU Yam -4 (Chagol Dhudh Alu) and BAU Yam 5 (Mou Alu); Aroid (4 nos.): BAU Kachu-1 (Panchamukhi), BAU Kachu- 2 (Poidnal), BAU Ol Kachu-1 (Ol Kachu) and BAU Man Kachu- 1 (Man); Sugarcane (1 no.): BSRI Akh - 47 (Chewing type).

PhD Program

PIU-BARC awarded 140 PhD scholarships. The distribution of 140 PhDs was 118 for scientists of NARS Institutes, 10 for DAE, 5 for DLS, 5 for DoF and 02 for Ministry of Agriculture. Out of 60 foreign PhD programs, 10 scholars were admitted in developed countries (USA, Germany, UK, Australia, and Japan) while 50 scholars were admitted in developing countries (Malaysia, Philippines, Thailand, China and India). The awardees are distributed in 28 disciplines in case of in-country PhD. On the other hand, in case of foreign PhD the highest awardees are under breeding followed by soil science, agronomy, plant pathology and fisheries. The PhD scholars are continuing their courses and researches in 10 different countries

Strengthening NARS Institutional Capacity

PIU-BARC conducted 13 national training programs with a total of 496 participants having 1,632 Clientele days. The duration of training events ranged from 3 to 12 days as per provision in the RDPP. But the duration of 12 training events was 2-12 days whereas duration of awareness training was one day. The titles of three training program were (1) Research Methodology, (2) Monitoring & Evaluation in project Management, and (3) Project Development and Management. The rest of training program were need based. Participants of trainings were the scientists of NARS institutes, such as BARI, BRRI, BINA, BJRI, BSRI, BFRI (Fish), BLRI, CDB, SRDI, BFRI (Forest), BTRI and BWMRI. PIU-BARC conducted a day- long 11 national workshops with 847 participants of which six workshop on annual progress review of PBRG sub-projects and five on different need based issues. The participants were scientists/extension providers/academia /officers from the NARS institutes, extension agencies, universities and NGOs. Research linkage workshop had the highest participants (140) whereas the least was in Nutrition and food safety (19).

III. Extension Components

Components II, III and IV support crops, fisheries and livestock sub-sector development and are being implemented by PIU-DAE, PIU-DOF and PIU-DLS respectively. The three PIUs altogether mobilized over one million smallholder farmers in 40514 CIGs in 270 upazilas of 57 districts, of them around 35% are female farmers. By end June 2021, 100% CIGs of PIU-DoF and 88% of PIU-DLS and 84% of PIU-DAE got registered with the Department of Cooperatives.

Every year, during April-May, the CIG members prepare their own bottom up demand-led Extension Micro Plans for their next year extension activities and the results are on track (89% of RDPP have already achieved). As on July 2021, the three PIUs together imparted 3.88 million client days training to the CIG members and other stakeholders and thus completed **97% of the total revised target of 3.98** million client days. PIU-DLS completed **100%, DoF-97.21% and DAE-96.63%**. The trainees included CIG & non-CIG farmers, CIG leaders, POs, agro-input dealers & traders, officers/staff of implementing units, and field extension workers. The PIU-DLS assessment of effectiveness of farmers training reveals that the training fully met technology knowledge demand for 62% respondents while 99% respondents stated that they acquired new knowledge/skills such as, housing/shed management, feeding management, and health management of the animals.

Dissemination & Diffusion of Technologies

In NATP-2, technology demonstrations are given topmost importance to quickly disseminate the newly released/improved technologies. From 2017 till June 2021, the three PIUs together implemented total 187564 technology demonstrations, i.e., 77% of total RDPP target

Crop Sector Technology Demonstration

PIU-DAE so far conducted 135024 (78% of RDPP target) demonstrations of 28 Productivity Enhancing, Climate Smart and eco-friendly Agricultural Technologies. Major areas of demonstrations were yield gap minimization of rice, wheat, lentil, mustard and maize; production technology of high value crops, summer tomato production technology, production and preservation of quality seeds of rice, wheat, mustard and lentil, zero tillage cultivation of garlic and mustard; demonstration on spices crops.

The data reveals that YGM technology package in last four years minimized 0.31 ton/ha yield gap for boro rice, 0.82 ton/ha for Aus rice and, 0.41 ton/ha for T.aman rice. For lentil the YGM package using BARI Masur 6 and 8 with recommended management practices reduced 0.64 mt/ha yield difference in 2020-21. For different high value crops the YGM technology packages sowed a difference of 9% to 64% compared to farmer's practices.

Community seed production is an innovative activity in the project. After raising the seedlings by CIG members, they shared the seedlings for seed production of the new rice varieties. After producing seeds all the CIG farmers preserved those seeds. So far 3418 tons of Aus rice and 2954 tons of Aman rice were distributed and or sold to the neighboring and other farmers. The 20 DAE Horticulture Centers together produced total 743503 quality seedlings/saplings. These planted seedlings/saplings at farm level will contribute to the replacement of the old fruit varieties.

Up to 2020-21, PIU-DAE had established 19224 demonstrations on Vermi-compost and Tricho-compost. On an average about 312 kg of Vermi-compost was produced from each of the demonstrations in one-month and in case of Tricho-compost average production per demonstration was about 136 kg in two months.

Fisheries Sector Technology Demonstration

Up to June 2020 PIU-DoF implemented **23535** demonstrations (**72% of RDPP target**) on eight proven, low-cost and productivity enhancing aquaculture technologies and there was no provision of demonstration during FY2020-21. The performance analysis of the demonstrated technologies reveals that changes in yield before and after demonstration of technologies over the years occurred from 16% to 56 % depending on the culture technology. The highest mean yield change appeared for koi

monoculture (56%), followed by pabda-gulsha mixed culture (50%), carp polyculture (50%), shing-magur mixed culture (43%), pangas monoculture (42%), monosex tilapia (42%), pangas monoculture (42%), carp-galda mixed culture (26%), pabda-galsha mixed culture (50%) etc. The highest Benefit Cost Ratio (BCR) was found in carp-gulsha mixed culture (1.78), followed by pabda-gulsha mixed culture (1.76), shing-magur mixed culture (1.69), singh monoculture (1.61), carp poly culture (1.56) etc.

Improvements of Capture Fisheries

Forty (40) beels were selected for five activities - (1) habitat improvement, (2) establishment of beel nurseries, (3) stocking of indigenous fish species, (4) establishment of fish sanctuaries and (5) initiation of Community Based Fishery Management systems. Out of 40 beels, 23 beels have been taken under community-based fisheries management before RDPP. Habitat improvement works have been completed in 23 beels. To conserve fish species from extinction and increase fish diversity in the open water, fish sanctuary has been established in 19 beels. Beel nurseries have been established in 23 beels and 55140 kg and 56904 kg of fingerlings were released in the beels during 2018-19 and 2019-20, respectively. Besides, a total of 17591 kg and 10095 kg fingerlings of indigenous fish species were stocked during 2019-20 and 2020-21, respectively. Due to these interventions, yield of fish in the beels has been increased from 700.24 kg/ha in 2017-18 to 1202.5 kg/ha during 2020-21

New 17 beels have been included in RDPP and have been taken under different management practices from 2021-22. Base line survey, formation of community-based organization (CBO) and formation of executive committees of CBOs have been completed

Livestock Sector Technology Demonstration

PIU-DLS implemented total 28899 demonstrations on improved livestock management practices on dairy Cattle (13047), beef fattening Cattle (6647), goat (4275), Sonali/Local Poultry (4141), duck (557), Sheep (165), Pig (47) and buffalo (20)), 106 demonstrations on improved compost pit using cow dung and 8388 on high yielding variety of fodder with improved cultivation practices. Major management practices used include Improved shed management, balanced feed management, vaccination, de-worming and other health management practices and bio-security of farm.

Most of the demonstrations were conducted with crossbred cows, black Bengal goat, and local and Sonali poultry birds. Average productivity in demo was significantly higher than in non-demo farms. The results showed that average milk production of demonstration farmers was 8.50 liter per day per cow as against 5.40 liter per day per cow in non-demonstration farmers for improved breed

Beef fattening demonstration results showed that the daily growth rate of cattle under demonstration was 749gm for cross bred and 394 gm in other than demonstration cattle. In case of local cattle, an average 627 gm. weight increase was observed in demonstrated cattle where 318 gm. in other than demonstration cattle. As a result of slat system housing demonstration along with supplementary feeding, regular vaccination and deworming, average body weight increased to 49.0 gm. per day per goat while 35 gm. weight was increased for other than demonstration.

PIU-DLS arranged vaccination (cattle, goat and poultry to decrease mortality and increase productivity), de-worming (cattle, goat to create awareness and control the worm) and infertility (dairy cattle to minimize the causes of reproductive disorder) campaigns at union levels. Total 5.58 million cattle, 2.35 million goat and 7.71 million poultry were vaccinated through 54734 campaigns (average 102 cattle, 43 goats and 141 poultry birds per campaign) organized till July 2021. De-worming medicine was given to total 2.0 million cattle and 0.97 million goat; and 0.18 million cows and heifers were diagnosed and

prescribed. The fodder cultivation area has been increased from 1301.00 acre to 4775.00 acre in the working upazilas.

Technology Adoption

NATP-2 implemented a large number of extension activities targeting technology adoption which includes technology training, technology demonstrations, technology validation trial, field days, exposure visits and learning sharing meetings and campaigns/workshops with the CIG - non-CIG farmers.

In crops 417,550 farmers, in fisheries 63736 farmers and in livestock 153565 farmers adopted the project promoted technologies. In total 18,10,675 CIG and non-CIG farmers adopted crops, fisheries and livestock technology.

The most adopted new crop varieties are Boro rice: BRRIdhan 74, 84, 89; T. aman: BRRIdhan 71, 72, 73 (stress tolerant) BRRIdhan 51, 52 & 91 (saline tolerant); Aus: BRRIdhan 48, 82, Narica mutant; wheat: BARI wheat 30, 31, 33, BARI wheat 28,30, 33 (*heat tolerant*); lentil: BARI lentil 6, 8. Of total adopters in fisheries, about 87% adopted improved management practices of carp polyculture, 5.3% adopted improved management practices of mono sex tilapia and 3.3% adopted improved management practices of carp-golda mixed culture technology. In **livestock sector** most of the CIG farmers adopted the improved housing/shed management, Slat system housing for goat, balanced feeding, schedule vaccination, scheduled de-worming and bio-security related technologies.

The Farmer's Information and Advice Centers (FIAC)

FIACs are established as extension service centers and housed in two rooms (one room for crop and the other room for fisheries and livestock) in the 1621 newly built two-storied Union Parishad (UP) office buildings of the project upazilas. FIACs remain open during the office hours, and SAAOs, CEALs & LEAFs provide services to both CIG and non-CIG farmers following a systematic office routine/ duty roster. Farmers can also borrow small equipment from the FIACs for their use. During July 2020 to June 2021 on average, 11 crop farmers visited a FIAC per day of which male 8 and female 3. It may be mentioned that due to the effect of COVID 19 number of visiting farmers came down from 15 to 11. The PIU-DoF and DLS data reveal that on an average, 11 fish and 24 livestock farmers visiting each FIAC per month. Number of visiting farmers at FIACs varies season to season.

Agricultural Innovation Fund-2 (AIF-2)

AIF-2 is a non-refundable matching grant for the CIGs, and its main objectives are to strengthen the capacity & sustainability of the CIGs, facilitate easy adoption of technologies by the CIG farmers and promote participation & strong linkage of CIGs with marketing facilities.

As of June 2021, PIU-DAE and PIU-DoF awarded 73% of their targeted number of sub-projects and utilized 67% and 55% of their funds respectively. PIU-DLS could only implement one third of their targeted number of sub-projects. Considering slow progress due to less demand for small scale farm equipment and material among the CIG members, PIU-DLS along with PMU developed Supplementary Guidelines for three thematic areas. The World Bank cleared the guidelines subject to approval of JPSC. JPSC gave approval on the Supplementary Guidelines in the 6th meeting held on 24 June 2021. PIU-DLS already circulated a notice inviting sub-project proposal from the CIGs.

Using the awarded AIF-2 matching grants CIGs under crop (PIU-DAE) component procured 1962 Power tillers- 1962, 227 Reapers, 978 Threshers, 7 Rice transplanters, 3 Combined harvesters, 631, Low Lift Pumps-631, 36 Shallow Tubwels (STWs), 527 Foot pump-527, 215 Pick-up vans; 11003 Plastic crate, 595

Seed preservation drums and other small scale machineries and utensils. AIF-2 sub-projects assessment data showed that a total of 334977 CIG & non-CIG farmers (CIG 57474) were benefited from the sub-project equipment/items

AIF-2 & 3 funds of PIU-DoF were utilized to purchase 11 to 13 categories of items. PIU-DoF conducted the study on six major categories of items procured/ and or established with AIF-2 (*transport vehicles, Fish Feed Pelleting Machine, Irrigation Pump, Nursery, Aerator, Mechanization in Cage Culture*) and AIF-3 (*transport vehicles, Fish Feed Pelleting Machine, Aerator, Ice factory, Hatchery, Magur Culture in RCC Tank*) funds

IV. Supply Chain and Marketing Development

The specific objectives of NATP-2 related to supply chain and market development are: i) establishing 30 CCMCs and 30 collection points (CPs) in 30 upazilas in clusters production areas for crops, 20 POs in 20 upazilas and 02 special POs in Mymensingh and Natore districts for fisheries, and establishing 120 POs in 60 upazilas for livestock; ii) selling of 34760 metric tons (MT) of agricultural-commodities (27360 MT for crops, 4,000 MT for fisheries, and 3,400 MT for livestock) by the end of the project through project arranged marketing facilities. All the producer organizations (172 POs) have been formed and mobilized. A total of 24631.95 metric tons of agricultural commodities, 4530 metric tons of fish, and 2927 metric tons of livestock products were sold up to June 2021 through the mobilizations of the 172 POs and 155 project supported marketing solutions (crop-60, Fishery-22, livestock-73).

Agricultural Innovation Fund (AIF-3):

NATP-2 project has a total of 698 sub-projects funding provisions under AIF-3 of which 287 for crops, 228 for fisheries and 183 for livestock components. As of June 30, 2021 the three components altogether awarded 550 sub-projects (crop-238, fisheries-208 and livestock-104) and had disbursed Tk. 251.68 million. Equipment and machineries procured with AIF-3 fund are: i) DAE- Pickup, Van, Power tiller, Plastic crate, Compost plant, Construction of shades, Weighing machine, and etc.; ii) DoF- **pick-up and motorized vans**, aerator, auto-feeder, pellet machine, floating feed making machine, irrigation pump, ice plant etc.; and iii) DLS- incubator, generator, pick-up, chopper machine, packing machine, feed mixing machine, cool van, etc.

V. Gender Integration, Environmental and Social Safeguards

Women and men have active participation in different program activities of NATP-2 including research, agricultural production, value chain development, and marketing. A total of 86 women are associated with PBRG sub-projects and or as beneficiaries of the PhD program. A total of 51 women (13%) scientists are working as Coordinator and Principal Investigator (PI) of the 51 PBRG sub-projects. Up to June 2021, in total 736 women attended the capacity building training program arranged by PIU-BARC while another 1300 women participated in the trainings organized under PBRG sub-projects.

Women participation in CIG's varied- 33.7% for crop, 35.4% for fisheries and 44.5% for livestock. Women CIG members received about 1.3 million client days training mostly on the project promoted scalable technologies. About 37% of the demonstrated technologies are received by women CIG members and 18% of the AIF-2 projects were awarded to women CIGs. NATP-2 formed 503 CIGs in 37 upazilas which includes 12,724 (1.26%) Indigenous People (IP) including 5709 ethnic women as beneficiaries.

The research sub-projects were evaluated and selected employing satisfactory compliance measures based on exclusion criteria and environmental screening matrix. The PBRG sub-projects that were

awarded, categorized into three groups based on their proposal as (i) climate-neutral; (ii) having climate co-benefits and (iii) direct climate-related. [No PBRG sub-projects required land acquisition, involuntary resettlement, encroachment of reserve forests, and use of prohibited pesticides.](#)

In total, 184 research activities addressed environmental and social safeguard issues covering biodiversity, unfavorable ecosystems, IPM, food safety, soil quality/soil health, agroforestry, integrated farming systems, methane emissions, mangrove ecosystem, Madhupur garh, roof top gardening, biofertilizer & composting, upscaling of solar pump, pesticide related health hazards & safety, upscaling of lac production, ground water, irrigation system/water use. Ninety one (91) CRG sub-projects, 49 PBRG sub-projects and 44 PhD research works addressed most of the above issues.

NATP-2 promoted sustainable production practices of crops, fisheries and livestock with environment friendly and climate smart technologies. Specific environmental and social safeguard activities performed by PIU-DAE include dissemination of climate resilient improved technologies, protecting the soil and water from pollution hazards, reduces health hazards risk both for human and animal, promotion of safe food production technology of crops, fruits, vegetables, livestock and fisheries and livelihood improvement of the crop, fisheries and livestock farmers.

PIU-DoF implements their aquaculture and open water fisheries extension activities in compliance with environmental safeguards – up to the reporting period conducted limited environmental assessments (LEA) in all 23,535 demonstration ponds and 40 beels; 1.2 million pond water sample testing for dissolved oxygen, pH and ammonia; and 290 fish feed samples testing in the equipment supplied by the project in Fish Quality Control laboratory, DoF. LEA identified 843 ponds having 8 types of potential negative impacts. As mitigation measures the pond owners were advised to adopt by good aquaculture practices to avoid the possibilities of negative impacts by raising pond dike, isolated waste disposal from the demo sites, and tested pond water quality regularly, removal of soil sediments in dry season. The mitigation measures suggested for Beels would require multi-year effort requiring substantial financial inputs.

PIU-DLS, since inception till June 2021, had arranged 54734 vaccination campaigns, 27,775 deworming campaigns and 10,639 infertility campaigns, installed 224 biogas plants, established 106 improved compost pit, 3711 cow dung pit, 4,275 slat system housing for goat rearing and 8388 fodder cultivation demonstrations.

NATP-2 is achieving **notable GHG emission reductions** compared to a situation without project of -7,058,845 tCO₂ equivalent emissions over 20 years; or -352,942 845 tCO₂ equivalent emissions annually

The project had established a multi-tier Grievance Redress Mechanism (GRM) for complaint resolutions. The complaints are mostly made in the area of demonstration, AIF-2 & AIF-3 sub-projects, membership of CIG, conflict among the CIG members, dissatisfaction about the activities of the president and secretary of the CIG and services of the extension workers. Most of the complaints are made in the form of verbal as the farmers are mostly illiterate. The issues have been solved by details discussion and explanation in a satisfactory manner.

VI. Research- Extension Linkage

NATP-2 facilitates both formal and informal mechanisms for technology transfer to the farmers. NATP-2 has an in-built committee system at different tiers consisting of officials of different extension (DAE, DoF, DLS) and research organizations. The district and upazila committees organize quarterly meetings where local research scientists are invited to inform the latest intervention of research results (variety, production technology, etc.) for field level application and collect information to generate research ideas. PMU conducts Regional Research-Extension Linkage Workshops with officials of different research & extension organizations for a) strengthening the linkage among researchers and extension officials and b) to identify scalable regional technologies through their face to face interactions.

NATP-2 promotes the use of various mobile Apps with technology information by the SAAOs, CEAL and LEAF working in NATP-2 working upazilas in the by installing those in the project provided mobile tablets while serving the farmers. In the 1621 FIAC established under the project various knowledge materials with technology information were supplied and had established seed and pest museums with latest samples from the research institutes and preserve here. SAAOs, CEAL and LEAF sitting in FIAC are using all these resource materials while serving the farmers visiting the FIAC.

During FY2020-21 major research-extension linkage activities undertaken by the four PIUs and PMU are:

PIU-BARC, through discussions selected total 24 technologies generated under CRG sub-projects for validation by the three extension PIUs and also through OFRD and farming systems research facilities of NARS institutes in collaboration with the public extension agencies (DAE, DoF & DLS). Of them 5 crop technologies were validated in 105 locations by PIU-DAE in FY2020-21. PIU-BARC also had arranged a **'Research Extension linkage and policy Development'** workshop which generated total 47 recommendations (16 for crop 16 for fishery and 15 for livestock) sub-sectors research extension linkage building.

PIU-DAE promoted 29 different technology packages among its CIGs through arranging over 1.7 lakh technology demonstrations, conducting 3780 validation trials to see the suitability and measure performances of the new varieties, arranging 1890 exposure visits and so on. Before setting up demonstration plots, PIU-DAE arranges technology training with the recipient farmers and their CIG groups where relevant expert scientists from local research stations are invited as resource speakers. Under exposure visit the CIG farmers also are taking to the local research stations to get exposed with the new crop varieties and their cultivation techniques and management practices.

As of June 2021 PIU-DAE conducted 62015 batches of farmers training, 2715 batches of CIG and non-CIG technology sharing training, 270 batches of technology training to the input-dealers, 1080 validation trials and 1350 batches of exposure visits.

PIU-DoF made a technical collaboration with the Bangladesh Fisheries Research Institute (BFRI) for supply of pure brood. Up to June 2021 BFRI supplied 16,88,608 fingerlings of Vietnamese Koi and GIFT and white pangus. BFRI is now working to further develop germplasms of four species (Vietnamese Koi and GIFT, white pangus and Kalibaus for seed multiplication. BFRI has also provided the feed formulation formula with locally available ingredients to PIU-DoF for use in the Feed Pellet Machine been supplied by PIU-DoF

PIU-DLS with the technical support from the scientists of Bangladesh Livestock Research Institute (BLRI) developed training course outlines of the newly released livestock technologies and had arranged 10 batches training for 300 DLS officers on management of newly released livestock technologies. PIU-DLS had arranged exposure visits at Bangladesh Livestock Research Institute (BLRI) for the participating farmers to observe BLRI activities directly and could make interaction with scientists of BLRI. PIU-DLS has also been validating 3 of the CRG generated technologies involving the PIs and co-PIs of those research projects, PIU-BARC and PMU

PMU as yet conducted a total of five **Regional Research-Extension Linkage workshops** and the last one was organized virtually on 31 May 2021 for Chattogram and Rangamati Regions. Over 900 participants (Barshal-100, Sylhet-150, Rajshahi and Bogra-230, Jashore and Khulna-240 and Chattogram and Rangamati-186) including regional scientists from BARI, BRRI, BINA, BLRI, BFRI, BFIRI and BWMRI, nominated district and upazila extension officers of DAE, DoF and DLS, experts of PMU and PIUs attended the workshop and identified the scalable regional technologies for dissemination/promotion to the farmers. Proceedings of the first four workshops is compiled and published and made available at www.natp2pmu.gov.bd.

VII. Project Coordination, Monitoring and Evaluation

The Project Management Unit (PMU) of NATP-2, established under the Ministry of Agriculture and headed by an Additional Secretary of the Government of Bangladesh as the Project Director, facilitates project implementation being carried out by the four implementing PIUs, consolidates annual budget and work plans of the components for approval by the Joint Project Steering Committee (JPSC), and coordinates with the development partners to secure technical backstopping and smoothen fund flow.

In FY2020-21, PMU had arranged 2 JPSC, 2 Project Implementation Committee, 11 Monthly Coordination meetings with the PIUs; trained 73 persons from DAE, DOF, BARC, BARI, BWMRI and PMU on “**Financial and Procurement Management**”; held virtually **7 regional progress review workshops with 1170 participants and 1 Regional Research-Extension Linkage workshop** with 186 participants. PMU had also produced and published the “NATP-2 Annual Progress Report for FY2019-20.

Monitoring and evaluation are integral parts of project management. As per DPP PMU is overall responsible for project’s results monitoring, while the day-to-day implementation monitoring and evaluation of CIG performances have been integrated within the decentralized project management arrangements. The PIUs have their own M&E Cells to make regular field visits to observe the implementation progress at the field levels, to review and analysis of available information and for producing various progress reports.

During FY 2020-21, the PIU M&E Cells were largely remained vigilant over telephonic contacts and made frequent field visits and conducted several small-scale studies and assessments to authenticate the field level reported results. In September 2020 the project hired TechnoVista Ltd., a software firm to design and develop an integrated web-based MIS software for inputting component specific data and maintaining the office records. In this financial year the World Bank and IFAD conducted two Implementation Support Missions virtually during 06-16 July, 2020 and 2-11 February, 2021 and considered the overall progress of the progress is satisfactory.

As of June 2021 **634851** CIG and non-CIG farmers (crop- 417550, fisheries- 63736 and livestock- 153565) adopted the project promoted scalable technologies; farm productivity gains of 12 different crops have

reached 80% to 88% of their end targets. The livestock sector also has achieved over 91% of its growth targets for dairy, 90% for beef fattening, overachieved the target for culture fish and remains on track with the targets of captured fish in beels.

VIII. Procurement, Financial Management and Audit

NATP-2 project includes in total 409 procurement packages – 209 for goods, 65 for works and 105 for services. Of them 353 packages have so far been completed by the end of June 2021 and thus achieved 86% its end targets.

During the FY2020-21, NATP-2 claimed reimbursement against IDA fund amounting to BDT 2269.09 Million through 4 (four) Withdrawal Applications (WA-20 to 23) to the World Bank and BDT 309.75 Million through 3 Withdrawal Applications to IFAD. During FY2020-21, NATP-2 project incurred expenditure BDT 22,805.31 Lakh and from inception to 30 June 2020 total expenditure incurred BDT 125,671.10 Lakh. Four IUFs are submitted in the financial year 2020-21.

NATP-2 activities were audited by representatives of C&AG (FAPAD) for FY2016-17, 2017-18, 2018-19, 2019-20 and 2020-21. PMU also appointed an internal audit firm who also completed its audit from FY2016-17 to FY2020-21.

SECTION 1: INTRODUCTION

1.1 Project Background

National Agricultural Technology Program-Phase II (NATP-2) Project is the second phase of an initially IDA-IFAD funded 15 yearlong 3-phased Program (NATP) designed to support the GOB strategy on agriculture - to improve national agricultural productivity, market linkage and farm income, with a particular focus on small, marginal and female farmers. NATP-2 was developed drawing learning from NATP-1. ***NATP-2 is an umbrella project in Agriculture Sector that supports research, extension, supply chain and marketing activities of crops, livestock and fisheries.***

The Ministry of Agriculture (MoA) and the Ministry of Fisheries and Livestock (MoFL) are jointly executing the project. NATP-2 comprised 5 inter-related components and includes a comprehensive grants program, i.e., the Agricultural Innovation Fund (AIF) with three windows (AIF-1, AIF-2, AIF-3), each addressing complementary strategic objectives pursued under NATP-2 with the implementation of a more holistic approach to agricultural technology. Component 1 is the research component being implemented by PIU-BARC; Component II, III and IV are the extension components being implemented by PIU-DAE, PIU-DoF and PIU-DLS. Component V is the project management component being implemented by the Project Management Unit (PMU) and is responsible for coordinating and facilitating the implementation of NATP-2 under the direction and supervision of the Joint Project Steering Committee (JPSC).

1.2. Objective of the project: Overall, PDO and Specific Objectives

The Project Development Objective (PDO) of NATP-2 is to increase agricultural productivity of smallholder farms and improve smallholder farmers' access to markets in selected districts.

The Specific objectives of NATP-2 are i) strengthening the capacity of the NARS and the extension services to generate and diffuse agricultural technologies, ii) increasing farm productivity and reducing post-harvest losses; and (ii) promoting sustainability of farmer groups and producer organizations mobilized and formed under the project by facilitating their linkages with markets.

1.3. Financing

NATP-2 is financed jointly by the World Bank (IDA credit), International Fund for Agricultural Development (IFAD), the United States Agency for International Development (USAID), and the Government of Bangladesh (GOB).The original and revised budget of NATP-2 in DPP and RDPP is presented in [Table-1.1](#).

Table-1.1: NATP-2 Original and Revised Budget in DPP and RDPP

Name of PIUs	GOB		RPA (IFAD, IDA, USAID)		Total	
	DPP	RDPP	DPP	RDPP	DPP	RDPP
PIU-BARC	1245	1854	39028	27492	40273	29346
PIU-DAE	3085	4176	49570	56570	52655	60746
PIU-DOF	11037	9566	27791	30260	38828	39826
PIU-DLS	10766	10563	35292	37663	46058	48226
PMU	971	581	9015	6935	9986	7516
Total NATP-2	27104	26740	160696	158920	187800	185660

Tk. in lakh

1.4. Launching of the Project and the Revision

NATP-2 was first approved by ECNEC on 12 April 2016 and the administrative order was issued by the Ministry of Agriculture (MOA) on 02 August 2016. The Financial Agreement between GOB and the World Bank was signed on 24 May 2016. IFAD signed the Financing Agreement with GOB on 06 August 2016. The World Bank declared 05 September 2016 as the loan effectiveness date of the project.

NATP-2 was designed for the period from October 2015 to September 2021. However, the project activity was officially launched on 25 May 2017 through a National Launching Workshop. Because of this delay in launching and also to respond to the Covid-19 impact, both the JPSC and the joint WB-IFAD Mission Team agreed to extend the project period till June 30, 2023. Subsequently the project team along with the World Bank Team prepared a budget reallocation plan of US\$ 13.94 million from component I (BARC) & V (PMU) to Component II, III and IV (DAE, DoF and DLS) to support the COVID-19 affected farmers with critical agricultural inputs and better access to farm machinery and also to cover the extended period operational and management costs; finalized the revised costs tables and then secured the Planning Commission approval. The Ministry of Agriculture issued the Administrative Order on the RDPP on 27 May 2021.

NATP-2 At a Glance

Project Title	: National Agricultural Technology Program-Phase II Project (NATP-2)
Development Objectives:	<ul style="list-style-type: none">• To increase agricultural productivity of smallholder farmers• To improve small holder farmers' access to market in selected districts
Sponsoring Ministry/Division:	i) Ministry of Agriculture (MOA), Lead Ministry ii) Ministry of Fisheries and Livestock (MOFL)
Components and Executing Units/Agencies:	<ol style="list-style-type: none">Enhancing Agricultural Technology Generation- being implemented by the Project Implementing Unit of Bangladesh Agricultural Research Council (PIU-BARC), MOASupporting Crop Development- being implemented by the Project Implementing Unit of Department of Agricultural Extension (PIU-DAE), MOASupporting Fisheries Development- being implemented by the Project Implementing Unit of Department of Fisheries (PIU-DOF), MOFLSupporting Livestock Development- being implemented by the Project Implementing Unit of Department of Livestock Services (PIU-DLS), MOFLProject Management- being implemented by the Project Management Unit (PMU), MOA
Implementation Period:	Original: 01 October 2015 to 30 September 2021 Revised: 01 October 2015 to 30 June 2023
Budget	DPP: 1878 Crore Taka (GOB: 271; IDA: 1607) RDPP: 1856.6 Crore Taka (GOB: 267.4; IDA: 1589.2)
Sources of Fund:	GoB, World Bank, IFAD, USAID
Beneficiaries	10 lakh
Geographical Coverage	8 Divisions, 57 Districts, 270 Upazilas

1.5 Beneficiaries Information: CIG (male, female); Non-CIG(male, female) including small, marginal farmers and household

NATP-2 directly works with over one million smallholder and marginal farmers in the 270 selected upazilas (107 upazilas covered under NATP-1, plus 163 new upazilas) of 57 districts. Of them 35% are female farmers. One CIG farmer is expected to motivate at least 1.8 non-CIG farmers to adopt the technologies promoted by the project and thus the number of total CIG and non-CIG beneficiaries may exceed 2.8 million.

1.6 Structure of the “NATP-2 Project Annual Progress Report 2020-2021”

“NATP-2 Project Annual Progress Report” presents compiled summary outputs of the project activities of the components of a year. This present report covers the progress of implementation of the project activities for the FY2020-2021. The activity-wise progress and output are described in nine sections, each containing several sub-sections on different issues.

Section 1 briefly describes the key information and contexts of the project, its PDO, geographical coverage, implementation mechanism, approval & launching, etc. to enable the readers to understand the nature, objectives and activities of the project. **Section 2** contains the report on the activities and progresses of Research Component (Component-I). This component is being implemented by PIU-BARC. Status of research sub-projects awarded under CRG and PBRG and updates of the HRD (PhD & trainings) and institutional development programs of NARIs are presented in this section. Project activities of three extension components (PIU-DAE/DoF/DLS) and their progress with implementation related issues are discussed in **Section 3**.

Sections 4–9 provide the activities and progress of the cross-cutting issues of the project. **Section 4** is on market access and supply & value chain development related activities and progress for crops, fisheries and livestock. **Section 5** gives updates on gender, environmental and social safeguard, and grievance redress mechanism (GRM). **Section 6** is on the project activities on research-extension linkage building. **Section 7** provides the activities and achievements of the Project Management Unit (PMU), which is overall responsible for NATP-2 implementation, coordination and management. Updates on two major support services –procurement and financial management & audit are given in **Section 8**. Major challenges faced and the lessons learned are documented in **Section 9**; while the composition of Joint Project Steering Committee (**JPSC**) & Project Implementation Committee (**PIC**), and Project Management Team (**PD, DPD & PIU-Directors**) are attached at the end of the report (**Annex-4**).

SECTION 2: PROGRESS OF RESEARCH COMPONENT (COMPONENT– I)

The Research Component (Component-1: Enhancing Agricultural Technology Generation) is being implemented by the Project Implementation Unit of the Bangladesh Agricultural Research Council (PIU-BARC) in association with NARS institutes and non-NARS organizations. The major objectives of this component include: i) generation of technologies/new information regarding crops, fisheries and livestock; ii) human resource development of NARS institutes through higher studies (local & foreign PhD programs), and local & foreign training programs, workshops, seminars, study visits, etc.; and iii) capacity development of all NARS institutes by improving research and training facilities.

The specific objectives of the research component are to: i) implement at least 190 Competitive Research Grant (CRG) sub-projects and 51 Program Based Research Grant (PBRG) sub-projects; ii) implement 80 local and 60 foreign PhDs; iii) provide need based short term trainings to the scientists of NARS institutes and officers of extension components; iv) improve the research and training facilities; v) build functional relationship among the NARS institutes.

2.1 The Competitive Research Grant (CRG) Sub-projects

The Competitive Research Grant (CRG) was the first research window of PIU-BARC to conduct short to medium term research programs. By September 2018, PIU-BARC completed implementation of 190 research sub-projects and their Project Completion Reports (PCRs) are now available online at <http://www.natpbarc.gov.bd/>. Research Highlights of 190 CRG sub-projects were compiled and published as a printed volume in June 2021. The technical factsheets of 69 selected technologies were developed, compiled and hosted in the website of PIU-BARC. Out of 69 identified technologies, 11 (06 for crops, 03 for livestock and 02 for fisheries) technologies were selected through discussion among PIUs (DAE, DoF & DLS) and PMU.

Titles of the selected 11 technologies are given below:

1. Tobacco replacement in char land through high value crops (ID 440)
2. Crop productivity enhancement in beel areas (ID 688)
3. Bio-organic fertilizer: A green technology to improve soil health and rice yield (ID 707)
4. Bagging technology for safe and quality mango production (ID 444)
5. Optimization of Pre Harvest Interval (PHI) of commonly used pesticides in vegetables (ID 529)
6. Introduction of high value vegetables in Sylhet region (ID 345)
7. Cost effective complete pellet feed for commercial goat and sheep production (ID 788)
8. Pro-biotic feed supplement for calves (ID 790)
9. Low-cost technology for making processed cheese (ID 661)
10. Culture of short cycle high valued fish species in the drought prone areas of Bangladesh (ID 825)
11. Mixed culture of Galda and native Cat fish in south-western coastal ghers (ID 827)

Of these 11 selected technologies, PIU-DAE set total 105 demonstrations in different locations with 5 CRG technologies in this financial year. The performances of demos are given below:

Technology-1: Bio-Organic Fertilizer: A Green Technology to Improve Soil Health and Rice Yield

DAE set 6 demos of which 3 demos in Tangail district, 2 demos in Gazipur and 1 in Manikganj District during Rabi season 2020-21. On an average yield of Demo plot is 7.47 ton/ha and control plot is 6.59 ton/ha. The result indicates that demonstration plot showed better yield and profitability over control plot. The yield of BRRidhan89 gave 11%, BRRidhan92 15% and BRRi dhan28 12% higher than control plot. Inclusion of Bio-fertilizer for cultivation of rice during Boro season increased yield which was also mentioned in technology factsheet. The profitability of BRRidhan89 is 28%, BRRidhan92 11% and BRRi dhan28 is 99% higher than control plot. From yield and profitability consideration it can be said that the extension agencies may replicate this technology for the next seasons. Before that, bio-fertilizer availability should be ensured and it would be better to do more demo in the next. The farmers should document or record the activities and input uses for demo and control plot.

Technology-2: Crop Productivity Enhancement in Beel Areas

This technology demonstrated in 45 locations of 11 District. In the beel area, the existing cropping pattern is Boro-Fallow-T-Aman. Traditionally, the farmers in the beel area did not cultivate any crop prior to Boro rice. For increasing productivity the technological approach was to cultivate BARIsarisha-14/potato before Boro rice in the beel area. The yield of mustard with and without project is 1.62 ton/ha and 1.32 ton/ha respectively. The yield of potato with and without project is 11.12 and 8.62 ton/ha. The yield of BARIsarisha and potato is 23% and 29% higher respectively than control plot. The profitability of BARIsarisha and potato is 50% and 83% higher than control plot. As both BARIsarisha-14/potato showed better yield and profitability, BARI sarisha-14 may be grown in the beel area where potato not possible.

Technology-3: Tobacco replacement in char land through high value crops

This technology demonstrated in 7 locations in 6 Districts. The researcher recommended wheat (BARI Gom-30 & BARI Gom-33), maize (BARI Hybrid Maize-9), groundnut (BARI Chinabadam-8) black cumin (BARI Kalozira-1), sweet potato (BARI Misti Alu –12), chilli (Bindu), bottle gourd (Local) may be cultivated in the charlands/tobacco plot to replace the crop with other economic crops. Average yield of Demo crops like maize, groundnut, Brinjal, sweet gourd and sweet potato is 16.02 ton/ha and control crop tobacco is 1.82 ton/ha. , On an average the demo crops yielded 8 times higher than tobacco crop. On an average, the profitability of alternative crops is 75% higher than tobacco crop. From the demo and control findings it is also found that Maize, groundnut, brinjal and sweet potato are more profitable than tobacco. These crops may be suggested for replacement of tobacco for the next seasons. This idea would be applicable in the tobacco intensive areas.

Technology-4: Optimization of pre-harvest interval of commonly used pesticides in some vegetables

The technology demonstrated in 8 locations of 5 Districts. Average yield of Demo crop is 31.93 ton/ha and control plot is 25.44 ton/ha. On an average, demo yield was 26% and profitability was 77% higher than control plot. Usually farmers used pesticides frequently to control various pests. In the study, demo plots also showed extreme reduction of cost of pesticides due to use of pheromone trap. This is due to increased knowledge of the farmers regarding need of more interval for spraying of pesticides. So, this guidelines may be continue for the next season to provide proper education to the farmers on days after spraying (DAS) for specific pesticide group.

Technology-5: Introduction of High Value Vegetables in Sylhet Region

Data of 15 demos were collected out of 39 demos. Average yield of Demo plot is 35.26 ton/ha and control plot is 28.41 ton/ha. The average yield is 24% higher than control plot. Average profitability was 108% higher than control plot. Most of the Demo vegetables yield and profitability is higher than control plot. Among this, vegetables like Tomato, Capsicum and Onion would be the promising high value vegetables in the Sylhet region. These high value vegetables may be replicated for next time in the Sylhet region.

In this FY2020-21, PIU-DLS demonstrated the technology 'Cost Effective Complete Pellet Feed for Commercial Goat and Sheep Production' in Harirampur Upazila of Manikgonj district with 2 CIG farmers and observed satisfactory progress - body weight of goat changed from 9.2 to 15.6 kg; 11.3 to 18.1 kg; 14.8 to 21.5 kg and 12.2 to 17.0 kg. If feeds are available farmer would use it. After one month of use with other feed like grasses the goat became adopted with the pellet feed.

From the list of **CRG generated technologies PIU-BARC also selected another 13 more technologies** (07 for crops, 02 for fisheries & 04 for livestock) through a review workshop held at BARC on 08 June 2021 with the participation of researchers, experts, extension officials of DAE, DLS & DoF and specialists of PIU-BARC and PMU for conducting validation trials during FY 2021-22 which are given below:

1. Mechanical Coconut De-husking Machine (ID-307)
2. Improved Sugarcane Power Crusher for Gur Production (ID-748)
3. Production and Bulb Preservation Techniques of Lilium (ID-479)
4. Non-chlorine Sanitizers for Post-harvest Washing of Betel Leaf (ID-452)
5. IPM for Quality Tea Production (ID-337)
6. Introduction of T. Aman – Potato – Jute Cropping Patterns in Enclaves of North Bengal (ID- 672)
7. Productivity Enhancement of Saline Areas through Barley, Kaon and Proso millet (ID-768)
8. Shrimp-tilapia Alternate Culture in Coastal Ghers (ID-778)
9. Nutrient Rich Live Feed (micro algae) for Larvae of Brackish Water Fish (ID-779)
10. Pro-biotic Feed Products for Poultry (ID-532)
11. Floating Bed Fodder Production in Submerged and Flooded Areas (ID-647)
12. Estrus Synchronization for An-estrus Cows (ID-313)
13. Complete Pellet Feed for Commercial Goat and Sheep Production (ID-778)

2.1.1 Monitoring Mechanism for CRG Generated Technology Demonstration

The project has developed a monitoring mechanism (steps to be followed) to assess the comparative performance (yield, profitability, etc.) of the demonstrated technologies (CRGs and others) by the extension agencies. The monitoring mechanism has been developed in close consultation with BARC, DAE, DoF, DLS and PMU. A monitoring team has been formed consisting of 10 members from PIUs (BARC, DAE, DoF and DLS) and PMU with the DPD as the chairperson. The terms of reference of the team has been indicated in the mechanism. The responsibilities of PMU and PIUs (BARC, DAE, DoF and DLS) have been fixed. The mechanism has suggested a work plan where the output will be added in the bar chart or Gantt chart to implement demonstration work. The future monitoring mechanism has been suggested.

The institutional responsibility fixed in the monitoring mechanism is presented below:

Sl.	Monitoring Aspect	Who will perform	To/For whom
1.	Provide the List of CRG generated technologies with Factsheet	BARC	PIUs, PMU, Team
2.	Orient on factsheet to the Extension agencies	BARC	PIUs, PMU, Team
3.	Establish Demo	Respective PIUs	Field office, Farmer
4.	Advice extension aspect to the farmers	Field offices	PIUs
5.	Follow up and supervision	Respective PIUs	PMU
6.	Ensure record keeping at farm level	Field office of PIUs	PIUs
7.	Prepare Team work plan for monitoring	Respective PIUs	PMU
8.	Prepare format for basic data collection (Sample	BARC/PIUs	PMU
9.	Collect basic information	Respective PIUs	PMU
12.	Determine sample size for assignment (for more than 10 demo sites)	Respective PIUs	PMU
13.	Prepare format for assignment data collection	BARC/PIUs	PMU
14.	Made Field visit by Monitoring Team		MT
15.	Collect Data	Respective PIUs	PMU
16.	Analyze Data and prepare report preparation	BARC	PMU

The monitoring team will provide required guidance and ensure timely completion of tasks.

2.2 The Program Based Research Grant (PBRG) Sub-projects

The Program Based Research Grant (PBRG) Sub-project is the second research window of PIU- BARC to promote institutional research investment including research on cross cutting issues. PBRG programs are being coordinated involving at least two research providers: coordination can be inter-institutional or it can be interdisciplinary within the institute. In total, PIU-BARC awarded 51 PBRG sub-projects which are being implemented by 34 NARS Institutes, Public Universities and other organizations.

None of the PBRG sub-project is yet been completed. However, a number of technologies have been registered /generated from successful implementation of the PBRG sub-projects. Till June 2021, PIU-BARC has received 30 Technology Factsheets on crop varieties and production/management technologies of crops, fisheries and livestock. The submitted and compiled factsheets are available at the PIU-BARC. From the on-going PBRG sub-projects 15 varieties of 7 crops have been registered through the National Seed Board (NSB) for cultivation in Bangladesh:

Banana (2 nos.):	BAU Kala-1 (Kulpat) and BAU Kala- 2 (Gerasundhuri);
Yam (5 nos.):	BAU Yam -1 (Pesta Alu), BAU Yam -2 (Mete Alu), BAU Yam -3 (Pahari Dhusor Alu), BAU Yam -4 (Chagol Dhudh Alu) and BAU Yam 5 (Mou Alu);
Aroid (4 nos.):	BAU Kachu-1 (Panchamukhi), BAU Kachu- 2 (Poidnal), BAU Ol Kachu-1 (Ol Kachu) and BAU Man Kachu- 1 (Man);
Sugarcane (1 no.):	BSRI Akh - 47 (Chewing type);
Jamun (1 no.):	BARI Jam-1;
Bullock's heart (1 no.):	BARI Ata-1.
Wood apple (1 no.):	BARI Kodbael-2;

Salient Features of these 15 varieties generated under PBRG Sub-projects are given below:

(1) BAU Kala-1 (Kulpat)

This cultivar is locally popular for its softness & sweetness and generally cultivated in southern districts. Tall yellowish green pseudostem, large dark green leaves, intermediate type male bud revolute, falling vertically, fruits are straight, rounded, bottle-necked, seedless. Yearly production 70 - 110 t/ha. Propagated by suckers. Life cycle is one year.

Planting time: September-October & February-March. **Harvesting time:** After 12-13 months of planting.



(2) BAU Kala-2 (Garasundari)

The plants are tall, strong blackish green pseudostem, leaves are dark green, ovoid type male bud revolute, falling vertically, fruits are slightly curved, slightly ridged, bottle-necked, medium size, soft, sweet cream pulp with few seeds. Yearly production: 50 - 80 t/ha. Propagated by suckers.

Planting time: September-October & February -March. **Harvesting time:** After 12-13 months of planting.



(3) BAU Yam-1 (Chupri Alu, Pesta Alu, Jum Pesta Alu, Kanta Alu, Mach Alu, etc.)

Stem is smooth, curled to the left. The leaves are relatively large and heart-shaped. Tennis ball shaped smooth bulbils are produced in leaf axils. One or two small round shape tubers are produced under the soil.

The best time for cultivation: February - May. Harvest time: October - December, when the plants are turned yellow or die back. Distance 2.5 - 3.0 m from one plant to another, seed rate: 200-250 kg/ha.



(4) BAU Yam-2 (Mete Alu , Gas Alu, Golapi Alu, Mach ranga Alu, Pan Alu, Gointa Alu, Goiza Alu, etc.)

BAU Yam-2 stems are curved and curl to the right. The petiole has wings. Both underground tuber and bulbil are produced from Mete Alu. Underground tubers are often branched in white or sometimes pink in color.

The best time for cultivation: February – May. Harvest time: October - December, when the plants are turned yellow or die back. Distance: 2.5 -3.0 m from one plant to another. Seed rate: 200-250 kg bulbil/ha. Underground tuber yield: 80-100 t/ha and bulbil yield: 5-10 t/ha.



(5) BAU Yam-3 (Pahari Duusor Alu, Lomba Alu, Pahari Alu, etc.)

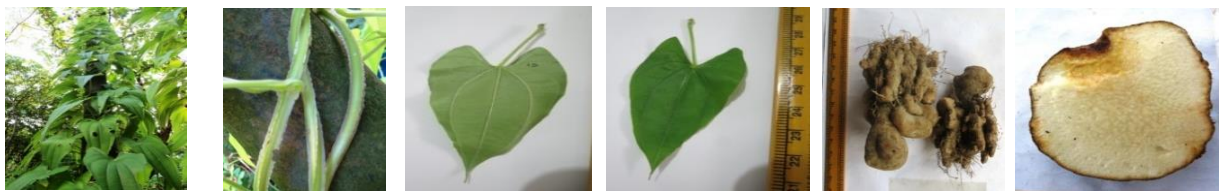
BAU Yam-3 mainly grows in Chattogram and Hill Tracts. Stems are curved to the right. Both underground tubers and bulbils are produced from Pahari Dhusor Alu. Underground tuber length: 50 -58 cm. Color of yam flesh may be yellowish or whitish in color, thin outer layer and tasty. Bulbils are mainly irregular round shape and inside color yellowish.

The best time for cultivation: February - May. Harvest time: October - December (sometimes perennial), when the plants are turned yellow or die back. During the rainy season, care should be taken not to hold water at the base of the tree. Distance: 2.5-3.0 m from one plant to another. Seed rate: 10-20 kg plant/ha. Underground tuber yield: 60-70 t/ha and bulbil yield: 3-5 t/ ha. Seed rate (bulbil): 200 -250 kg/ha.



BAU Yam-4 stems are curved and curl to the right. The petiole has green color wings. Bulbils are absent in this species. Underground tubers are often branched in white color. Flesh color white and tasty.

The best time for cultivation: February - May. Harvest time: October -December, when the plants are turned yellow or die back. Distance: 2.5-3.0 m from one plant to another. Seed rate: 200-250 kg bulbil/ha. Underground tuber yield; 80-100 t/ha.



(7) BAU Yam-5 (Mou Alu, Mom Alu, Mon Alu, Gol Alu, etc.)

BAU Yam-5 stems are usually smooth, spiny and curved to the left. No wings and bulbils are present. Height is not more than 7-10 feet of this plant. Underground tuber is produced within a cluster. Shapes of tubers are spindle or long round; flesh color is whitish and outer skin color is golden. Flesh is very soft and tasty.

The best time for cultivation: February - May. Harvest time: October - December, when the plants are turned yellow or die back. Distance: 2.5-3.0 m from one plant to another. Seed rate: 200-250 kg tuber/ha. Underground tuber yield: 80-100 t/ha.



(9) BAU Kachu-1 (Panchamukhi)

BAU Kachu-1 is mainly grown in northern and southern districts including hill districts. Plants are semi-erect in nature. Leaves are heart-shaped and sometimes peltate. The petioles are yellowish-green in colour. Tubers produce five or more eyes. Cuttings of corms are used as seed.

Cultivation: February - March. Harvest time: October - November when the plants are turned yellow or die back. Annual yield: 40-50 t/ha. Space: 60 cm x 45 cm for commercial cultivation.



(10) BAU Kachu-2 (Poidnal, Bansh Kachu, Chinn Kachu, Garo Kachu, etc.)

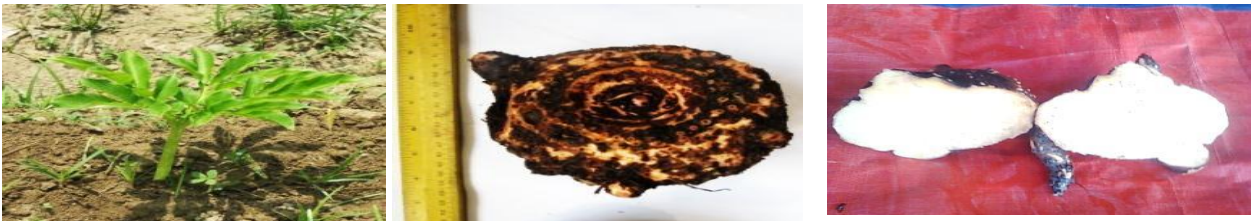
BAU Kachu-2 is mainly concentrated in Madhupur, Gazipur and Chattogram and Chattogram Hill Tracts due to the requirement of high land. The petiole of this crop is tall and tan in colour. Leaves are heart-shaped and deep green in colour. Plants produce cylindrical/ elongated corm and cormels. Cuttings of cormel and apical portion of corm with 2 or more eyes are used as seed.



Best time for cultivation: February - March. Harvest time: November -December when the plants turn yellow or die. Annual yield: 35-50 t/ha. Palatable and good in taste.

(11) BAU OI Kachu-1 (OI Kachu)

BAU OI Kachu-1 is concentrated in Pabna, Sathkhira, Khulna, Madhupur Sylhet, Chattogram and Chattogram Hill Tracts; **Best time for cultivation:** March - April. Harvest time: November - December when the plants turn into yellow or die back.



(12) BAU Man Kachu-1 (Man Kachu, Mugur Kachu)

BAU Man Kachu-1 is mainly concentrated in southern districts i.e. Jessore, Khulna, Bagerhat, Sathkhira, Barishal and Patuakhali but it can be grown all over Bangladesh.



Man kachu is important for its nutritional characteristics along with traditional medicinal values like anti-fungal, anti-bacterial, anti-rheumatism, anti-cancer, anti-inflammatory, etc.

(13) BSRI Akh 47



Chewing type, early maturing (9 -10 months) & high yielding (183 t/ha), number of chewable cane ($98 \times 10^3 \text{ ha}^{-1}$). Tall, erect, medium thick and non-lodging, very soft having only 11.69% fibre, sugar content: 11.5% and reducing sugar: 0.99% and also non-flowering.

Planting time: October-November, seed requirement: Conventional method: 6-7 t/ha, STP (spaced transplanting) method: 2.0 -2.5 t/ha. Harvesting time: September when the internode becomes long, hard and greenish yellow in colour, and yield: 234 t/ha. Suitable for cultivation throughout the country, upland ecosystem with irrigation and drainage facility. One can earn a net income Tk. 7-15 lakh/ha annually.

(14) BARI Jam-1



BARI Jam-1 is regular bearer and high yielding variety, fruits are bigger in size and individual fruit weight is 9.8 g, very sweet (TSS:14.3%) and edible portion is more than 83%.

Planting material: Propagules (cleft/veneer grated), planting time: June to August and harvesting period is late June to late July. Ripe fruits are full in size and purple to black in colour, fruit yield (6 years) is 58.7 kg/plant and number of fruits per plant is 6670. It can be cultivated in all

the Agro Ecological Zones (AEZs) of the country.

(15) BARI Ata-1



BARI Ata-1 has been released as first registered variety of bullock's heart for cultivation in Bangladesh. It is regular bearer and high yielding variety, fruits are comparatively bigger (fruit weight: 261 g), edible portion is 72% and very sweet in taste (TSS 26%).

Planting material: Propagule (cleft), planting time: June to August, harvesting period is early March to mid May when the fruits are full in size and pale to reddish yellow in colour and fruit yield (8 years) 84 kg/plant and number of fruits per plant is 322.

It can be grown in all the Agro Ecological Zones (AEZs) of Bangladesh.

(16) BARI Kodbael-2



BARI Kodbael-2 as an off season variety Regular bearer and high yielding variety. Availability of fruits in the off season (February to May), which is a unique character and fruits are bigger in size and average individual fruit weight is 455g.

Planting material: Propagule (cleft), planting time: June to August. Harvesting period is early February to May when the fruits skin turns gray and dirty and fruit stalk become loose. Average fruit yield per plant (10 years) is 80 kg and average number of fruit is 176.

It can be cultivated in all the Agro Ecological Zones (AEZs) of Bangladesh.

In addition to varieties, 15 production/machinery technologies also been developed through PBRG sub-projects and the list is given below:

1. Self-propelled Drum Type Carrot Washing Machine
2. Low-cost Vacuum Frying Machine for Chips Production
3. Integrated Management of Gummosis Disease of Bael
4. Bio-rational Management Approach Against Fruit Borer in Wood Apple
5. Integrated Crop Management of Coconut (Application of Fertilizer, Rugose Spiraling Whitefly and Gray Leaf Spot and Bud Rot Disease)
6. Three Crop Based Cropping Pattern Radish-Carrot- Groundnut in Padma Char Region;
7. Mustard-Mungbean-T.Aus-Blackgram: An Improved Cropping Pattern for High Land in Madhupur Tract Soil
8. Integrated Rice-Fish-Vegetables Culture/Cultivation in Gher
9. Farming of Gulsatengra in Floating Cages in the Running Waters
10. Brood Stock of Mud Crab under Captive Conditions for Sustainable Hatchery Operation
11. Carp Fattening Technology in Ponds under Coastal Regions of Bangladesh
12. Native Sheep Rearing in Charland Area
13. Integrated Management of Gummosis Disease of Golden Apple
14. Profitable Cropping Pattern: Mustard (Binasarisha-9)- Boro (Binadhan- 10)- T. Aman (Binadhan- 17) Rice Suitable for Saline Areas
15. Good Aquaculture Practice Based Carp Fattening in Pond

From the findings of the sub-projects the Principal Investigators published **33 scientific articles** in different national and international journals (details of the articles published are given in **Annex 1**).

Because of COVID-19 some PBRG sub-projects requested for time extension to complete their field and laboratory research activities. Subsequently the Executive Council of BARC has approved the time extension plan of PBRG sub-projects up to December 2022 for successful completion of the sub-projects activities. As per the approved time extension plan 12 sub-projects will be completed by December 2021, 28 sub-projects will be completed by June 2022 and 11 will be completed by December 2022.

2.3 Higher Studies (PhD Programs)

PIU-BARC has been implementing the PhD program since February 2018 and awarded 140 PhDs (60 foreign and 80 local) to the selected candidates (118- scientists from NARS institutes, 10 from DAE, 5 from DLS 05 from DoF 05 and 02 from Ministry of Agriculture).

Of the 80 local PhD programs, 60 were from NARS and 20 of mid-level extension personnel of DAE (10), DLS (05) and DoF (05). The awardees are distributed in 28 disciplines in case of in-country PhD. Most of the in-country PhD program is continuing at BAU.

Out of 60 foreign PhD programs, 10 scholars admitted in developed countries (USA, Germany, UK, Australia, and Japan) while 50 scholars admitted in developing countries (Malaysia, the Philippines, Thailand, China and India). The highest awardees are under breeding followed by soil science, agronomy, plant pathology and fisheries. The PhD scholars are continuing their courses and researches in 10 different countries, maximum in Malaysia followed by the Philippines and Thailand.

BARI as the largest national agricultural research institute shared the highest number of in-country (26%) and foreign (32%) PhDs followed by BRRI (in-country, 8% and foreign 17%) PhD program. Of the awardees, the highest scholars are under agronomy discipline followed by soil science and breeding.

Due to selection process, time variation in admission of different universities and also the COVID-19 impact, most of the PhD scholars (both foreign and local) will require time extension beyond the initial project period, i.e., September 2021 to complete their PhD program. This has also come up from an online survey conducted by PIU-BARC in May 2020. The survey revealed that because of COVID-19 restrictions all academic, field and lab research activities are stopped in the universities both home and abroad; survey type researches hampered due to restriction on public movement; and some of the research samples damaged due to lack of proper management. Considering all these PIU-BARC made a detail assessment, prepared and got endorsed by the BARC Executive Council for a maximum of six months' time extension for both in-country and foreign PhD scholars, where necessary.



PIU- BARC team frequently meets the PhD scholars virtually via Zoom, messenger call or phone call to monitor the PhD activities. During monitoring, PIU-BARC involved the institute heads, divisional heads, supervisors, Member Directors of BARC, PMU representatives and the team of PIU-BARC. PIU-BARC also monitors the PhD activities physically.

Publication of PhD research work: Seventeen foreign scholars have already published 26 scientific research papers. Besides, four in-country PhD scholars have published five papers in reputed journals (List of scholars with research article and journal name/link and impact factor are showed in Annex-2).

Electronic media broadcasted the PhD research activities on Colour potato and Dragon fruit cultivation in TV program, BTV (Mati o Manush) and RTV (Krishi o Krishti)



Vaccine development from PhD research: One PhD scholar in Malaysia Mr. Md. Shirajum Monir, Senior Scientific Officer, Bangladesh Fisheries Research Institute conducted his PhD research on Development and Evaluation of Feed-based Divalent Vaccine against Streptococcosis and MAS like diseases in Red Hybrid Tilapia (Nile tilapia, *Oreochromis niloticus* × Mozambique tilapia, *O. mossambique*) and finally developed a very effective oral base vaccine. Oral base vaccine for marine fish got the patents from the Patents Registration Office, Malaysia. Another patent titled Oral base vaccine for Tilapia is under process. Electronic media broadcasted the PhD research activities on Color potato and Dragon fruit cultivation in TV program, BTV (Mati o Manush) and RTV (Krishi o Krishti). As of now, 14 scholars both in foreign and in-country reported that they were infected by COVID-19.

2.4 Status of Training and Workshop

During the reporting period PIU-BARC conducted 13 batches of local training, both physical and virtual, with 2-9 days duration. In total, 496 participants attended the training courses. Training topics included E- Filing, Research Methodology, ToT Training on Transferable Matured Technology on Spices Crop Production, Monitoring and Evaluation in project Management, Modern Farm Machinery for Ensuring Food Security, Agronomic Research to Address Unfavorable Ecosystem, Climate Smart Agriculture, Excel Based Data Analysis for Early Career Scientist, Excel Based Data Analysis for Early Career Scientist, Climate Change Carbon Sequestration and Adaptation Strategies, Project Development and Management, Awareness Training on Nutrition and Food safety and Scientific Report Writing.

PIU-BARC also conducted 11 daylong national workshops with 847 total participants during FY2020-21, of which six were on annual progress review of PBRG sub-projects and five on different need based issues. Except one all other workshops are conducted by physically. The venues of the workshops were either at BARC auditorium or BARC conference room (Table-2.1).

Table-2.1: National training conducted by PIU-BARC in FY 2020-21

Sl	Name of training	Held on	Venue	Level of scientist	No of participant	Client-days
1	E- Filing	9-10 Oct, 20	BARC	All	18	36
2	Research Methodology	3-14 Dec, 20	BARI	Junior	30	360
3	ToT Training on Transferable Matured Technology on Spices Crop Production	27-29 Dec,20	BARC	Mid	30	90
4	Monitoring and Evaluation in project Management	24-28Jan, 21	BARC	Mid	29	145
5	Modern Farm Machinery for Ensuring Food Security	26-28Feb, 21	BARC	Mid	30	90
6	Agronomic Research to Address Unfavorable Ecosystem	24-26Feb, 21	BARI	Junior	30	90
7	Climate Smart Agriculture	24-25Mar, 21	BARC	Junior	40	80
8	Excel Based Data Analysis for Early Career Scientist	7-12 Mar, 21	BARC	Junior	31	93
9	Excel Based Data Analysis for Early Career Scientist	7-12 Mar, 21	BARC	Junior	31	93
10	Climate Change Carbon Sequestration and Adaptation Strategies	22 -24Jun 21	Online	All	40	120
11	Project Development and Management	3-8 Apr 21	BARC	Mid	32	160
12	Awareness Training on Nutrition and Food safety	22 May 21	Online	All	125	125
13	Scientific Report Writing	13-17Jun, 21	Online	Junior	30	150
Total					496	1632

SECTION 3: PROGRESS OF THREE EXTENSION COMPONENTS (COMPONENTS- II, III & IV)

Components II, III and IV of NATP-2 are to support crops, fisheries and livestock sub-sector development and are being implemented by the Project Implementing Units of Department of Agricultural Extension (PIU-DAE), Department of Fisheries (PIU-DoF) and Department of Livestock Services (PIU-DLS), respectively. The aims of the components are to increasing farm yields, diversifying production, and improving market linkages for smallholder farmers by promoting an integrated approach and through transfer of improved technologies as well as better access to market opportunities.

These three extension components have interventions in 270 upazilas of 57 districts (include 107 upazilas covered under NATP-1, plus 163 new upazilas) covering all major agro-ecological zones including the drought-prone areas in the North-West (dry Barind Tract), salt-affected tidal surge areas in the South, flash-flood prone areas in the North and North-East and the Hill Tracts.

Focuses of the Components

Component II: Crop Sector development

- a) Improving the outreach and quality of extension and advisory services by strengthening the skills of public extension workers from DAE, promoting ICT in agricultural extension services, and supporting farmer-to-farmer extension;
- b) Developing farmers' skills to scale-up the dissemination of scalable technologies and Good Agricultural Practices including those developed under NATP-1, as well as in identifying technologies for a sustainable production of safer food;
- c) Promoting farm and off-farm mechanization to increase efficiency in crop handling, reduce post-harvest losses and support processing;
- d) Facilitating stronger collaboration with the private sector for agri-business development on agro-processing, market access for smallholders, as well as for the establishment of machinery hire-services; and
- e) Strengthening institutions involved in the crop sub-sector through capacity development and selected investments in infrastructure and capacity development of CIGs and rural entrepreneurs through AIF2 & AIF-3 matching grants respectively.

Component III: Fishery Sector development

- a) Promoting specific fish production models involving improved fish varieties,
- b) Producing better quality fish seeds;
- c) Introducing appropriate fish feed;
- d) Applying relevant fisheries management tools;
- e) Restoration of aquatic habitat; and
- f) Creating more suitable market linkages for better access to markets and improved realization of value for the product.

Component IV: Livestock Sector development

- a) Strengthening livestock institutions (including food and feed safety and quality, animal health);
- b) Improving livestock extension services, and reinforcing the linkages between research, extension and livestock farmers;
- c) Scaling up outreach programs to reach out to a larger number of farmers; and
- d) Facilitating the participation of smallholder farmers in selected livestock markets.

The project is financing activities related to Mobilization of Common Interest Groups (CIGs) of farmers, Decentralized extension services by government frontline extension agents i.e., SAAOs for crops and Community Extension Agents for Livestock (CEAL) and Local Extension Agents for Fisheries (LEAF) and through FIAC, Technology dissemination through establishing field demonstrations, field days and exposure visits, Training to extension agents and farmers, enhancing institutional efficiency of the national agencies involved in agricultural extension, and facilitating market access to farmers.

3.1. CIG Information: (Number, registration, performance evaluation)

The activities of three extension components started with the mobilization of farmers through formation of Common Interest Groups (CIGs) in the targeted upazilas of selected districts. A Common Interest Group (CIG) is an association of 20 or 30 farmers (crop and livestock -30, fishery – 20) having common interests in one major agricultural activity; coming from the same socio-economic status; and living preferably in one village or sub-village (para). In one union a total of 15 CIGs are formed – 10 for crops, 3 for livestock and 2 for fisheries. CIGs for crops are usually established in all unions of the targeted upazilas, while the fishery and livestock group formation was dependent upon the availability of ponds, and/or potentiality and willingness of farmers to grow cattle, goat and or poultry. The other important considerations for farmers identification and their mobilization were: (i) their interest in adoption of new/improved technologies, (ii) willingness to make available suitable plots, ponds, etc., for demonstrations setup, (iii) their commitment to assist in spill over technologies to the non-CIG farmers, (iv) interest to produce market oriented high value commodities, and (v) agreement to include at least 35% women farmers, especially in the new CIGs and also focusing on small and marginal farmers.

At the very start of NATP-2 in 2017, PIUs completed reformation of CIGs in the old 107 NATP-1 upazilas and formation of new CIGs in 163 extended upazilas for NATP-2. In total, PIUs mobilized over one million farmers of which over 35% farmers are women (Fig.3.1). In case of farming category, 41% are landless, 34% marginal, 18% small, 6% medium and 1.5% are large farmers.

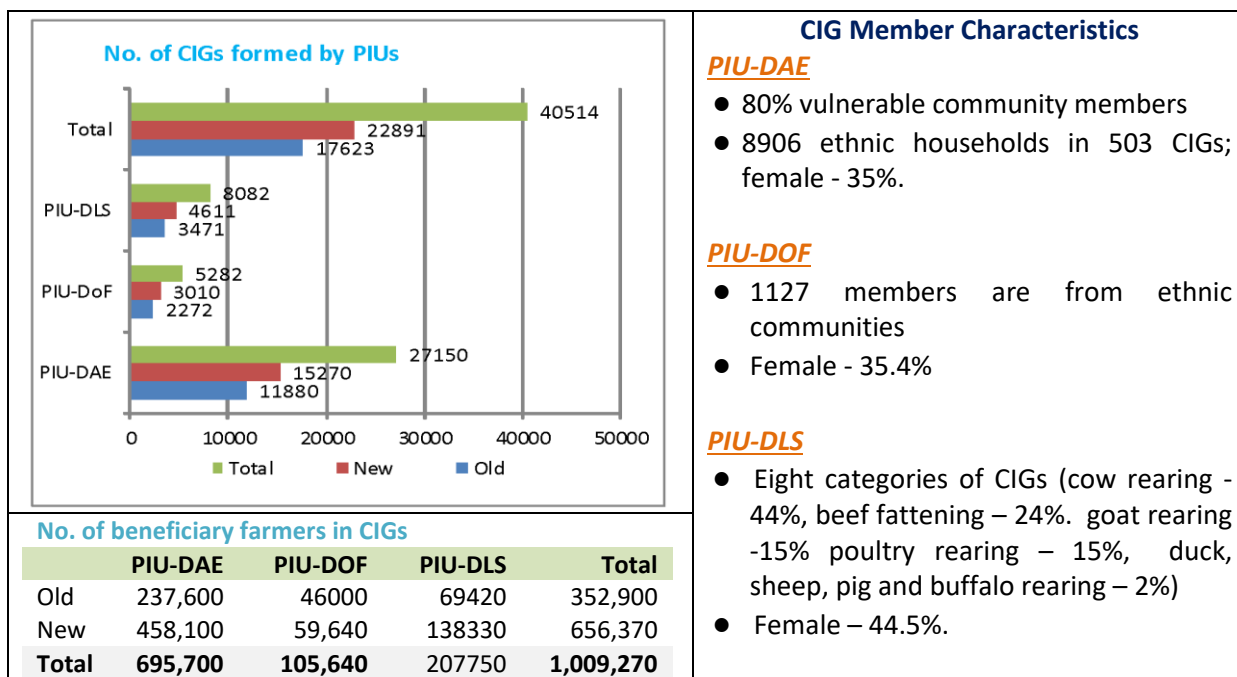


Fig. 3.1: Details of CIGs formed by the PIUs- DAE, DoF and DLS

CIGs are working as vehicle for knowledge and skill development, technology dissemination as well as enhancing production at the village level.

CIG-Registration: CIG Registration with the Department of Cooperatives, as an important milestone, the project has been undertaking since NATP-1 with a view to authenticate their formation and functioning, as well as making them officially legal. It has also been set as one of the major eligibility criteria for CIGs to apply for AIF-2& AIF-3 matching grants of the project. By end June 2021, 100% CIGs of PIU-DoF and 88% of PIU-DLS and 84% of PIU-DAE got registered with the Department of Cooperatives wherein the Upazila Extension Offices of DAE, DOF and DLS provided necessary supports and assistance for preparation of application and related documents([Table-3.1](#)).

Table-3.1: CIG Registration Trends by PIUs (%)

CIG Registration	PIU-DAE	PIU-DoF	PIU-DLS
2017-18	26	42	27
2018-19	62	92	61
2019-20	79	97	80
2020-21	84	100	88

CIG performance evaluation by the field offices:

During June of every year the field staff of the three PIUs conduct CIG performance assessments in all CIGs (PIU-DAE conducts the assessment twice in June and December) using a 16-indicator based tool named “Balance Score card” in order to make necessary adjustments in extension service deliveries. Through these reviews CIGs are categorized as Grade A (very good) when the achieved score becomes 4.0, Grade B (Good) when score becomes 3.00-3.99, Grade C (Average) when grade becomes 2.0-2.99 and Grade C (Poor) when score becomes <2 out of 4.0 scale.

Results of CIG performance evaluation of the last four consecutive years are given in [Table-3.2](#) below which reveal a gradual and significant progression of CIGs from Grade “C” to “B” and “A”.

Table-3.2: Results of PIU-wise CIG performance evaluation using balance score card (%)

CIG Category	PIU-DAE				PIU-DOF				PIU-DLS			
	2017-18	2018-19	2019-20	2020-21	2017-18	2018-19	2019-20	2020-21	2017-18	2018-19	2019-20	2020-21
GRADE A	16.5	41	45	58	4.8	28.5	55.4	55.4	3.4	6.3	14.8	31.4
GRADE B	63.5	59	49	35.5	64.2	60	43.3	43.3	40.1	55.2	61.4	57.2
GRADE C	20	0	5	6	29.1	11.5	1.3	1.2	50.1	35.7	22.1	10.9
GRADE D	0	0	1	0.5	1.9	0	0	0	6.5	2.8	1.7	0.5

Balance Score Card based CIG Performance Assessment Results Analysis

Balance Scorecard (BSC) is a 16-indicator based CIG performance scoresheet been used by the extension PIUs in last four years. Q12-Q16 are the five outcome indicators included in the tool to assess their extent of technology adoption of the project promoted technologies by both the CIGs and non-CIGs, extent of their productivity increase; the group cohesion towards joint marketing and also the group compliance on safeguard issues. PMU customized this BSC form in the online KOBO Toolbox in November-December 2020 and requested the PIUs to fill-out the form and submit it online. As of July 15, 2021 total 36,514 forms were duly filled in by the SAAOs, LEAFs and CEALs which were endorsed and submitted by the upazila offices of DAE, DoF and DLS.

Summary results of the received forms including the five outcome indicators by the three PIUs and the old and new upazilas are given below. The results show higher rates of adoption by the CIG and non-CIG farmers in old upazilas and among the fish and livestock farmers. The productivity increase also found highest for fish and livestock technologies which are expected. Most of the groups are aware of the environmental safeguard issues are being practiced in their own farms.

Balance Scorecard Based CIG Performance Evaluation Results (4 outcome indicators) of PIU-DAE, PIU-DoF and PIU-DLS											
Indicators	Sub-indicators	NEW (30 member)		Old (20 member)		Total		DoF (20 member)			
		DAE	DLS	DAE	DLS	DAE	DLS	New	Old	Total	
Q12. CIG farmers adopted the demonstrated technologies	6 - 8 (Member)	4.0%	4.5%	2 - 4 (Member)	2.0%	2.1%	3.1%	3.4%	0.3%	0.4%	0.3%
	9 - 11 (Member)	11.4%	17.6%	5 - 7 (Member)	8.9%	13.6%	10.3%	15.8%	5.0%	3.5%	4.4%
	12 - 17 (Member)	26.8%	31.3%	8 - 11 (Member)	20.7%	34.1%	24.0%	32.6%	17.4%	15.3%	16.5%
	18 and above	57.8%	46.6%	12 and above	68.3%	50.2%	62.6%	48.2%	77.3%	80.8%	78.8%
	Total	100.0%	100.0%	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Q13. Non CIG farmers adopted the demonstrated technologies	Up to 20	8.7%	10.8%	Up to 15	6.6%	8.5%	7.8%	9.8%	5.0%	3.8%	4.5%
	21 - 30 (Member)	19.4%	21.4%	16 - 25 (Member)	14.1%	23.7%	17.0%	22.4%	10.4%	9.0%	9.8%
	31 - 40 (Member)	23.2%	34.9%	26 - 30 (Member)	18.1%	30.8%	20.9%	33.1%	19.2%	17.7%	18.6%
	41 and above	48.7%	32.9%	> 30 (Member)	61.2%	37.1%	54.4%	34.8%	65.4%	69.5%	67.1%
	Total	100.0%	100.0%	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Q14. Increased production in the CIG over baseline	Up to 2%	6.6%	3.6%	Up to 2%	6.0%	3.8%	6.3%	3.7%	1.1%	0.8%	1.0%
	3% - 5%	21.9%	33.4%	3% - 5%	15.3%	27.0%	18.9%	30.6%	8.6%	5.5%	7.3%
	6% - 8%	24.3%	35.0%	6% - 8%	18.9%	36.6%	21.8%	35.7%	20.3%	20.3%	20.3%
	9% and above	47.2%	28.0%	Above 8%	59.8%	32.7%	52.9%	30.1%	70.0%	73.4%	71.4%
	Total	100.0%	100.0%	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Q15. Group marketing implemented	NO	44.1%	65.4%	NO	35.3%	67.5%	40.1%	66.3%	17.4%	14.8%	16.3%
	YES	55.9%	34.6%	YES	64.7%	32.5%	59.9%	33.7%	82.6%	85.2%	83.7%
	Total	100.0%	100.0%	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Q16. Aware of Social /Environmental issues & addressed in production process	NO	4.1%	9.5%	NO	4.9%	6.0%	4.5%	8.0%	1.8%	2.4%	2.1%
	YES	95.9%	90.5%	YES	95.1%	94.0%	95.5%	92.0%	98.2%	97.6%	97.9%
	Total	100.0%	100.0%	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
CIG Categories	A Category	31.4%	12.7%		46.4%	13.8%	38.3%	13.2%	53.4%	53.1%	53.3%
	B Category	61.0%	76.0%		48.4%	76.4%	55.2%	76.1%	45.5%	45.2%	45.4%
	C Category	7.3%	11.2%		4.6%	9.7%	6.0%	10.6%	1.2%	1.6%	1.4%
	D Category	0.4%	0.1%		0.7%	0.0%	0.5%	0.1%	0.0%	0.1%	0.0%
Total No. of CIGs assessed		13456	3514		11515	2773	24971	6287	3041	2215	5256

3.2. Preparation of Micro/extension plans: Number of Micro/extension plans prepared

Every year, during April-May, the CIGs members prepare their own bottom up demand-led Extension Micro Plans for their next year extension activities and the results are on track (89% of RDPP have already achieved). At union level, CIG Micro plans are consolidated into Union Extension Micro plans for Crop, Livestock and Fisheries components and Union Extension Micro plans are consolidated in Upazila Extension Plans at upazila level. The prepared Upazila Extension Plans sent to District Extension Coordination Committee (DECC) for review and comments. Finally Upazila Extension Coordination Committee (UECC) approves the Upazila Extension Plans incorporating comments and suggestions made by DECC and submit to respective PIUs for fund allocation. The extension problems and issues identified in micro plans are given as below:

Crop: Yield performance of rice, wheat & mustard are not satisfactory, inadequate knowledge about safe vegetable production, knowledge gap about new varieties of Boro, T. aman rice, wheat & mustard and unavailability of new variety seeds of modern variety, degradation of soil health, infestation of pests & diseases, limited knowledge about HVC crops and their cultivation procedure, inadequate market facilities and low prices of commodities etc.

Fisheries: scarcity of quality fingerling, feed ingredients, high price of feed, scarcity of ice and nets, getting fair price of fish, undeveloped transportation system, lack of knowledge of disease and drying of ponds.

Livestock: Lack of knowledge on improved management practices of livestock rearing, Zoonotic/ Infectious Disease i.e. FMD, LSD, PPR, ND etc., Parasitic infestation, High price of livestock feed and other inputs, Low price of livestock products, Scarcity of green fodder/grass Lack of capital etc.

3.3. Farmers' training: Client days both of male and female

To disseminate the project promoted agricultural technologies and make the CIGs operational and skilled, technology and motivational trainings are being provided to CIG members. As on July 2021, the three PIUs together imparted 3.88 million client days training to the CIG members and other stakeholders and thus completed **97% of the total revised target of 3.98 million client days**. PIU-DLS completed 100%, DoF-97.21% and DAE-96.63% (Table-3.3).

Table-3.3: CIG farmers, CIG leaders and CIG & non-CIG farmers' technology sharing trainings by PIUs (client-days)

PIU	FY 2020-21		Project Cumulative Till June 2021		
	Target	Progress	RDPP Target	Progress	Remarks
PIU-DAE	272340	272340	2472330	2389020	achieved-96.63%; female-35%
PIU-DOF	45870	45870	684585	665545	achieved-97.21%; female-35%
PIU-DLS	108766	108766	828000	828306	achieved-100%; female-44%
Total	426976	426976	3984915	3882871	achieved-97.43%

The trainees included CIG & non-CIG farmers, CIG leaders, POs, agro-input dealers & traders, officers/staff of implementing units, and field extension workers. The major training topics were production technologies, post-harvest management, leadership capacity building, operation and management of CIG, procurement and other cross cutting issues including financial management.

To make the training modules and knowledge & resource materials available online, **PMU hired Pridesys Ltd.**, a software firm to design and develop a Knowledge and Learning Platform.

Assessment of Effectiveness of Farmers Training on Management of Improved Livestock Technology for Enhancing Knowledge and Skill of CIG Farmers as well as Increasing Livestock Productivity

PIU-DLS conducted this assessment by engaging MIDAS, with the objectives to know to what extent the knowledge and skill increased, extent of utilization of training knowledge, impact on increasing productivity and recommendation for improvement in future an agency having long experiences of conducting such assessment. The assessment was conducted on the major 4 of the total 8 volumes of technology training offered by PIU-DLS to their CIG farmers. The four volumes of training considered for the assessments are (1) Improved feeding and rearing practices of cow; (2) Beef fattening using UMS technology; (3) Improved feeding and rearing practices of goat; and (4) Improved management and rearing practices of poultry. The assessment was conducted using a mix method – questionnaire survey on 1200 farmer trainees covering 24 upazilas of 8 divisions, 24 KII with the selected Upazila Livestock Officers, and 8 FGDs with the farmers groups of 8 divisions. Major areas covered by the study are: focuses of the training courses, fulfillment of technological needs of CIG farmers, use of appropriate resource person, convenience of training venue, use of training tools, increased knowledge and skills of CIG farmers, utilization of training knowledge, adoption of new technology, impact on production etc. The study also identified problems of training programs and suggested the way to overcome those problems. Summary findings are as below:

- ✚ 62% reported that the training 'Fully Met' their needs, 68% found the sessions participatory and 32% reported as 'Very much participatory; 59% ranked resource Person's delivery as 'Very good; overall Organization and Management of the course was found 'Satisfactory' by 77% and 53% were 'Not satisfied' with the amount of training allowance.
- ✚ 99% respondents stated that they acquired new knowledge/skills such as, housing/shed management, feeding management, and health management of the animals etc and 95% were applying those knowledge in their own farm, such as shed management; maintenance of health/hygiene, feed and nutrition management etc.
- ✚ Production of meat, milk and egg also recorded substantial increase from 2017 to 2020 - milk 23%, meat 24% and egg (Sonali) 16%

3.4. Dissemination & Diffusion of Technologies

In NATP-2, technology demonstrations are given topmost importance to quickly disseminate the newly released/improved technologies generated by the research Institutes at farm levels for their wide scale adoption by CIG and non-CIG farmers and thus achieving the production and productivity targets of the project.

From 2017 till June 2021 the three PIUs together implemented total 187564 technology demonstrations, i.e., 77% of total RDPP target (Table-3.4).

Table 3.4. Technology/Cluster demonstration by PIUs

	RDPP Target	Up to June 2021 Achievements	%
PIU-DAE	173349	135024	78%
PIU-DoF	32602	23535	72%
PIU-DLS	37501	29005	77%
Total	243452	187564	77%

3.4.1 Crop Sector Technology Demonstration

PIU-DAE established as many as 135024 (78% of RDPP target) demonstrations of 29 Productivity Enhancing, Climate Smart and eco-friendly Agricultural Technologies. The technology list with number of demonstrations implemented, number of total and female farmers received the demonstrations and their percentage of adoption are given in Table-3.5.

Table-3.5: Progress of PIU-DAE Technology Demonstrations and Adoptions

Broad areas	Demonstration type	Up to June 2020	FY 2020-21	Up to June 2021	Participants		Adopted demo farmer (%)
					Total	Female	
Productivity Enhancing Technologies	1 Yield Gap Minimization of Rice, Wheat, Lentil, Maize & Mustard	21234	1579	21611	21611	36%	91%
	2 Short duration varieties of Rice	411	0	411	411	37%	90%
	3 New varietal technology of Rice, Wheat & Lentil	1818	0	1818	1818	40%	88%
	4 Production and preservation of quality seeds of Rice, Wheat, Mustard & Lentil	3217	0	3217	3217	39%	81%
	5 Production technologies Summer Tomato	3682	253	3682	3682	35%	82%
	6 Production technologies of High Value Crops	5625	1313	6288	9970	35%	89%
	7 Production technologies of Spices Crops	2961	532	3119	3365	36%	87%
	8 Production technologies of off-seasonal Crops	492	0	492	492	40%	90%
	9 Production technologies of Colcasia	576	0	576	576	21%	100%
	10 Production technologies of vegs in Floating Bed	789	0	789	789	38%	91%
	11 Production technologies of Mushroom	65	0	65	65	40%	98%
	12 Homestead Gardening	2287	0	2287	2287	38%	98%
	13 Establishment and Management of Fruit Orchards	9365	0	9365	9365	36%	81%
	14 Community Seed Production (Quality seeds)	36281	2609	37290	37290	36%	89%
Climate Smart Agricultural Technologies	15 Flood & Saline tolerant varieties of T. aman Rice	1498	0	1498	1498	36%	55%
	16 Blast & Heat tolerant varieties of Wheat	2021	0	2021	2134	37%	92%
	17 Drought tolerant varieties of rice	99	0	99	99	40%	93%
	18 Zero Tillage cultivation of Garlic & Mustard	1729	258	1729	1729	57%	96%

Broad areas	Demonstration type	Up to June 2020	FY 2020- 21	Up to June 2021	Participants		Adopted demo farmer (%)
					Total	Female	
	19 Technology of Raising Boro Rice seedlings in Dry Seed Bed	18	0	18	18	39%	89%
	20 Climate Change Adaptation: Production of vegetables in Gher ail	102	0	102	102	35%	56%
Eco-friendly Agricultural Technologies	21 Pest Management using Sex Pheromone Trap	12340	761	12340	17178	39%	75%
	22 IPM in brinjal & bean	432	0	432	432	41%	88%
	23 Bagging Technology in production of Fruits	582	0	582	582	37%	94%
	24 Irrigation water-saving technology using AWD	722	0	722	722	38%	89%
	25 Good Agricultural Practices (GAP)	338	0	338	338	40%	91%
	26 Production technologies of FYM and Quick Compost	4432	0	4432	4432	36%	90%
	27 Production technologies of Vermi-compost & Tricho-compost	18683	1670	19224	19324	28%	88%
	28 Stress Tolerant crop variety	259	372	372	372	35%	81%
	29 CRG sub-project technologies	84	105	105	105	14%	
Total		132142	9452	135024			
		RDPP	Target: 173349				

It is seen from the table that community seed production, yield gap minimization (21611) and production of Vermi & tricho-compost are the three technologies with highest number of demonstrations established so far. In most cases over 80% of the CIG farmers who received the demo have adopted those technologies in their own farm.

Details of the Technologies demonstrated in FY2020-21 and their yield performances in demonstrations and farmers' practice fields are given below:

3.4.1.1 Productivity Enhancing Technologies

3.4.1.1.1 Yield Gap Minimization (YGM)

It is seen that yield of different crops in research stations is distinctly higher than the farmers' fields due to controlled production practices and environment. This yield gap is related to knowledge gap of the farmers in using the improved/new variety quality seeds and improved management of production technologies. To minimize the knowledge and yield gaps for rice, wheat, lentil, maize and mustard, PIU-DAE established a total of 21611 demonstrations on improved technology till June 2021. Crop-wise progress of establishing demonstrations and their results are given in [table-3.6](#):

Table-3.6: Crop wise progress of technology demonstrations on yield gap minimization

Crop	Year wise number of demonstrations established on YGM					Total	Demonstrated Varieties
	2016-17	2017-18	2018-19	2019-20	2020-21		
Rice (Boro)	0	1236	2541	1209	566	5552	Boro (BRRI dhan 58, 67, 74, 81, 89, etc.)
Rice (Aus)	100	1717	1871	1151	429	5268	T-Aus (BRRI dhan 48, 82, Nerica-10, Nerica Mutant, etc.)
Rice (T.aman)	362	1117	1264	597	228	3568	T-Aman (BRRI dhan 49, 51, 52, 70, 71, 72, 73, etc.)
Rice total	462	4070	5676	2957	1223	14388	
Wheat	0	447	424	413	194	1478	BARI Wheat- 28, 30, 31, 33, etc.
Lentil	0	1365	754	120	46	2285	Lentil (BARI Masur-6 & 8)
Maize	0	896	375	134	52	1457	Don111, Mirakkal, Kohinur, Pacific 139 & 984; Supersign 2740, 2760, Hybrid 339, NH-7720
Mustard	0	1055	731	153	64	2003	BARI Sharisha- 9,14,15 & 17; Binasharisha- 9
Total	462	7833	7960	3777	1579	21611	

a. Yield Gap Minimization in Rice

Rice is the staple food of Bangladesh people. Meeting the growing demand of the Population is an issue of high concern. At present total area under rice in three cropping seasons (Rabi, Kharif I&Kharif II) covers almost 3/4th of the total cropped area and there is no scope for horizontal expansion due to limited land area. In this situation, vertical expansion using the highest yielding newly released varieties and other crop management technologies that can minimize the yield gap is the only alternative. Keeping this in view and demand-led need of the farmers as many as, 14388 technology demonstrations in three rice growing seasons (Aus, Aman and Boro) were conducted up to the FY 2020-21. The technological packages promoted by the project for YGM in boro, T. aman and Aus rice are given below:

YGM in Boro Rice	YGM in Aus Rice	YGM in T. aman Rice
<ul style="list-style-type: none"> ❖ Boro rice is an irrigation intensive crop growing in Rabi season, and is favored by clean weather as well as by more potential technologies. ❖ BRRI dhan 58, 67, 74, 81, 89, etc. along with recommended management technologies were promoted. ❖ The technology package includes use of quality HYV seeds, optimum age of seedlings, proper spacing, balanced fertilizer dose with proper management, optimum irrigation at regular intervals, management of insect-pests & diseases and harvesting at optimum time. 	<ul style="list-style-type: none"> ❖ Aus is grown in Kharif-1 season. ❖ BRRI dhan 48, 82, Nerica-10, Nerica Mutant, etc. along with recommended management technologies were promoted. ❖ The technology packages includes use of quality seeds, seedlings of optimum age, proper spacing, balanced fertilizer application with proper management, supplementary irrigation, management of insect-pests & diseases and harvesting in optimum time. 	<ul style="list-style-type: none"> ❖ T. aman is cultivated in Kharif II season under rain- fed condition. ❖ One or two supplemental irrigation in the month of September and October may apply. ❖ BRRI dhan 49, 51, 52, 70, 71, 72, 73, etc. varieties combined with other recommended technologies were promoted ❖ The technology package includes use of quality seeds, seedlings of optimum age, proper spacing, balanced fertilizer application with proper management, supplementary irrigation, management of insect-pests & diseases and harvesting in optimum time.

The yield performances of YGM technology package per hectre of land, both in demonstration and farmers' practice plots of last four years are presented in [Table-3.7](#). The results presented in the table show that the project promoted YGM technology packages resulted in increasing rice yield in both the demonstrations and farmers' fields.

Table-3.7: Yield Performance of YGM technology package in Demonstrations and farmers Practice plots by years and by seasons (ton/ha)

Year		Rice (Boro)	Rice (Aus)	Rice (T.aman)
2017-18	Demonstrations	5.89	4.42	4.97
	Farmers' practice	4.26	3.35	3.7
	Difference	1.63	1.07	1.27
2018-19	Demonstrations	5.01	5.92	4.5
	Farmers' practice	3.8	4.27	3.42
	Difference	1.21	1.65	1.08
2019-20	Demonstrations	6.38	4.54	5.1
	Farmers' practice	6.05	4.12	4.27
	Difference	0.33	0.42	0.83
2020-21	Demonstrations	6.382	5.11	4.55
	Farmers' practice	6.07	4.29	4.14
	Difference	0.312	0.82	0.41

b. Yield Gap Minimization in Wheat

Wheat is grown all over the country, but most suitable areas for cultivation are the northern districts of Bangladesh due to prolong cool temperature during winter. Area under wheat is estimated to be around 3.5 lakh hectares in FY 2019-20. Gradually a decreasing trend in area coverage under wheat is observed due to short winter and rise in winter temperature. Following the farmers' demand reflected in CIG Micro Plan, during the period from FY 2017-18 to FY 2020-21, a total of 1478 demonstrations on yield gap minimization of wheat were established. Wheat varieties used the technology demonstrations were BARI wheat 28, 30, 31, 33 etc. and the technological practices applied were timely sowing, optimum irrigation at scheduled intervals, management of pests and diseases, harvesting at optimum maturity, etc. An average yield of 3.821 mt./ha was obtained over the farmers' practice of 3.532 mt./ha showing the yield difference of 0.289 mt./ha (fig.3.2).

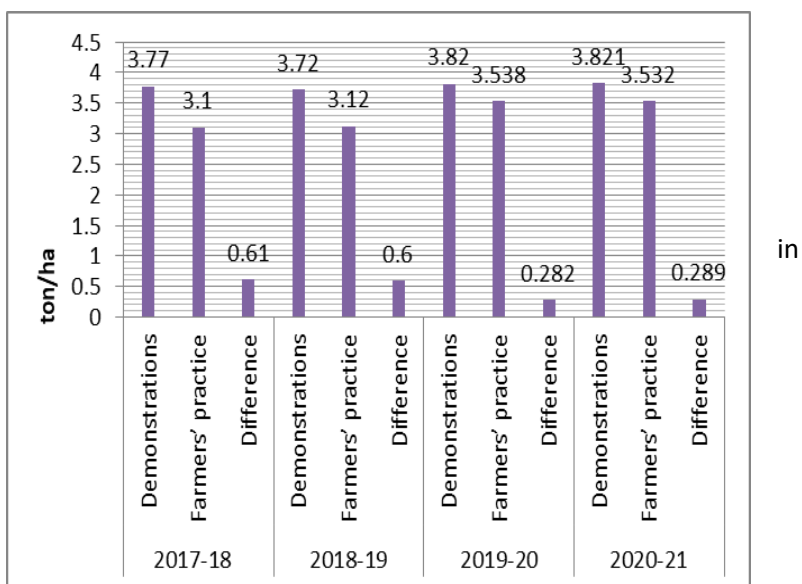


Fig.3.2: YGM Technology Performance in wheat (ton/ha)

c. Yield Gap Minimization in Lentil

Among the pulse crops lentil is the most popular and widely consumed in Bangladesh. Area and production of lentil is quite insufficient in comparison to demand. Lentil grows all over the country, but more intensively grows in the districts of Jessore, Faridpur, Pabna and Rajshahi. Based on the farmers' needs and demands, so far 2285 demonstrations were established on yield gap minimization of lentil using the varieties BARI Masur 6 and 8 and following the recommended management practices. From the demonstrations, an average yield of 1.69 mt/ha was obtained over the farmers practice 1.05 mt/ha making a yield difference of 0.64 mt/ha (fig.3.3).

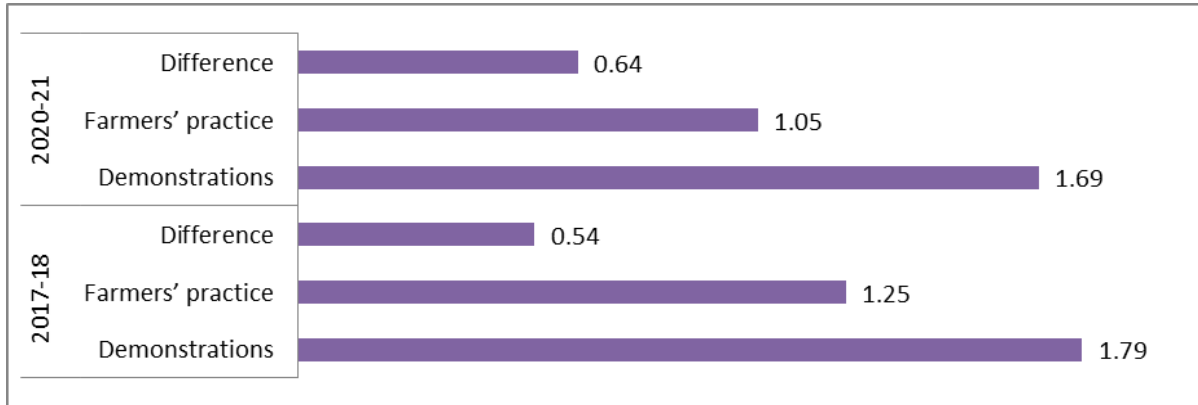


Fig. 3.3. Yield Performance of YGM technology package in Lentil (ton/ha)

d. Yield Gap Minimization in Maize

Maize is a well adopted cereal crop due to its high yield and market demand and fair price. It is widely grown in Northern districts as well as in the districts of Chuadanga, Meherpur, etc. The crop is mostly used as poultry feed and recently are being used for human consumption to a limited extent. Average yield of maize is much less due to knowledge gap of farmers in modern production technologies. With a view to maximize production of maize by minimizing yield gap though enhancing farmers' knowledge in modern production technologies, PIU-DAE implemented a total of 1457 YGM in maize demonstrations. The technology package used was:

- ✚ Varieties used were Don 111, Mirakkel, Kohinur, Pacific139, 984; Supersign2740, 2760, Hybrid 339, NH-7720.
- ✚ All the recommended practices like time of sowing, plant and row spacing, recommended fertilizer dose, irrigation etc.

An average yield of 6.21 mt/ha was obtained over the farmers practice 4.82 mt/ha making a yield difference of 1.39 mt/ha.

e. Yield Gap Minimization in Mustard

Traditionally mustard is a widely known and well adopted oil crop in Bangladesh, but its low production due to poor management and traditional production practices was insufficient to meet the demand. Recent development of improved and high yielding varieties along with improved production practices created an opportunity to increase its production significantly, yet there exists a significant yield gap. To minimize the yield gap at farm level and considering the demand of farmers, as on FY 2020-21, 2003 demonstrations were established using the potential high yielding varieties BARI-sorisa 9, 14, 15, 17; BINA-sorisa 9; all the recommended practices were practiced in technology demonstrations. An

average yield of 1.65 mt/ha was produced in demonstration plots over the farmers practice 1.01 mt/ha showing a yield difference 0.64 mt/ha.

3.4.1.1.2 Production technology of Summer Tomato

Cultivation of summer tomato incurs high cost but very profitable. It requires more care and additional investment due to climatic adversities, particularly for construction of Poly Tummel to protect the crop both from scorching heat & excess rainfall during the months of April to October. Due to the high market demand, fair price and good profitability, the crop is increasingly being popularized all over the country, specifically in the south-western districts. Following the farmer demands as reflected in CIG Micro Plans, this year 213 (total 3642) demonstrations on summer tomato were established.



Varieties used in the demonstrations were BARI hybrid 4 & BARI hybrid 8, and the practices/technologies applied were: timely planting, proper spacing, timely irrigation & management practices, management of pests & diseases, use of poly tummel, etc. Progress and performances of the established demonstrations are shown in **Table-3.8** below:

Table-3.8: Cumulative progress and performances of demonstrations on Summer Tomato

Crop	Year wise number of demonstrations established on Summer Tomato						Demonstrated Varieties	Average Yield (ton/ha)		Yield difference (ton/ha)
	2016-17	2017-18	2018-19	2019-20	2020-21	Total		Demonstration	Farmers' practice	
Tomato	87	1632	1523	187	253	3682	BARI hybrid 4, 8	34.96	32.53	2.43

3.4.1.1.3 Production Technologies of High Value Crops (HVCs)

Considering the farmers' demands PIU-DAE in FY2020-21 had established 1313 demonstrations (total 6288) on 13 different high value crops and those were Sweet guard, Country bean, Brinjal, Potato, Dhundol, Cauliflower, Bangi, Aroids, Bottle gourd, White gourd, Carrot, Water melon and Broccoli. The varieties used and their yield performances in demonstration plots and farmers practice fields are shown in



High Value Crops (HVCs)

Table-3.9. As it reveals from the table yield performances in demo plots were much higher and the factors contributed were optimum time of planting, plant population, balance fertilizer dose and recommended pest and disease management practices in demo plots.

Table-3.9: Yield performances of demonstrations on High Value Crops (HYV)

Crops	Varieties used	Yield performances(mt/ha)		(+/-)	% change
		Demo plot	Farmers' practice		
Sweet guard	Hybrid	22.82	20.02	2.8	14%
Country bean	BARlseem-2 Hybrid-2	18.22	14.21	4.01	28%
Cauliflower	BARI badha copi-1, 2; Atlas 70	30.03	21.02	9.01	43%
Potato	Diamond, Asterix	24.23	22.25	1.98	9%
Dhundol	Hybrid	8.01	7.31	0.7	10%
Brinjal	BARl begun-1,4,6,7,10	35.64	24.62	11.02	45%
Bangi	Hybrid	12.51	10.41	2.1	20%
Water melon	Dragon, Ganga,Pakija	53.05	34.83	18.22	52%
Bottle gourd	BARllou-1, hybrid(daina)	25.02	18.02	7	39%
White gourd	BARlchalkumra-1	26.03	19.02	7.01	37%
Carrot	Hybrid	20.42	16.02	4.4	27%
Aroids	BARlmukhikochu-2, Lotiraj	25.03	18.02	7.01	39%
Broccoli	Greenjoint	11.31	6.91	4.4	64%

3.4.1.1.4 Production Technologies of Spices Crops

The farm level yields of spices crops are yet far less than than their expected levels. Considering the farmers' demands and with a view to improving farmers' hands-on knowledge & skill on production technologies, PIU-DAE established 532 demonstrations in FY 2020-21 on spices crops like Garlic, Onion, Chilli, and Kalojira. Technologies used in the demonstrations of these crops were: Use of improved variety seeds, timely seeding/planting, proper spacing, use of balanced organic/inorganic fertilizers, optimum irrigation, proper intercultural practices, insect-pest & disease management, etc. Crop wise progress & performances of the demonstrations are given in [table-3.10](#).



Table-3.10: Progress and performances of demonstrations on spices crops

Crop	Year wise number of demonstrations established on spices crops						Demonstrated Varieties	Average Yield (ton/ha)		Difference (ton/ha)
	2016-17	2017-18	2018-19	2019-20	2020-21	Total		Demo	Farmers' practice	
Garlic	0	236	242	247	141	866	BARIrosun-3,4	7.51	6.14	1.37
Onion	0	82	103	186	105	476	BARIonion-1,4; Taherpuri	13.52	12.65	0.88
Chili	0	294	311	394	223	1222	Bindu, Balujhuri,	10.99	8.80	2.19
Kalojira	0	16	10	9	5	40	BARIkalojira-1	1.49	1.14	0.35
Zinjer	0	43	149	58	33	283	BARlada-1,3	25.83	19.37	6.46
termaric	0	32	131	44	25	232	BARlholud-1(Dimla), 2,3	6.36	5.96	0.40
Total	0	703	946	938	532	3119				

3.4.1.1.5 Community Seed Production (Quality seeds)

Community seed production is an innovative activity in the project. In this activity, a group of farmers of the same CIG established seedling raising demonstrations in their land and the remaining members of the CIG were involved in nursing and caring of seedbed. After raising the seedlings they shared the seedlings for seed production of the new rice varieties. After producing seeds all the CIG farmers preserved those seeds. During the seasons farmers sold or distributed the seeds of new varieties to other farmers. This has facilitated the process of disseminating newly released rice varieties to the farmers.



So far 3418 tons of Aus rice and 2954 tons of Aman rice were distributed and or sold to the neighboring and other farmers (Table-3.11).

Table-3.11: Year wise progress and results of community seed production

Name of crop	Year wise number of demonstrations established on community seed production					Varieties used	Yield (ton/ha)	Total seeds produced (ton)	Quantity distributed
	2017-18	2018-19	2019-20	2020-21	Total				
Rice (Boro)	3758	237	2084	857	6936	BRRIdhan 58, 68, 74, 81, 89	6.16	10659	8634
Rice (Aus)	5377	10193	1455	599	17624	BRRIdhan 48,51,75, 82, Nerica-10	4.41	4367	3538
Rice (T.aman)	2656	119	2372	976	6123	BRRIdhan 49, 51, 52, 70, 71, 72	4.93	4339	3514
Mastard	0	827	231	95	1153	BARI sarisa 14, BINA sarisa 9, 10	1.34	541	438
Mungbeen	0	58	41	17	116	BARI mug 6	1.28	41	33
Wheat	0	5115	158	65	5338	BARlWheat-28, 30, 31, 33 etc.	3.71	533	416
Total	11791	16549	6341	2609	37290				

3.4.1.1.6 Zero Tillage cultivation of Garlic & Mustard

Crops can be optimally grown in zero tillage conditions in many parts of the country. Usually it does not require irrigation and protects the soil from erosion as well as degradation. Zero tillage minimizes cost of production without significant loss of yield.

To disseminate the advantages of zero tillage cultivation, PIU-DAE had established 1729 demonstrations in Garlic and Mustard of which 258 demonstrations were in FY2020-21. In establishing the demonstrations of Garlic, healthy cloves were dibbled in no tillage condition on muddy condition of soil followed by mulching, and in case of mustard seeds were sown in wet land condition. Crop wise progress and performances of demonstrations on zero tillage cultivation of Garlic and Mustard are shown in [Table-3.12](#). The results showed that demonstration yields were higher than farmers' practices.

Table-3.12: Progress & performances of demonstrations on zero tillage cultivation

Cultivation practice	Year wise established demonstration on zero tillage cultivation					Varieties	Average Yield (ton/ha)	
	2017-18	2018-19	2019-20	2020-21	Total		Demo	Farmers' practice
Zero tillage	373	745	353	258	1729	Garlic(BARI rosun 2, 3/hybrid/kutubpuri)	7.41	7.14
						Mustard(BARI sarisa 9, 14, 15, 17, BINA sarisa 9)	1.73	1.36

3.4.1.1.7 Pest Management using Sex Pheromone Trap

Sex Pheromone traps are very effective for the management of pests like fruit flies as well as shoot & fruit borers in fruits and vegetables. This helps in production of safe vegetables & fruits, getting fair



Sex Pheromone Trap

market price of produces and reduced use of pesticides. Considering the farmers' demands and with a view to demonstrating the effectiveness of the traps for wide dissemination, up to FY 2020-21 as many as 12340 demonstrations were established.

Crop-wise progress & performances of the established demonstrations using sex pheromone traps on different vegetable and fruit crops are shown in [Table-3.13](#).

Table-3.13: Progress & performances of demonstrations using sex pheromone traps

Name of crop	Varieties	Year wise No. of demonstrations					Total	Average yield (ton/ha)	
		2016-17	2017-18	2018-19	2019-20	2020-21		Demo	Farmers' practice
Bottle gourd	BARI lao 2, 3, 4	0	278	201	225	78	782	40.13	29.54
Bitter gourd	BARI corolla 1, 2, 3	0	314	85	247	86	732	19.71	11.55
Brinjal	BARI BT begun 4	0	1506	305	364	127	2302	38.91	29.54
Sweet gourd	Sweety	0	860	67	119	42	1088	38.88	26.06
Country bean	BARI seem 2, Hybrid 2	0	512	252	358	125	1247	16.83	12.18
White gourd	BARI calkumra 1, Hybrid	0	48	28	81	28	185	16.52	12.81
Cucumber	Hybrid	0	62	14	56	20	152	13.21	10.84
Pointed gourd	Hybrid	0	681	89	396	138	1304	35.51	25.15
Dhundol	Hybrid	0	21	20	42	15	98	12.41	10.82
Water melon	Dragon, Ganga, Pakija	0	173	2239	294	102	2808	59.64	35.02
Veg., Leafy veg. & fruits	Veg., Leafy veg. & fruits	1262	314	66	0	0	1642	-	-
Total		1262	4769	3366	2182	761	12340		

3.4.1.1.8 Production technologies of Vermi-compost & Tricho-compost

PIU-DAE included Vermi-compost and Tricho-compost in the demo activities as technologies to protect soil from degradation. One production cycle of Vermi-compost & Tricho-compost takes 35-45 days. Vermi & Tricho-compost adds plant nutrients in soil and also acts as good soil conditioners.



Vermi-compost & Tricho-compost

As on FY 2020-21, PIU-DAE had established 19224 demonstrations on Vermi-compost and Tricho-compost. Progress and production position of demonstrations are given in table-3.14. It is reported that on an average about 312 kg of Vermi-compost was produced from each of the demonstrations only in one-month and in case of Tricho-compost average production per demonstration was about 136 kg in two months.

Table-3.14: Progress of demonstrations on Vermicompost & Tricho-compost

Name of demonstration	Year-No. of demonstrations					Total	Average production (kg)
	2016-17	2017-18	2018-19	2019-20	2020-21		
Vermi-compost	1335	5639	4321	2228	1,080	14603	312
Tricho-compost	0	309	1628	2094	590	4621	136
Total	1335	5948	5949	4322	1,670	19224	

3.4.1.2. Validation Trials

Validation trials were conducted to demonstrate adaptation of the technology at the local environmental conditions. During the FY 2017-18 to FY 2019-20 as many as 1080 validation trials were established on newly released varieties of Boro, T. aman, wheat and other crops, achieving the target to 100% and the trials showed good adaptation and yield performances. Progress & performances of validation trials are shown in [table-3.15](#).

Table-3.15: Progress & performances of validation trials

Crops	Variety	Year-wise No. of validation trials				Total	Yield (paddy) (ton/ha)
		2017-18	2018-19	2019-20	2020-21		
Rice							
Boro	BRRIdhan-	270	402	0	0	672	6.22- 6.78
	74,81,84,89, SL8H						
T.Aman	BRRIdhan-72,73,90	69	0	203	0	272	4.7- 4.9
Wheat	BARRI Gom 30,32,33	0	36	36	0	72	3.73- 3.8
Lentil	BARRI Lantil-8,6	0	0	4	0	4	1.6- 1.81
Maize	Kabery-63, Super	0	0	6	0	6	10- 11.2
	Shine 2760						
Mustard	BARRI Sarisa-17,10,14,9	0	33	15	0	48	1.7- 2.01
Tomato	Mintu Super,	0	0	6	0	6	50- 60
	VL-642						20- 30
RDPP target: 1080;				Achievement: 100 %			

Outputs of validation trials:

1. It is seen that varieties used in validation trials are better suited than the farmers' varieties producing more yield.
2. Gradual increases in adoption of trial varieties by farmers have been observed.
3. Farmers' varieties are being increasingly replaced by the varieties used in validation trials e.g. in Boro, BRRIdhan 74 & 81 are occupying the coverage of BRRIdhan 29 and in T. aman, BRRIdhan 72 & 73 occupying the coverage of BRRIdhan 49.



Validation trial on BRRIdhan-84

4. In wheat, BARI wheat 31, 32 & 33 are now the widely used varieties due to their high yield potential and stress tolerant characteristics.

3.4.1.3. Production of Improved/New varieties of Seedlings/Saplings of Fruit Crops at Horticulture Centers

With a view to disseminating the improved/newly released varieties of fruit crops and enhancing productivity of fruits, a total of 743503 quality seedlings/saplings were produced at the 20 DAE Horticulture Centers up to the FY 2020-21.

The seedling/saplings are distributed among the farmers keeping separate records and giving advices for better management after planting. SAAOs helped the farmers in collecting the seedlings/saplings. The seedlings/saplings are also used for the establishment of demonstrations. Planted seedlings/saplings will take around 3- 5 years to show results. This effort helps in replacing the old fruit varieties and the impact of replacing old varieties by the new ones would be visible in near future.

Outputs of producing new variety seedlings/saplings:

1. Around 743503 seedlings/saplings of new/improved varieties of fruit crops have been planted to encourage total production of fruits.
2. The initiative helped in dissemination of new/improved varietal technologies of fruit crops around the farm families, resulting to many of the farmers collecting the seedlings/saplings from the nurseries.
3. In course of time, the planted seedlings/saplings would be used as good sources of propagation material that will contribute to the replacement of the old fruit varieties.

3.4.2 Fisheries Sector Technology Demonstration

Inadequate knowledge on improved aquaculture was identified as one of the most important problems while preparing micro plans. Demonstration is the best method for dissemination of new technology. Therefore, demonstrations were established on various technologies to disseminate modern aquaculture related information to the fish farmers.

For PIU-DoF RDPP have provisions for **32602** technology demonstrations. The component up to June 2020, implemented **23535** demonstrations (**72%**) and there was no provision been made for FY2020-21. In the demonstration ponds eight proven, low-cost and productivity enhancing aquaculture technologies were demonstrated and those are: 1) *Carp Polyculture (CPC)*, 2) *Monosex Tilapia (MST)*, 3) *Pangas Monoculture (PMC)*, 4) *Shing Monoculture (SMC)*, 5) *Koi Monoculture (KMC)*, 6) *Shing and Magur Mixed culture (SMMC)*, 7) *Carp-Galda Mixed Culture (CGMC)*, and 8) *Pabda-Gulsha mixed culture (PGMC)*. *Carp Polyculture* comprised of 84.6% followed by *Monosex Tilapia* (8.64%). Details of the technologies demonstrated and their relative percentages are given in **Table-3.16**.

Table-3.16: Progress of PIU-DoF Technology Demonstrations

Sl. No.	Technology name	Technology Details	No. of demonstrations (Up to June 2020)	% to total
1	Carp Poly Culture	Culture of Rui, Catla, Mrigal, Silver carp, Mirror carp, Common carp, Grass carp, Thai sarpunti etc. together. For fry of 250-400 gm weight, the stocking density of 16-21/decimal was followed. Regular feeding practice was followed on the basis of body weight of fish.	19905	84.59
2	Mono Sex Tilapia	Stocking of fry of 5-10 g weight having a density of 200-250/decimal. Regular feeding practice was followed on the basis of the bodyweight of fish	2034	8.64
3	Carp Galda Mixed Culture	Culture of Rui, Catla, Silver carp, Mirror carp, Common carp, Grass carp along with Galda. Regular feeding practice was followed on the basis of body weight of fish, Golda 50-100 PL per decimal and 10 carp per decimal.	246	1.28
4	Pangas Mono Culture	Stocking of fry of 100-g weight having the density of 250-300/decimal. The feeding rate varied on the basis of gain in bodyweight of fish.	302	1.23
5	Nursery	Collection of hatchlings from the government farm/private farm and rearing in the nursing pond and supply fingerlings to the pond owners. A number of fry per gram fertilized egg 1gm: Carp-400 fries per gram. The stocking rate is 25-30 gm fertilized egg per decimal.	289	1.05
6	Pabda gulsha mixed culture	Fry size of 3.5 cm/ 0.5-0.6g. Gulsha: 700-800 fries per decimal. Pabda: 700-800 fries per decimal.	214	0.91
7	Shing monoculture	Stocking fry of 0.5-1g weight having the density of 1000-1200 per decimal.	168	0.71
8	Shing magur mixed culture	Shing: Stocking fry of about 0.5g weight having the density of 800-1000 per decimal, and Magur: 0.5g weight with 100-150 fingerlings per decimal.	147	0.62
9	Koi monoculture	Stocking fry of 0.5-1g weight having the density of 1000-1500 per decimal	79	0.34
10	Others	Culture of a combination of fishes other than above is termed as 'Others' demonstration technology.	151	0.62
Total			23535	100



Photo 2: Fish harvesting at demonstration pond



Photo 3: Field days at demonstration site

3.4.2.1 Performance of the Demonstrated Fisheries Technologies

PIU-DoF conducted a performance analysis of the demonstrated technologies in terms of yield and profitability and compared the same with the same farmers' previous productivity of the same technology.

Changes in yield before and after demonstration technologies over the years are shown in [Table-3.17](#). The data shown that the mean yield change occurred from 16% to 56. % depending on the culture technology. The highest mean yield change appeared for koi monoculture (56%), followed by pabda-gulsha mixed culture (50%), carp polyculture (50%), shing-magur mixed culture (43%), pangas monoculture (42%), monosex tilapia (42%), pangas monoculture (42%), carp-galda mixed culture (26%), pabda-galsha mixed culture (50%) etc.

Table-3.17. Changes in yield before and after demonstration of fishery technologies over the year ((kg/ha))

	2017-2018			2018-2019			2019-2020			Mean % change
	Before Demo	After Demo	% change	Before Demo	After Demo	% change	Before Demo	After Demo	% change	
1.Carp Polycultures	3163	5086	61%	3702	5522	49%	4015	5640	40%	50%
2.Monosex Tilapia	7466	11414	53%	9196	12279	34%	9240	12794	38%	42%
3.Pangas Monoculture	12507	18032	44%	13262	18620	40%	13384	18926	41%	42%
4.Carp-Galda Mixed Culture	3163	4480	42%	3702	4640	25%	4015	4510	12%	26%
5.Pabda Gulsha Mixed Culture	3163	5330	69%	3702	5410	46%	4015	5475	36%	50%
6.Shing Mono Culture	6495	8064	24%	5507	6194	12%	5536	6230	13%	16%
7.Shing Magur Mixed Culture	3427	5965	74%	5507	7163	30%	5643	7096	26%	43%
8.Koi Mono Culture	5164	8188	59%	7332	11859	62%	7364	10942	49%	56%

Results of the economic analysis of the demonstrations established in 2019-20 by technology type are shown in [Table-3.18](#). The highest Benefit Cost Ratio (BCR) was found in carp-gulsha mixed culture (1.78), followed by pabda-gulsha mixed culture (1.76), shing-magur mixed culture (1.69), singh monoculture (1.61), carp poly culture (1.56) etc.

Table-3.18: Economic analysis results of the demonstrations established in 2019-20 by technology type

Parameters	Carp Polyculture	Monosex Tilapia	Pangas Monoculture	Carp Galda Mixed culture	Pabda Gulsha Mixed culture	Shing Monoculture	Singh Magur Mixed Culture	Koi Monoculture
1. No. of demonstrations	4486	328	50	65	4	55	21	18
2. Av. water area in (dec.)	55	45	52	49	45	38	45	52
3. Yield (Kg/ha)	5640	12794	18926	4510	5475	6230	7096	10942
4. Production cost (Tk/ha)	562855	921058	1226225	734850	853165	1007921	1080943	918360
5. Gross return (Tk/ha)	879840	1343370	1457302	1307900	1505625	1626030	1830768	1203620
6. Net return (Tk/ha)	316985	422312	231077	573050	652460	618109	749825	285260
7. Benefit cost ratio (Tk/Tk)	1.56	1.46	1.19	1.78	1.76	1.61	1.69	1.31
8. Fish price (TK/kg)	156	105	77	290	275	261	258	110
9. Yield before demo. (kg/ha)	4015	9240	13384	4015	4015	5536	5643	7364
10. Change of yield (Kg/ha)	1625	3554	5542	495	1460	694	1453	3578
11. Increase of yield (%)	40%	38%	41%	12%	36%	13%	26%	49%

Productivity and economic performance of the technology demonstrated over the year is depicted in Table-3.19. Data showed that the highest BCR (benefit-cost ratio) was found for pabda-gulsha mixed culture technology, followed by shing-magur mixed culture, carp-galda mixed culture, shing monoculture, carp polyculture etc.

Table-3.19: Performance of the demonstrations over the years by technology type

Technology	Average yield (Kg/ha)				BCR (Average)			
	2017-18	2018-19	2019-20	Mean	2017-2018	2018-19	2019-20	Mean
1. Carp Polyculture	5086	5522	5640	5416	1.65	1.61	1.56	1.61
2. Monosex Tilapia	11414	12279	12794	12162	1.52	1.48	1.46	1.49
3. Pangas Mono Culture	18032	18620	18926	18526	1.55	1.23	1.19	1.32
4. Carp-Galda Mixed Culture	4480	4640	4510	4543	1.82	1.8	1.78	1.80
5. Pabda Gulsha Mixed Culture	5330	5410	5475	5405	2.14	2.16	1.76	2.02
6. Shing Mono Culture	8064	6194	6230	6829	1.9	1.78	1.61	1.76
7. Shing Magur Mixed Culture	5965	7163	7096	6741	2.55	1.78	1.69	2.01
8. Koi Mono Culture	8188	11859	10942	10330	1.82	1.38	1.31	1.50

Productivity and economic performance of the technology demonstrated over the years is depicted in Table-3.20. Data showed that the highest BCR (benefit-cost ratio) was found for pabda-gulsha mixed culture technology, followed by shing-magur mixed culture, carp-galda mixed culture, shing monoculture, carp polyculture etc.

Table-3.20: Yield performance and BCR of the demonstrations over the years by technology type

Technology	Average yield (Kg/ha)				BCR (Average)			
	2017-18	2018-19	2019-20	Mean	2017-18	2018-19	2019-20	Mean
Carp Polyculture	5086	5522	5640	5416	1.65	1.61	1.56	1.61
Monosex Tilapia	11414	12279	12794	12162	1.52	1.48	1.46	1.49
Pangas Mono Culture	18032	18620	18926	18526	1.55	1.23	1.19	1.32
Carp-Galda Mixed Culture	4480	4640	4510	4543	1.82	1.8	1.78	1.80
Pabda Gulsha Mixed Culture	5330	5410	5475	5405	2.14	2.16	1.76	2.02
Shing Mono Culture	8064	6194	6230	6829	1.9	1.78	1.61	1.76
Shing Magur Mixed Culture	5965	7163	7096	6741	2.55	1.78	1.69	2.01
Koi Mono Culture	8188	11859	10942	10330	1.82	1.38	1.31	1.50

3.4.3 Improvements of Capture Fisheries

In RDPP forty (40) beels were selected for (1) habitat improvement, (2) establishment of beel nurseries, (3) stocking of indigenous fish species, (4) establishment of fish sanctuaries and (5) initiation of Community Based Fishery Management systems.. It is expected that at the end of project implementation yield of capture fisheries will be increased by 100% (1.14 mt/ha) from the baseline production (0.70 mt/ha). Physical verification showed that many of the selected Beels were not suitable for intervention because in the meantime many of them were leased out, some were silted and some were occupied by the development of infrastructure like road, drainage channel etc.. For this reason, beel management activities were started in 2018-19 in 23 beels of 20 Upazilas of 09 districts. List of 23 beels with water area, number of male and female beneficiaries, and the activities performed in last three years are shown in [Annex 4](#).

All the 23 beels have been taken under community-based fisheries management. In addition, habitat improvement works have been completed in 23 beels. To conserve fish species from extinction and increase fish diversity in the open water, fish sanctuary has been established in 19 beels so far. Beel nurseries were also established in 23 beels, by which 55140 kg and 56904 kg of fingerlings were released in the main beels in 2018-19 and 2019-20, respectively. Besides, a total 17591 kg and 10095 kg fingerling of indigenous fish species were stocked in 2019-20 and 2020-21, respectively, in 23 beels. Due to various interventions, yield of the beels has been increased from 700.24 kg/ha in 2017-18 to 1202.5 kg/ha in 2020-21 ([Annex 5](#)). It is hoped that the target productivity will be achieved at the end of the project.



Photo: Establishment of beel nursery



Photo: Fingerling stocking in a beel



Photo: Monitoring habitat improvement works in a beel



Photo: Fish sanctuary in a beel

Management Plan for 17 New Beels

In the RDPP, new 17 beels have been included and will be taken under management from 2021-22. Base line survey, formation of community-based organization (CBO) and the respective executive committees have already been completed. The management plan for the newly included 17 beels is shown in **Table-3.21**.

Table-3.21: Milestone chart for newly included 17 Beel management plan

Activities	No.	2020-'21				2021-'22				2022-'23				Remarks
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	
1. Baseline survey	17													
2. Formation of CBO	17													
3. Pursuing No Objection Certificate	17													16 received
4. Preparation and implementation of fishing code														
5. Preparation of DPR	17													
6. Habitat improvement works	17													
7. Establishment of beel nursery	17													
8. Establishment of fish sanctuary	17													
9. Stocking of small indigenous fish species	17													

3.4.3. Livestock Sector Technology Demonstration

PIU-DLS implemented 28899 demonstrations on improved livestock management practices of 8 types of livestock species (Dairy Cattle (13047), Fattening Cattle (6647), Goat (4275), Sonali/Local Poultry (4141), Duck (557), Sheep (165), Pig (47) and Buffalo (20)), 106 demonstrations on improved compost pit using cow dung and 8388 on high yielding variety of fodder with improved cultivation practices (Table-3.22). Major management practices used include Improved shed management, balanced feed management, vaccination, de-worming and other health management, bio-security of farm etc.

Table-3.22: Progress of PIU-DLS Technology Demonstrations

Sl. No.	Technology type	Source of Technology	Focused Technology of Demonstration	Number of established demos		
				Up to June 2020	FY2020-21	Up to June 2021
1	Cow rearing	BLRI/BAU	Balanced feeding and health management of cow	9495	3552	13047
2	Beef fattening	BLRI	Beef fattening using UMS	4740	1907	6647
3	Goat rearing	BLRI	Goat rearing using slat system housing	3062	1213	4275
4	Poultry rearing	BLRI/BAU	Balanced feeding of sonali/local poultry	2954	1187	4141
5	Duck rearing	BLRI/BAU	Balanced feeding of duck	400	157	557
6	Sheep rearing	BLRI/BAU	Sheep rearing using slat system housing	119	46	165
7	Pig rearing	BLRI/BAU	Pig rearing using balanced feeding and health management	33	14	47
8	Buffalo rearing	BLRI/BAU	Balanced feeding and health management of buffalo	14	6	20
9	Improved compost pit	RDA	Three chambered pit with pacca wall covered by plastic sheet	0	106	106
10	Fodder cultivation	BLRI/DLS.	Improved cultivation practices of HYV fodder	8386	2	8388
Total				29203	8190	37393

The Upazila reports of PIU-DLS reveal that most of the demonstrations were mainly conducted with crossbred cows, black Bengal goat, local and sonali poultry birds. Average productivity in demo was significantly higher than in non-demo farms (milk - 8.5 vs 5.4 liter/day/cow; cattle meat - 688 vs 394 gm/day/cattle; goat – 49 vs 34 gm/day/goat; poultry - 179 vs 154 egg/year/bird; duck – 162 vs 138 egg/year/duck. The fodder cultivation area has also been increased from 1301.47 acre to 4775.00 acre in the working upazilas.

Details of the five major technologies demonstrated are described below:

3.4.3.1 Establishment of Demonstration on Cow Rearing Technology

The major and largest source of milk is dairy cow in Bangladesh. During micro plan preparation it was identified by CIGs that low productive native cow and acute scarcity of feeds and fodder as well as poor knowledge and skills on improved management of cow i.e. improved housing, balanced feeding, health management, maintaining bio-security of farm etc. are the causes of low productivity. To improve the knowledge and skills of the farmers, 13047 demonstrations were established since inception to June 2021, of which 3552 demonstration were established in the reporting year 2020-21. Most of the demonstrations were conducted with crossbred cows. I



The analysis of upazila sample data of crossbred cow rearing demonstrations showed an increase of average milk production by 3.10 liter per day per cow with the demonstrated farmers over the non-demonstration farmers. The average production of non-demonstration farmers' was 5.40 liter per day per cow against 8.50 liter in demonstration farmers. In case of local cow, an average milk production increased 0.96 liter per day per cow. The average milk production per day per cow is 2.37 liter in case of participating demonstration farmers where 1.41 liter in other than demonstrated farmers. The data indicates that cow rearing activity has the potentiality to i reduce the milk production gap in the country.

To disseminate cow rearing technology to other CIG farmers as well as non-CIG farmers, various extension methods and techniques i.e. training, field day, CIG-non-CIG gathering, vaccination campaign, de-worming campaign, infertility campaign etc. were implemented. As a result since inception to till June, 2021, in total 258082 farmers adopted technology of which 68513 are CIG farmers and 189569 are non-CIG farmers.

3.4.3.2 Establishment of Demonstration on Beef Fattening Technology

Due to increasing demand of meat, beef fattening has been taken as a profitable income generating enterprise by smallholders farmers in many areas of Bangladesh. As per findings of Bangladesh Livestock Research Institute (BLRI), the body weight of fattening cattle by practicing modern technology can be increased to 700-900 gram per day per cattle against the normal growth rate of 200 to 350 gram per day per cattle with traditional practices. To demonstrate this productivity enhancing recommended technology, a total of 6647 demonstrations were established since inception to 30 June 2021, of which 1907 demonstrations were established during the FY 2020-21. Mainly Urea Molasses Straw (UMS) or Urea Treated Straw (UTS), concentrate feed, de-worming, vaccination etc. technologies were applied in fattening demonstration and fattening cattle were reared for 3 to 6 months.



The demonstration results showed that the daily growth rate of cattle under demonstration was 749gm for cross bred and 394 gm in other than demonstration cattle.. In case of local cattle, an average 627gm weight increase was observed in demonstrated cattle where 318gm in other than demonstration cattle.

The data indicates that beef fattening enterprises have the potentiality to increase the meat production by adopting fattening technology. A total of 122011 farmers adopted the demonstrated technology, of them 34895 are CIG farmers and 87116 are non-CIG members.

3.4.3.3 Establishment of Demonstration on Goat Rearing Technology

Meat production of goat is very low in Bangladesh but it can be increased by modern management practices. To demonstrate improved production technology of goat, PIU-DLS established 1213 demonstrations on goat rearing during 2020-21. On the other hand 4275 demonstrations were established on goat rearing technology from the beginning of the project up to 30 June 2021. Most of the demonstrations were established with Black Bengal Goat. Slat System Housing was used in the demonstration along with supplementary feeding, regular vaccination, and de-worming etc. as technologies.

The farmers with whom demonstrations were conducted reported that no goat was affected by diseases particularly PPR during demonstration. The physical growth of goat was good. Most of the she-goats were conceived every after six months, as they reported.. Besides, average body weight increased 49gm per day per goat where 35gm weight was increased other than demonstration farmers. The result indicates that the goat rearing has the opportunity to maximizing production and farm income by practicing improved technologies.



Up to June 2021, 90057 farmers adopted demonstrated technologies of which 24009 are CIG farmers and 66048 are non-CIG members.

3.4.3.4 Establishment of Demonstration on Poultry Rearing Technology

Poultry produces both meat and egg. Many of the consumers in our country prefer to eat local poultry meat and egg. The availability of local poultry is decreasing day by day due to low growth and productivity against the high demand. The market price is also high for local poultry meat and egg. . To increase the knowledge and skills of farmers on improved management practices of local poultry bird, NATP-2: Livestock Component established 4141 demonstrations since inception of the project to 30 June 2021 including 1187 demonstration during 2020-21. Improved breed, ideal housing, balanced feeding, vaccination, bio-security etc. technologies were practiced by the demonstration farmers..

The results of demonstrations conducted in last year revealed that the number of egg production was 73 per local bird per year in the demonstrated farms as against only 57 egg production in non-demonstrated farms. In case of Sonali bird, the number of egg production was 189 per bird per year in the demonstrated farms whereas 153 egg production in non- demonstration farms, which was about 23% higher than traditional farmers practices.

The results indicated that improved poultry rearing technologies have potential to maximizing the production at farm level. A total of 75951 farmers adopted the technology of which 22197 are CIG farmers and 53754 are non-CIG members.

3.4.3.5 Establishment of Demonstration on Duck Rearing Technology

Many small, marginal and landless farmers are involved in duck rearing with both local and exotic breed. Though rivers, haors (Water bodies), canals, pond etc. in the rural areas are most suitable for duck rearing but duck farmers don't get optimum production from duck due to limited use of improved rearing practices of duck as well as gradually reduction of natural feeds. To motivate farmers on improved management and rearing practices of duck, 557 demonstrations were established by the CIG farmers since inception of the project to 30 June 2021 including 157 demonstrations in the FY 2020-21. Improved breed, housing management, balanced feeding, schedule vaccination, bio-security etc., were practiced in the demonstration activities.

The demonstrations data of duck rearing revealed that the number of egg production per duck per year was 189 in the demonstrated farms whereas 155 in other than demonstration farms indicating that the duck rearing has the opportunity to maximizing production by practicing demonstrated technologies. A total of 7907 farmers adopted this technology of which 2884 are CIG farmers and 5023 are non-CIG members.

3.4.3.6 Establishment of Demonstration on Sheep, Pig & Buffalo Rearing Technology

Though sheep is being reared in limited areas of Bangladesh, sheep can play an important role in agricultural GDP by producing meat and wool. Sheep is comparatively more disease resistant than goat. So sheep rearing may be more suitable than goat in the low lying areas.

To expand the sheep rearing and to disseminate improved sheep rearing technology, PIU-DLS established 165 demonstrations since inception to 30 June 2021. The result of demonstration showed that the disease infection has been reduced and body weight increased.

Besides the above technology demonstrations, PIU-DLS also established 20 demonstrations on buffalo rearing and 47 demonstrations on pig rearing technology.

3.4.3.7 Establishment of Demonstration on Fodder Cultivation Technology

Scarcity of fodder is one of the major constraints for sustainable dairy farming as well as other livestock rearing in Bangladesh. Due to in-sufficient production of fodder, cattle farmers in Bangladesh face different problems such as low growth, low re-productive performance, susceptible to various diseases and finally low productivity. To overcome the acute scarcity of green grass, special emphasis was given to expand fodder cultivation in the project area through organizing fodder cultivation demonstration. As part of different initiatives for expanding fodder cultivation, since inception of the project to 30 June 2021, total 8388 fodder cultivation demonstrations were established. Mainly 2 types of HYV of fodder were practiced in demonstration plots.

The main objective of fodder cultivation demonstration is to increase the number of fodder cultivating farmers as well as increase the area of fodder cultivation in the project upazilas. Due to these initiatives, the number of farmers engaged in fodder cultivation has been increased to 56842 no. which was 17327 no. before starting of project activities. On the other hand, the fodder cultivation area has also been increased from 1301.47 acre to 4775.0 acre. Now the fodder is being cultivated commercially in many places of the project areas.

Cost and Return Analysis of Different Livestock Farming Activities in Bangladesh

PIU-DLS conducted this Costs and Return Analysis with a view to understand profitability of dairy, beef, goat and poultry farms of CIG farmers under NATP-2, existing level of economic efficiency of selected livestock enterprises and factors affecting their economic efficiency and sensitivity of input price and costs affecting growth of livestock sector in Bangladesh. For this analysis 120 dairy farms, 100 beef cattle farms, 100 goat farms and 80 poultry farms were randomly selected from different locations of the country. Data were collected on a recall basis using questionnaire through face to face interview and those were used to estimate farm profit/unit output while profit efficiency was measured by using stochastic frontier profit function.

The analysis reveals the below:

Milk production: for crossbred cow average cost and gross return per liter of milk production were Tk. 27.24 and Tk. 46 respectively. For local cow, the cost was TK 36.61 and gross return was Tk. 53. The average BCR of crossbred and local breed dairy farmings were 1.84 and 2.12 respectively.

Beef fattening: average costs of rearing crossbred cattle was Tk. 37055/per cattle and for local breed it was Tk. 30226/per cattle. The average net profit per crossbred beef cattle was TK 36793 and BCR was 1.96. The annual profit of crossbred cattle farmers was Tk. 107528 per farm. The farmers received a good cash income from rearing crossbred beef cattle. The average BCR of a crossbred beef cattle farming was 1.96. The average net profit per cross bred beef cattle was TK 54173. The annual profit of local cattle farmers was Tk. 116746 per farm. The farmers received a good cash income from rearing local beef cattle. The average BCR of a local beef cattle farming was 2.77.

Goat Rearing: Average annual costs of rearing goats were Tk. 22048 per farm. The average annual net profit of the CIG goat farmers was Tk. 20445. The farmers received a good cash income from rearing goats. The average BCR of goat farming was 1.93.

Poultry rearing: The average total cost of rearing Sonali poultry for meat purposes for 60 days was Tk. 102.83 per bird. On all average per bird net profit was Tk. 44.34. The average annual number of rearing of Sonali poultry bird was 4406 per farm (Table 2.4.5). The average number of bird sold was 4391 and 3755 kg with an average price of Tk. 189 per bird. The farmers received an annual net profit of Tk. 255426. The average BCR was 1.56. Thus rearing Sonali poultry is fairly profitable and the CIG farmers of NATP2 of DLS received a good amount of cash income.

The mean economic efficiency of dairy farms is 0.64 or 64%. This means that the dairy farmers are losing 36% profit due to inefficiency. The mean economic efficiency of beef cattle farms is 0.87 or 87%. This means that the beef fattening farmers are losing 13% profit due to inefficiency. The mean economic efficiency of goat farms is 0.60 or 60%. This means that the goat farmers are losing 40% profit due to inefficiency. The mean economic efficiency of poultry farms is 0.95 or 95%. This means that the poultry farmers are losing 5% profit due to inefficiency.

In terms of proportion of respondent reported, the problem of high price of feed could be ranked 1, low price milk could be ranked 2 and low price of poultry could be ranked 3, disease problem could be ranked 4 and quality of feed could be ranked 5th.

3.5 Field Days, Exposure visits, Technology sharing training/gathering/rally

The PIUs (PIU-DAE, PIU-DoF and PIU-DLS) have been arranging field days in technology demonstration sites, exposure visits to the best performing CIGs, AIF-2 sub-projects, Research sub-stations, Horticulture centers, and demo sites of other areas, and CIG-non CIG interactions for technology diffusion from farmers to farmers. The objectives of these extension activities are to achieve the technology adoption targets within CIG farmers (64%) and the CIG and non-CIG technology adoption ratio i.e. one CIG farmers would motivate 1.8 non-CIG farmers. RDPP included provision of Total 1.09 million of such events, of them 84% have been completed by end June 2021 (Table-3.23).

Table-3.23: Details of Extension Activities by PIUs (Cumulative)

		Field Days for technology demonstration	Field days for Validation Trial	Exposure Visits	CIG & non-CIG gathering (client days cumulative)
PIU-DAE	RDPP target	23505	2361	1890	334500
	Jun-20	14435	1011	1080	
	Jun-21	14916	1011	1350	271500
	% of RDPP	63%	43%	71%	81%
PIU-DoF	RDPP target	23535		270	371990
	Jun-20	18641		270	
	Jun-21	23535		270	343200
	% to RDPP	100%		100%	92%
PIU-DLS	RDPP target	44443		1349	289700
	Jun-20	27739		809	
	Jun-21	35821		1079	222650
	% to RDPP	81%		80%	77%



Photo: Fish harvesting at demonstration pond



Photo: Field days at demonstration site

PIU-DLS has also been arranging vaccination (cattle, goat and poultry to decrease mortality and increase productivity), de-worming (cattle, goat to create awareness and control the worm) and infertility (dairy cattle to minimize the causes of reproductive disorder) campaigns at union levels. Total 5.58 million cattle, 2.35 million goat and 7.71 million poultry were vaccinated in 54734 campaigns (average 102 cattle, 43 goats and 141 poultry birds per campaign) organized till July 2021 (fig. 3.4). De-worming medicine was given to total 2.0 million cattle and 0.97 million goat; and 0.18 million cows and heifers were diagnosed and prescribed.

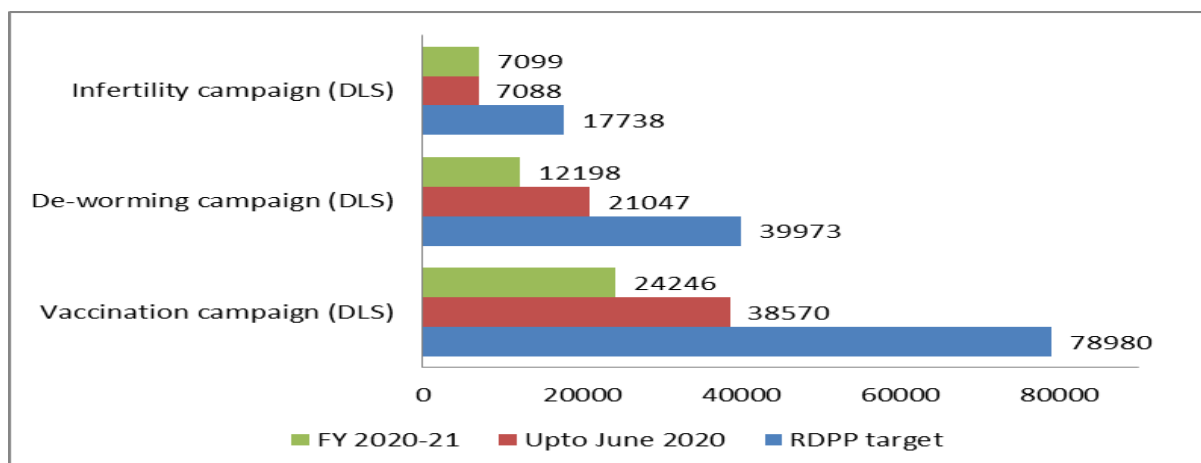


Fig.3.4: Health and hygiene practice of PIU-DLS

3.6 Technology Adoption

NATP-2 implemented a large number of extension activities targeting technology adoption which includes technology training, field demonstrations, technology trial, field days, exposure visits and learning sharing meetings and campaigns with the CIG - non-CIG farmers.

The field records kept in the field offices shows a great deal of success in this regard (Table-3.24).

Table-3.24: Summary Details of the Technology Adoption by CIG and non-CIG Farmers

	Unit	PIU-DAE	PIU-DoF	PIU-DLS	Total
CIG farmers	Person	417550	63736	153565	634851
Non-CIG farmers	Person	671480	101540	402804	1175824
Ratio of CIG and non-CIG farmers	Person	1.61	0.63	2.62	
Total Adopter	Person	1089030	165276	556369	1810675

In crop sector 417,550 farmers (female 34%) found adopted the project promoted technologies (Table 7). Technology-wise percentages of CIG members adopted the project promoted technologies are given in Table 3.5 before.

List of top 5 technologies that are being adopted in large scale and factors contributed the adoption are described below:

#	Name of technologies	Factors contributed in adoption
1	New variety seeds including stress tolerant and short duration varieties	<ul style="list-style-type: none"> New variety seeds are more productive & tolerant to pests & diseases Stress tolerant varieties are more adaptable to adverse climatic conditions Short duration varieties help in meeting the domestic deficit, facilitate better marketing and fair price and early/timely planting of the next crop, overall increased cropping intensity Commercial production of seeds is profitable
2	Seed production & preservation	<ul style="list-style-type: none"> Demand of quality seeds always a vital issue and farmers want to ensure use of quality seed for better production
3	Production & use of vermi-compost	<ul style="list-style-type: none"> Significant awareness developed among the farmers about degradation of soil health and integrated nutrient management. Soil health quality gradually being deteriorated and production response seems not to be at the desired target

#	Name of technologies	Factors contributed in adoption
		<ul style="list-style-type: none"> ▪ Test results proved higher productivity of soil ▪ Commercial production is significantly profitable
4	Production of safe vegetables using sex pheromone trap	<ul style="list-style-type: none"> ▪ High demand at the markets and supports fair price/profitability of produced commodities ▪ Health safety ▪ Reduced cost of production
5	Technological features/packages in yield gap minimization	<ul style="list-style-type: none"> ▪ Helps in higher production minimizing yield gap at farm level ▪ Higher profitability in comparison to cost of production

The **less adopted technology** is raising *Boro Rice seedlings in Dry Seed Bed* and the reason being is that it requires more care and cost expensiveness, after the first year of the project no more demand is seen reflected in CIG Micro Plan and then only 18 demonstrations were established.

The DAE Upazila reports revealed that

- The most adopted new varieties are Boro rice: BRRIdhan 74, 84, 89; T. aman: BRRIdhan 71, 72, 73 (stress tolerant) BRRIdhan 51, 52 & 91 (saline tolerant); Aus: BRRIdhan 48, 82, Narica mutant; wheat: BARI wheat 30, 31, 33, BARI wheat 28,30, 33 (*heat tolerant*); lentil: BARI lentil 6, 8. The mass scale adoption of these new varieties and other management technologies promoted by the project noticeably reduced yield gaps of demo crops like rice, wheat, maize and mustard and helped in increased production.
- Seeds produced from demonstrations helped minimizing farmers' demand significantly, particularly the new variety seeds, and this enhanced increased area coverage under the new crop varieties.
- Safe vegetables production at the homestead demonstrations and its widespread dissemination/adoption contributed to food & health safety, increased nutrition and additional income for the small & marginal women farmers.
- Sex pheromone trap helped reduced use of pesticides resulting increased production of safe vegetables which have high demand in market. Wide adoption of Vermi-compost & Tricho-compost technologies enhanced its massive production & uses, protecting soil from degradation and contributing to increased productivity, etc.

Adoption Impacts on Crop Production and Productivity, Food Security and Income

PIU-DAE conducted a short study to measure the impact of the extension activities related to Paddy and summer tomato, been offered by the project on production & productivity, food security & income of both CIG & non-CIG farmers. Detail data for this analysis were collected from 126 CIG and 126 non-CIG farmers from 42 CIGs (3 farmers from each CIGs and 3 from non-CIG farmers) of 42 Upazillas through a pre-designed questionnaire. Group performance data of those 42 CIGs were also collected through focus group discussions. Additionally the upazila level consolidated productivity data, collected from 70 Upazilas comprising of 7350 CIGs of the 14 DAE regions by using other tools, have also been used to complement and cross-verify the survey findings.

Results shows an increase in rice productivity from 4.88 ton/ha to 5.16 ton/ha during 2017-2020 and this increase found a little higher for the CIG farmers. Among the technologies, newly released varieties, recommended fertilizer dose and seed production & preservation to meet the demand of new variety/quality seeds were largely adopted.

The productivity of summer tomato was found increased from 31.25 ton/ha to 33.55 ton/ha in last four years and no significant yield difference between CIG and non-CIG farmers was found. Highest yield among CIG members found in Dhaka (38.7ton/ha), Jashore (36.73 ton/ha) and Dinajpur (36.47) and lowest in Sylhet (25.33 ton/ha).

The survey found 93% of and 64% of non-CIG farmers adopted the project demonstrated technologies and those are: use of new variety seeds, proper spacing & time of seeding/planting, use of fertilizers/pesticides in recommended dose, production & use of vermi-compost, use of sex pheromone trap for safe food production etc. The other adopted technologies practiced were judicious use of irrigation water, production technology of HVC/pulses/vegetables and pest management. Their household level annual production and demand for different cereal and non-cereal food items including fish, meat and egg in 2016 and 2020 shows that both the CIG and non-CIG farmers' demand for food had increased over time. But their productions are now surpassed over their demand.

Average annual income & savings of both the CIG & non-CIG respondents were remarkably increased. For CIG farmers the total income found increased by 44% from Tk. 176378/-to Tk. 253867/ and for non-CIG the increase was 36% (from Tk. 131645/- in 2016 to Tk. 178768/- in 2020). The increases in agricultural income for CIG and non-CIG farmers were 45% and 33% respectively.

FGDs with the CIGs reveal that in last four years performances of all CIGs were upgraded at A & B grades and their group savings increased by 74%. The CIG farmers mostly adopted the new varieties replacing the old varieties of Boro, Aus & T. aman paddy, wheat, mustard and tomato. New varieties adopted are Rice- Boro:BRRIdhan58,74, 88, 89, 92,Aus:BRRIdhan48,65,82 T.aman:BRRIdhan-71,72,75; Mustard: Barisharisha-14,15,16; Tomato- Bari tomato 4,8.

Success Story 1: Sohel Ahamed in Production of Summer Tomato from Grafted Saplings

Sohel Ahamed, a practiced crop farmer lives in Nadampur, a remote village in Sadar Upazilla of Moulvibazar district. He became member of 'Nadampur CIG (crop) Co-operative Society' in 2009 during NATP-1. Due to his active involvement with CIG and leadership capacity he was elected as Chairman of the society.

Sohel is a lead farmer, mainly involved in producing High Value Crops (HVC). He used to help disseminating the practices/technologies of HVCs to other CIG & neighboring non-CIG farmers. Before NATP-2, he was cultivating different HVC crops in his own and leased lands ranging from 6.00 acres to 10.5 acres. He initially cultivated summer tomato in small area to gather experiences. He then contacted with Upazilla Agriculture officers and received



hands on training on grafted seedling raising techniques for cultivating summer tomato and built his confidence. In early 2020 being inspired by the knowledge he received through training, he collected grafted sapling (grafted with wild brinjal) of BARI summer Tomato variety- 4&8 and planted the sapling in 1.5 acres of land. He planted around 8500 saplings per acres and produced around 62 tons of summer tomato, on average around 5 kg per plant. He sold the tomato in local and distant markets initially @ taka 100/kg and ended up with Tk 10.00/kg. In total he spent Tk. 275,000 as costs of production and earned about BDT 1,000,000 from tomato. His net income from 1.5 acres was around Tk. 725,000. He also sold 15,000 - 20,000 saplings @Tk.10 per sapling.

This year (2021) he started cultivating summer tomato in an around the same area and motivated about 70 farmers to cultivate summer tomato. By now Sohel developed his skill as an expert in commercial production of grafted saplings of summer tomato. With his initiative summer tomato and other HVC vegetables are now cover in around 500 acres in his own village Nadampur. The farmers there also widely use sex pheromone traps for food safety measures. Now the village Nadampur is known as **“Nadampur Safe vegetable production village”**.

In fisheries sector 63736 CIG farmers adopted the project promoted technologies of them 30.5% female. Of total adopters, about 87% adopted improved management practices of carp polyculture, 5.3% adopted improved management practices of mono sex tilapia and 3.3% adopted improved management practices of carp-golda mixed culture technology (Table-3.25).

Table-3.25. Details of Fishery Technology Adoption Data

Technology Name	No. of adopters	%	% Female
1. Carp Polyculture	55,292	86.75	30.26
2. Monosex Tilapia	3,343	5.25	29.61
3. Carp Golda Mixed Culture	2,090	3.28	38.28
4. Shing and Magur Mixed Culture	894	1.4	26.62
5. Pangas Monoculture	729	1.14	28.81
6. Pabda Gulsha Mixed Culture	316	0.5	31.33
7. Koi Monoculture	171	0.27	18.71
8. Shing Monoculture	6	0.01	50.00
9. Others	652	1.02	34.79
10. Nursery	243	0.38	35.19
Total	63,736	100	30.47

In livestock sector a total of 153565 (74% of the CIG farmers) CIG farmers adopted the improved housing/shed management, Slat system housing for goat, balanced feeding, schedule vaccination, scheduled de-worming, bio-security related technologies promoted by the project. It may be mentioned here that the adoption rate of vaccination, de-worming, housing, balanced feeding etc. technology is comparatively high because farmers are very much interested to vaccinate their animals for prevention of diseases and de-worming to improve the herd health and increase productivity of animals. The detail information of technology adoption is provided in the table-3.26.

The highest adoption rate is observed in Khulna division (80%), 2nd highest in Rangpur division (76%) and the lowest in Barishal division (61%). It is also observed that the adoption ratio in old upazilas (NATP-1 Upazila) is comparatively high then new upazilas. All upazila under Barishal division are new. That's why the adoption in Barishal division is relatively less.

Highest technology adoption is achieved in goat rearing (97%) and cow rearing (93%) and lowest for pig (72%) and sheep rearing (68%). Most of the sheep and pig rearing CIGs were formed in hilly areas which are physical less accessible that's why the adoption by the pig rearing farmers is relatively less. Highest female adopters are among Goat Rearing CIGs (61%), the second highest in Sheep Rearing (58%) and the third highest in Poultry Rearing (57%).

Table-3.26: Percent of Livestock CIG Members adopted the Project Promoted Technologies

	Title of Activities	Cow rearing	Beef fattening	Goat rearing	Poultry rearing	Duck rearing	Sheep rearing	Pig rearing	Buffalo rearing	Total Adopter	Female Adopter
2020-21	Target	11000	6100	3700	3500	400	100	80	40	24920	8722
	Achievements	10971	6041	3632	3334	360	18	64	30	24452	9012
	%	100%	99%	98%	95%	90%	18%	80%	75%	98%	103%
Cumulative	RDPP Target	73416	38736	24808	24056	3672	1056	336	120	166200	58170
	Achievements	68513	34895	24009	22197	2884	722	243	102	153565	63139
	%	93%	90%	97%	92%	79%	68%	72%	85%	92%	109%

Success Story 5: Momtaj Khatun Finds a Way for Better Life with NATP-2

Momtaz Khatun is one of the 20 members of Ayelchara Clubpara Cow Rearing CIG formed in 2009 under Kushtia district. She was a housewife when joined and had to pass days in acute poverty and starvation with their four daughters. That time she had only one Cross breed cow producing 5 to 6 litre of milk per day. She attended a training course organized by the project on improved management and rearing practice of cow, organized by ULO, Kushtia Sadar and learnt on cowshed management, balanced feeding, vaccination, de-worming etc. After receiving training she bought 2 more cows by taking a loan from NGO and applied her knowledge and skill gained from the training. By this time, she also upgraded her cowshed, vaccinating and giving deworming medicine to her cattle on routine basis. As a member of CIG she receives necessary extension services from Upazila Livestock Office without pay.



Due to proper management, no cattle were affected by any diseases. She informed that no cattle of her farm were affected by disease and nor died during last couple of years and all cattle are in good health. Cows have been come under heat maintaining regular interval. Now she has 6 cross breed cows in her farm, gets 40-45 litre milk per day and sell milk @Tk. 45/litre and earns Tk. 55,000.00 per month from milk. Every year she sales one cow and earns around Taka-55-60 thousand and 2-3 beef cattle and earn Tk. 120-150 thousand. With the money earned her family leased in a piece of cultivable land and cultivating crops for household consumption. Now she and her family become solvent financially than before. Observing her success many of her neighbors have started cow rearing using improved technology. Ms. Momtaz Khatun maintains functional communication with Upazila Livestock Office. She expected that the continued extension services from Upazila Livestock Office can enrich all the cattle farms in this locality and the farmers will be able to make sustainable production of milk and meat in Bangladesh.

Success Story 6: Kawsara Begum Could Overcome Financial Crisis through Poultry Farming

Mrs Kawsara Begum is a member of Katabonia Poultry Rearing CIG, established in 2017 in the very distressed and isolated Char Amanullah in Subarnachar upazila under Noakhali district, Mrs Kawsara Begum is a full-time housewife was passing a very depressed life in a 8-member family with no other income except an small pension amount of her husband.

Being a member of CIG, Kawsara participated in several training programs and participated in the vaccination campaigns organized by the project in her village after regular intervals. She received a Model Poultry Demonstration in FY2017-18 and acquired knowledge from field days, CIG & non-CIG gathering, exposure visit etc. organized by the project showing the direct benefit of applying improved technology for increasing production. Kawsara Begum started poultry rearing with only 10 Sonali Poultry (Pullet). What she learnt from training and through implementation of technology demonstration



is now applying - provides balanced feed and vaccine to the poultry regularly and improved her poultry shed. Now she has 200 poultry birds in her firm and earns Tk. 25-30 thousand/month from selling of eggs and pullet. With this she could minimize the financial crisis of her family. The food intake of her family has also been improved through inclusion of egg in daily meal. The neighboring women are being motivated for rearing sonali pullet by observing her success.

Other CIG members and many neighboring farmers started to rear sonali poultry and they are practicing

balanced feeding and schedule vaccination of poultry. As a result, disease infection as well as mortality rate of poultry are very negligible in the area. Upazila Livestock Office, Subarnachar is providing necessary extension services as per need of the farmers. She hopes that the required extension supports from upazila livestock office will be continued in future. Due to insufficient production of Day Old Chick against the demand of the locality, Katabonia Poultry



Rearing CIG planned to establish a mini poultry hatchery using matching grant through AIF-2 under this project. She expressed her sincere gratitude to NATP as well as DLS for providing need based supports and cooperation.

3.7 Strengthening Institutional Capacity to Improve the Outreach and Quality Extension Service Delivery

3.7.1 Officers and Staff Training

The project activities of PIU-DAE are being implemented by the SAAOs under the direction and supervision of upazila and district level DAE officers. DoF and DLS don't have their departmental staff posted below Upazila level and thus the project kept provisions for one Extension Officer for two Upazilas and one Field Assistant per Upazila and is funded with GoB resources. The project also recruited 2681 Community Extension Agent for Livestock (CEAL) and 2640 Local Extension Agents for Fisheries (LEAF) from the community to support delivering the project promoted livestock and fisheries related extension services both at FIAC and in the community. Each CEAL had received 14-day basic and 3-day refresher training, one bi-cycle, one starter kit box from the project. All LEAF received 8-day basic and 4-day refresher trainings, one water testing kit, a bicycle from PIU-DoF for their mobility. All the CEALs and LEAFs received a mobile tablet with internet connection for their easy communication with farmers. They are also receiving a monthly lump sum fixed amount of money to cover their local travel cost.

NATP-2 also made provisions for officers and staff training for the three extension departments with the objectives to enhance their knowledge & skill, and also for more efficiently managing the project activities. District and upazila level departmental officers serving as resource persons in training sessions organized for SAAOs, CEAL, LEAF and project staff. Resource speakers were also invited from NARS stations/sub-stations, Department of Youth Development, Department of Audit & Accounts, etc. Major areas of training include *Implementation strategy of project activities, various extension methods and techniques, accounts, finance & procurement management, ICT skill development, community mobilization, CIG organizational development, extension planning, newly released technology* from research institutions and universities.

PIU-DAE and PIU-DoF completed most of their Officers and Staff training (Table-3.27) while PIU-DLS has included few more training in RDPP under GoB budget.

Table-3.27: Status of Officers and Staff Training.

Activities		PIU-DAE		PIU-DoF		PIU-DLS		% of Total RDPP
		RDPP Target	Upto June 2021	RDPP Target	Upto June 2021	RDPP Target	Upto June 2021	
Officer's training	Batch	99	94	29	25	105	67	80%
Staff Training	Batch	802	780	32	25	56	19	93%
LEAF/CEAL training	Batch			213	213	144	119	93%
Foreign training	Batch	21	21	1	1	4	4	100%
Foreign study tour	Batch			8	8	4	4	100%

Training programs helped the extension officials developing their capacity in performing the following project activities of the project more efficiently and effectively:

Officers:

1. Improved/updated knowledge & skill gathered from training have significantly helped the DAE, DoF and DLS officers in implementing the project activities on financial & procurement management, CIG organizational development, dissemination of modern production technologies and ICT activities.
2. Developed and enabled them to become efficient trainer and smart resource speakers
3. Improved understanding of the field problems and able to providing appropriate solutions to field problems faced by the farmers.

4. Trainings contributed to overall management and coordination skills of the officers.

SAAOs, CEAL, LEAF, DAE and project staff:

1. Skill and efficiency of the trainees improved in performing their duties and responsibilities in project activities.
2. Improved skill and technology knowledge of the trainee SAAOs that enabled effective dissemination of technologies among the CIG & non-CIG farmers.
3. Impacts of training are seen to be effectively reflected in CIG organizational development and capacity building of the CIGs.
4. Increased capacity of DAE office staff that helped in providing efficient & skilled services in office management.
5. Improved skill of the Gardeners/Nursery men/Nursery supers/SAHOs helped in producing quality seedlings/saplings at the nurseries.

Lessons learnt in foreign training/study tours by DAE:

Cultivation of vegetables in Poly Mulch, Net house/Poly house Cultivation (a typical Greenhouse farming system), raising of seedling in Coco Peat, production technologies of Tricho-Compost/Vermi Compost, Sorting/Grading of vegetables/fruits, use of Plastic crates for carrying agricultural produce, ICT in Agriculture, Hydroponics/soilless culture/production of vegetables, Urban Agriculture/ City farming, Wall Gardening/ Vertical Gardening, GPS Technology, use of Nano-Technology in crop production, Agro-eco Tourism, etc.

Learnt technologies practicing in Bangladesh

▪ Poly Mulch in Vegetables Cultivation:

Poly-mulching technology learnt from Indonesia is being successfully used in cultivating Water melon, Tomato, Cucumber and Cucurbits in Pakundia of Kishoreganj District and Dumuria of Khulna District and expanding in other areas.

▪ Net House/ Poly House/ Green House Farming

Poly House Farming system learnt from Malaysia and Thailand is being practiced in producing Summer Tomato, Chui-jhal and Capsicum in Dumuria upazila of Khulna District and are being practiced in Jessore, Jhinaidah and other neighbor districts.

▪ Germinating and raising of seedlings in Coco-Peat

The technology was visited in Thailand and Indonesia, and is successfully practiced for raising seedlings of Capsicum, Cucurbits, Tomato and Eggplant in Dumuriaupazila of Khulna and Dinajpur Districts.

▪ Tricho-Compost/Vermi-Compost Technology

The technology learnt from Thailand and Indonesia are widely used in the overall project area and Sadarupazila of Bogura, Pakundia of Kishoreganj, Shibpur/sadar of Norsindi, Pirganj of Thakurgaon and Dumuria of Khulna are pioneer in commercializing its use.

▪ Sorting, grading vegetables/fruits using Sacks & Plastic crates

The practices of sorting & grading of vegetables/fruits have been included as training topics in CIG events and it is widely accepted by the farmers due to the advantages of maintaining the quality of products, getting fair market price, reduced post-harvest losses, etc. As a result its use are gaining popularity among the farmers.

3.7.2. Services of Farmer's Information and Advice Center (FIACs):

The Farmer's Information and Advice Centers (FIAC) are one-stop extension service centers established and housed in two rooms (one room for crop and the other room for fisheries and livestock) in the newly built two-storied Union Parishad (UP) office buildings of the project upazilas. 1621 FIACs have been established, of them 654 were established during NATP-1. FIACs have been equipped with signboard, necessary furniture, pest & seed museum, seed moisture meters, foot pumps, water testing kit, and other small scale agricultural equipment, IEC materials e.g. booklets, technology leaflets etc. FIACs remain open during the office hours, and SAAOs, CEALs & LEAFs provide services to both CIG and non-CIG farmers following a systematic office routine/ duty roster. Farmers can also borrow equipment from the FIACs for their use.



FIAC Services at a Glance

- Extension service providing office and meeting place for SAAOs, CEAL and LEAF
- Technology information display center
- Pests, seeds, inputs and disease museums
- Borrowing of seed moisture meters, foot pumps, water testing kit, and other small scale agricultural equipment by farmers
- Insects, pest and disease diagnosis, prescriptions and extension advisory services to the farmers
- Information service to farmers related to availability source of quality seeds, saplings, animal breed, fingerlings etc.

FIACs are also equipped with mobile tablets and PICO Projectors being used in demonstrating captured images, apps, etc. to the visiting farmers in the FIACs. SAAOs/CEAL/LEAF working in FIACs also uses the tablets in video conferencing with the farmers Upazilla and district officers. Displaying arrangements of improved crop variety seeds, major pests & diseases, beneficial insects, sex pheromone traps, etc. have been displayed at the FIACs and are used to motivate the visiting farmers. These arrangement and facilities add significant value in technology dissemination and adoption.

The services of FIAC also extended to provide technical supports through field visits, primary treatment and diagnostic services, promotion and expansion of scalable new technologies through motivation, linking producers to the markets, etc. along with the advice.

PIU-DAE Reports collected from the field shows that during July 2020 to June 2021 on average, 11 farmers visits a FIAC per day of which male 8 and female 3. It is to be mentioned that due to the effect of COVID 19 number of visiting farmers came down from 15 to 11 (fig.3.5).

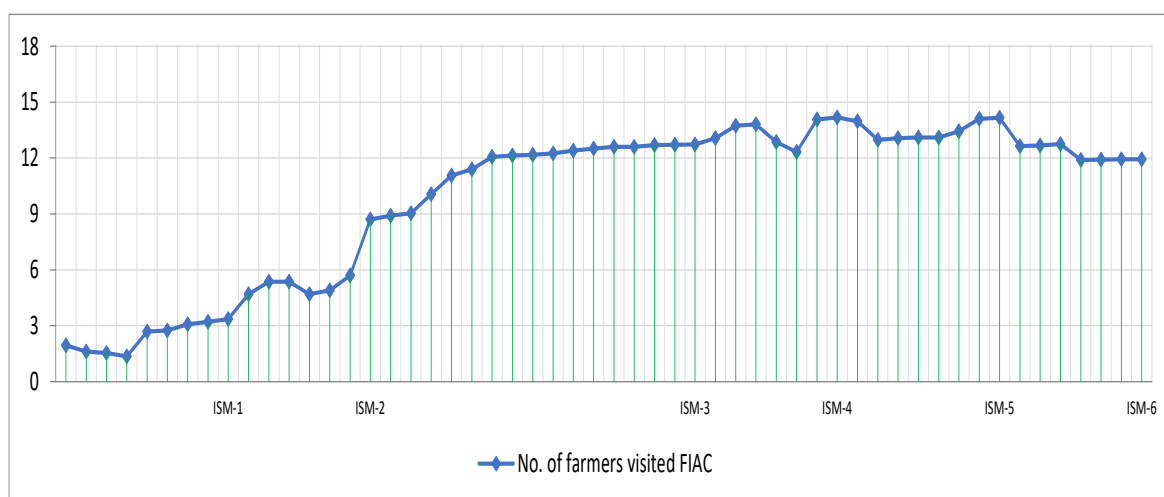


Fig. 3.5: Trend of farmers visiting FIACs (crop)

Major Issues/Areas or Fields of Receiving FIAC services by the Visitors:

Farmers, dealers & traders, public representatives & social workers usually visit the FIACs to receive services and collect information on the following areas/issues/fields:

Crop	Fisheries	Livestock
1. Pest management- specially name of pesticides and its dose per ha	1. Excessive clay at bottom of the pond.	1. Anorexia (Khuda monda)
2. Disease Management- Specially name of fungicide and its dose per ha	2. Low/weak embankment:	2. Diarrhea
3. Fertilizer dose of different crops	3. Large trees on embankment:	3. Parasitic infestation (krimi shongkromon)
4. Sources of good quality seeds	4. Lack of quality fish seed:	4. Malnutrition (opushti)
5. Sources of seed of newly recommended/released crop varieties	5. Water color	5. Tyntanities (pet fula)
6. Sources of good quality saplings and its price	6. Red layer on water surface	6. Cattle vaccination
7. Flower and fruit dropping of fruit crops	7. Blackish water	7. Goat Vaccination
8. Sources of sex pheromone and use method with dose	8. Slow growth of fish	8. Poultry vaccination
9. How to get Government incentives (<i>pronodona</i>)	9. Grasping	9. Feeding
10. How to prepare and apply for AIF-2 and AIF-3 matching grants	10. Plankton bloom	10. Housing
11. Lending of foot pump, fita pipe, moisture meter, sprayer machine	11. Natural calamities:	11. AI
12. How to produce and store good quality seeds	12. Inputs related problems	12. Others
13. Propagation techniques of different fruit crops	13. Fish marketing related problems	
14. What are the management practices of rice seed bed during too much cold and too much hot	14. Biological management of undesirable weeds/fish/	
15. How to get training from DAE	15. Others	
16. Collection of booklet, leaflets and posters on technology etc.		

The PIU-DoF and DLS data reveal that on an average, 11 fish and 24 livestock farmers visiting each FIAC per month. The most important advise/problems/issued raised by the FIAC visiting fish farmers are (i) sources of quality fish seed and feed, (ii) control of fish disease, (iii) water quality management, (iv) stocking density, species composition, (v) fertilization, (vi) fish feeding, (viii) information of fish price prevailing in other areas. Farmers are getting pond water quality testing services along with a

prescription for taking corrective measures if needed. Leaflets were given to the visiting farmers if needed. All these activities are contributing to production of fish. During the COVID-19 farmers are getting extension services through mobile phone and tablet.

PIU-DoF is conducting periodic monitoring in 18 FIACs through a questionnaire survey in Google Forms. The first survey was conducted in 2019-2020 and the 2nd one was in June 2021 and the major findings are: average 11 farmers per month visited the FIAC. Of them female were 15% (fig. 3.6). Major types of advice taken from the FIACs were:

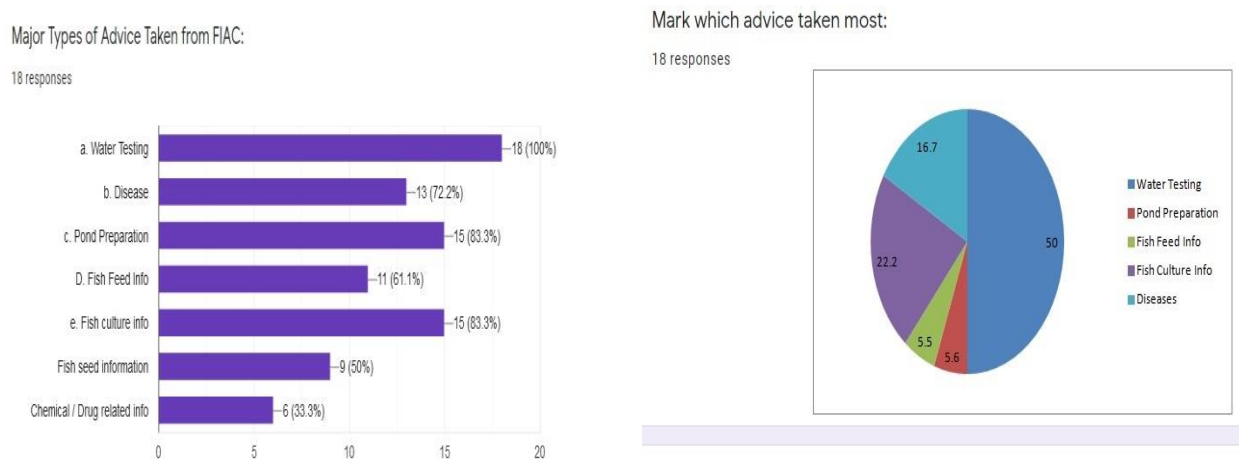


Fig.: 3.6: PIU-DoF FIAC Services

In the FIAC separate registers are being maintained by the SAAOs, CEAL and LEAF. They records date-wise contact details of the farmers visiting FIAC, details of the problems faced and the prescriptions given by the SAAOs, CEAL and or LEAF. Complaint registers and complaint boxes are kept in the FIAC for the farmers to drop their complaints and/ or write those in the registers, which have been reviewed time to time by the Upazila Officers and take necessary measures to address them.

Several initiatives have been undertaken to popularize FIAC: Publicity of FIAC services are continued using posters, leaflets and conducting campaigns. Messages of FIAC services are being intensively communicated to CIG and non-CIG farmers making personal contacts. Elite persons and public representatives are invited at the FIACs. Instant and quality services are ensured keeping the FIACs full-time opened.

3.8 Agricultural Innovation Fund-2 (AIF-2)

AIF-2 is a non-reimbursable competitive matching grant for the CIGs, and its main objectives are to strengthen the capacity & sustainability of the CIGs, facilitate easy adoption of technologies by the CIG farmers and promote participation & strong linkage of CIGs with marketing facilities.

As of June 2021, PIU-DAE and PIU-DoF awarded 73% of their targeted number of sub-projects and utilized 67% and 55% of their funds respectively (Table-3.28). PIU-DLS could only implement one third of their targeted number of sub-projects. Considering slow progress due to less demand for small scale farm equipment and material among the CIG members, PIU-DLS along with PMU developed Supplementary Guidelines for three thematic areas. The World Bank cleared the guidelines subject to approval of JPSC. JPSC gave approval on the Supplementary Guidelines in the 6th meeting held on 24 June 2021. PIU-DLS already circulated a notice inviting sub-project proposal from the CIGs.

Table-3.28: Progress of awarding AIF-2 matching grant sub-project (July 31, 2021)

PIUs	Target (RDPP)		Sub-projects		Disbursement July 2021 million Tk	Achievements (%)	
	No	Million Tk.	Upto June 2020	Upto June 2021		Sub- project	Fund utilized
DAE	1803	587.55	1173	1314	390.82	73%	67%
DoF*	960	329.20	388	699	182.53	73%	55%
DLS	1080	418.40	148	359	91.98	33%	22%
Total	3843	1335.146	1745	2372	665.33	50%	62%

* Progress includes up to June 2021

The list of major items procured with AIF-2 funding by the CIGs are given below

PIU-DAE		PIU-DoF		PIU-DLS	
1.	Power Tiller	1.	Auto Feeder,	1.	Chopper machine,
2.	Reaper	2.	Oxygen cylinder,	2.	Feed crushing machine,
3.	Thresher/Sheller	3.	Ice plant,	3.	Mixing machine,
4.	Rice Transplanter/Bed Planter	4.	Irrigation pump,	4.	Milk Pasteurization machine,
5.	Combine Harvester	5.	Auto van,	5.	Milk, packaging machine,
6.	Pickup	6.	Pickup van,	6.	Cool van,
7.	Seed preservation Drum	7.	Floating fish feed pellet machine	7.	Incubator, Freezer, etc.
8.	Low lift Pump	8.	Sinking fish feed pellet machine,		
9.	Foot Pump	9.	Aerator,		
10.	Seeder	10.	Net for cage culture,.		
11.	Oil extractor	11.	Fishing net		
12.	Seed storage room	12.	Mechanization of Nursery		
13.	Solar Drier/Drier	13.	Insulated cooling van		
14.	Plastic crates	14.	Others		
15.	Vermi/Tricho compost plant				
16.	Others				

Using the awarded AIF-2 matching grants CIGs under crop (PIU-DAE) component procured 1962 Power tillers- 1962, 227 Reapers, 978 Threshers, 7 Rice transplanters, 3 Combined harvesters, 631, Low Lift Pumps-631, 36 Shallow Tubwels (STWs), 527 Foot pump-527, 215 Pick-up vans; 11003 Plastic crate, 595 Seed preservation drums and other small scale machineries and utencils.

A Success Story on the Mechanization of fish farming: One bold step towards modernization for a sustainable fish production system

Shailakopa motsha CIG somobaisomiti Limited of Kotchandpur, Jhenaidah, was formed in July 2009. Knowing from the Upazilla officers about the matching grants provision of CIG the somobaisomity prepared a sub-project to procure a pick-up Van for the transportation of fish, fingerlings, fish feed and other aquaculture ingredients 2019 and it was granted. With AIF-2 fund the CIG bought a pick-up van and is being used to transport fish, fingerlings, fish feed and other aquaculture ingredients, etc. primarily for all the CIG members. Some non-CIG farmers are also using the pick-up van on rental basis. A pick-up driver has been appointed by the CIG. A committee of 5 members has also been formed for proper monitoring management and use of the vehicle. Information of every trips along with goods transported, maintenance income and expenses, etc. are documented and presented to the management committee meeting every month. Every decision related to the management and use of the pick-up van is documented in the resolution book of the CIG.

By April 2021 a total of 105 tons of fish, fingerlings, fish feed were transported and earned about Tk. 100,000/ as net income. Getting this pick-up van support facility, the fish farmers can now transport and sell their products to their desired places at a better price, maintain the quality of fish and earn more. As a result, average cost of fish production of the CIG has been decreased by 10% due to use of good quality feed access and reduction in post-harvest loss and production increased by 7% than before. The labor cost of the farmers has also decreased by 5% than before.

Using the pick-up van, 270 CIG and non-CIG beneficiary fish farmers associated with the CIG are enjoying the benefit of the transport. Farmers are getting the opportunity to sell their 'small indigenous species' of Kotchandpur such as, tengra, Puti, koi, Magur, Shing etc., to distant market places of the country where there is high demand. The pick-up van has played a significant role in the marketing and transportation of fish, fish fry and feed of the fish farmers during the Corona period. In addition, it has been possible to bring the fish to the doorsteps of the consumers by operating a safe mobile fish market by using the pick-up van during the corona period.

3.6.1 AIF-2 Performance Assessment

PIU-DAE conducted a performance assessment on AIF-2 by collecting data from 366 AIF-2 sub-projects awarded to 55 upazilas and the summary assessment results are shown in Table-3.29.

The assessment result showed that all the equipment/items are in operation except a few which are waiting for repairing. All the sample equipment was in good condition.

AIF-2 sub-projects assessment data showed that a total of 334977 CIG & non-CIG farmers (CIG 57474) were benefited from the sub-project equipment/items. The equipment/items helped in area coverage of around 39167 ha and transporting of 18046 ton farm produces. Income generation varied from equipment to equipment and from CIG to CIG. Nevertheless, the CIGs of the 55 upazilas made a net income of Tk. 85944000 (around Tk. 86 million) from the equipment/items of 366 sub-projects during the period from 2017-18 to 2020-21.

The assessment revealed that equipment/items under operation brought about remarkable changes in farming practices of the beneficiary CIG & non-CIG farmers. Data collected from the assessment area show that -

- Around 85% CIG & 60% non-CIG farmers adopted the improved farm practices like timely tillage operation, sowing, planting and harvesting of crops
- Average threshing time, labor & drudgery were reduced to 65% for the CIG farmers and 40% for the non-CIG farmers
- Average time for farming practices for the CIG farmers was reduced to 60% and for the non-CIG farmers to 40%
- Approximate labor cost for the CIG farmers reduced to 60% and for non-CIG farmers to 35%
- Post-harvest loss & total cost of production reduced to around 5% and 3% for the CIG farmers and for the non-CIG farmers 3% & 2% respectively
- Average productivity of CIG farmers was increased to around 10% for the CIG farmers and 6% for the non-CIG farmers
- Also the sub-project items helped in increasing cropping intensity of the beneficiary CIG farmers by 6% and for the non-CIG farmers by 2%.

Table-3.29: Assessment report of 366 awarded AIF-2 sub-projects

Procured items	No. of items procured	Functional	Repairable	Total beneficiaries			Area coverage(ha)/ quantity transported(ton)	(Taka in Thousand)			
				CIG farmer	Non-CIG farmer	Total		Income generated (Tk.)			
								Days in operation	Total income	*Operational	**Net income
1. Power tiller	590	551	39	17497	75653	93150	21630	13073	82588	33966	48622
2. Reaper	20	16	4	495	1632	2127	485	919	2588	974	1614
3. Power Thresher	253	235	18	10135	41050	51185	12442	6457	32370	15329	17041
4. Low Lift Pump	172	170	2	1777	23920	25697	1025	2642	6889	2212	4677
5. Power sprayer	73	73	0	1153	1860	3013	679	1217	1442	517	925
6. Hand sprayer	342	329	13	1896	3930	5826	1671	2790	5164	2780	2384
7. Foot pump	198	173	25	4039	27703	31742	1235	2316	8104	1236	6868
Total				36992	175748	212740	39167	29414	139145	57014	82131
8. Plastic crates	1370	1370	0	19525	100185	119710	Transported 17567 ton	1556	420	126	994
9. Power tiller trolley	32	28	4	300	1391	1691	Transported 222 ton	1862	2104	848	1256
10. Pick up/mini-truck	23	23	0	657	179	836	Transported 257 ton	2267	3406	2050	2906
Total				20482	101755	122237	18046 ton	5685	5930	3024	3571
Grand Total				57474	277503	334977	39167 ha/ 18046 ton	35099	145075	60038	85037
*Operational expenses include fuel											
**Net income = (Total income - operational expenses)											



AIF-2 equipment

AIF-2 and AIF-3 Sub-projects Impacts of the Fisheries component

AIF-2 & 3 funds of PIU-DoF were utilized to purchase 11 to 13 categories of items. PIU-DoF conducted the study on six major categories of items procured/ and or established with AIF-2 (*transport vehicles, Fish Feed Pelleting Machine, Irrigation Pump, Nursery, Aerator, Mechanization in Cage Culture*) and AIF-3 (*transport vehicles, Fish Feed Pelleting Machine, Aerator, Ice factory, Hatchery, Magur Culture in RCC Tank*) funds. Data were collected from 495 recipients (407 AIF-2 and 88 AIF-3) of those items by administering separate item-wise questionnaires. Findings of 4 items are given below:

Vehicle (pick-up and motorized vans): Data were collected from owners of 199 (178 AIF-2 and 21 AIF-3) of the total 361 (334 AIF-2 and 27 AIF-3) vehicles procured. The study revealed that about half of the AIF-2 fund were utilized to purchase pick-up and motorized vans for safe transportation of fish, fingerlings, fish feed, and aquaculture inputs. On average, 2 persons are hired to operate one vehicle and 13-16 CIG family members are involved in each vehicle operation. One vehicle transported 20,321 kg produces per month. As the operators are paying on monthly basis, the profit earning mainly depends on the number of trips made per day/month which varies from CIG to CIG and area to area. All respondents opined that awarded transports reduced their transportation cost and thus contributed in making better profit margin from the fishes. Problems encountered during the period of operation were- Irregular renting of the vehicles, problems in managing driver, reduced operation due to lockdown and frequent fine imposed in road

Aerator: Data were collected from 38 (15 AIF-2 and 23 AIF-3) of the total 124 (65 AIF2 and 59 AIF-3) aerators procured with AIF-2. PIU-DoF funded different types of Aerators - Paddle Wheel, Four Wheel, Double Wheel, Push Wave, and Impeller Paddle Wheel. The aerators are now on average 170 days of operation. The study found that yield per decimal pond with aerator was 30 kg as against 19.75 kg per decimal without aerator and the net increment is 51.9%. Average cost of operation and maintenance of one aerator was Tk 16,500. Sixty percent of the users informed that their repair and maintenance services are available locally.

Feed pellet machines: data were collected from 113 (82 AIF-2 and 31 AIF-3) of the total 185 (133 AIF-2 and 52 AIF-3) pellet machines purchased with AIF-2 and AIF-3 funds. Of them 91% found were operational during the survey; 60% were in operation for about 9 months and had produced 2100 kgs/month of feed following BFRI supplied formula with locally available ingredients (*i.e., rice bran, wheat bran, corn, maize, dry fish, fish meal, Oil cake, flour, rice polish, vitamin, molasses, etc*); The feed production capacity of each pellet machine varied from 40-200kg/hr. Two hired person operates one machine. Per kg feed production cost in pellet machine is Tk. 33 and their selling price is Tk. 42-45, whereas, market price of similar quality fish feed available in the market is about Tk 50-52 /kg. Major constraints confronted in this enterprise were-High prices of raw materials, Irregular electricity supply

and high cost of electricity, High maintenance and operation cost (labor, house rent, electricity bill, etc.), Non-availability of packaging materials, Scarcity of skill operator and Lack of servicing facilities at localities.

Ice Plant: Data were collected from 4 Ice Plans established with AIF-3 (total 15 ice plant supported 2 from AIF-2 and 13 from AIF-3). On an average, 7 family members and 2 hired persons were engaged with each ice plant and 12,112 blocks of ice were produced. Av. net profit generated from the Ice plants was Tk 23,193 per month. Numbers of farmers benefited from this plant was 161 including 30 CIG farmers. Only 25% respondents stated that servicing facilities for the plant is available nearby.

PIU-DLS conducted an economic analysis of the **four** AIF-2 sub-projects. Details of the analysis are presented below:

Sub-project Title	Recipient	Items procured	Analysis Results
Livestock Feed Processing, Transportation and Marketing	Tipna –Angerdah Cow Rearing CIG, Dumuria, Khulna	01 Feed Crushing machine and 01 Feed Mixing Machine bought in Sept., 2020	<ul style="list-style-type: none"> • 16 tons/month mixed grinding feed is prepared with local ingredients • 20 CIG and 65 non-CIG farmers benefitting • Annual expenditure - Tk. 55.60 lac and income Tk. 64.86 lac, BCR is 1.17 • Full-time job for 1 person created • farmers buy feed Tk. 3.50 per kg less price
Production of Day Old Chicks	Talukisad Poultry Rearing CIG of Pargacha upazila under Rangpur	01 incubator bought in Aug. 2019	<ul style="list-style-type: none"> • The capacity of setter is 4000 egg and hatcher capacity is 1000 egg • One month cycle • 60 CIG and 200 non-CIG farmers are collecting poultry chicks from this hatchery • Full-time job for 2 persons created to operate the incubator. • Annual expenditure Tk. 8.13 lac and income Tk.11.65 lac, BCR is 1.43. • Available @Tk. 2-3 /per bird lower price
Milk Pasteurization, Packaging and Marketing	Osmanpur Cow rearing CIG, Badorganj, Rongpur	01 pasteurization machine, 01 packaging machine @ 500 litre per day capacity in Sept. 2019	<ul style="list-style-type: none"> • 120 litre milk/day is pasteurized. CIG sells the milk in the neighboring market. • About 20 CIG and 21 non-CIG farmers are providing milk • Tk. 4/litre increased milk price • Full-time job for 2 persons created
Milk Collection, Pasteurization, Packaging and Marketing	Solimpur Cow Rearing CIG of Thrisal upazila under Mymensingh	01 pasteurization machine, 01 packaging machine @ 500 litre per day capacity in October 2019	<ul style="list-style-type: none"> • 130 litre milk/day is pasteurized. CIG sells the milk in the neighboring market. • About 20 CIG and 6 non-CIG farmers are providing milk • Tk. 3-5/litre increased milk price • Full-time job for 2 persons created

SECTION 4: VALUE CHAIN AND MARKET DEVELOPMENT

The second part of the Project Development Objective (PDO) of NATP-2 is to improve smallholder farmers' access to markets in the selected project areas to be achieved and measured through establishing the processing and marketing structure/enterprises for crop, livestock and fisheries products and quantity of product processed and marketed from these structures/enterprises.

The Specific Objectives related to Value Chain and Market Development are:

For crop: Establish value chains development program in 30 clusters in 30 upazilas of 22 districts; establishing 30 Commodity Collection and Marketing Centers (CCMCs) and 30 Collection Points and sell a total of 27360 metric tons of agricultural commodities through project arranged marketing facilities by the end of project period;

For fisheries: Establish 20 Producers' Organizations (POs) in 20 upazilas and 02 special POs in Mymensingh and Natore districts and supported with logistics and training for fisheries and selling 4000 metric tons of fishes and fish products through project arranged marketing facilities by the end of project period; and

For livestock: Establish 120 Producers' Organizations (POs) in 60 upazilas and supported with logistics and training for livestock; and selling 3,400 metric tons of livestock commodities through project arranged marketing facilities by the end of project period.

To achieve these specific objectives the PIU-DAE, PIU-DoF and PIU-DLS in collaboration with their strategic partner (Hortex Foundation for crop) and service providers (Kranti Associates for fisheries and Centre for Centre for Resources Development Studies Ltd (CRDS) for livestock) formed 172 Producer Organizations (POs) by mobilizing CIG farmers and private entrepreneurs and by following specific guidelines (Table 4.1).

4.1 Mobilization and Functioning of the Producer Organizations (POs)

Producer's Organization (POs) is a platform of farmers, input suppliers and other stakeholders of a specific area where the producers are facing problem for marketing of their produces. POs are the key to the sustainability of the CIGs, and their memberships are open to non-CIG farmers as well. Table-4.1 provides details of the number of POs formed under crop, fisheries and livestock components by years.

Hortex Foundation, the strategic partner of PIU-DAE, formed and mobilized 30 POs, one at each Commodity Collection and Marketing Centres (CCMC¹) in 30 selected upazilas. A PO is formed with the representatives of 20 CIGs around each CCMC in the production cluster. A 29-member executive committee of the PO oversees the function of the CCMC. All of the 30 POs and their executive committees have been formed and mobilized. Continuous efforts are on-going for strengthening and building the capacity of the POs. So far 09 POs obtained registration from the Department of Cooperatives and the others also applied.

PIU-DoF with the assistance of Kranti Associates Ltd formed and mobilized twenty (20) general POs each with 750 CIG and non-CIG members, and interested local businessmen in aquaculture, and two (2) Special POs - one at Trishal of Mymensingh and the other at Singra of Natore district with 1,200 members in each special PO. All the 22 POs already obtained registration from the Department of

¹ A CCMC is a pack house, established at the heart of a market place with the aim of improving produce quality, enhancing food safety, reducing postharvest loss, and improving market linkage for the farmers. Here the farmers can adopt improved PHM practices for their products to add value and earn a better price. The facilities of CCMC are also available to non-CIG farmers who grow and bring vegetables/fruits and bring to the CCMC.

Cooperatives.

PIU-DLS with CRDS, the hired service provider first identified clusters targeting a CIG, where the members of the CIG do not get fair prices for their products. CRDS formed total 120 POs in 60 upazilas including 108 dairy POs, 9 beef fattening POs, and 3 goat rearing POs. Each PO comprises 30 members including non-CIGs farmers. Criteria for the selection of 120 livestock CIGs for value chain development are: (i) CIG must have critical mass production of milk/goat/cattle and face marketing problems with their access production. (ii) CIG must have good physical communication facility with local/regional market. (iii) CIG performance evaluation score should be A or B Grade (iv) Price of milk/goat/cattle is comparatively low in this area. (v) CIG hold monthly/periodical meeting regularly and initiate raising group fund by accumulating savings (vi) CIG must have keen interest to involve in value chain development activities and (vii) Mixed of male and female group should get preferences for value chain development activities.

Each of the POs has a nine-member Executive Committee (EC) for management of the POs activities. Executive Committee is comprised of President (1), Vice President (1), Secretary (1), Treasurer (1) and Executive Members (5). The hired service provider, CRDS supported for capacity building of the POs and helped them to take initiatives to solve the marketing problems.

All the POs are now functional and involved in facilitating marketing of inputs and outputs, investing in varieties of income generating activities, promoting increased access to information, technical service delivery and access to finances. As the POs have strong business orientation, they are the key to the sustainability of the CIGs, and their membership is open to non-CIG farmers as well.

Table-4.1: Mobilization and functioning of the Producer Organizations (POs)

PIUs	Target	Mobilization and Functioning of the POs			PO Registration by June 2021
		FY2017-18	FY2018-19	FY2019-20	
PIU-DAE	30 POs	9 POs	30 POs	30 POs	09 (30%)
PIU-DOF	22 POs	-	22 POs	22 POs	22 (100%)
PIU-DLS	120 POs	-	25 POs	120 POs	55 (46%)
Total	172 POs	9 POs	77 POs	172 POs	86 (50%)

4.2. Value Chain and Marketing Activities of Crops

Hortex Foundation, the Strategic Partner of PIU-DAE, has been piloting the value chain and marketing activities of six selected High Value Crops (HVCs), namely, brinjal, bitter melon, sweet melon, tomato, banana and aromatic rice in 30 upazilas of 22 districts for their vertical expansion (Table-4.2) and also for horizontal expansion of some other identified vegetables and fruits..

The activities of Hortex Foundation include: providing marketing capacity building training to CIGs, POs and DAE staff/officials on value chain management; organizing and assisting POs in establishing/renovation of CCMCs/CPs, develop market linkages and contractual arrangements between CIGs/POs and traders, supermarkets, processor and exporter; provide financial advisory services to CIGs/POs and entrepreneurs to apply for matching grants from AIF-2 for technology adoption and AIF-3 for markets and enterprises development; and organizing awareness campaign on food safety, GAP, SPS, etc.

Table-4.2: Selected HVCs for vertical expansion against Value Chain Cluster upazilas in NATP-2.

Brinjal- 6 clusters	Bitter Gourd – 5 clusters	Tomato - 6 clusters		Sweet Gourd - 5 clusters	Banana – 5 clusters	Aromatic Rice - 3 clusters
		Winter	Summer			
1.Raipura, Narshingdi 2.Shibpur, Narshingdi 3.Sadar, Jashore 4. Islampur, Jamalpur 5.Sreemangal, Moulvibazar 6.Parbatipur, Dinajpur	1.Kaliganj, Jhenaidah 2.Madhupur, Tangail 3.Belabo, Narshingdi 4.Sadar, Naogaon 5.Mithapukur, Rangpur	1.Chandina, Comilla 2.Dakkhin Surma, Sylhet 3.Mirsarai, Chittagong 4.Godagari, Rajshahi	5.Bagharpara, Jessore 6.Jhikorgachha, Jashore	1.Sadar, Bogra 2.Baraigram, Natore 3.Delduar, Tangail 4.Sadar, Kishoreganj 5.Savar, Dhaka	1.Shibganj, Bogra 2.Palashbari, Gaibandha 3.Kapasia, Gazipur 4.Sadar, Khagrachhari 5. Muktagachha, Mymensingh	1.Birganj, Dinajpur 2.Chirirbandar, Dinajpur 3.Nakla, Sherpur

4.2.1 Establishment of the Commodity Collection and Marketing Centers (CCMCs) and Collections Points (CPs)

Hortex Foundation first established the 30 CCMCs in 2019. Establishment of the 30 Collection Points (CPs), linked to 30 CCMCs was started in last financial year and continued till this FY 2020-21. A CP is established adjacent to crop fields where farmers have problems of aggregation, finding a market close to their fields or to get to a trader for selling. Like in CCMCs, this year the CPs were provided with a weighing scale, some plastic crates, few chairs to initiate the marketing activities.



Photos 1 & 2: Collection Points (CPs): Belabo (left) and Dakkhin Surma (right) – established near production fields.

4.2.2 Progress of Training of DAE Officials, LBFs, CIG/PO members and Traders

Between FY2017-18 to FY2020-21, Hortex Foundation completed 89% of its revised training targets and imparted training to 11750 CIG farmers and 3838 PO members on the PHM technologies (sorting, grading, washing, drying, and packaging). Topics included in the training sessions for CIG farmers include: maturity and harvest indices, contract farming, PHM practices, marketing, CCMC functionalities, food safety and quality, and especially, hands-on training on sorting, grading, washing, drying and packaging. The PO members received also similar training, but with more emphasis on good governance, market management, business planning, etc. for especially running the CCMCs. The 147 DAE officials (UAO, AAO, AEO, ADD, DTO, DD) who received the ToTs in 2018, have been now acting as trainers to train the CIG farmers, POs, traders, etc. Details of the training are given in [Table-4.3](#).

Table-4.3: Progress of training on value chain development

Participants	Up to June 2020			2020-21			Client-days (total)	
	Batches	Partici-pants (No.)	Client days (No.)	Batches	Partici-pants (No.)	Client days	RDPP Target	Achieved
DAE Officers	6	147	294	-	-	-	300	294 (97%)
SAAOs	10	300	600	-	-	-	600	600 (100%)
LBFs	4	60	240	-	-	-	240	240 (100%)
CIG Farmers	318	9530 (2166)	9,530	74	2,220 (499)	2,220	14,000	11750 (84%)
POs	94	2608	2608	40	1200	1200	3480	3808 (109%)
Traders	15	450	450				900	900 (100%)
Total	402	11,417 (2639)	12,045	114	3420 (611)	3,420	19,670	17592 (89%)

Figures in parentheses indicate number of women participants

4.2.3 Marketing of High Value Crops through CCMCs

During FY2020-21, 10589.401 tons and cumulatively 24631.95 tons of agricultural commodities were sold through the 30 CCMCs and 30 CPs as shown in Table-4.4 below. Rice was the highest marketed HVC (1507 tons), while the second-most marketed crop was brinjal (1157 tons). The third-most marketed crop was country bean (912 tons), followed by banana (826 tons), then potato (810 tons) and lemon (565 tons). During the year, a total of 58 crop items were marketed through the CCMCs & CPs as shown in Annex 6.

Table-4.4: Year wise volume of HVCs marketed from the CCMCs

Year	No. of CCMCs & CPs operationalized	Volume of HVCs marketed (ton)	Major HVCs marketed (crops are arranged in order of high volume to low volume)
2016-17	01	100	Brinjal, Radish, Bitter gourd, Sweet gourd, etc.
2017-18	05	965.31	Lemon, Brinjal, Bitter gourd, Teasel gourd, etc.
2018-19	28	5125.71	Brinjal, Lemon, Aromatic rice, Potato, etc.
2019-20	30 +04 CPs	7851.53	Banana, Country bean, A. Rice, Brinjal, etc.
2020-21	30+30 CPs	10589.40	A. Rice, Brinjal, Country bean, , Banana, Potato, etc.
Total		24631.95	

The month-wise sale presented in Fig. 4.1 show a gradual increase in sale volume from August to February then slightly fluctuated caused by lean season. Unlike last year, the effect of Covid-19 pandemic did not affect vegetable marketing as learnings from the past helped mitigate disruptions.

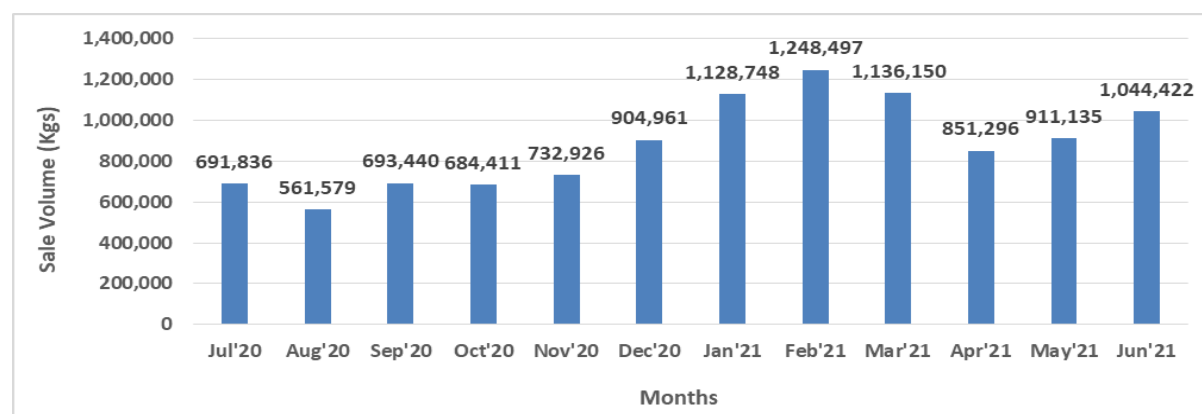


Fig. 4.1: Month-wise Volume of Sale in FY2020-21 (kgs)

The CCMC-wise sale data presented in Fig. 4.2 show that among the upazilas, Nakla followed by Birganj marketed the most amounts of 1057 and 901 tons of respectively and those were mostly Aromatic Rice. The third-highest upazila marketing HVCs was Godagari (835 tons) followed by Dakkhin Surma (687 tons) and Parbatipur (568 tons) respectively. The CCMC at Palashbari shows a very low figure for marketing as it was unable to function at different times due to the adjacent highway widening work and delay in finding a new structure for the CCMC.

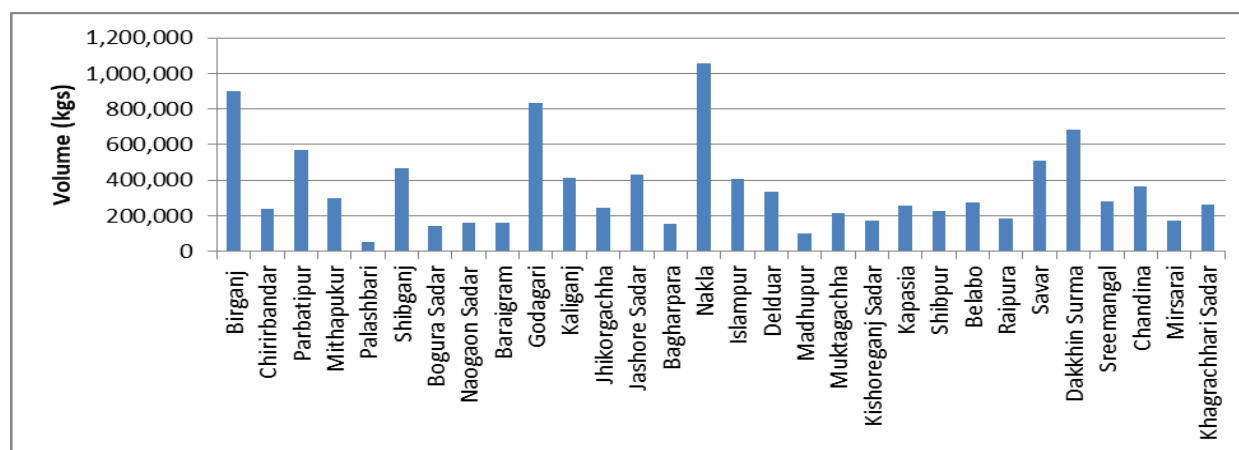


Fig. 4.2: Upazila/ CCMC-wise Volume of Sale in FY2020-21 (kgs)

Using the CCMCs over 1938 metric tons of vegetables have been exported so far of which 599.26 metric tons were in FY2020-21 to countries like, Malaysia, Dubai, Qatar, Kuwait and Saudi Arabia. These were mostly brinjal, teasel gourd, bottle gourd, bitter gourd, lemon and potato have been exported to these countries. These have been exported using the CCMCs at Shibpur & Belabo of Narshingdi, Mithapukur of Rangpur and Chandina of Cumilla districts during July 2018 to June 2021.

4.2.4 Marketing of High Value Crops through hortexbazar

Online marketing of fresh vegetables, fruits and other agricultural commodities was started by Hortex Foundation from June 2020. The portal <https://hortexbazarbd.com> was developed as a full-phased e-commerce site having all the user-friendly features. After a couple of weeks' test run, the hortexbazarbd.com was officially inaugurated by the Agriculture Minister Dr. Muhammad Abdur Razzaque MP on 24th June 2020.

Different fruits sold		Different vegetables sold		
Mango	Guava	Pumpkin	Wax gourd	Jackfruits seed
Jackfruit	Burmese grape	Pointed gourd	Bitter gourd	Arum/Eddo
Banana	Dragon fruit	Teasel gourd	Sponge gourd	Stolon of taro
Litchi Pineapple	Green coconut	Cucumber	Snake gourd	Broccoli
Papaya	Zara Lemon	Brinjal	Bottle gourd	Radish
	. . . and more	Yard long bean	Green papaya	Red amaranth
		Okra		and more

Within a month of its operation, over 15 tons of fresh fruits, vegetables and other agri-commodities were sold online through the portal valued at about Tk. 12 lakh. Fruits remained the mainstay of sale during this time and being the most popular, mangoes alone were sold for over seven tons. **Up to June 2021 a total of 44 tons of different agri-commodities were sold at a value over Tk. 25 lakh.**

The agri-commodities were sourced from farmers organized in CIGs (Common Interest Groups) comprising 20 or 30 farmers around the CCMCs in the production clusters.

4.2.5 Post-harvest loss and price gap minimisation

The 2019-20 Annual Progress Report of NATP-2 presented some results from the collected by Hortex Foundation data on post-harvest loss and price gap minimisation. It was found that for tomato the post-harvest losses were between 13-18%, for brinjal 6-32%, bitter melon had 11-13% and for banana it was between 9-12%. By any standards, this sample study pointed to a very high level of PH loss. Similarly data on price differences was collected during November 2018 to December 2019. The analysis reported at that time that price gain for tomato was the highest at 23%, followed by bitter melon at ca. 16%, for brinjal about 11%, for sweet melon 9%, and only around 3% higher price was recorded for bananas. But due to movement restrictions and abnormal marketing conditions during the pandemic times, no such data collection or analysis could be carried out. Hortex will undertake a comprehensive study in FY2021-22 to analyze PH loss and price appreciation from PHM practices at the CCMCs and contribution to farmers' income.

4.2.6. Campaign on Safe Food

Hortex Foundation has long been involved in campaigning for safe food and these principles are embedded in most of the work related to PHM as part of NATP-2 activities. During the year additional efforts were undertaken to publish fact sheets on the following urgent issues:

- ❖ Observing preharvest interval for pesticide application
- ❖ toxic residue removal methods from fresh fruits and vegetables (Photo below)
- ❖ microbial contaminant removal methods



ঘরে বসে সতেজ ফল ও সবজি বিষমুক্ত করার সহজ উপায়

নিরাপদ খাদ্য প্রচারণা কর্মসূচী

সারসংক্ষেপ প্রযুক্তি # ১

মুক্তি (Introduction): ফসল ও শাকসবজির উৎপাদন করতে গিয়ে রোগ ও পোকাকীটের ক্ষতি থেকে ফসলকে রক্ষা করার জন্য আমাদের কৃষকরা সাধারণত: বিভিন্ন ধরনের রাসায়নিক বালাইনাশক (Chemical Pesticides) যেন কীটনাশক, ছত্রাকনাশক, আগাছানাশক ইত্যাদি ব্যবহার করে থাকেন। যথাযথ জ্ঞানের অভাবে অনেক কৃষকই বালাইনাশক ব্যবহারের অনুমোদিত মাত্রা, স্প্রে বিধি এবং প্রয়োজনীয় স্প্রে সংখ্যা না জেনে ফসলে মাত্রাতিরিক্ত রাসায়নিক পদার্থ ব্যবহার করে থাকেন। উপরন্তু বালাইনাশক ব্যবহারের পর অপেক্ষমাণ সময় পার না করেই সেগুলি বিক্রয়ের উদ্দেশ্যে মাঠ থেকে সংগ্রহ করে থাকেন। যার ফলে ফসলে মাত্রাতিরিক্ত বিষাক্ত বালাইনাশকের অবশিষ্টাংশ থেকে যেতে পারে, যা ফসলকে স্বাস্থ্যের জন্য ঝুঁকিপূর্ণ ও অনিরাপদ করে ফেলে। ফল ও সবজিতে বালাইনাশকের উপস্থিতির একটি সর্বোচ্চ সঙ্গীয় মাত্রা আছে, যাকে Maximum Residue Limit (MRL) বলে। কিন্তু ফসলে বালাইনাশকের পরিমাণ যদি মাত্রাতিরিক্ত পর্যায়ে অর্থাৎ MRL-এর উপরে থাকে, তখন তা স্বাস্থ্যের জন্য ঝুঁকিপূর্ণ বলে বিবেচিত হয়। তবে উত্তম কৃষি চর্চা (GAP) অনুসরণ ও উন্নত সংগ্রাহকের ব্যবস্থাপনার মাধ্যমে ফল ও সবজি থেকে রাসায়নিক বালাইনাশকের মাত্রা কমিয়ে যাওয়ার জন্য তা নিরাপদ করে তোলা সম্ভব।

ঝুঁকিপূর্ণ রাসায়নিক উপাদান (Hazardous Chemicals): রাসায়নিক বালাইনাশক ছাড়াও ঝুঁকিপূর্ণ অন্যান্য প্রধান রাসায়নিক উপাদানগুলো হলো ফল ও সবজি প্রক্রিয়াজাতকরণের কারণে ব্যবহৃত জিয়ারজেট ও এজিটিস, ফল পাকানোর জন্য প্রয়োগকৃত রাসায়নিক পদার্থ (যেমন: ক্যালসিয়াম কার্বাইড), বিভিন্ন ধরনের ভাঙ্গী খাত যেন: আর্সেনিক, সীসা, পারদ, ক্যাডমিয়াম, ক্রোমিয়াম ইত্যাদি।

ঝুঁকিপূর্ণ রাসায়নিক উপাদানের উৎস (Source of chemical hazards): সাধারণত দূষিত (Contaminated) মাটি, অপরিষ্কার পানি, অশোধিত জৈবদ্রব্যের বিশেষ করে মুরগির বিটাড্রাক সার, করখানার বর্জ্য ইত্যাদি উৎস থেকে ভাঙ্গী খাতব পদার্থ কৃষিপণ্যকে ঝুঁকিপূর্ণ করে তোলে। তবে বাংলাদেশে ফসল ও শাকসবজি উৎপাদনে ব্যবহৃত বিভিন্ন ধরনের রাসায়নিক বালাইনাশকের মাত্রাতিরিক্ত ব্যবহার মানব মানব সৃষ্ট স্বাস্থ্যঝুঁকির মধ্যে সবচেয়ে মারাত্মক রাসায়নিক ঝুঁকি বলে বিবেচিত।

মানবদেহে ঝুঁকিপূর্ণ রাসায়নিক পদার্থের ক্ষতিকর প্রভাব (Risk of chemical hazards in human health): ফল কিংবা সবজিতে বালাইনাশকের অবশিষ্টাংশের মাত্রাতিরিক্ত উপস্থিতির কারণে বমি, মাথাব্যথা, পাতলা পাখানা ইত্যাদি সমস্যা দেখা দেয়। অনেক ক্ষেত্রে যাদের উপস্থিতি রাসায়নিক পদার্থের প্রতিক্রিয়া তৎক্ষণিকভাবে বোঝা না গেলেও মানবদেহে তার দীর্ঘমেয়াদি প্রভাব যেন-কিডনি ও ফলকণ্ঠ, শ্বাসকণ্ঠ ও ফুসফুসে বিভিন্ন রোগ দেখা দিতে পারে।

ফল ও সবজি থেকে রাসায়নিক বালাইনাশকের অবশিষ্টাংশ কমানোর উপায় (Measures in reducing pesticide residues of fruits & vegetables): শুধুমাত্র প্রচলিত রন্ধন প্রক্রিয়ায় ফল বা সবজিতে বিদ্যমান বালাইনাশকের অবশিষ্টাংশ কাটতে মাত্রাে দ্রুত হতে পারে। এই সমস্যা সমাধানের জন্য বাংলাদেশ কৃষি গবেষণা ইনস্টিটিউটের কীটন্ত্র বিভাগের বিজ্ঞানীরা গবেষণা করে বিভিন্ন পদ্ধতি উদ্ভাবন করেছেন, যার মাধ্যমে ঘরে বসে খুব সহজেই ফসল ও শাকসবজি থেকে বালাইনাশকের অবশিষ্টাংশের মাত্রা কমিয়ে সেগুলোকে খাবারের জন্য অনেকটা নিরাপদ করা যায়। পদ্ধতিগুলো পরের পৃষ্ঠায় বর্ণনা করা হলো:

রাসায়নিক বালাইনাশকের অবশিষ্টাংশ কমানোর ঘরোয়া পদ্ধতিসমূহ





পদ্ধতি-১: এক লিটার পানিতে ২০ গ্রাম (২ চা চামচ) খাদ্য লবণ মিশিয়ে তাতে ফল ও সবজিকে ১৫ মিনিট ডুবিয়ে রেখে পরিষ্কার পানিতে ধুয়ে নিলে বালাইনাশকের প্রকৃতির উপর নির্ভর করে শতকরা ৩০-৮০ ভাগ পর্যন্ত বিষাক্ততা দূর হয়ে যায়।





পদ্ধতি-২: এক লিটার পানিতে ২০ মিলিগিটার ভিনেগার মিশিয়ে তাতে ফল ও সবজিকে ১৫ মিনিট ডুবিয়ে রেখে পরিষ্কার পানিতে ধুয়ে নিলে বালাইনাশকের প্রকৃতির উপর নির্ভর করে শতকরা ৭০-৯০ ভাগ পর্যন্ত বিষাক্ততা দূর হয়ে যায়। এতে ফল ও সবজি খাওয়ার জন্য বহুলাংশে নিরাপদ হয়ে যায়।





পদ্ধতি-৩: ফসল ও শাকসবজিকে জীবাণুমুক্ত পরিষ্কার পানিতে কিছু সময় ধরে হাত ধরা করলে ভালভাবে ধৌত করে বালাইনাশকের অবশিষ্টাংশের একটি উল্লেখযোগ্য অংশ দূর হয়ে যায়।

এ ছাড়াও ফল বা সবজির বাহিরের আবরণ বা শেঁসা ফেলে দিয়ে পরিমিত তাপমাত্রায় রান্না করার ফলে বালাইনাশকের শতকরা ৫০ ভাগেরও বেশি দূর হয়ে যায় এবং খাওয়ার জন্য সেগুলো অনেকটাই নিরাপদ হয়ে যায়। কাজেই আসুন আমরা সবাই মিলে বিষমুক্ত নিরাপদ ফল ও সবজি খাই এবং একসাথে সুস্বাস্থ্যের বিকাশই হই।

তথ্যসূত্র: পেস্টিসাইড এনালিসিসক্যাল ল্যাব, কীটন্ত্র বিভাগ, বাংলাদেশ কৃষি গবেষণা ইনস্টিটিউট, গাজীপুর

প্রচারণা: এনএটিপি ফেজ-২ প্রজেক্ট, **হর্টেক্স ফাউন্ডেশন**, স্ট্র্যাটেজিক পার্টনার অব ডিএই (DAE), কৃষি সঙ্গঠন যোগাযোগের ঠিকানা: হর্টেক্স ফাউন্ডেশন, পো. বন, ২২ মানিক মিয়া এডিনিটি, শেরেবাগা নগর, ঢাকা-১২০৭।
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ওয়েবসাইট: <https://hortex.portal.gov.bd>, ই-কমার্স সাইট: <https://hortexbazarbd.com>

Photo: Factsheet on toxic residue removal methods from fresh fruits and vegetables (front and back sides).

Sustainability Assessment of the Commodity Collection and Marketing Centres (CCMCs) and Collection Points (CPs) by Hortex Foundation

Hortex Foundation carried out a sustainability assessment of all the 30 CCMCs and the CPs operating within the CCMC locations. The sustainability prospects were examined from a number of aspects of the PO-MMC capacities, which were: institutional capacity, financial management, improved postharvest management practices, achievements through income generating activities and marketing progress. The required data and information were collected by the LBFs during March to June 2021 from three PO-MMC members, two CIG farmers, three traders, the LBF, one SAAO and the UAO in each upazila through a structured questionnaire.

The grading scale used for the top performers is adjudged as **'very good'** with scoring over 90; followed by **'good'** with scores between 76 and 90; **'moderate'** within 61 to 75; **'average'** within 50 and 60; and **'low'** scoring below 50.

Grading scale	CCMC Locations
very good	<i>Chiribandar, Mithapukur, Palashbari, Shibganj, Naogaon Sadar, Godagari, Kaliganj, Jashore Sadar, Jhikorgachha, Bagharpara, Delduar, Kapasia, Belabo, Dakkhin Surma and Chandina</i>
good	<i>Parbatipur, Islampur, Muktagachha, Kishoreganj Sadar, Sreemanga and Khagrachhari Sadar</i>
moderate	<i>Birganj, Baraigram, Madhupur, Shibpur, Raipura and Savar</i>
average	<i>Bogura sadar and Mirsarai</i>
low	<i>Nakla</i>

To improve performance and standings of the PO-MMCs Hortex in the remaining project period has plan in engaging more with the PO-MMCs for their organizational improvement through visits and meetings; organizing exposure visits to better performers; facilitating business planning workshops; assisting in income generation and expenditure management; help in asset development, help them handle financial matters and account keeping and other records.

PO-MMCs adjudged as moderate, average and low will get special attention and stronger support. Gradual withdrawal of rent and other cash supports will be the exit strategy to keep the CCMCs/CPs viable.

4.3 Value Chain and Marketing Activities of Fisheries

PIU-DoF in collaboration with the supply chain consulting firm, *Kranti Associates Ltd* worked for increasing fish productivity and market access through backward and forward linkage development. All the 20 general and 2 special Producer Organizations (FPOs), formed in March 2019, are now fully functional in 22 designated upazilas, having a total of 17,000 beneficiaries, including 11,614 males and 5,756 females.

4.3.1 Savings and income generation of POs

The 22 POs together had mobilized a total of Tk. 206.46 lakh till 30 June 2021 with an average savings per PO of Tk. 9.38 lakh. All the POs had used their savings to avail AIF-3 matching grants and purchase pick-up vans. The daily registers been maintaining in the PO offices show that from pickup, every PO have been earning on average Tk. 21652 per month. The maximum net earning from Pickup operation was observed in Adamdighi, Bogura and Chatmohor, Pabna, whereas least income generated from the same in Barhatta and Raipur. The status of savings and income generation as per POs are shown in [Table-4.5](#).

Also PIU-DoF had purchased 20 feed pelleting machines with project resources and provided those to all the 20 general POs. Each each PO, on average, earns Tk. 4600 as service charges from the feed Pellet Machine been used by the PO members to produce fish feed with locally available ingredients by using BFRI formula.

Table-4.5: Location of Producers Organization (PO) and total number of CIG members

Location of PO	Total member in PO	Number of CIGs in PO	Total savings (tk)	Investment in IGA /pick-up van (tk)	Average monthly income from IGA (Tk.)
General PO:					
1. Adamdighi, Bogura	750	12	759776	644000	44768
2. Alamdanga, Chuadanga	747	30	696876	580000	15675
3. Bagerhat Sadar, Bagerhat	750	20	961155	913000	12000
4. Baniyachong, Habiganj	753	30	849000	769000	24500
5. Barhatta, Netrokona	750	14	1705140	1625000	7500
6. Bhairab, Kishoreganj	750	14	577650	500000	17187
7. Bholā Sadar, Bholā	750	26	1044425	102000	17489
8. Chatmohar, Pabna	750	22	930000	900000	48042
9. Dumuria, Khulna	750	28	694000	634000	25000
10. Kotalipara, Gopalganj	750	24	477000	212000	0
11. Manirampur, Jashore	750	34	786000	611000	19000
12. Mithapukur, Rangpur	750	34	777000	700000	28000
13. Nandail, Mymensingh	750	24	1066000	1019000	27250
14. Nangalkot, Cumilla	750	32	660000	610000	10833
15. Paikgacha,	750	20	684500	610000	28571
16. Raiganj, Sirajganj	750	18	834850	789000	19203
17. Raipur, Laxmipur	750	20	992800	949000	3000
18. Rajoir, Madipur	750	22	850000	695000	42000
19. Satkhira Sadar, Satkhira	750	28	1956469	1896869	11900
20. Shibpur, Narsingdi	750	18	1180000	1050000	28000
Special PO:					
21. Singra, Natore	1200	24	833000	713000	21428
22. Trishal, Mymensingh	1200	24	1330000	1300000	25000
Total	17400	518	20645641	18939569	

4.3.2 Progress of Supply Chain Development and Market Linkage Activities

4.3.2.1 Development of Mobile/Online Fish Marketing

PIU-DoF had developed an online fish marketing website (www.pofishmarket.com) with a mobile apps version and launched it in March 2020, primarily for the POs to connect to the city markets and online customers. When fishes are ready for sale in the fish farms, the PO members can upload the relevant information, such as, species, size, price, quantity, location, pictures of the fish to be sold, etc. in the website. Farmers those do not have computers with internet connection can get connected to the online platform using the mobile apps ('FISHMARKET'). As of June 2020 839 tons of fishes were marketed through 1463 transactions Worthing Tk. 1726 lakh.

Total volume of fish sold through direct contact and via POfishmarket website and apps of PIU-DoF component reached to 4530 metric ton against the RDPP target of 4000 metric ton.

Impact Studies of Online Fish Marketing

In June 2021, PIU-DoF conducted the second repeat survey, six months after the first survey was conducted and nine months after the 'POFISHMARKET' digital platform was launched. Purposes of this survey were to identify the areas of improvement that happened due to lesson learning of the first survey, and also to list down areas where more works are necessary to continue and/or pursue to get to desired level of results. Findings of the survey are summarized below:

A). POs who made better use of the online platform.

- ✦ Fish sales (online/offline) quantity by the beneficiaries are in higher range.
- ✦ PO savings amount is better than others
- ✦ Percentage of beneficiaries registered with the online platform as potential sellers is more than the others.
- ✦ Strong PO leadership and effective supervisory guidance provided by the concerned Upazila Fisheries Office are the key factors in this regard.

B) Consumers' feedback: in the form of suggestions or appreciation.

Consumers are FARIAs, PAIKARS and ARATDARS. 104 such consumers/buyers responded. 93% liked it because it makes purchasing and collection of fish easy. 80% likes it because it saves costs. They suggested following measures will make the system more attractive:

- ✦ Arrange sending fish directly to retailers and/or household consumers.
- ✦ Help create linkage between the POs and large consumer groups such as police, army barracks, student dormitories etc., and super-shops
- ✦ Make online fish buying more attractive by offering discounts.
- ✦ Ensure quality packaging and faster delivery.
- ✦ Aggressive mass campaigning can attract many more buyers especially during the COVID time.

4.3.2.2 Progress of Market Linkage Activities

To ensure good prices of the products, PIU-DoF supported the fish POs (FPOs) to develop direct market linkages with different local buyers & consumers and making value added fish products for the consumers. The FPOs are now in touch with different big buying platform (both online and offline buyers) like, Swapno, FARGO, Meena Bazar, Parmeeda.com etc. Six of FPOs have already signed MoUs with FARGO (an online platform for selling fresh organic products). On the other hand,



Photo: MoU signing 6 POs with FARGO

Swapno (super shop) and Parmeeda.com (an online platform for selling quality agri-food) have shown interest in dealing directly with the producers of both wet and live fish. Initial contacts have been made with super shops Meena Bazar and Agora leading to probable MoU signing soon. Five FPOs from shrimp producing area namely Satkhira sadar, Bagerhat sadar, Paikgacha, Dumuria, and Kotalipara are now in contact with AgroLink Ltd for signing MoU to facilitate shrimp export. Moreover, some prominent local traders have been linked with the FPOs for ensuring better prices of fish.

4.3.2.3 Establishment of Post Harvest Service Centers

The need for proper handling and processing of fish is important both for the fishing industry and for the consumers. Improvement of the processing and handling of fish in terms of quality, product range and volume results in increased economic activity and employment. It is also one way of stabilizing fish marketing by providing an outlet for surplus and peak catch even during emergency harvest, thereby ensuring high fishing activities and stable prices. It can also contribute to the efforts related to nutritional



Photo: Post Harvest Service Center, Singra, Natore

Natore and Trishal of Mymensingh have been completed. Some works of site development and procurement of accessories is under process. At each of the post-harvest service center, there are office room, fish landing platform, ice plant water supply facility, insulated cold storage and effluent management system. Two local marketing facilitators have been employed and they had been supervising the construction activities.

In makeshift 'landing spots' benefisheries are seen busy in washing, grading & sorting of the harvest; water used is pond water, grading and sorting haphazard, no shading, working under direct sunlight without ice, in a filthy environment.



Photo 8: Common post harvest handling practices in local market

4.3.2.4 Establishment of Mini Fish Processing Centres

PIU-DoF through AIF-3 has been supporting the local entrepreneurs to establish mini fish processing centres. There are 7 fish processing firms now functioning as shown in Table-4.6.

Table-4.6: List of Mini Fish Processing Centers in operation

Fish Processing Firms	Address	Services
1. Maacher Bari	Manirampur, Jashore	Fish washing, dressing, icing, mini packaging, etc.
2. Eelma Fish Process Center	Trishal, Mymensingh	1. Fish washing, dressing, icing, mini packaging, etc. 2) Soon to start home delivery
3. Deshi Maach Ghor	Singra, Natore	1. Fish washing, dressing, icing, mini packaging, etc. 2) Soon to start home delivery
4. Allahr Daan Mini Fish Processing Center	Paikgacha, Khulna	Fish washing, dressing, icing, mini packaging, etc.
5. "Maacher Pitha", Value Added Fish Food Selling Center	Nandail, Mymensingh	Processed fish products
6. Fish Solution	Shibpur, Narshingdi	1. Fish washing, dressing, icing, mini packaging, etc. 2) Soon to start home delivery
7. Maacher Thikana	Sadar Upazila, Bagerhat	Fish washing, dressing, icing, mini packaging, etc.

At least 4 more are in the pipe line.



Photo: Transformation towards processed fish marketing

Mr. Waliur Rahman, of 'Macher Bari', a young entrepreneur took this initiative and is providing post-harvest services to the consumers is emerging as a strong livelihood source for many; first as an entrepreneur and also as employees there.

4.4 Value Chain and Marketing Activities of Livestock

PIU-DLS started implementing its value chain development and market linkage activities from November 2019 by engaging a specialized technical firm namely Centre for Resources Development Studies Ltd (CRDS) till July 2021. PIU-DLS formed 120 POs in 60 upazilas under 39 districts. The service package of CRDS includes PO mobilization, need assessment, capacity building, implementation of marketing solutions etc. of POs.

CRDS took initiatives to solve the marketing problems in two ways:

1. To identify and explore existing marketing channels and made then functioning; and
2. To establish new marketing arrangement/structures with support through AIF-3 matching grant.

After formation of POs, CRDS conducted 120 batches training on PO mobilization, developed training module on entrepreneurship and business development, indigenous sweetmeat preparation, slaughtering & butchery etc; conducted need assessments by holding 120 Focus Group Discussions (FGDs) with all the 120 POs and prepared action plans for necessary support.

Up to June 2021, the 120 livestock POs together saved Tk. 22.25 lakh. All the POs are now operating their PO bank accounts in different schedule banks and are properly maintaining their passbooks and register for properly management of group funds.

4.4.1 Progress of Supply Chain Development and Market Linkage

PIU-DLS formed livestock POs to solve marketing problems of milk at village level. The large or national milk companies have not established milk collection points all the milk producing area. Therefore, local milk traders, called *Goalas* are playing a vital role in rural areas for milk marketing. *Goalas* are also experts on milking of milk from farmer's dairy cow. Because milking of milk needs specialized skills and there is critical crisis for such type of skilled persons. They do not demand additional charge for milking and this marketing channel is functioning round the year without any disruption. A total of 198 *Goalas* were identified, and provided orientation on hygienic milk collection, storage, transportation etc. PIU-DLS already



provided 100 hygienic aluminum milk canes to 50 POs for collection and transportation of milk for reducing post-harvest losses. On the other hand, a total of 23 marketing solutions have been implemented through newly established structures/arrangements providing AIF-3 matching grant and the establishment of 12 structures/arrangements is in progress. More 26 POs have already been identified for establishing new marketing structure/arrangement using AIF-3 matching grant.

List of 23 PO-based Marketing Solutions Implemented through AIF-3 Matching Grant by PIU-DLS

SI No.	District	Upazila	Name of entrepreneur	Name of enterprise
1	Manikgonj	Singair	Md Omar Faruk	Pickup
2	Dhaka	Dhamrai	Abu Said	Pickup
3	Dhaka	Dhamrai	Md Hosne Mobarak Siddiki	Pickup
4	Madaripur	Shibchar	Rafikul Islam	Pickup
5	Kishoregonj	Bhairab	Md Pavel Mia	Pickup
6	Kishoregonj	Bhairab	Md Shahin Mia	Pickup
7	Tangail	Dhanbari	Md Younus Ali	Chilling Plant
8	Rajshahi	Baghmara	Sarower Jahan	Chilling Plant
9	Rajbari	Sadar	Golam Mostofa	Pickup
10	Chattogram	Patiya	Najim uddin	Pickup
11	Noakhali	Chatkhil	Md. Sohag	Chilling Plant
12	Noakhali	Chatkhil	Gopal Ranjan Chandra	Pickup
13	Rangpur	Kaunia	Julfiker Hayder	Chilling Plant
14	Rangpur	Kaunia	Abubakar Siddik	Pickup
15	Tangail	Sadar	saiful Islam	Pickup
16	Joypurhat	Akkelpur	Ahmmmed Sabbir	Chilling Plant
17	Joypurhat	Akkelpur	Md Rezwan Hossen	Pickup
18	Jashore Sadar	Sadar	Joynal Abedin	Joynal Dairy Farm
19	Jashore Sadar	Sadar	Riaz Mehmud	Jashore dairy
20	Satkhira	Tala	Akij Milk	Chilling Plant
21	Satkhira	Tala	Gopynath Ghosh	Pickup
22	Khulna	Dumuria	Gobinda Ghosh	Pickup
23	Magura	Sadar	Mizanur Rahman	Pickup

Since inception to June 2021, a total of 2927 metric tons of milk have already been marketed and about 3327 farmers are being benefitted from this arrangements of which 2255 PO/CIG members and 1072 farmers from outside POs/CIG.

PIU-DLS has taken an initiative for developing an online marketing arrangement. By this time, an online dynamic website www.natpdlsbazar.com has been developed so that CIG farmers can sell their products and the interested customers can buy necessary livestock products through this website. **Now farmers can upload the product description along with important particulars of products using the website.** The website has been developed recently and it has been updated with the information of buyers and sellers along with the particulars the products. As of today, 2 cattle (524 kg) were sold using this website.

Case Study of a National Milk Processing Company

Akij Food & Beverage, a national milk processing company established a Chilling Plant in July 2020 using AIF-3 matching grant from NATP-2 at Tala upazila under Satkhira district. Initially 500 to 700 litre milk was collected from the farmers every day. Now they collect 1200 to 1500 litre milk per day from 96 farmers, of which 21 farmers from PO and 75 from outside PO. Milk price in the plant varies from Tk. 39 to 43 per litre depending on fat percentage. Previously milk price in this area was Tk. 30.00 to 35.00 per litre. Now farmers are getting Tk. 5.00 to Tk. 7.00 higher price per litre of milk and also can sell their milk without any transport cost. The milk marketing of farmers has also been ensured due to establishment of the chilling plant.



4.5 Progress of Agricultural Innovation Fund (AIF-3)

AIF-3 is a non-reimbursable competitive matching grant for the rural entrepreneurs and CIGs. Its main objectives are to facilitate smallholder farmers' participation to markets, develop partnership among the CIGs, non-CIGs, Producer Organizations (POs) & agri-business entrepreneurs, and enhance or develop capacity of agro-service providers/rural entrepreneurs.

As of June 2021, the three PIUs together awarded 79% of their targeted number of sub-projects and had utilized 77% of their fund (Table-4.7).

Table-4.7: Progress of awarding AIF-3 matching grant sub-project (June 30, 2021)

PIUs	Target (RDPP)		Sub-projects		Disbursement	Achievements (%)	
	No	Million Tk.	June 2020	June 2021	June 2021 million Tk	Sub-project	Fund utilized
DAE	287	159.73	72	238	129.46	83%	81%
DoF	228	89	102	208	83.29	91%	94%
DLS	183	77	51	104	38.93	57%	51%
Total	698	325.73	225	550	251.68	79%	77%

The list of major items procured with AIF-3 funding by the CIGs are given below

PIU-DAE		PIU-DoF		PIU-DLS	
1.	Pickup	1.	Hatchery,	1.	Feed crusher machine,
2.	Power Tiller	2.	Pickup van,	2.	feed mixing machine,
3.	Plastic Crates	3.	Water pump,	3.	curd incubator,
4.	Compost Plant	4.	packaging factory,	4.	Generator,
5.	Van	5.	aerator,	5.	Pick-up,
6.	Shade for processing centre	6.	Floating fish feed pellet machine	6.	Chopper machine,
7.	Weighing Machine	7.	Ice plant	7.	Feed mixing machine,
8.	Air Cooler	8.	Mini fish processing plant	8.	Brooder,
9.	Lab room with chemicals	9.	Fish landing center/aarot development	9.	milk pasteurization machine,
10.	Inoculation Chamber	10.	Auto feeder	10.	generator,
11.	Autoclave machine	11.	Insulated cooling van	11.	milk Packing machine,
12.	Honey extractor	12.	Others	12.	Cool van,
13.	Solar Panel			13.	cooling tank etc.
14.	Grading table/ sorting mat				
15.	Shelf				
16.	Others				

PIU-DAE awarded total 238 sub-projects and the items procured by the AIF-3 sub-project recipients include Pickup-170, Van-39, Power tiller-7, Plastic crate-8705, Compost plant-47, Construction of shade-23, Weighing machine-94, and etc.



**A Story on Mehadi Hasan Bablu:
AIF 3 Recipient and Producer of Off-seasonal Water melon & Country Bean**

Mehadi Hasan Bablu lives in Chuknagar village of Dumuria Upazilla in Khulna district. He completed Masters in English but was unemployed. Finding no other way he decided to do farming and small agri-business. He came to know from a farmers' training at the upazila Head Quarter about the AIF-3



matching grant provision of NATP-2 for the rural entrepreneur. Being interested, he submitted a sub-project titled **“Procuring pick up to facilitate fair/reasonable price of produced commodities of the CIG & neighbor non-CIG farmers”** and received BDT 5,81,000/- as grant and with his contribution it stands to BDT 1219000/-. He managed his own share from bank loan taking support from Upazila Agriculture Officer and procured a pick- up, one digital balance and 40 plastic

crates.

Mehadi took the challenge of cultivating off-seasonal water melon and country bean in **‘Gher ails (big boundary like structure around fish culture)’** of six acres of land taking advices from Upazila Agriculture Officer. Also he convinced members of three neighboring crop CIGs to cultivate off-



seasonal water melon & bean in their Gher ails. He seeded the beans and melons in the month of May-June and started harvesting after 65 days to catch off season early market. In the first year, he made an income of BDT 200,000/-



from water melon and BDT 1,200,000/- from bean. He practiced

relay cropping in planting water melon that facilitates producing water melon for longer time.

As an entrepreneur and awardee of AIF-3 sub-project, he collected the produced water melon & bean from 200 CIG farmers including the farmers of the three CIGs and from about 500 neighboring non-CIG farmers, and making the activities of value addition like sorting, grading, cleaning and packaging. He transported the produces to Dhaka, Khulna and other favorable markets using the AIF-3 sub-project procured pickup, and facilitated selling at a higher price ranging from BDT 2/- to 5/- per kg. The activities of Mehadi Hasan Bablu developed the opportunity of employment of 5-6 persons. Now Mr. Mehadi is well-known at the locality for his successful initiatives and many neighbor farmers are encouraged to follow him.

PIU-DAE conducted a rapid assessment on 69 sub-projects and found all, except one, equipment are now functioning well. Summary outcome of the assessment is presented in below **Table-4.8**.

Table-4.8: Performances of representative AIF-3 sub-projects

Title of awarded sub-projects	Days	Beneficiaries (No.)			Quantity marketed (ton)	Av. Market distance (km)	(Taka in Thousand)		
		CIG	Non-CIG	Total			Income (Tk.)		
							Total income	*Operational expenses	**Net income
A. Rural Entrepreneurs									
1. Procuring pick-up/mini truck, plastic crates and marketing of commodities	6177	1755	7744	9499	13414	23.65	23053	12192	10861
2. Production / marketing of mushroom & dissemination production technology for self-employment & income generation	120	3	5	8	Marketed 3 ton (produced 3 ton)	20	3000	2550	450
3. Production & marketing of Vermicompost as well as dissemination of technologies	60	38	145	183	Marketed 23 ton (produced 13 ton)	35	330	120	210
4. Procuring of sorting mat, grading table, plastic crates, etc. for value addition and rickshaw van for marketing	730	47	96	143	428	5	856	258	598
5. Increasing honey collecting, processing & marketing	1	40	22	62	Marketed 4 ton (produced 5 ton)	2.5	1163	306	857
6. Organic Fertilizer Processing and Packaging Sub-project	210	0	1	1	Marketed 100 ton (produced 100 ton)	50	1000	350	650
7. Procuring Tractor for Farm Mechanization	8	20	300	320	-	0	170	50	120
Total		1903	8313	10216	12972		29572	15826	13765
B. CCMC/POs									
8. Transportation of agro-commodities from CCMC/CP to urban markets for marketing at profit. [Procuring of mini-truck]	148	1010	430	1440	303 ton	120-160	439	302	137
9. Marketing of smallholder farmers agro-commodities by managing own transport. [Procuring of mini-truck]	102	1100	312	1412	135.5 ton	2.5- 5	215	35	180
Total		2110	742	2852	439		654	337	317
Grand total		4013	9055	13068	13411		30226	16163	14063

Source: PIU-DAE Report

PIU-DoF also conducted an assessment and data were collected from 495 recipients (407 AIF-2 and 88 AIF-3) of the purchased items by administering separate item-wise questionnaires. Few findings from the assessment are stated below:

- About half of the AIF-3 fund were utilized to purchase **pick-up and motorized vans** for safe transportation of fish, fingerlings, fish feed, and aquaculture inputs. On average, 2 persons/van are hired and 13-16 CIG family members are involved in each vehicle operation. One vehicle transported 20,321 kg produces per month. Transports reduced transportation cost of CIGs and POs and thus contributed in making better profit margin from the fishes.
- 91% **Feed pellet machines** are operational and 60% were in operation for about 9 months and had produced 2100 kgs/month of feed following BFRI supplied formula with locally available ingredients (*i.e., rice bran, wheat bran, corn, maize, dry fish, fish meal, Oil cake, flour, rice polish, vitamin, molasses, etc*); The feed production capacity of each pellet machine varied from 40-200kg/hr. Two hired person operates one machine. Per kg feed production cost in pellet machine is Tk. 33 and their selling price is Tk. 42-45, whereas, market price of similar quality fish feed available in the market is about Tk 50-52 /kg.
- In **Ice Plants** on an average, 7 family members and 2 hired persons were engaged with each ice plant and 12,112 blocks of ice were produced. Av. net profit generated from the Ice plants was Tk 23,193per month. Numbers of farmers benefited from this plant was 161 including 30 CIG farmers.

Success Story 4: Shipul's Fish Cake: Fusing Traditional Taste with Modern Day Demand

Shipul Akter Khanom is working in a clinic and occasionally got involved in fish cake selling for any additional income. Fish farming is their family business. The outbreak of COVID-19 pandemic along with incidents of flash floods in around May 2020 affected her business grossly. She then searched for an agricultural loan or any other financial support to rebuild her fish farm. She then contacted with the Upazila Fisheries Office of Nandail and got to know about AIF-3 Funding.



She then contacted with the Upazila Fisheries Office of Nandail and got to know about AIF-3 Funding.

Shipul came up with the idea of setting up a 'Value-Added Fish Foods Selling Center' i.e. fish cakes, submitted the proposal and received Tk. 1,50,000 as grant amount from AIF-3. With this fund Shipul bought a refrigerator, deep fridge, oven, deep fryer, table, and utensils to initiate her venture.

Shipul's fish cake has created a buzz among the local women, men alike. Not only from the local people, she gradually started getting orders from different adjoining districts of the country like Mymensingh, Kishoregonj, Narsingdhi, and even from Rajshahi, etc. One can easily order fish cakes from her through Facebook which is a great help to her admirers to get 'pithas' even during the pandemic time. She is committed to always offering healthy and wholesome snacks.



Now a proud owner of the unique business, Shipul has employed one full time and two part time employees to run the business smoothly. In no way, the support she received from her family members can be ignored and she is always thankful to them. For helping in a most meaningful way, she is also indebted to the Upazila Fisheries Office. She now dreams big. By utilizing the experience she has gained so far, she is now planning to build permanent selling points in Mymensingh and Kishoregonj districts and introduce some mobile food carts in Nandail Upazila.

PIU-DLS conducted an economic analysis of two (02) AIF-3 sub-projects and results are shown below:

Sub-project Title	Recipient	Items procured	Analysis Results
Preparation and Marketing of Cattle Feed	Mr. Navid Anjum, an entrepreneur, of Dhanbari upazila under Tangail	01 Pick up, 01 Feed Crushing machine and 01 Feed Mixing Machine bought in Jan, 2020	<ul style="list-style-type: none"> Total 3000 Kg low cost cattle feed produced with locally available ingredients. Price of prepared cattle feed is lower compare to national feed companies. Besides his own upazila, he supplied the prepared cattle feed in neighbouring upazilas. He transported the ingredients as well as prepared feed to different places with his own pick up. About 200 CIG farmers and 400 non-CIG farmers purchase the feed for their cattle. Benefit Cost Ratio is 1.23. Full-time employment created for 3 persons
Establishment of Poultry Hatchery	Proyas Manobik Unayon Society, Belepukur, Sadar, Chapainababgonj	incubator-1, generator-1, IPS-1 and brooder-01	<ul style="list-style-type: none"> 6400 poultry chicks and 4800 duckling are produced in every month. The annual expenditure and income were Tk. 76.10 and Tk. 100.36 lac respectively. The Benefit Cost Ration (BCR) is 1.32. Full-time jobs created for 01 person About 98 farmers are being benefitted from this sub-project. Increased availability of Chicks at local level, reduced price of per chick, for poultry Tk. 3/- and Tk. 10/- for ducklings.

SECCION 5: GENDER INTEGRATION, ENVIRONMENTAL AND SOCIAL SAFEGUARDS

The program and activities of NATP-2 has been implementing in compliance with gender integration and environmental and social safeguards standards. This report focuses on the project activities related to gender equality and women's empowerment, environmental and social safeguards and participation of indigenous people (IP) in research, extension services, and value chain activities

5.1 Gender Integration

Gender Integration refers to strategies applied in program assessment, design, implementation, and evaluation to take gender norms into account and to compensate gender-based inequalities. Women and men have active participation in different program activities of NATP-2 in regards to agricultural production, value chain development, and marketing. The women have active participation and leadership role in technology demonstration & dissemination and operation of the project activities; decision-making in input and resource management. Women have also been involved in the operation of income generation activities (IGA) which contributes to poverty reduction, ensures food security, livelihood improvement and improves household nutritional status. The detailed gender analysis clearly recognized the participation and leadership role of women across the project activities that led to promotion of gender equality and women's empowerment.

5.1.1 Women Participation in Research Program

Besides men, women have participated in implementation of CRG & PBRG sub-projects. A total of 86 women (16% of total) have been associated in implementation of the research sub-projects and as beneficiaries of the PhD program. A total of 51 women scientists have been involved as Coordinator and Principal Investigator (PI) in implementation of research sub-projects which is about 13 percent of total Coordinator and Principal Investigator. Out of 140 PhD scholars, there are 35 women, of them 27 are in-country and 8 are abroad. Up to June 2021, a total of 736 women participated in training under the capacity building program which is about 20% of total participants. As of June 2021, a sum of 1300 women have participated in the training provided by PI under the components of PBRG sub-project which is around 36 percent of total participants.

5.1.2 Women Participation in Extension Services

Women have active participation in various areas of extension services like training, technology demonstrations, exposure visits, and field days, leadership roles in CIGs and POs and access to FIAC services (Table-5.1).

There are 364,174 women CIG farmers (36% of total CIG farmers) included as project beneficiaries in the CIG groups of crop, fisheries and livestock components. Women's involvements are more prominent in livestock groups (44.5%) followed by fisheries (35.4%) and then crop (33.7%).

Women CIG members received about 1.3 million client days training mostly on the project promoted scalable technologies. The non-CIG women farmers were also participated in technology sharing training/meeting/workshop organized by PIU-DAE, PIU-DoF and PIU-DLS. Details of the number of CIG and non-CIG women farmers participated in improved technology demonstration and adopted those in their own farms are given in Table-5.1.

The extension services contributed to development of women leadership. Women CIG farmers are playing leadership role within and beyond the project activities. They have been playing leadership

roles in CIGs, POs and as social leaders like public representative of union parishad and at different institutions and social & cultural organizations. A total of 135,115 women CIG farmers are in leadership roles which is about 35 percent of total CIG leaders and 37 percent of total women beneficiaries. Out of total women beneficiaries, about 42,737 (26.3% of total core leader and 12% of total women beneficiaries) women CIG farmers are holding core leadership positions in the CIGs and POs those are designated as president, vice-president, secretary and cashier. About 1.4% CIG women are leading in the social sector as members of union parishad and different positions of executive committee of School Managing Committee, religious organization/institutions, local club and cultural forum.

Table-5.1: Women Participation in various activities of Extension Components

		PIU-DAE	PIU- DLS	PIU-DOF	Total
Women CIG farmers	Total CIG Farmers (No.)	6,95,700	207,750	1,05,640	10,09,090
	Women CIG farmers (No.)	2,34,440	92,337	37,397	3,64,174
	% of women to total	33.7	35.4	44.45	36.09
Women CIG participants	No. of demonstrations	146,094	23,535	28,899	198,528
	No. of women received demo	56,717	3,356	13,361	73,434
	% of total	38.82	14.26	46.23	36.99
Technology adoption	Total CIG Adopter (o.)	417,550	63,736	153,565	634,851
	Total women adopter (No.)	151,381	19,418	65,964	236,763
	% of total	36.25	30.47	42.96	37.29
CIG Leader Total	Total	256,743	52,554	77,328	386,625
	Women (No.)	111,028	7,830	16,257	135,115
	Women (%)	43.24	14.9	21.02	34.95
CIG Leader Core	Core	108,600	21,238	32,328	162,166
	Women (No.)	35,864	1,467	5,406	42,737
	Women (%)	33.02	6.91	16.72	26.35
CIG Leader Social	Social	12,393	5,016	4,590	21,999
	Women (No.)	3,445	378	1,170	4,993
	Women (%)	27.8	7.54	25.49	22.7

5.1.3 Women Farmers Access to AIF-2 and AIF-3 matching grants sub-projects

A total of 430 AIF-2 sub- projects were awarded to the women CIGs which is 18% of the total awarded sub-projects. Of them 409 sub-projects were awarded by PIU-DAE and 21 sub-projects by PIU-DLS. The PIU-DOF has no separate women group. In total 58 AIF-3 sub-projects were awarded to the rural women agricultural entrepreneurs. Of them PIU-DAE, PIU-DOF and PIU-DLS were awarded 28, 19 and 11 sub-projects respectively. The AIF-2 sub-projects contributed to increasing income of the women CIGs. The women agricultural entrepreneur benefited through AIF-3 sub-projects in terms of transporting their own and groups' produces that facilitated market linkage and enhancing their income.

5.2 Environmental and Social Safeguards

NATP-2 offers to assess, prevent, mitigate or minimize the potential or identified adverse effects on environmental and social issues in all aspects of the project cycle. Project activities are implemented keeping in view to protecting or avoiding risks (do no harm), while promoting benefits (do good) associated with the project. Environmental and social safeguards assessment was done during interventions planning. Environmental and social safeguards issues are being addressed in research, extension services, value chain programs and during program development for indigenous people.

5.2.1 Environmental and Social Safeguards Compliance in Research Program

Environmental and social safeguard activities have been undertaken by the component since the inception of NATP-2. All the awarded CRG & PBRG sub-projects and PhD programs addressed environmental and social safeguard issues like bio-diversity (Flora, fauna, genetic diversity, hybrids), soil quality (Organic matter, chemical fertilizer use, soil salinity, fertility status, microbial activity, heavy metal contamination, water quality), agro-chemicals (Pesticide use, pest infestation, bio-pesticides, health hazard) and pollution (Soil, water, air) directly or indirectly to improve environmental and social development through sub-project and PhD research interventions.

The research sub-projects were evaluated and selected employing satisfactory compliance measures based on exclusion criteria and environmental screening matrix. The PBRG sub-projects that were awarded, categorized into three groups based on their proposal as (i) climate-neutral; (ii) having climate co-benefits and (iii) direct climate-related. **No PBRG sub-projects offered land acquisition, involuntary resettlement, encroachment of reserve forests, and use of prohibited pesticides.**

Table-5.2 illustrates the environmental and social safeguard issues addressed by sub-projects and PhD interventions under PIU-BARC. As shown in the table, total 184 research activities addressed environmental and social safeguard issues covering biodiversity, unfavorable ecosystems, IPM, food safety, soil quality/soil health, agroforestry, integrated farming systems, methane emissions, mangrove ecosystem, Madhupur garh, roof top gardening, biofertilizer & composting, upscaling of solar pump, pesticide related health hazards & safety, upscaling of lac production, ground water, irrigation system/water use. Ninety one (91) CRG sub-projects, 49 PBRG sub-projects and 44 PhD research works addressed most of the above issues. All the awarded CRG & PBRG sub-projects and PhD research programs addressed environmental and social safeguard issues directly or indirectly to improve environmental and social development through sub-project/PhD research interventions. These sub-projects were designed to develop sustainable production practices of crops, fisheries and livestock leading to end with environment friendly and climate smart innovative technologies. Hence, most of the sub- projects under CRG and PBRG and PhD research works are not only environment friendly but also improving the environment of the project areas. All the information generated through the research component and disseminate to extension components will enhance crop, livestock and fisheries production in the country through promoting environment friendly technologies which is available in the website (www.natpbarc.gov.bd) and other publications of PIU-BARC.

Table-5.2: Number of CRG & PBRG sub-projects and PhD research programs addressing environmental and social safeguard issues

Area of safeguard issues/sub-projects	Number of sub-projects/PhD program			Total
	CRG	PBRG	PhD	
Biodiversity	4	5	3	12
Improvement of unfavourable ecosystems (Char, haor, beel, coastal, drought)	16	10	13	39
Integrated pest management (IPM)	23	4	8	35

Food security, safety and livelihood improvement	19	9	8	36
Soil quality/soil health	3	3	6	12
Agroforestry	7	2	1	10
Integrated farming system	3	10	2	15
Methane emission	2	1	2	5
Mangrove ecosystem	1	0	0	1
Madhupur garh ecosystem	2	2	0	4
Roof top gardening	3	1	0	4
Biofertilizer upscaling & production of compost, vermicompost, tricho compost	5	0	0	5
Upscaling of solar pump	0	1	0	1
Pesticide related health hazard & safety	2	0	0	2
Upscaling of lac production	1	0	0	1
Irrigation system/water use/Ground water	0	1	1	2
Total	91	49	44	184

5.2.2 Environmental and Social Safeguards in Agricultural Extension Programs

PIU-DAE, PIU-DoF and PIU-DLS activities promoted sustainable production practices of crops, fisheries and livestock with environment friendly and climate smart technologies. Key environmental issues that has been addressed in NATP-2 included (1) improving soil fertility through application of organic manures and vermi-compost (2) protect potential pollution of agrochemicals in ponds and water bodies (3) applying integrated Pest Management to reduce pesticide use (4) use cow dung to produce biogas (5) adoption of climate smart crop varieties (6) adoption of good agricultural and aquacultural practices like fertilizer management, water management (7) waste management and clinical waste management etc.



The environmental and safeguard aspects are considered while preparing the CIG Micro plans, Union Micro plans and upazila extension plans annually. The training programs for both the extension providers and farmers also includes a module on the potential adverse effects on environment and social risks in crop, fisheries and livestock production and possible mitigation measures of the extension activities. The training contributed to increase knowledge and skill on environmental safety measures during implementation of the project activities.

5.2.2.1 Environmental and Social Safeguard Issues addressed in Crop Sector

Key environmental and social safeguard issues that has been addressed in crop sector by PIU-DAE includes (i) reducing potential soil degradation, (ii) optimum use of irrigation water to protect possible depletion water table (iii) implementation of Pest Management Plan (PMP) and extensive use of IPM/pest management traps/color cards/etc. to reduce use of pesticides, (iv) safe food production, (v) encouraging good agricultural practices (GAP), (vi) adopting personal safety measures, (vii) damaging of crop debris/waste/garbage, (viii) avoiding contamination & pollution, (ix) participation, capacity building and empowerment of women and indigenous people, etc.

Environmental and social safeguard related activities performed till June 2021:

Environmental:

-  Implementation of PMP to protect the environment from pesticide hazards and safe food production,
-  Massive production and use of Vermi-compost & Tricho-compost to protect soil from degradation as well as making recovery of the broken soil health,

- ✚ Development of awareness using the facilities of discussion meetings, campaigns, demonstrations, field days, etc.
- ✚ Use of Pheromone traps/color cards in producing safe vegetables,
- ✚ Accommodating one lecture on environmental & social safeguard issues in the CIG training events, and ensuring intensive learning & capacity building of the CIG farmers,
- ✚ Strengthening the DAE Central Pesticide Lab for evaluating pesticide quality
- ✚ Monitoring the pesticide dealer/retailers' shop to stop marketing of adulterated, hazardous & unregistered pesticides and agro-chemicals,
- ✚ Emphasizing Integrated Nutrient and Pest Management (INPM) strategy to reduce excessive & unwanted use of fertilizers & pesticides,
- ✚ Encouraging 'practicing of irrigation water use efficiency' by the ground water users,
- ✚ Discouraging increased use of fertilizers particularly urea, pesticides & other agro-chemicals to enhance higher yield/production of crops.

Social:

- ✚ Ensuring involvement & effective learning of at least 35% women in all project activities,
- ✚ Capacity building, empowering and leadership development of women and ethnic community people,
- ✚ Developing capacity and competence of the ethnic CIGs and ethnic community entrepreneurs for AIF-2 & AIF-3 matching grants, etc.
- ✚ Carrying out the assigned responsibilities by the Environmental & Social Management Focal Points.

Table-5.3 provides details of the activities included in RDPP and their cumulative progress as on June 30, 2021. The extension activities given importance on the dissemination of climate resilient improved technologies, protecting the soil and water from pollution hazards, reduces health hazards risk both for human and animal, promotion of safe food production technology of crops, fruits, vegetables, livestock and fisheries and livelihood improvement of the crop, fisheries and livestock farmers.

Table-5.3: PIU-DAE activities addressing environmental and safeguards compliances

Activities	Target (RDPP) (Nos.)	Cum. Progress As of June 2021)
Demonstration on Homestead gardening	1540	540 (35%)
Demonstration on pheromone trap in clusters	1350	540 (40%)
Demonstration on safety measure in pesticide application	3621	2000 (55%)
Demonstration on quick compost/vermi-compost preparation	900	100 (11%)
Demonstration on 'Fita pipe irrigation	770	270 (35%)

Outcome of the environmental and social safeguard compliance measures

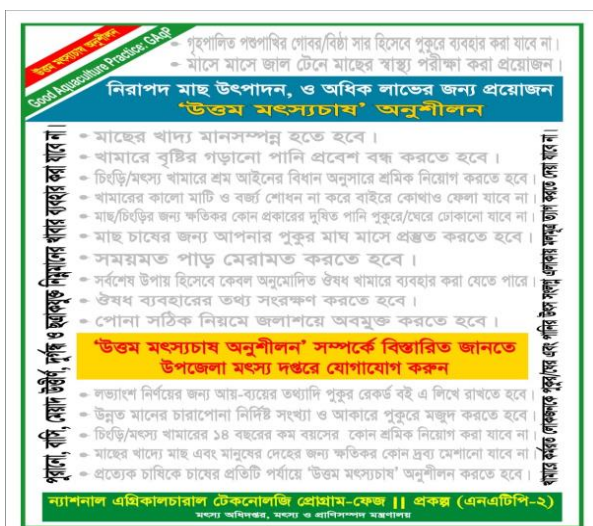
- The field observation showed that PMP is extensively followed by the farmers resulting in reducing the use of chemical pesticides and pest infestations. Specific observation shows that use of sex pheromone trap in cucurbits reduced the uses of chemical pesticides by 50-60% in fruit fly management in cucurbits.
- PMP is being practiced by the farmers that resulted to (i) reduce the use of chemical pesticides; (ii) protect the environment and people from pesticide hazards; (iii) production and promotion of safe crops, fruits and vegetables; (iv) reduced cost of production (v) awareness building among the farmers and cosumers.
- Promotion of pheromone traps reduced the use of chemical pesticides in cucurbits by 50-60% having an impact on environmental improvement and in producing safe vegetables.
- Farmer's awareness has been built on the use of gas mask, globs, and apron, hat, gumboot etc during pesticide application.
- Demonstrations on homestead gardening facilitated the promotion of organic manure, mechanical pest control, water use by Jhajri. Selection of nutritious vegetables throughout the year that resulted in safe vegetable and fruits production and consumption at household level.
- Vermi and tricho compost technology becomes popular among the farmers and the use of compost improves the soil health;
- The pest museum in the FIAC helping the farmers in familiarizing with the harmful and beneficial insect during the visit of farmers in FIAC. This has encouraged them to adopt IPM practices in crop production.

5.2.2.2 Specific Activities of PIU-DOF in Environmental and Social Safeguards Compliances

PIU-DoF implements their aquaculture and open water fisheries extension activities in compliance with environmental safeguards. The open water fisheries activities being implemented in 40 beels include habitat improvement, establishment of beel nurseries, stocking of indigenous fish species, establishment of fish sanctuaries, and community based fisheries management. Beel management program facilitates production of fishes in the natural environment having impact on environmental conservation leads to management and improvement of biodiversity.



5.2.2.2.1 Assessment of the Good Aquaculture Practices (GAqP)



The Good Aquaculture Practice (GAP) is a set of guidelines to help fish farms to improve in key areas such as farm infrastructure management, farm husbandry, fish health management, and farm environment management. The Good Aquaculture Practice (GAqP) is the way to keep pond environment friendly. Department of Fisheries has been promoting GAP among the fish farmers through field visits, training, demonstrations, distributing posters, leaflets and other printed material.

For quantification of GAqP, PIU-DoF conducted two small studies using focus group discussions – the first one in August 2020 that covered 8 divisions, 54 district, 232 Upazilas, 834 CIGs and 16680 CIG

members and the second one in June 2021 that covered 8 divisions, 54 districts, 270 Upazilas, 913 CIGs and 18258 CIG members including 6390 female CIG members. Findings of the GAqP assessment are as below:

As it reveals from the above, the CIG farmers are now more conscious about social and environmental issues and practiced GAqP more compared to previous year.

Parameters Studied	% of respondents	
	August 2020	June 2021
Respondents stopped inflow of water in to the pond	68%	75%
Respondents removed sediment from the pond bottom	56%	63%
Respondents removed aquatic weeds before stocking	87%	90%
Respondents tested pond water quality before stocking	70%	75%
Respondents stocked healthy fingerlings from reliable sources	84%	84%
Respondents did not use unauthorized chemicals,	83%	89%
Respondents applied lime after stocking	91%	92%
Respondents used dry net for fish harvesting	79%	80%
Respondents used aerator	7%	10%

The outcome of GAqP on environment and social safeguards are shown in [Table-5.4](#):

Table-5.4: Outcomes of Good Aquaculture Practices (GAqP) on environment and social safeguards

Sl.	Type of Good Aquaculture Practices in fisheries production	Result/Outcomes/Impact on environmental and social safeguards
1	Stop using cowdung and poultry litters as fertilizers in aquaculture	This menace has been largely eradicated due to this timely campaign.
2.	Wash and dry nets properly before using it in another pond	This good practice is helping control spread of disease contamination from one affected pond to another good pond.
3.	Advised not to use manufactured feed without knowing its ingredients	Chance of adulteration with harmful ingredients is reducing which helps safe fish production. Farmers are motivated and coming forward to prepare their own fish feed with known ingredients.
4	Always keep pond dyke in good condition, and high	Chances of getting in polluted waters from adjacent fields are substantially reducing keeping the pond waters inhabitable by fish.

Sl.	Type of Good Aquaculture Practices in fisheries production	Result/Outcomes/Impact on environmental and social safeguards
5	Jute retting by the jute farmers, during rainy season, in beel water is a big social problem. Beel management bodies persuaded to sit and talk about the problem jute retting poses, with the jute farmers.	Continuous consultation and pushing by the beel management people and the beneficiaries themselves are slowly but steadily working. Concerned agricultural farmers are looking for alternative places for jute retting.

5.2.2.2 Limited Environmental Assessments (LEA)

Limited Environmental Assessments (LEAs) have been conducted in 23,535 demonstration ponds and 40 beels up to the reporting period. A total of 843 ponds were identified having 8 types of potential negative impacts. The considerable negative impacts were: low dike of pond, intrusion of unsafe water and polluted water from the house and agricultural lands, mixing of household wastes, soil sedimentation, and broken the pond embankment. As mitigation measures the pond owners were advised to adopt by good aquaculture practices to avoid the possibilities of negative impacts by raising pond dike, isolated waste disposal from the demo sites, and tested pond water quality regularly, removal of soil sediments in dry season.

Limited Environmental Assessments (LEAs) in 40 beels were conducted during January-June 2021 with active participation of CBO members. A total of 4418 CBO members were involved in those assessments and among them 1409 were female CBO members. Major LEA findings on 40 beels are shown in [Table-5.5](#).

Table-5.5: Impacts and mitigation measures recorded out of 40 beels through LEA

Impacts	No of Beels	Mitigation measures, undertaken or anticipated, by most affected beel operators
1. Beel may get inundated	26	1. Dyke, in parts, should be raised/repared where badly damaged
2.(1) Outside water may enter through the broken/damaged parts/low dyke	24	2.(1) Every year dyke should be repaired, if needed, in parts, should be raised/repared where mostly needed
2. (2) Possibility of fish poaching	24	(2) Beel Management Committee should employ night guard(s) on their own /participatory day-night guarding by the beneficiaries by themselves has recently been introduced
3. Agricultural land waste water carrying insecticides, pesticides, etc., enter into the beel	23	3. Creating awareness among the adjacent agricultural land owners, about the problem /raising the beel dyke where the problem is most severe
4. Wastage/sewage dumping from the beel-adjacent houses	18	4. Beel-adjacent house owners would be verbally protested
5. Possibility of beel water being irrigated out into the adjacent agricultural lands in an uncontrolled way	12	5. Land owners of the beel-adjacent areas would be made aware of the problem through mass campaign
6. (1) Possibility of jute retting in beel water during rainy season, affecting fishes	11	6. (1) Creating awareness among nearby jute farmers about the harmful effect of retting practice in beel water
6 (2) Possibility of destroying biodiversity by drying the beel or by other harmful measures to catch fish	11	6.(2) Aware the beneficiaries about the problem/ fishing code should be strictly followed by all.
7. Livestock droppings maybe dumped into the beel from the beel adjacent houses	8	7. Creating awareness among the adjacent livestock owners and general inhabitants about the problem

The assessment suggests the following:

1. The mitigation measures would require multi-year effort requiring substantial financial inputs. Following points will act as prerequisite to ensure long term sustainable socio-economic benefit for the beneficiaries-
 - ✚ Long-term, at least 5 years, beel leasing has to be pursued.
 - ✚ The Beel Management Committee has to be very strict about maintaining transparency in physical development activity-handlings and financial dealings; especially in the fair benefit distribution among all the beneficiaries.
 - ✚ Adequate and proper record keeping is a must.
 - ✚ All the beneficiaries would have equal rights to know details of beel activities, responsibilities as well as benefits they would receive.
 - ✚ Upazila Fisheries Offices would have to play a bigger and more active role (1) in providing leadership trainings in development activities, financial dealings, record keeping, group handling, (2) supervision and (3) regular holding of group/beneficiary meetings.
2. Each of the beel beneficiary group should build a handsome savings fund of their own that can effectively help them when they need it most.
3. All the beel beneficiary groups need to be registered with the appropriate Government body (Department of Cooperatives).

5.2.2.2.3 Waste Management System

Two Post Harvest Fish Service Center has been established at Singra upazila of Natore district and Trishal upazila of Mymensingh district. Waste management facilities have been established in both the centers for effective management of the solid and liquid waste to keep the Center clean and hygienic. A guideline has been prepared for the management and operation of the center.

5.2.2.2.4 Testing the quality of pond water

PIU-DoF has provided training and water testing kits to the LEAF to test the pond water periodically to determine the water P^H, dissolved oxygen, and ammonia content. Up to June 2021 a total of 1.05 million of water samples were tested (Table 5.6). The activity contributed to raise awareness among the fish farmers which ensured the quality of pond water. The followings impacts have been recorded in this respect:

- ✚ Biodiversity and other relevant environmental issues are conserved through improvement of pond water;
- ✚ Production friendly water quality ensured in the pond;
- ✚ Production of safe fisheries is ensured;

Table-5.6: Number of pond water samples tested by parameters up to June 2021

Farmers	Nos. of Samples			Grand total
	Dissolved oxygen (O2)	pH	Ammonia (NH3)	
1. CIG	189659	235937	211231	636652
Female	66760	83522	74564	224846
2. Non-CIG	121662	151266	138756	411684
Female	39540	52187	43708	135435
Total	311321	387203	349987	1048336

5.2.2.2.5 Equipment Procurement for FIQC Laboratory, DoF

The Fish Quality Control laboratory (FIQC), Department of Fisheries has been performing as the sole laboratory of Bangladesh entitled for fish feed quality analysis. To strengthen the Quality Control Laboratories of DoF, four analytical equipments (Kjeldahl Digestion Unit, Kjeldahl Distillation Unit, Auto Fiber Analysis System and Fat Extractor) were procured through PIU-DoF and commissioned at the Savar and Khulna laboratories. Using those equipment a total of 290 fish feed samples were tested to measure active ingredients like protein, fat, fiber, ash, moisture, non-protein nitrogen etc (Table 5.7) of feed. The Upazila Fisheries

Table-5.7: Fish Feed tested at FIQC Laboratory up to June 2021

Type of Test	No. of Upazila	No. of Sample
Proximate	88	142
NPN	88	134
CP	68	12
CP. Fat	20	2
Total	264	290

Offices collected the samples from fish farmers and also from the market and sent to the laboratory for testing. The laboratory tested the nutritional quality of fish feeds. This has enhanced the capacity of DoF on quality control of fish feeds in following ways: Speed-up the quantification of fish feed proximate composition and Farmer can judge nutritional value and take decision about the feed.

5.2.2.3 Specific Environmental and Social Safeguards Compliances Activities of PIU-DLS

Major environmental safeguard activities undertaken by the PIU-DLS since inception till June 2021 are described below.

- Awareness campaign on disease prevention and livestock development: Up to reporting period** PIU-DLS organized 54,734 Vaccination, 27,775 deworming and 10,639 Infertility campaigns in order to reduce the disease infection and improvement of the cattle and other livestock populations.
- Farm house management:** The PIU-DLS has implemented improved technology on farm house management practices. The practice included use of floor mats, maintaining proper slope to drain out urine, heat protective shed, wear of gum boot, cleaning and use of disinfectant by spray antiseptic fluid. The activities of farm house management contributed to maintaining biosecurity of farms.
- Installation of biogas plant:** 224 Biogas plants were established as demonstrations. Use of cowdung and urine in Biogas plants reduced methane (CH₄) emission. CIG farmers have established 2288 Biogas plants at their own cost. Reducing methane (CH₄) emission has an impact on environmental improvement
- Preparation of improved compost pit:** Establishment of 106 demonstrations on improved compost pit motivated CIG farmers to establish 836 improved compost pits. Compost pits have been prepared through utilization of farm wastage which contributes to the clean environment of the homestead and cattle/ poultry farm and reduces the emission of methane (CH₄).
- Preparation of cow dung pit:** CIG farmers have prepared 3,711 cowdung pits which contributed to reduce the risk of environmental pollution.
- Establishment of slat system housing for goat:** In order to disseminate the technology of slat system housing at the farmer's level, up to June 2021 the PIU-DLS has established 4,275 demonstrations where women participants were 2,229 (52%). The activities and practices of the technology contributed to cleanliness of the house having an impact on environmental safeguard.

7. **Fodder cultivation:** PIU-DLS has established 8,388 demonstrations on fodder cultivation. The demonstration focused on cultivating the fodder by using only organic manure. The technology is highly environment friendly due to non-uses of pesticide & chemical fertilizer in fodder production.

5.2.2.4 Environmental and Social Safeguards Affairs for Indigenous People

NATP-2 research and extension programs addressed environmental conservation and livelihood improvement of the Indigenous People (IP). Different activities under the research program are being implemented in order to promote household food security and livelihood improvement of the indigenous people (IP)/tribal community. Eleven (11) PBRG sub-projects were implemented in (i) Chattogram Hill Tract- 6, (ii) Modhupur Tract (Mymensingh)-2, (iii) Sylhet region-2, and (iv) Barind Tract area (Rajshahi/Chapai)-1. A total of 503 CIGs have been formed in 37 Upazilas where 12,724 (1.26%) Indigenous People (IP) including women have been included as project beneficiaries. A total of 5,709 ethnic women have been included as project beneficiaries which is 44.87% of total ethnic and 1.57% of total women beneficiaries.

Most of the IP-CIGs are located in hilly and CHT region comprising Rangamati, Bandarban and Khagrachari districts because of their mass dwelling in that area. Garo, Chakma, Marma, Tripura, Tanchanga, Rajbangshi, Oraon, Munda, Santal, Rabidas, Monipuri, Teor, Kol shing, Boraik and Mahto are the identified ethnic people. Various extension services are being provided to the IP by the PIUs based on their socio-economic, cultural and ecological conditions. Major services and support included skill development training, technology demonstration, validation trials, technology field day, exposure visit, FIAC services, CCMC and PO services for agricultural commodity marketing, and matching grant support (AIF-2 & AIF-2). Almost all ethnic CIG farmers have received training on improved technology where 26,463 training client days are reported. A total of 7,198 ethnic CIG farmers including 3,415 ethnic women CIG farmers have participated in technology demonstration. The representation of ethnic CIG farmers in technology demonstrations and their adoption are given in [Table-5.8](#).

Table-5.8: Status of Indigenous People participation in technology demonstration and their adoption up to June 2021

		PIU-DAE	PIU-DoF	PIU-DLS	Total/ Av.
Indigenous CIG participants in technology demonstration	Total CIG in technology demonstration	146,094	23,535	28,899	198,528
	Total	6,469	324	405	7,198
	% of total	4.43	1.38	1.4	3.63
	% of total ethnic CIG	72.64	28.75	15.05	56.57
Indigenous women CIG participants in technology demonstration	Total	3,050	107	258	3,415
	% of total	5.38	3.19	1.93	4.65
	% of total Indigenous	47.15	33.02	63.7	47.44
	% of total women	82.21	27.79	15.99	59.82
Technology adoption by Indigenous CIG farmers	Total CIG Adopters (#)	417,550	63,736	153,565	634,851
	Indigenous CIG farmers (#)	8,631	550	1,875	11,056
	% of total adopter	2.07	0.86	1.22	1.74
	% of total Ethnic	96.91	48.8	69.68	86.89
Technology adoption by Indigenous women CIG farmers	Total women	3,602	89	1,001	4,692
	% of total	2.38	0.46	1.52	1.98
	% of total Indigenous	41.73	16.18	53.39	42.44
	% of total women	97.09	23.12	62.02	82.19

5.3 Climate co-benefits

NATP-2 is supporting development, testing and dissemination of **innovative climate-smart agriculture technologies and practices** which can be applied in varied agro-ecological and climatic zones. As yet **634,851 farmers** have adopted improved climate-smart technologies promoted by the project. Climate smart agricultural practices in NATP-2 include amongst others:

- ✚ **Climate-smart technologies for crop production:** promoting submergence tolerance, short duration rice varieties, heat tolerant summer tomato and wheat varieties, integrated pest and nutrient management to reduce pesticide use and inorganic fertilizer; alternate wetting and drying technology in irrigated rice to minimize the underground water use and reduce GHG emissions; developing area specific and climate, pest and disease resilient technologies suitable to local agro-ecological situations.
- ✚ **Climate-smart technologies for fisheries production:** the project is promoting a community-based approach in open water fisheries (beels) that concentrates on habitat improvement, nursery development, stocking and sanctuary development, and promoting of indigenous small fishes.
- ✚ **Climate-smart technologies for livestock production:** the project supports conservation of livestock waste for manure production, establishment of bio-gas plants for household cooking and better housing management; and scheduled deworming and vaccination for improved animal health and disease management.

These practices have managed an increase in **yields between 13% and 71%** for selected crops, fisheries and livestock products. A World Bank **GHG emission reductions** assessment conducted in June 2020 reveals that the project is achieving **notable GHG emission reductions** compared to a situation without project of -7,058,845 tCO₂ equivalent emissions over 20 years; or -352,942 845 tCO₂ equivalent emissions annually.

5.4 Grievance Redress Mechanism (GRM)

Grievance Redress Mechanism (GRM) has been established in the NATP-2 project in order to ensure the accountability and transparency of the project implementation. Various initiatives have been taken in the research program and extension services in this respect.

GRM in Research Program

The PIU-BARC has placed a complaints box and a registrar book in the office premise in regards to receiving or keeping record the written complaints/suggestions by the stakeholders. Also, BARC has a provision to make complaints or constructive suggestions in the PIU-BARC website (www.natpbarc.gov.bd). The PIU-BARC has been appointed Grievance Redress Officer (GRO) and Appellate Officer (AO) in order to resolve the complaints or suggestions. No complaints or suggestions have received during reporting period.

GRM in Extension Program

Three tiers (i.e., Upazila, District and PIU level) GRM systems have been established in each PIU in order to ensure accountability and transparency in the implementation of the project interventions. A complaint format and register book have been opened at the FIACs, upazilas & districts offices of PIU-DAE, PIU-DoF and PIU-DLS for recording and documenting of the complaints. List of Grievance Redress Officer (GRO) & Appellate Officer with their address and contact telephone number have been placed in visible places of FIAC and upazila offices. There is an option to make the complaints in the form of written, verbal, and telephonic. The complaint boxes are also kept at the PIU, district & upazila offices and FIACs for avoiding the unwillingness of the assigned grievance redress officers to record the complaints.

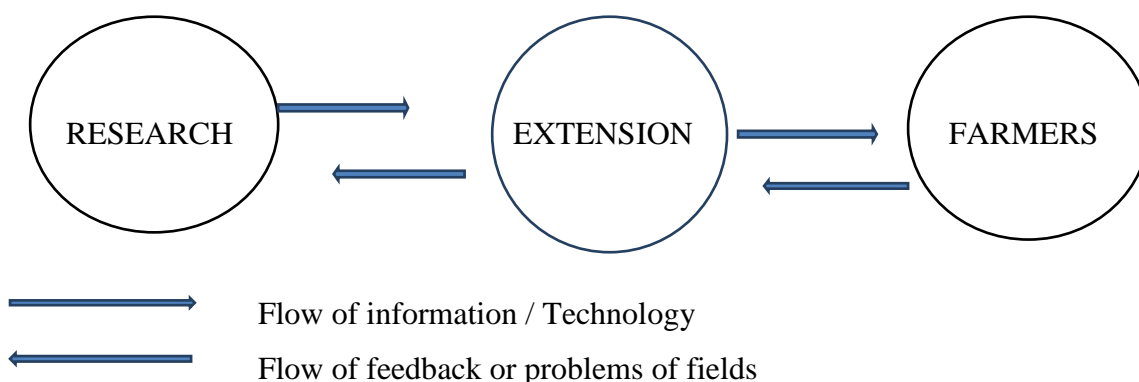
The complaints are mostly made in the area of demonstration, AIF-2 & 3 sub-project, membership of CIG, conflict among the CIG members, dissatisfaction about the activities of the president and secretary of the CIG and services of the extension workers. Most of the complaints are made in the form of verbal as the farmers are mostly illiterate. Most cases the complaints of the farmers to be considered as needs/demands/problems. However, some of the complaints are recorded in the complaints register. The respective local officers/ officials have solved the maximum complaints instantly. However, some of the complaints were solved by the Grievance Redress Officer (GRO). All the issues were resolved by convincing the complainant in a satisfactory manner (Table-5.9).

Table-5.9: The major identified complaints and measures

Area of complaints	List of major complaints	Solving approach
Management and Functionality of CIG	Some of the members are not following the discipline of the association	The concern officers met the general and EC members of CIG and settled the matter
	Interruption of CIG activities due to conflict among the Executive Committee members	
	Some of the members informed that they want to withdraw their savings and leave the CIG	The respective officials investigated the issue and resolved by satisfying the concerned CIG members
	Rejection of membership application to become a member of CIG	The respective officials discussed about the criteria, procedure to become the member of CIG farmer
AIF-2 and AIF-3 matching grant awards	Application submitted for awarding of AIF-2 and AIF-3 sub-project but finally not awarded	The shortfalls/gaps were discussed with the Complainant and suggested to make adjustment for submission again
Technology demonstration	Not being listed for establishing of technology demonstrations	The issue was discussed with the complaints. The complainants were informed about the criteria and procedure for selecting the demo farmers.
	Insufficient number of demonstration pond	The objectives, approach and methodology were discussed with the complainer.
	Poor budget allocation for demonstration	The justification of budget allocation was discussed with the complainer.
FIAC services	Less availability of SAAO/LEAF/CEAL at FIAC	The complaints were informed about the availability and schedule of SAAO/LEAF/CEAL and suggested to visit accordingly.
	Not getting machineries and equipment services during the time of needs	The issue was discussed with the complainer. The reasons for the shortage of machinery and equipment were explained.
Services of extension professionals	Less frequent farm site visit of the SAAO/LEAF/CEAL	Complainant were provided the cell phone number and suggested to communicate when needed.
Exposure visit	Not being participated in exposure visit	The complainers were informed about the objectives and outcomes of the exposure visit.
Expectation of the farmers	Unavailability of new variety rice seeds like BRRI dhan 87, 89, etc.	The complainants were suggested to communicate with SAAOs where SAAOs were advised to provide support in this respect

SECTION 6: RESEARCH - EXTENSION LINKAGE BUILDING

The agriculture sector in Bangladesh is supported by both the public and private organizations through generation and transferring knowledge and technologies to the farmers. Researchers generate new technologies which the extension agencies transfer to farmers for adoption. Thus NATP-2 identifies Research-Extension linkage building as one important area for intervention.



NATP-2 facilitates both formal and informal mechanisms for technology transfer to the farmers. The NARS institutes and universities have their own technology transfer mechanism to promote and disseminate the new technologies in a limited scale. NARS institutes use their technology transfer units (On Farm Research Division (OFRD) and similar others to validate the new technologies at farmers' fields prior to handing over those technologies to the extension agencies. BARC through Technology Transfer and Monitoring Unit (TTMU) collects proven scalable technologies from NARS institutes through review workshops and provide those to the extension agencies.

NATP-2 has an in-built system of National Extension Coordination Committee (NECC), DECC (District Extension Coordination Committee) and UECC (Upazila Extension Coordination Committee) consisting of officials of different extension (DAE, DoF, DLS) and research organizations. The DECC and UECC Committees organize quarterly meetings where local research scientists are invited to inform the latest intervention of research results (variety, production technology, etc.) for field level application and collect information to generate research ideas. PMU conducts Regional Research-Extension Linkage Workshops with officials of different research & extension organizations for a) strengthening the linkage among researchers and extension officials and b) to identify scalable regional technologies through their face to face interactions.

NATP-2 promotes the use of various mobile Apps like "Krishoker Janala, Krishoker Thikana, Rice Knowledge Bank, Krishi Projukti Bhandar...., with technology knowledge. NATP-2 provided mobile tablets to all the frontline extension service providers, i.e., SAAOs, CEAL and LEAF working in the 270 NATP-2 working upazilas, and advised to install and use all the available mobile apps while serving the farmers. The project also supplied various technology factsheets, booklets, leaflets, posters and other knowledge materials with updated information as well as had established seed and pest museums in the 1621 FIAC been established in the Union Parishad buildings. In the seed and pest museums seeds of the latest crop varieties, samples of major pests and insects (both harmful and beneficial insects), sex pheromone traps etc. are collected from the research institutes and preserved here. SAAOs, CEAL and LEAF sitting in FIAC are using all these resource materials while serving the farmers visiting the FIAC.

The **Research and Extension Linkage Building** activities of NATP-2 in FY2020-21 are briefly discussed in the following sub sections.

6.1 Research - Extension Linkage Building Initiative of PIU-BARC

6.1.1 Implementation of CRG and PBRG Sub-projects to generate Scalable technologies

To meet the current and emerging demand for technological solutions in agriculture, PIU-BARC, the research component of NATP-2, awarded 190 CRG-short term and 51 PBRG-long term research sub-projects. Implementation of the CRG sub-projects already been completed. The CRG sub-projects generated 69 different technologies and other valuable information. From the CRG generated list of technologies 11 (06 for crops, 03 for livestock and 02 for fisheries) technologies were selected through discussion among PIUs (DAE, DoF & DLS) and PMU. The three extension departments are now validating 11 technologies at the farmers' field. PIU-BARC, PMU, the related extension departments, PIs and Co-PIs of those generated technologies are making regular joint field visits to share the learning with each other and provide further backstopping support to improve performances of the validated technologies and also for adoption by the farmers.

On 08 June 2021 PIU-BARC conducted one workshop on 'Selection of CRG Generated technologies for Validation' and attended by the PIs and Co-PIs of the related CRG sub-projects, PMU and PIU experts and officials of BARC and extension departments. The workshop recommended 13 CRG technologies (07 for crops, 02 for fisheries & 04 for livestock and those have been mentioned in [section 2](#)) for validation trials during FY 2021-22 in the field using OFRD and farming systems research facilities of NARS institutes in collaboration with the public extension agencies (DAE, DoF & DLS).

6.1.2. Research Extension linkage and policy Development' workshop

To improve research extension linkage PIU-BARC had arranged a '**Research Extension linkage and policy Development**' workshop held at BARC on 23 December 2020 and the workshop proceeding/minutes has been published. In the workshop five (05) policy papers from BARI, BAU, DAE, DoF and DLS were presented related to their overall Research Extension linkage strategies of NARS, the Universities and Academia and the three extension departments. The workshop generated total 47 recommendations (16 for crop 16 for fishery and 15 for livestock sub-sectors) for research extension linkage building.

The workshop also provided recommendations related to Transfer of Technologies generated through NATP-2 or other Projects:

1. Research projects of NATP-2 and the projects from other funding sources should be administered with the core/regular research program of NARS institutes and universities.
2. Technologies generated from NATP-2 or from other projects with different funding sources should be recognized by the concerned organizations and channelized immediately for dissemination. The dissemination process should involve extension agencies, NGOs and private entrepreneurs, as appropriate.
3. Technology generated from NATP-2 or other projects funding from other sources should be disseminated through extension agencies, social, print and electronic media.
4. Allocation of sufficient fund has to be ensured by the concerned organizations for validation/demonstration of newly developed technologies for NATP-2 or other projects.

6.2. Research - Extension Linkage Building Initiative of PIU-DAE

Two third of the NATP-2 project beneficiaries are under PIU-DAE and the component portfolio includes promotion of 29 different technology packages through arranging over 1.7 lakh technology demonstrations, conducting 3780 validation trials to see the suitability and measure performances of the new varieties, arranging 1890 exposure visits and so on. Before setting up demonstration plots, PIU-DAE arranges technology training with the recipient farmers and their CIG groups where relevant expert scientists from local research stations are invited as resource speakers. Under exposure visit the CIG farmers also are taking to the local research stations to get exposed with the new crop varieties and their cultivation techniques and management practices.

As of June 2021 PIU-DAE conducted 62015 batches of farmers training, 2715 batches of CIG and non-CIG technology sharing training, 270 batches of technology training to the input-dealers, 1080 validation trials and 1350 batches of exposure visits.

6.3. Research - Extension Linkage Building Initiative of PIU-DoF

There is a technical collaboration between PIU-DoF and Bangladesh Fisheries Research Institute (BFRI) for supply of pure brood. PIU-DoF receives pureline brood and technical knowledge from BFRI for multiplication of broods. Pureline seed multiplication program has been implemented in Raipur of Laximpur, Nimgachi of Sirajganj, Shantinagar of Sunamganj and Kotiadi of Kishoreganj seed multiplication farms of DoF since FY 2017-2018. Up to June 2020, BFRI has developed pure line brood for the GIFT Tilapia, Vietnamese Koi and Vietnamese Pangas. Physical facilities of these farms have been developed and received germplasm of three above stated species, reared to produce brood and seed production started from GIFT and Vietnamese Koi. From Vietnamese white Pangas, seed production will start from July 2021. For Vietnamese Koi and GIFT, target of fingerling production was a total of 9,20,000 and in response to that 102.13% and 100.68% fingerlings were produced and sold in FY 2019-2020, whereas, up to June 2021, 16,88,608 fingerlings were produced in response to a target of 16,67,000 (Annex 7).

Considering the prospective scopes and results of the pureline brood development program and to disperse the quality seeds to local farmers, the pureline brood development program with BFRI has been kept under provision of extension for another year in RDPP with one more species (**Kalibaus**) together with previous three species. The MoU has been signed between DoF and BFRI with the provision that BFRI will further develop the previous 3 species and also a new species, *Labeo kalbasu*. The developed germplasms will be transferred to five government farms of DoF for seed multiplication in 2nd week of July 2021. Five government seed multiplication farms and species to be transferred are:

- i. Fish Breeding and Training Center, Raipur, Laxmipur (Vietnamese white Pangas, "GIFT" Tilapia and Vietnamese Koi);
- ii. Neemgachi Aquaculture Project (Revenue), Raiganj, Sirajganj (Vietnamese White Pangas, 'GIFT' Tilapia and Vietnamese Koi);
- iii. Fisheries Training and Extension Center, Gangabordhi, Faridpur (Kalibaus, and Vietnamese Koi);
- iv. Fisheries Training and Extension Center, Kotchandpur, Jhenaidaha (Vietnamese White Pangas, and Kalibaus); and
- v. Fish Seed Multiplication Farm, Parbatipur, Dinajpur (Vietnamese White Pangas, and Kalibaus)



Apart from brood development, BFRI has also provided the feed formulation formula with locally available ingredients to PIU-DoF for use in the Feed Pellet Machine been supplied by PIU-DoF and or procured under AIF-2 & 3.

PIU-DoF has finalized the validation plan for two CRG generated technologies involving the PIs and co-PIs of those research projects, PIU-BARC and PMU.

6.4. Research - Extension Linkage Building Initiative of PIU-DLS

PIU-DLS initiated some specific activities to operationalize research extension linkage system within the project provision. The initiatives are briefly mentioned below:

- ❖ PIU-DLS has the provision to provide training to 480 DLS officers and 360 staff on newly released livestock technologies which are available at research institutions, universities and other organizations for dissemination to the farmers. PIU-DLS organized 10 batches training for 300 DLS officers on management of newly released livestock technologies. The scientists of Bangladesh Livestock Research Institute (BLRI) outlined the course design, prepared training manual and the scientists of BLRI conducted the training sessions. The field level officers of DLS and the scientists of BLRI have got an opportunity to directly interaction with each other through this type of training courses.
- ❖ Every year, PIU-DLS organizes 8 regional progress review and planning workshops at the regional level. Scientists of regional research centers are invited in these workshops to share their research activities which are carried out in the respective region. The extension officers highlighted the researchable issues in the workshop along with other issues. The researchers get the opportunity to know the farmers problems through extension officers as well as researchable issues. So, the regional progress review workshops are considered an important event for research extension linkage. In this reporting year PIU-DLS could not arrange the planned 8 regional progress review workshops due to spread out of COVID 19.
- ❖ The project has the provision to organize Exposure Visit by the upazila offices in every year separately. In many upazilas those exposure visits were arranged at Bangladesh Livestock Research Institute (BLRI) for the participating farmers to observe BLRI activities directly and could make interaction with scientists of BLRI.
- ❖ PIU-DLS has been validating 3 of the CRG generated technologies involving the PIs and co-PIs of those research projects, PIU-BARC and PMU.

6.5. Research - Extension Linkage Building Initiative of PMU

PMU facilitates the research-extension linkage building initiatives of the four PIUs, attends the relevant workshops and meetings and also arranges Regional Research extension Linkage Building workshops. As yet PMU conducted total five **Regional Research-Extension Linkage workshops** and the last one was organized virtually on 31 May 2021 for Chattogram and Rangamati Regions. Over 900 participants (Barshal-100), Sylhet-150, Rajshahi and Bogra-230, Jashore and Khulna-240 and Chattogram and Rangamati-186) including regional scientists from BARI, BRRI, BINA, BLRI, BFRI, BFiRI and BWMRI, nominated district and upazila extension officers of DAE, DoF and DLS, experts of PMU and PIUs attended the workshop and identified the scalable regional technologies for dissemination/promotion to the farmers. Proceedings of the first four workshops is compiled and published and made available at www.natp2pmu.gov.bd.

The Chattogram-Rangamati workshop included 08 districts and 23 upazilas of Chattogram and Chattogram Hill Tracts Regions. In total, 186 participants attended the workshop from BARC, DAE, DoF, DLS, BARI, BRRI, BINA, BFRI, BLRI, BSRI, BWMRI and PMU. In the workshop over 60 technologies for crops, fisheries and livestock were selected for dissemination to the regional farmers. The technologies identified from the presentations of different research institutes are in **Annex 8 (A-H)**.

SECTION 7: NATP-2 PROJECT COORDINATION, MONITORING AND EVALUATION

The Project Management Unit (PMU) of NATP-2 is established under the Ministry of Agriculture and headed by an Additional Secretary of the Government of Bangladesh as the Project Director. PMU coordinates and facilitates the overall implementation and management of NATP-2 under the direction and supervision of an inter-ministerial Joint Project Steering Committee (JPSC) and Project Implementation Committee (PIC). PMU facilitates project implementation being carried out by the four PIUs (PIU-BARC, PIU-DAE, PIU-DOF, PIU-DLS) in line with the provisions in the official project documents, consolidates NATP-2 annual budget and work plan, based on inputs from different implementing units, for approval by JPSC.

Besides the overall project coordination, PMU undertakes a range of fiduciary activities including overall financial management, training to PIUs and the research partners on cross-cutting issues; organizing annual progress review workshops & other PMU workshops on cross-cutting issues; coordination of procurement and corresponding support to other components; etc. PMU is also responsible for coordinating overall Project Monitoring and Impact Evaluation (M&IE), reporting and implementation of the communication activities of the project. It also coordinates the internal annual audits and facilitates the World Bank-IFAD Joint Missions.

This section reports progress of activities PMU directly implemented in the FY2019-20 and cumulatively, as well as progress and results of overall coordination and monitoring of the project.

7.1 NATP-2 Project Coordination

In FY2020-21, PMU had arranged 2 JPSC (5th and 6th), 2 PIC and 11 Monthly Coordination meetings with the PIUs and several others issue based and problem solving meetings with the PIUs and outsourcing Firms and companies. Most of the meetings were organized using ZOOM Platform. PMU had also successfully arranged two World Bank-IFAD Joint Implementation Support Missions.

7.1.1 Joint Project Steering Committee Meeting

The Fifth and Sixth Joint Project Steering Committee meeting were held on 17 August 2020 and 24 June 2021 respectively using ZOOM Platform. In the sixth JPSC Meeting, the FY 2021-22 work and procurement plans of four PIUs and PMU which were prepared based on the revised DPP, were discussed and approved. The 6th JPSC also approved the three supplementary guidelines under AIF-2 on the three thematic areas of PIU-DLS. Major decisions taken in the 5th and 6th JPSCs were as below:

5 th JPSC Meeting Decisions	6 th JPSC Meeting Decisions
<ol style="list-style-type: none"> 1. PhD Scholars (in country and foreign) must submit a copy of their PhD thesis to PIU-BARC as indicated in their signed agreements. 2. PIU-DAE, PIU-DoF and PIU-DLS should engage the Department of Cooperatives officers as trainers where possible. 3. PIU-DoF should expedite implementation and complete the planned Beel management activities within stipulated timeframe. PIU-DLS 	<ol style="list-style-type: none"> 1. All implementing organizations should complete implementation of all the FY2020-21 planned activities within the specified time mentioned in the work and procurement plans. 2. The three supplementary guidelines on the three thematic areas of PIU-DLS were approved with changes in the profit sharing percentage of heifer rearing and beef fattening under AIF-2. The approved supplementary guidelines should be followed for the sub-project implementation.

5 th JPSC Meeting Decisions	6 th JPSC Meeting Decisions
<p>should achieve the AIF-2 and AIF-3 targets.</p> <p>4. PMU should complete the DPP revision by considering the decision of the 4th JPSC Meeting and on the basis of Aide Memoire of the WB/IFAD's fourth Implementation Support Mission and submit it to the Ministry of Agriculture at the earliest.</p>	<p>3. Monitoring should be expedited by PIUs and PMU for the quality implementation of the work plan for the FY-2021-22.</p> <p>4. Relevant field level officers must remain present in the ZOOM meeting conducted by the Project Director for implementing agencies. All PIU-Directors will ensure their presence in the meeting.</p>

7.1.2 Project Implementation Committee of PMU (PMU-PIC) Meeting

Two meetings of PMU-PIC were held on 12 August 2020 and 8 June 2021, where the following important decisions were taken:

1. Efforts should be made to improve CIG performance and complete the registrations of CIGs of NATP-2 for their sustainability.
2. RFQ & DPM method of procurement should be limited as far as possible or practicable.
3. The PIC meetings should be organized regularly (4 times in a year);

7.1.3 Monthly Coordination Meetings of PMU with the PIUs

Monthly Coordination meeting with the PIUs and PMU is a problem solving forum where the component Directors give quick updates of their implementation progress, raise and discuss the recurrent problems and issues being faced and derive their solutions. Summary decisions taken in the Monthly Coordination meetings organized by PMU during FY2020-21 and which have policy relevances are given below:

1. Annual work plan, training plan, procurement plan with budget of FY2021-22 are recommended to present in the JPSC meeting for approval. All PIUs reports to be prepared in similar format.
2. Each PIU-Director should submit their monthly progress report (including the progress of their Strategic Partner Hortex Foundation, Kranti Associates and CRDS) to Project Director at least 3/4 days before the monthly coordination meeting. The report should be prepared based on the work and procurement plans of the respective units as per the workplan format provided earlier.
3. Each PIU should inform the PMU about the field visit program of their unit and include the PMU experts for field monitoring activities. PIUs must send their field visit report to PMU with recommendations and comments after the visit.
4. For the online workshop participants allowance will be given by using the online mobile banking system like bkaash, nogod etc. Every participants need to open an online mobile bank account to receive the participants allowance and the charge will ultimately borne by the end users.
5. All PIUs should prepare their component progress report for the World Bank-IFAD Missions based on the guidelines provided earlier by PMU and the World Bank. A summary report will be prepared by PMU based on the PIUs reports. Project Director PMU will form a committee for the preparation of summary report and presentation for the Project Director drawing consultants/experts from PMU.
6. All PIUs and PMU should implement the decisions of JPSC meetings and agreed actions of the World Bank-IFAD Joint Missions relevant to their units timely and effectively.

7. All PIUs should continue to submit their field monitoring report to Project Director with a copy to SCE and M&E of PMU on a monthly basis as decided earlier for compilation, reporting and follow-up actions.
8. The NECC, DECC and UECC meetings should be organized regularly ensuring the participation of the representative(s) of DAE, DOF and DLS and the proceedings of the meeting should be sent to PIU-Directors and Project Director.
9. All PIUs should follow the financial guideline mentioned in the proceedings.
10. Audit objections/observations which have not yet been resolved should be resolved immediately.
11. CIG-wise and entrepreneurs-wise complete inventory of agricultural machinery/tools/vehicle/pick-up van procured under AIF-2 and AIF-3 should be prepared along with their uses and present status by PIUs of extension components and submit it to PMU
12. PIU-BARC should issue a letter addressing Director Generals of DAE, DOF and DLS regarding the transfer of CRG and PBRG generated technology through PIUs.
13. The Hortex Foundation should develop business plans for Commodity Collection and Marketing Center (CCMC) and Collection Point (CP) and motivate the POs to run those accordingly. POMS of PMU and Hortex will jointly prepare the business plans. All possible efforts should be made for the sustainability of CCMC and CP.
14. PMIS software development progress should be reported by each PIU-Director in the Monthly Coordination meetings.
15. In the current COVID-19 situation project activities like training, workshop, meeting field data collection and monitoring shall be carried out by using online system.
16. At present situation in office management e-nothi should be practiced by all PIUs, especially by PIU-BARC and PIU-DLS.
17. PIU-DAE and PIU-DLS should complete their 100% CIG registrations very soon and inform the Project Director.

7.1.4 Coordination of Extension Activities

NATP-2 has an in-built system of National Extension Coordination Committee (NECC), DECC (District Extension Coordination Committee) UECC (Upazila Extension Coordination Committee) and Union Extension Facilitation Team (UEFT) consisting of officials of different extension (DAE, DoF, DLS) and research organizations. NECC provides policy guidance and inter-agency coordination for the extension departments. DECC maintains overall oversight on technical guidance, input-output linkage and training support to extension officers and staff. UECC oversees planning, budgeting, coordination and implementation of extension activities at the field level. The Union Extension Facilitation Team (UEFT) comprising SAAO, CEAL and LEAF from three extension departments have been formed in each union of the project area. UEFT meets in every month at FIAC or other suitable places to coordinate the implementation at union level. The Upazila Resource Team (URT) provides technical guidance to UEFT and maintaining liaison between UECC and UEFT.

At PIU level, there is a Project Implementation Committee (PIC) to meet on quarterly basis. The PIU-PICs are formed with representatives from the ministries and departments, PMU, IMED and the Planning Commission to (i) review and recommend annual work plan, procurement plan & budget, (ii) review and monitor the implementation progress (iii) provide necessary guidance for successfully implementation of the project and (iv) any other issue as deemed necessary.

7.2 PMU Local Trainings and Workshops 2020-21

7.2.1 Local Trainings

In this reporting year PMU organized virtually two batches of “Financial and Procurement Management” training of 6-day duration during 27-29 April & 2-4 May 2021. Total 73 participants from DAE, DOF, DLS, BARC, BARI, BWMRI and PMU attended the courses. In the sessions GOB financial and procurement rules and guidelines of the World Bank were taught and their practices were demonstrated in the training courses.

In total PMU trained about 1800 persons in different local training courses and sent 32 persons abroad on study visits and trainings.

7.2.2 Local Workshops

During FY 2020-21 PMU organized the following seven virtual workshops where over 1170 participants from DAE, DOF, DLS, BARC, PMU and other concerned local offices attended. The previous and following day of each workshop, field monitoring visit and interaction meeting were organized during each workshop.

- 1) Cumilla Regional Progress Review Workshop (Virtual) was held on 12 October 2020 where over 140 participants from DAE, DOF, DLS, BARC and PMU attended virtually through ZOOM Apps/Platform connected from PMU Office, BARC Complex, Farmgate, Dhaka.
- 2) Sylhet Regional Progress Review Workshop (Virtual) was held on 20 October 2020 where over 98 participants from DAE, DOF, DLS, BARC, PMU and Sunamganj District Administration attended virtually through ZOOM Apps/Platform connected from DC Conference Room, Sunamganj.
- 3) Barishal Regional Progress Review Workshop (Virtual) was held on 11 November 2020 where over 56 participants from DAE, DOF, DLS, BARC, PMU and Barishal District Administration attended virtually through ZOOM Apps/Platform connected from DC Conference Room, Barishal.
- 4) Faridpur Regional Progress Review Workshop (Virtual) was held on 25 November 2020 where over 132 participants from DAE, DOF, DLS, BARC, PMU and Gopalganj District Administration attended virtually through ZOOM Apps/Platform connected from DC Conference Room, Gopalganj.
- 5) Dhaka Regional Progress Review Workshop (Virtual) was held on 08 March 2021 where over 150 participants from DAE, DOF, DLS, BARC and PMU attended virtually through ZOOM Apps/Platform connected from PMU Office, BARC Complex, Farmgate, Dhaka.
- 6) Mymensingh Regional Progress Review Workshop (Virtual) was held on 25 April 2021 where 238 participants from DAE, DOF, DLS, BARC and PMU attended virtually through ZOOM Apps/Platform hosting from PMU Office, BARC Complex, Farmgate, Dhaka.
- 7) Rajshahi-Bogura-Rangpur-Dinajpur Regional Progress Review Workshop (Virtual) was held on 02 June 2021 where 329 participants from DAE, DOF, DLS, BARC and PMU attended virtually through ZOOM Apps/Platform hosting from PMU Office, BARC Complex, Farmgate, Dhaka.

In the Regional Progress Review Workshops, PIUs presented their Regional annual and cumulative activity implementation progresses, the achievements, successes, challenges, lessons learnt and way-forward. The workshop participants raised questions, discussed issues, and made suggestions for improvements. The workshop proceeding were prepared for each workshop and sent to PIUs for their necessary action on the minutes/decisions.

On 31 May 2021 During FY2020-2021 PMU also organized one Strengthening Research –Extension Linkage Workshop (Virtual) for Chattogram- Rangamati Regions where 186 participants from DAE, DOF, DLS, BARC, BARI, BRRI, BINA, BSRI, BWMRI, BFRI, BLRI and PMU attended virtually through ZOOM Apps/Platform hosting from PMU Office, BARC Complex, Farmgate, Dhaka.

In the Strengthening Research-Extension Linkage Workshops, researchers presented their regional scalable technologies mentioning the benefits of those technologies. The extension officials and the house discussed those, debated and finally selected the good technologies for the farmers of the region(s). Proceeding was prepared for each workshop and sent to PIUs for their necessary action on the minutes/decisions.

7.2.3 Implementation of the NATP-2 Communication Strategy and Action Plan by PMU

In June 2021, PMU hired Expressions, a media and communication Firm for implementation of the NATP-2 Communication Strategy Action Plan developed by engaging a short-term consultant. It is a 12 month contract with Expressions under which *20 community videos each with 10 minutes duration, 20 audio based program, 4 magazine program, 4 docudrama and some other IEC materials will be developed*. As per the contract agreement a three day content development training workshop was organized virtually from 26-28 July, 2021. In this training workshop 60 nominated DAE, DoF and DLS project related officials, both from HQ and field, and 10 PMU Officials and Experts participated in four groups (2 for crop, 1 for fisheries and 1 for livestock) and finalized the overall production plan including the list of community videos, their content outline, key messages, call for actions and the shooting timeline with possible sites. The draft outcome of the three sectors were further discussed in another online daylong workshop held on 31 July, 2021 and attended by 1000+ participants from 270 upazilas, PIUs and PMU.

7.2.4 Publication of “NATP-2 Annual Progress Report”

PMU collects information on project implementation and progress from all components (PIUs); compiles, reviews and analyzed the information and then produce the report in a more concise form as “NATP-2 Annual Progress Report”. PMU already published three Annual Progress Reports for FY2017-2018, FY2018-2019 and FY2019-20 in 500 copies each and distributed those to the ministry and departmental officials, development partners, PIUs, PMU and other stakeholders. This report is NATP-2 Annual Progress Report for FY2020-2021.

7.3 Addressing Pandemic COVID-19

Bangladesh is the second most affected country in South Asia after India. The pandemic has taken a heavy toll on almost all sectors of the economy. Bangladesh faces significant challenges in combating COVID-19 as it is a densely populated country. The Government of Bangladesh was concern about its multidisciplinary effects. In the changing situation, the country was locked-down from Late March 2020 to June 2020. Further, three nationwide lock-downs were declared between April to August 2021. However, the Government offices continued their activities maintaining government health guideline. Throughout nationwide locked down, government took initiatives to allow safe transport of agricultural

products and inputs anything related to agriculture, fisheries and livestock production to keep the agricultural production unhampered.

Activities performed with results

1. Due to COVID-19 pandemic, the PhD scholars became compelled to be in a break period of more than 6 months when they were unable to continue course or research works at field and lab. During January to June 2021 strong monitoring of the activities of PhD scholars (in-country and abroad) were continued both physically and virtually. PIU-BARC virtually monitored the progress of PhD programs of foreign scholars pursuing their degrees in Malaysia, India, Thailand, Philippines, China, Japan, Germany, UK, USA and Australia. Progress of field research of in-country scholars of BSRI (9), BINA (9), DAE (10), DLS (5), and DoF (5) also monitored virtually in different dates. The scholars presented their activities using zoom facilities. Physical monitoring of 8 scholars at BARI was done in March 2021. Considering the time loss of PhD scholars due to COVID 19 pandemic and no-cost extension of NATP-2 for 21 months, PIU-BARC has decided to extend the period for PhD programs maximum of 6 months through analysis of need by individuals. By this time 17 foreign scholars published 26 scientific research papers in reputed journals. Rests are submitted one or more papers which are under review stage at supervisor or journal level. Besides, four in-country PhD scholars published 5 papers in reputed journals.

2. PIU-BARC conducted large numbers of national training courses during the year 2020-21 even though the activities of the component were affected by the COVID 19 pandemic. Considering the severity of the pandemic some of the training programs were arranged virtually. During the fiscal year 2020-21 altogether 13 events of local training were conducted covering 496 trainees. The major training courses are on E-filing, research methodology, M&E, modern farm machinery, climate smart agriculture, scientific report writing etc.

3. None of the project activities of PIU-DAE was suffered in risks of COVID-19, rather implemented taking safety measures in time. Trainings (CIG farmers, SAAOs, DAE officers) were conducted following appropriate health safety measures and maintaining safe physical distances; Demonstrations were implemented as per project design without any disruption; Meetings, workshops, training, etc. were organized virtually; Virtual monitoring and supervision continued; Physical movement was active, getting protected from the risk of COVID-19 so far possible; SAAOs duty at the FIACs was almost regular and digitized communication emphasized more.

4. The fisheries sector activities like demonstrations and pond aquaculture were not much affected from Covid-19. Likewise, the beel nursery and stocking of fingerlings in selected beels were continued as per plan. But the concerns usually expressed by the fish farmers regarding low market price of fish products has been further exacerbated by the Covid-19 situation. To address the situation, PIU-DoF launched pofishmarket website and apps, which facilitated PO farmers to get better market access and ensure fair prices of their fish products. As results of the efforts about **839** MT of fish was sold using this online platform till June 2021. Apart from that mobile fish marketing also introduced to sale farmer's fish at consumer's doorstep and it caught much interest among consumers.

5. Fish farmers also consistently raised the issue of ensuring quality fisheries inputs, primarily fish seed and feed at an affordable cost. Farmers strongly felt the issues during the pandemic situation. To ensure quality fish seed, NATP-2 supplied quality fish seed of GIF-tilapia and Vietnamese Koi from four Government fish farms under the pure line brood program. Besides, all other Government and private hatcheries kept continued production of fish seed under the Covid-19 situation. So, the fish seed was available to the farmers. To address the feed issue, the project funded CIGs and entrepreneurs through AIF-2 and AIF-3 for the establishment of fish feed machines to prepare feed with locally

available ingredients at affordable prices. A feed composition recipes guideline prepared by the BFRI was also provided to the recipients to ensure quality feed preparation.

6. Physical monitoring of field implementation by the PIUs was hampered due to restricted mobility. It was mitigated through virtual communication with the CIGs and Upazila Offices to monitor CIG performance in respect of registration, generation of savings, holding of monthly group meetings, participation in the training program etc., and by arranging frequent online meetings with the stakeholders, using social media group chatting and other mode of communications using internet.

7. PIU-DLS officers and consultants continued the anticipated tasks staying at home. Field level officials were given instructions to provide extension services and to follow up the implementation of on-going activities over phone. Field level monitoring was carried out through mobile phone, internet, facebook, Viber, whatsApp etc. Initiatives were taken to revise DPP. Saved or unspent money re-allocated to support project beneficiaries: increased the number of demonstration, vaccination and de-worming etc. to supply critical inputs like feed, vaccine, de-worming medicine etc. Increased the number of AIF-2 & 3 sub-project target for collecting equipment and materials for mitigation of input problems by feed processing locally, products processing equipment, access to market by local entrepreneur etc. Actions were taken to promoted door to door marketing or mobile marketing. Revised work plan and carry forwarded the remaining tasks to next year. Undertook campaign to grow awareness to eat meat, milk and egg regularly to boost up immune system of body so that local consumption id increased.

7.4 Monitoring and Evaluation

Monitoring and evaluation are integral parts of project management. As per DPP PMU is overall responsible for project's results monitoring, while the day-to-day activity implementation monitoring and evaluation of CIG performances have been integrated within the decentralized project management arrangements.

7.4.1 Monitoring of research and human resource development activities by PIU-BARC

In 2020-21, the monitoring section of PIU-BARC was primarily responsible for monitoring the ongoing research activities of 51 PBRG sub-projects with 190 components, identifying the mature/scalable technologies from the CRG and PBRG sub-projects, validation of the technologies in farmers' field and their corresponding field monitoring and monitoring of PhD programs and other skill development activities of the component and submitting the reports to the Director, PIU-BARC; PMU, WB and other relevant authorities.

The M&E activities performed by the PIU-BARC during FY2020-21 were as below:

7.4.1.1 Monitoring of PBRG Sub-project

At present 51 PBRG sub-projects are continuing field/lab researches with a view to generate scientific information, knowledge and suitable agricultural technologies for up-scaling. The PIU-BARC provides funding for 190 components of 51 research sub-projects through evaluating their progress of researches by reviewing the half-yearly and annual progress reports. Submissions of satisfactory reports are mandatory for releasing fund to the sub-projects. So, reviewing of reports of the sub-projects is one of the regular activities of the monitoring section. The desk monitoring also includes organizing annual progress workshop and annual monitoring workshop.

In November 2021 the monitoring team had organized 6 annual progress review workshops where the PIs of the sub-projects presented their updated progress and the expert panel including other senior scientists reviewed their project progress based on work plan. The workshop compiled several

recommendations for each of the sub-projects and duly sent to the respective PIs for accommodate them in their programs.

In FY2020-21, PIU-BARC unit physically visited research sites of 51 components of the PBRG sub-projects in different locations given below

Quarter	# of sub-project/ components monitored	Coverage of location
July to Sept 2020	6	Paikgacha, Bagherhat, Jashore Satkhira
Oct. to Dec. 2020	16	Barisal, Gazipur, Sylhet
Jan. to Mar 2021	19	Mymensingh, Dinajpur, Panchagar and Cox's Bazaar
April to June 2021	10	Gauripur, Mymensingh

7.4.1.2 Monitoring of CRG and PBRG Generated technology Validation

The unit has also developed a monitoring mechanism for CRG Generated Technology Demonstration and also conducted a comparative assessment of five CRG generated technologies demonstrated by PIU-DAE through joint monitoring visits. Details of the Monitoring Mechanism and preliminary assessment results are described under section 2.1.

In June 2021 PIU-BARC had arranged a workshop with the PIs and Co-PIs of the CRG and PBRG sub-projects and had selected 13 CRG and 17 PBRG generated technologies covering crops, livestock and fisheries sub-sectors for validation. The final lists of those selected technologies are given in section 2.1 & 2.2.

7.4.1.3 Monitoring of PhD Program

The PIU-BARC has provision to support higher studies (PhD programs). The monitoring section in association with the concerned responsible officer organized monitoring visits to the research fields and attended numbers of virtual meetings with the scholars.



Physical verification of the research plots of national PhD scholars was done in BIRRI and BARI. In BIRRI, 6 scientists are pursuing PhDs using NATP-2 fund while 21 awarded scholarship from BARI. The monitoring team visited BIRRI on 22 Oct 2020, attended the presentation sessions of 6 scholars and later in the afternoon made field visits to their experimental plots. On 21 March 2021 the team visited BARI for monitoring the activities of 08 PhD scholars. Similar modality followed as of BIRRI (presentation session followed by field visit of research fields). DG BARI was with the team during presentation and field visit.

Due to COVID 19 incidence and budget cut in RDPP virtual monitoring systems have been adopted for progress monitoring of the PhD scholars especially for foreign students. PIU-BARC monitored the progress PhD programs of foreign scholars pursuing their degrees in Malaysia, India, Germany, UK, USA and Australia. Progress of field research of in-country scholars of BSRI (5+4), BINA (5+4), DAE (10), DLS (05), and DoF (05) also monitored virtually in different dates. The scholars presented their activities using zoom facilities.

7.4.2 Monitoring of Extension Activities of PIU-DAE, PIU-DOF and PIU-DLS

The PIUs have established their own M&E Cells with their Deputed Departmental Officers and consultants working in the units for regular visits on-site visits to observe the implementation progress at the field levels and also to oversee the status of implementation progress within the specified

timeline. In addition, the Upazila, District, Regional and HQ departmental Officials, Officials from the Ministries, IMED and PMU are also monitoring the project's field activities. The M&E Specialists of implementing units had developed their M&E plans, formats and checklists to record the field observations and outputs data and their reporting from the field to PIUs and PMU.

During FY 2020-21, the PIU M&E Cells were largely remained vigilant over telephonic contacts and made frequent field visits. During field visits the visiting team made interactions with Upazila officers, CIG & non-CIG farmers, CIG executive committee members and FIAC visiting farmers. During interactions CIG performances were evaluated in respect of registration, generation and use of savings, holding of monthly group meetings, participation in the training program and field days, quality of the training, establishment and management of technology demonstrations. During FIAC visits checked the registers kept in FIAC to observe the use trend of project supplied small equipment like mobile tabs, moisture meters, water analyzing kits and the use trend of farmers visiting FIAC and seeking extension services. The PIU M&E experts were also heavily involved in checking, analyzing and Interpreting the fortnightly, monthly & quarterly reports, AIF-2/AIF-3 sub-projects, etc. as received from the field, and producing different reports for the ministries, IMED and World Bank Missions.

Monitoring Finding and Observations:

- ✚ Demonstrations, training of CIG farmers, etc. are conducted within the timeframe even during the crisis of COVID-19 following the prescribed health safety measures
- ✚ Overall observation showed an increasing trend of more area coverage under project promoted improved technologies and farm productivity
- ✚ Increased awareness developed among the farming communities as well as to public representatives regarding productivity increase, CIG organizational development, FIAC activities, market access, etc.
- ✚ Awarded AIF-2 and AIF-3 sub-projects are successfully implemented and the sub-projects helped strengthening & sustainability of the CIGs enriching their assets
- ✚ Awareness regarding Environmental safeguard issues developed among the CIG & non-CIG farmers, and use trend of pesticides gradually declining
- ✚ Vermi-compost and Tricho-compost technology have been widely adopted among the farmers
- ✚ Supervision and monitoring of project activities are continued through Internet, video calls, social media, program activity based messenger groups and mobile phones are used for communication of information between fields and PIU and for close monitoring from PIU.
- ✚ All planned activities were implemented maintaining social distance and following government health guideline.
- ✚ Data collection through Geo-Enabling initiative for Monitoring and Supervision (GEMS) using Kobo toolbox found effective and used for collection of Upazila M&E Information, Upazila CIG Information, Upazila Demonstration Information, FIAC Information, Upazila Demo Productivity, Financial Management Report, PO Information and Upazila Procurement Information.
- ✚ Field Officers continuously uploaded visual photos of the activities implemented for maintaining transparency and accountability.
- ✚ Upazila, district and PIU level officers provided technical backstopping support on demand to the fish farmers through mobile phone and online video calls.
- ✚ Producer's organizations initiated fish sale in the local area using mobile van having iced fish in Styrofoam boxes.

- Project supplied Motor bikes at the NATP-1 Upazilas are quite old and expensive to repair, some are about to non-repairable, and this makes monitoring difficult for the Upazila officers

7.4.2.1 Establishment of the Project Management Information System (PMIS)

In September 2020, PMU selected TechnoVista Ltd., a software firm to design and develop an integrated web-based MIS software with three separate interfaces for the three PIUs to input their own component specific data and maintain the office records. By June 2021 the software firm completed requirement analysis, finalized the layout and data architecture (fig. 7.1) and progressed about 80% of their software design work.

To collect backlog data from 270 upazilas, PMU developed ten KOBO

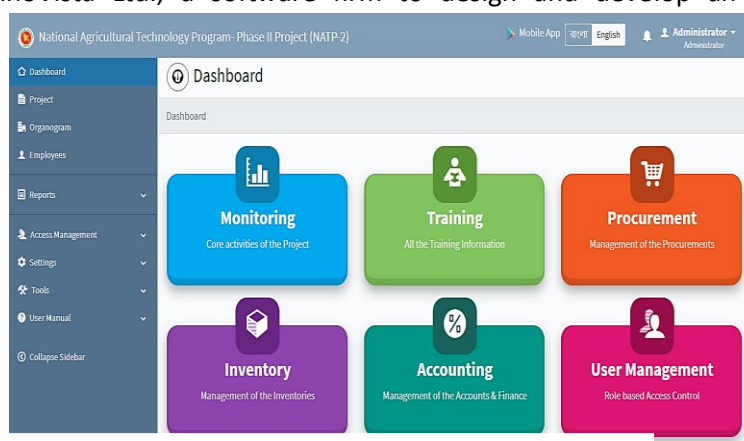


Fig. 7.1: NATP-2 PMIS Dashboard

Collect Forms and made them available in www.natp2pmu.gov.bd.

7.4.3 Performance Monitoring of Extension Components by PMU and PIUs

Last year PMU experts and the monitoring sections of all PIUs were extremely busy with the following major tasks:

Sl. No.	List of Studies /Assessments Conducted	PIUs/PMU
1	Demonstration Performance Assessment of 5 of CRG Generated Technologies	PIU-BARC, PMU, PIU-DAE
2	Adoption Impacts on Crop Production and Productivity, Food Security and Income	PIU-DAE, PMU
3	Assessment of AIF-2 awarded equipment of PIU-DAE	PIU-DAE, PMU
4	Assessment of FIAC Services of PIU-DAE	PIU-DAE, PMU
5	Assessment Report on Agricultural Innovation Fund 3 (AIF-3) of PIU-DAE	PIU-DAE, PMU
6	CCMC and Collection Points (CPs) Sustainability Assessment	Hortex Foundation, PMU
7	Analysis of Aquaculture Technology Demonstration and Adoption	PIU-DoF, PMU
8	AIF-2 and AIF-3 Sub-projects Impacts of the Fisheries component	PIU-DoF, PMU
9	Rapid Impact survey online fish marketing	PIU-DoF, PMU
10	Analysis of Livestock Technology Demonstration and Adoption	PIU-DLS
11	Assessment of Effectiveness of Farmers Training on Management of Improved Livestock Technologies	PIU-DLS
12	Cost and Return Analysis of Different Livestock Farming Activities in Bangladesh"	PIU-DLS
13	Gender and Value Chain study	PMU
14	Client Satisfaction study	PMU
15	BSC-based CIG Performance Assessment Results Analysis	PMU

Summary Study Findings

- ✚ The assessments results show significant increase in the area coverage under project promoted improved technologies and newly released crop varieties and an increasing trend in farm productivity;
- ✚ Vermi-compost and Tricho-compost technologies are widely adopted among the farmers.
- ✚ Awareness on modern management of livestock has been improved due to training, demonstration, vaccination & de-worming campaign and other extension activities. As a result, adoption of technology and productivity of livestock is increasing day by day.
- ✚ Data collection through Geo-Enabling initiative for Monitoring and Supervision (GEMS) using Kobo toolbox found effective and used for collection of Upazila M&E Information, Upazila CIG Information, Upazila Demonstration Information, FIAC Information, Upazila Demo Productivity, Financial Management Report, PO Information and Upazila Procurement Information.
- ✚ FIAC are gradually popularized among the rural people. Accounts related registers, books of accounts and other related documents were maintained properly by the most of the upazilas.
- ✚ Supervision and monitoring of project activities were continued through Internet, video calls, social media, program activity based messenger groups and mobile phones are used for communication of information between fields and PIU and for close monitoring from PIU.
- ✚ CIG mobilization activities need to be strengthened so that the status of savings, investment, registration etc. would be increased.
- ✚ The knowledge and skills of CEAL in delivering extension services are not sufficient. CEALs need more training on livestock technology, extension techniques and skill development.

7.5 Performance Review by the World Bank and IFAD

During FY2020-21, the World Bank and IFAD conducted two Implementation Support Missions virtually during 06-16 July, 2020 and 2-11 February, 2021 respectively.

The objectives of the two Missions were to: (i) assess project implementation progress towards meeting project objectives; and (ii) discuss the status of DPP revision. Both the two mission reports noted that the project implemented all the priority actions agreed during the last Missions. Overall progress of the project is considered satisfactory, with most results indicators on track to meet their end targets. The missions recommended capturing the innovations and good practices;

7.6 Achievements against Targets in the Results Framework

The internal MIS data reveals that NATP-2 is on track in almost all indicators ([Table-7.1](#)). The project has already mobilized over one million of smallholder farmers and formed the CIG groups during first year, thus, overachieved its beneficiary target; undertook 241² research sub-projects; imparted 3.9 million client days training against RDPP target of 4.0 million client days training and thus already achieved 97% against the target. The value chain and marketing activities Although there were some delays in the launching of supply chain and marketing activities of the project but and AIF-2 and AIF-3 activities, but

² Comprising 190 research sub-projects implemented under CRG window funding and 51 research sub-projects are being implemented under PBRG window funding. The 190 CRG sub-projects generated 69 new technologies of which 11 were handed over to PIU-DAE (6 crop technologies), PIU-DLS (3 livestock technologies) and PIU-DoF (2 fishery technologies). Under PBRG window funding 51 research sub-projects with 190 components are on-going with satisfactory performance.

had put its all out efforts in this financial year to expedite the process and now achieved 91% of its RDPP targets. Implementation of AIF-2 & 3 sub-projects has also increased from 56% to 64%.

The PIU reports reveal that a total of **634851** CIG and non-CIG farmers (crop- 417550, fisheries- 63736 and livestock- 153565) adopted the project promoted scalable technologies and thus achieved 93% of its RDPP target. As a result farm productivity gains for 12 different crops have reached 80% to 88% of their project end targets. The livestock sector also has achieved over 91% of its cumulative change targets for dairy (3.82 ltr milk/day/cow against the six year target of 3.9 ltr milk/day/cow with a baseline value of 3.0/ltr milk/day/cow) and for beef fattening the achievement is 90% (218.22 kg live weight/cattle against the six year target of 225 kg live weight/cattle with a baseline value of 160 kg live weight/cattle). Productivity increase for culture fish has reached to 4.94 t/ha against the target of 4.8 t/ha for 2021. For captured fish the productivity has reached to 1.20 t/ha from the baseline value of 0.7 t/ha.

Table-7.1: NATP-2 updated results framework as on June 30, 2021

#	Outcome Indicators	Baseline (2014)	End Target (June 2023)	June 2021	Cum. Achievements (%)	
					End June 2020	End June 2021
1	Farm Productivity:					
	Rice(paddy) -t/ha	4.7	5.4	5.29	60%	84%
	Tomato - t/ha	30	36	34.95	58%	83%
	Banana - t/ha	18.23	20.96	20.41	64%	80%
	Eggplant- t/ha	27.17	33.96	32.65	72%	81%
	Mustard- t/ha	1.12	1.25	1.23	69%	85%
	Maize- t/ha	6.74	7.54	7.42	66%	85%
	Wheat- t/ha	2.91	3.2	3.16	69%	86%
	Lentil- t/ha	1.1	1.27	1.25	71%	88%
	Mungbean- t/ha	1.1	1.27	1.24	65%	82%
	Potato- t/ha	18.75	20.25	20.02	62%	85%
	Onion- t/ha	9.1	10	9.87	70%	86%
	Garlic- t/ha	6.55	7.2	7.11	66%	86%
	Dairy - ltr milk/day/cow	3	3.9	3.82	69%	91%
	Beef- kg live weight/cattle	160	225	218.22	65%	90%
	Culture (ponds) - t/ha	3	4.8	4.94	104%	108%
	Capture (<i>beel</i>) - t/ha	0.7	1.4	1.2	79%	71%
2	Commodities sold (amount)	0	35360	32088.95	66%	91%
3	# of Direct beneficiaries:	352,900	1,000,000	1009090	100.9%	100.9%
4	# of Technologies demonstrated		40	6	27.5%	15%
5	Research projects (CRG&PBRG)		241	241	100%	100%
6	Client satisfaction (%)	Tbd	93%		87%	92%
7	Technology adoption (No)	0	679058	634851	93%	93%
8	Marketing solutions (No)		142	155	47%	109%
9	AIF-2 & AIF-3 projects		4541	2922	55.7%	64%
10	Client-days training		4004982	3899145	83.6%	97%

SECTION 8: PROGRESS OF PROCUREMENT AND FINANCIAL MANAGEMENT & AUDIT

Finance, Procurements and other fiduciary relevant issues at NATP-2 are directly being managed by the PIU Directors or their HOPEs as per GOB and the World Bank rules and procedures and the provisions stipulated in the NATP-2 Financing Agreement and PAD of the World Bank. The key project accounting responsibilities/functions lie with PMU and the procurements are handled by the PMU and PIUs both.

8.1 Procurement Management

NATP-2 workplans include a wide range of goods, works and services procurements. Procurements under NATP-2 were carried out in accordance with the World Bank's Procurement Guidelines revised in July 2014 and the Government of Bangladesh's Public Procurement Act (PPA-2006) and Public Procurement Rules (PPR-2008) and their subsequent amendments.

The procurement progresses against targets of four PIUs and PMU for FY2020-21 and cumulatively upto June 30, 2021 are given in [Table-8.1](#). As shown in the table

The Annual Procurement Plan (APP) of PMU for FY2020-2021 contained 06 (six) packages of goods and 10 (ten) packages of services. All goods packages were completed and thus achieved 100%. The service packages consisted of: 5(five) packages of individual consultants for PMU; 1(one) Pooled individual consultant for PIU-DOF; 02(two) pooled firms-PMIS and KLP; 1(one) firm for PMU (Communication) and 01(one) firm for NATP -2 Impact Assessment. Two two pooled firms (PMIS and KLP) and one firm-Communication of PMU were completed. However, Pooled package for PIU-DOF was dropped as per decision of the ISM-5. 1 (one) individual consultant for PMU was also dropped.01 (one) service package – firm NATP-2 Impact Assessment were carried over to FY2021-22.

The APP of PIU-BARC for FY 2020-2021 consisted of 8 packages: 5 packages of goods, 1 package of works and 2 packages of services. PIU- BARC has completed all the targeted packages: 5 packages of goods, 1 package of Works and 3 packages of services. And thus in FY2020-2021 the progress of procurement of PIU- BARC is 100%.

The APP of PIU-DAE for FY 2020-2021 consisted of 11 packages: 7 packages of goods, 1 package of works and 1 package of services. PIU- DAE has completed all the targeted packages: 7 packages of goods, 1 package of Works and 1 package of individual service. The 2 (two) pooled service packages PMIS and KLP were completed by PMU. And thus in FY 2020-2021 the progress of procurement of PIU- DAE was 100%.

The APP of PIU-DoF for FY2020-2021 had 23 procurement packages: 07packages of goods; 12 packages of works packages, and 3 (three) service packages. 07 packages of goods and 12 packages of works were completed. The 02(two) pooled service packages PMIS and KLP were completed by PMU.

The APP of PIU-DLS for FY 2020-2021 contained 5 packages - 4 packages of goods and 1 package for individual consultant. Also PIU-DLS had 2 (two) Pooled packages. PIU-DLS completed 4 goods packages. The two pooled service packages (PMIS and KLP) were completed by PMU. Evaluation for selection of individual consultant for Assistant ICT Specialist was going on. This package (PS/LS-6.1) was then carried over to FY2021-2022.

Cumulatively NATP-2 project includes 409 procurement packages – 209 for goods, 65 for works and 105 for services. Of them 353 packages have so far been completed by the end of June 2021 and thus achieved 86% its end targets.

Table-8.1: Procurement Progress of NATP-2 up to June 2021

	Name of Comp.	Goods		Works		Services		Total					
		Target	Achievements		Target	Achievements		Target	Achievements				
			No.	%		No.	%		No.	%	No.	%	
FY 2021-22	PMU	6	6	100%	0	0	0%	10	9 ⁺⁺	90%	16	15	94%
	PIU- BARC	5	5	100%	1	1	100%	2	2	100%	8	8	100%
	PIU-DAE	7	7	100%	1	1	100%	1	1	100%	9	9	100%
	PIU- DLS	4	4	100%	0	0	0%	1	**	0%	5	4	80%
	PIU- DOF	7	7	100%	12	12	100%	1	1	100%	20	20	100%
	NATP-2	29	29	100%	14	14	100%	15	13	87%	58	56	97%
Till June 30, 2021		239	209	87%	65	56	86%	105	88	84%	409	353	86%

**Carried over to FY: 2021-2022

8.2 Financial Management and Audit

8.2.1 Financial Management

Fiduciary and other relevant issues of NATP-2 are being managed and disbursed directly to the PIU-Directors or head of implementing units as per GOB and the World Bank rules and procedures. The key project accounting responsibilities/ functions lie with PMU. Cash basis accounting system especially double entry book keeping principle is followed in the project accounting.

8.2.1.1 Funds Flow and Disbursement Arrangements

NATP-2 receives IDA and IFAD funds in the form of reimbursement from IDA against withdrawal application. Project Management Unit (PMU) transfers IDA and IFAD funds to four implementing units and PMU on the basis of six monthly estimated expenditure, approved work plan and ADP allocation. PMU receives Statement of Expenditure (SOE) from PIUs/PMU and claims reimbursement to IDA, IFAD & USAID through withdrawal application. All PIUs disburse fund to their spending units (Districts, Upazilas, Research Institutes, Universities, Training Institutes and Principal Investigators) according to their need after submission of SOE.

GOB contribution is routed through Ministry of Agriculture (MOA) for PMU, BARC, DAE and through Ministry of Fisheries and Livestock (MOFL) for DOF and DLS. IDA, IFAD & USAID funds are claimed by PMU. IDA fund disbursed the amount claimed in DOSA Account lying with Bangladesh Bank which is maintained by PMU. From inception to February 2018, the project maintained CONTASA account for IDA fund management but from March 2018, the project has been maintaining DOSA account with the Bangladesh Bank. On the other hand SAFE account has been maintained for the IFAD fund management from the beginning of the project. For USAID fund a CONTASA special account was maintained by PMU which is now transactions suspended as the USAID fund has closed.

During the FY2017-18, the project claimed reimbursement against IDA fund amounting to BDT. 2493.85 million through nine Withdrawal Applications (WA-02 to 10) to the World Bank. Against IFAD fund the project claimed BDT 386.55 million through 4 (four) Withdrawal Applications (WA-01 to 04) to the World Bank (Table-8.2). In FY 2018-19 PMU, NATP-2 claimed reimbursement against IDA fund amounting to BDT 3005.523 Million through 5 (five) Withdrawal Applications (WA-11 to 15) and IFAD fund amounting to BDT 418.21 Million through 5 (five) Withdrawal Applications (WA-5 to 9) to the World Bank. During the FY 2019-20 PMU, NATP-2 claimed reimbursement against IDA fund amounting to BDT 2328.31 Million through 4 (four) Withdrawal Applications (WA-16 to 19) and IFAD fund amounting to BDT 398.24 Million through 4 (four) Withdrawal Applications (WA-10 to 13) to the World Bank (Table-8.2). During the FY 2020-21 PMU, NATP-2 claimed reimbursement against IDA fund amounting to BDT

2269.09 Million through 4 (four) Withdrawal Applications (WA-20 to 23) and IFAD fund amounting to BDT 309.75 Million through 3 (three) Withdrawal Applications (WA-14 to 16) to the World Bank. The year wise details of fund disbursement from three development partners are shown below in [Table-8.2](#):

Table-8.2: Year wise fund disbursement from development partners

Dev. Partner	FY 2016-17		FY 2017-18		FY 2018-19		FY 2019-20		FY 2020-21	
	BDT (In million)	USD (In million)	BDT (In million)	USD (In million)	BDT (In million)	USD (In million)	BDT (In million)	USD (In million)	BDT (In million)	USD (In million)
IDA	400.00	5.23	2493.85	30.17	3005.52	35.75	2328.31	27.49	2269.09	26.74
IFAD			386.55	4.69	418.21	4.97	398.24	4.7	309.75	3.65
USAID	70.00	0.85	320.81	3.96	26.36	0.32	-	-	-	-
TOTAL	470.00	6.08	3201.21	38.82	3450.09	41.04	2726.55	32.19	2578.84	30.39

8.2.1.2 Fund Transfer to PMU and PIUs' Operating Accounts

As on 30 June, 2021, total RPA fund transfer to PIUs and PMU operating accounts from management accounts of PMU is Tk. 116,362.72 lakh (IDA Tk. 98,728.41 IFAD Tk. 13,462.64 and USAID Tk. 41,71.68). Details of fund transfer shows in [Table-8.3](#) as follows:

Table-8.3: Fund transfer to PMU and PIUs operating accounts

(Taka in Lakh)

	Inception to 30 June 2020	FY 2020-21	Inception to 30 June 2021
IDA	81904.56	16823.85	98728.41
IFAD	11168.81	2293.83	13462.64
USAID	4171.68	0.00	4171.68
Total RPA	97245.04	19117.68	116362.72
GoB	9135.61	2331.28	11466.89
Total RPA+GoB	106380.65	21448.96	127829.61

8.2.2.3 Cumulative Expenditure Incurred

The project activities started one and half years after the NATP-2 effective date due to late recruitment of the Project Director and other experts in PMU and PIUs. This has resulted in a much lower expenditure. In FY 2016-17 total expenditure (RPA+ GoB) incurred in NATP-2 stands to BDT 5,566.3 Lakh. Whereas Financial Statements FY 2020-21 of NATP-2 Project showed actual expenditure (RPA+ GoB) for the year 2020-21 BDT 22,805.31 lakh and detailed PIU/PMU wise actual expenditure (RPA+GoB) are shown in [Table-8.4](#).

Table-8.4: Cumulative expenditure incurred

(Taka in Lakh)

Components	Inception to 30 June 2020	FY 2020-21	Inception to 30 June 2021
PMU	2,152.28	690.84	2,843.12
BARC	16,111.12	5489.46	21,600.58
DAE	38,408.79	5574.15	43,982.94
DLS	23,263.40	6412.22	29,675.62
DOF	22,930.20	4638.64	27,568.84
TOTAL	102,865.79	22,805.31	125,671.10

8.2.2.4 FY2020-21 Financial Progress

Table-8.5 shows FY2020-21 Revised Annual Development Program (RADP) allocation, expenditure, unspent amount and percentage of expenditure of the four PIUs and PMU.

As given in the table The FY 2020-21 RADP of NATP-2 was Tk. 24925 lakh (GoB Tk. 2524 lakh and RPA Tk. 22371 lakh) of which 91.5% were expended. PMU budget was Tk. 792.00 Lakh (GoB Tk. 48.00 lakh and RPA Tk. 792.00 lakh) against which Tk. 690.84 lakh (GOB Tk. 42.93 lakh and RPA Tk. 647.91 lakh) were expended. PIU-BARC expended 85.44%, PIU-DAE expended 95.38%, PIU-DoF expended 98.38% and PIU-DLS expended 89.69%.

Table 8.5: Financial Progress of PMU for FY 2020-21

Taka in lakh

PIUs/PMU	Sources of Fund	RADP Allocation	Expenditure	Unspent	Progress %
PMU	GoB	48.00	42.93	5.07	89.44%
	RPA	744.00	647.91	96.09	87.08%
	Total	792.00	690.84	101.16	87.23%
PIU-BARC	GoB	28.00	20.66	7.34	73.79%
	RPA	6,397.00	5,468.80	928.2	85.49%
	Total	6,425.00	5,489.46	935.54	85.44%
PIU-DAE	GoB	225.00	200.47	24.53	89.10%
	RPA	5,619.00	5,373.68	245.32	95.63%
	Total	5,844.00	5,574.15	269.85	95.38%
PIU-DoF	GoB	1253.00	1214.71	38.29	96.94%
	RPA	3,462.00	3,423.93	38.07	98.90%
	Total	4,715.00	4,638.64	76.36	98.38%
PIU-DLS	GoB	1000.00	815.00	185.00	81.50%
	RPA	6,149.00	5,597.22	551.78	91.03%
	Total	7,149.00	6,412.22	736.78	89.69%
NATP-2	GoB	2554	2293.77	260.23	89.81%
	RPA	22371	20511.54	1859.46	91.69%
	Total	24925	22805.31	2119.69	91.50%

8.2.3 Report and Audit

8.2.3.1 Interim Un-audited Financial Report (IUFR)

PMU consolidates quarterly Interim Un-audited Financial Reports (IUFR) received from the four PIUs and PMU and submitting the quarterly Consolidated IUFR to the World Bank regularly within the stipulated time. Four (4) IUFRs were submitted duly to the World Bank for the FY2020-21.

8.2.3.2 Audit

8.2.3.2.1 External Audit

External audits of NATP-2 for the FY2016-17, 2017-18, 2018-19, 2019-20 and 2020-21 were conducted by representatives of C&AG (FAPAD). Each fiscal year audit report is duly communicated to the project authority and NATP-2 has sent broad sheet reply thereon. The FY2020-21 audit report was received in January 2022 and all PIUs are requested to comply as per audit recommendations.

8.2.3.2.2 Internal Audit

Chartered Accountant firm namely M.I.Chowdhury & Co. has been appointed to perform Financial and Performance Audit. The firm has completed its audit from FY2016-17 to FY2019-20. They also completed their field audit on project accounts for FY2020-21 and will submit their audit report within a short time.

SECTION 9: CHALLENGES FACED AND LESSONS LEARNED

NATP-2 is a multi-agency and multi-stakeholder complex project that supports research, extension, supply chain and marketing activities of crops, livestock and fisheries. The year 2019-20 was a very difficult year for the project particularly due to the outbreaks of COVID-19 pandemic which hampered implementation of many NATP-2 activities. Thus, while implementing the project activities it faced a number of challenges at the same time also learned many lessons. The major challenges faced and lessons learned are briefly described below:

9.1 Challenges Faced

Research Related

- ✚ The up scaling programs of scalable technologies into the farming community involving extension agencies (public and private) would require additional resources and time.
- ✚ The activities of some PBRG sub-project are also disrupted due to COVID-19 effect. Physical monitoring of the activities was also hampered which may affect the progress of the farmers' activities related to project outcomes.

PhD Related

- ✚ The PhD programs, both in-country and abroad, are being hampered as all the universities and research institutes globally remain closed.
- ✚ The PIU-BARC faced difficulty in the processing of foreign PhD and raised complexity in disbursement of foreign exchange to the PhD scholars. This issue may demand additional time for completion of PhD programs beyond present project period.

CIG Related

- ✚ Making 100% CIGs registered, due to Covid 19 and lacking in proper documents
- ✚ Due to cumbersome procedure CIG registration is slow and difficult; many of the unregistered CIGs want to see the advantages of registration.
- ✚ Due to low savings and non- registration many CIGs are unable to apply for AIF-2 and AIF-3 grants.
- ✚ Local leaders influenced CIG and intra conflict among the members hampers the CIG activities
- ✚ To maintain regular meeting and record keeping in a CIG group is very difficult.
- ✚ Poor understanding and backward mind set-up among CIG members regarding collective investment, farm mechanization and collective marketing, Involvement of CIG savings in IGAs

CCMC and Value Chain Related

The ups and downs of the continuing Covid-19 pandemic over the reporting year pose serious operational challenges to the work of CCMC and value chain. These are summarised below:

- ✚ Exposure visits for the selected PO-MMCs were long overdue and again this year these had to be postponed
- ✚ Training schedules were affected
- ✚ Planned business planning workshops could not be carried out
- ✚ Visits for physical monitoring of the CCMC activities could not be carried out
- ✚ Getting traders & Market actors to adopt improved PHM
- ✚ Increased savings of PO-MMC members needed to start fresh produce's business and other IGAs using the CCMC facilities

- ✚ Ensuring the presence of maximum number of PO-MMC members in monthly meeting to take decision on new and innovative business idea

Technology Demonstration and Adoption Related

- ✚ All CIG-members want demonstration.
- ✚ Seeds availability of newly released crop varieties was inadequate to meet the farmers' demand.
- ✚ Generation of location specific technology and its proper dissemination is difficult.
- ✚ Establishment of demonstration and adopter farmers' database was challenging job.
- ✚ Identification of technology for dissemination, Scarcity of quality fingerlings and feed, Risk of disease, thrift and flood, Low water holding capacity in some areas. High feed price. Low fish market-price

FIAC Related

- ✚ Reaching FIAC services to unions with no Union Parishad building, as having no FIAC (about 50% unions).
- ✚ 5-10 days training program is not sufficient for CEAL and LEAF to provide effective service at FIAC.
- ✚ Ensuring service of the LEAF with low remuneration.

AIF-2 & AIF-3 Related

- ✚ Awarding with AIF-2 and AIF-3 matching grants to many of the interested CIGs and entrepreneurs due to their less savings and other qualifying mistakes

Project Management Related

- ✚ Because of COVID-19 pandemic which has already affected most of the sectors of the country, many of NATP-2 planned programs like regional progress review workshops, trainings, international training and study tours could not be arranged physically due to bio-security reasons.
- ✚ In absence of an outsourced M&IE firm on-board, the project personnel and consultants serving at the PIUs and PMU had to perform both the monitoring and supervision of project implementation activities including conducting of short studies and assessments. Collection and validation of the huge backlog data with 8 formats using KOBOTOOLBOX were very difficult and challenging tasks also been performed by the PIUs and PMU personnel.
- ✚ Frequent transfer of officers from non NATP-2 Upazila to NATP-2 Upazilas is a major issue. The PIUs and PMU provided training to the officers on project implementation but transferring that particular officer to non NATP-2 Upazilas hampers the project implementation process.
- ✚ Developing marketing strategies to help marginal farmers selling their produces during COVID-19
- ✚ Lack of manpower in Upazila level, especially with accounting background, hampering project implementation
- ✚ Establishing inter-agency coordination and effective monitoring.
 - Timely report sending and proper record keeping because of lack of personnel.

9.2 Lessons Learned

Through planning, implementation and supervision of project activities and sharing views with field level officers, staff, and farmers, the following lessons have been learned:

Research Related

- ✚ PBRG sub-projects enabled researcher to work on key problems, develop institutional linkages and capacities across organizations
- ✚ PBRG programs have widen the scopes in integrating multiple organizations for jointly combating national agricultural problems and strengthening research and research management capability
- ✚ Generated technologies need to be further validated for refinement in collaboration with extension line agencies.

Project Management Related

- ✚ Inter-departmental collaboration & cooperation is essential for successful implementation of the project interventions.
- ✚ Payment of beneficiaries and other stakeholders through bank account is time consuming.
- ✚ For continuing LEAF and CEAL services more logistic supports & capacity building seems important.
- ✚ Seeds of newly released crop varieties in adequate quantities were difficult to make available and meet the farmers' demand

CIG Related

- ✚ Technology transfer and communication is more effective through group approach.
- ✚ Members having leadership qualities in the CIGs helped in smooth functioning of group activities.
- ✚ Registration procedure of CIGs is complicated, which creates less interest.
- ✚ CIG mobilization and strengthening through motivation is essential for successful project implementation.
- ✚ CIGs can play as media between service providers and community people.
- ✚ Female members are enthusiastic to involve themselves in the mainstream of agriculture.
- ✚ AIF-2 and AIF-3 are very innovative ideas of NATP-2 and CIGs are very happy getting those funds.
- ✚ Difficulty in operationalizing the CIG bank accounts due to fund limitations, as the funds are mostly invested into IGAs.

Technology Demonstrations and Adaptation Related

- ✚ Community seed production is an excellent way of quality seed production in larger quantities.
- ✚ Skills development through training & demonstration is important for dissemination of modern technology. Demonstration helps in promotion of GAP.
- ✚ Technology selection is very important for different agro-ecological regions.
- ✚ Validation trial gives actual idea of location specific yield of a crop.
- ✚ Dissemination of aquaculture technologies is easier through a group rather than an individual.
- ✚ Technical assistance can bring a satisfactory change in production up to 30% and income
- ✚ Exposure visit is a good initiative for farmers to learn new practices.
- ✚ CIG and non-CIG farmers' technology sharing training is highly effective for instant motivation

- ✚ Research-Extension-Farmers linkage is very much effective in sharing & dissemination of newly released technologies

CCMC Related

- ✚ In face of COVID-19 restricted movements, the LBFs kept communications with the PO and CIG members over mobile phones. This way information for marketing needs for prices, supply arrangements, scheduling, transport, etc. could be shared and a level of activity remained viable around the CCMCs/CPs.
- ✚ Selected HVCs for vertical expansion in some upazilas are not grown anymore; farmers shift to other crops after a certain period due to compounding disease-pests, change in demand, or market competition, etc. Periodically, old crops to be replaced by new popular crops.
- ✚ Reaction from training sessions: too many topics covered in too little time.

AIF-2 & AIF-3 Related

- ✚ Quick mobilization of AIF-2 and AIF-3 supported equipment helped in timely and quickly harvesting of boro rice, especially in haor areas, to avert flash flood and also for overcoming labour shortage
- ✚ AIF-2 matching grant sub-projects are advantageous for strengthening the capacity of CIGs

COVID-19 Related

- ✚ It is true that COVID-19 affected many project activities, but it is also true that it promoted the use of electronic/virtual media tremendously. Electronic/virtual media (like, ZOOM Platform) is found very effective to organize meetings, workshops and also for monitoring of field implementation to some extent.
- ✚ During COVID-19 dissemination of information to the Fish Farmers through Mobile Phone, Social Media and Internet is found very effective.
- ✚ Online fish marketing and mobile fish market for fish selling was very useful whilst COVID-19, organization of online meetings for the project personnel was successful efficiently running the project.

List of Scientific Articles from the Findings of PBRG Sub-projects

1. Sabbir, W., Hossain, M. Y., Rahman, M. A., Hasan, M. R., Mawa, Z., Tanjin, S., & Ohtomi, J. (2021). First report on reproductive features of the Hooghly croaker *Panna heterolepis* Trewavas, 1977 from the Bay of Bengal in relation to environmental factors. *Environmental Science and Pollution Research* 28(18), 23152-23159. <https://doi.org/10.1007/s11356-020-12310-w> (**Impact factor 4.22**)
2. Mawa, Z., Hossain, M. Y., Hasan, M. R., Tanjin, S., **Rahman, M. A.**, Sarmin, M. S. & Habib, K. A. (2021). First record on size at sexual maturity and optimum catchable length of 10 marine fishes from the Bay of Bengal (Bangladesh) through multi-models approach: a key for sound fisheries management. *Environmental Science and Pollution Research*, 28, 38117-38127. <https://doi.org/10.1007/s11356-021-13491-8> (**Impact factor 4.22**)
3. Rahman, M. A., Hossain, M.Y., Hasan, M.R., Mawa, Z., Tanjin, S., Sarker, B.K. & Islam, M.A. (2021). Length weight relationships and form factor of 8 marine fishes from the Bay of Bengal. *Thalassas: An International Journal of Marine Sciences*. <https://doi.org/10.1007/s41208-021-00312-5> (**Impact factor 0.62**)
4. Rahman, M. A., Hossain, M. Y., Tanjin, S., Mawa, Z., Hasan, M. R. & Ohtomi J. (2021). Length weight relationship of 5 marine fishes from the Bay of Bengal. *Journal of Applied Ichthyology*, 37(02), 364-366. <https://doi.org/10.1111/jai.14176> (**Impact factor 0.89**)
5. Sabbir, W., Rahman, M. A., Hossain, M. Y., Hasan, M. R., Mawa, Z., Rahman, O., Tanjin, S. & Sarmin, M. S. (2021). Stock assessment of Hooghly Croaker *Panna heterolepis* in the Bay of Bengal (Southern Bangladesh): implications for sustainable management. *Heliyon* 7, e07711. <https://doi.org/10.1016/j.heliyon.2021.e07711> (**Q1, SJR 0.46**)
6. Sabbir, W., Hossain, M.Y., Rahman, M. A., Rahman, M. A., Islam, M. A., Khan, M. N., Chowdhury, A. A., Hasan, M. R. & Mawa, Z. (2021). The Hooghly Croaker, *Panna heterolepis* Trewavas, 1977: Identification through Morphometric and Meristic Characteristics. *Indian Journal of Geo-Marine Sciences*, 50(06), 502-506. (**Impact factor 0.496**)
7. Rahman, O., Hossain, M.Y., Rahman, M.A., Islam M.A., Rahman, M.A., Parvin, M.F., Sarmin, M.S., Sarker, B.K., Sabbir, W. and Habib, K.A. (2021). Temporal variations of condition factor and relative weight for *Mystus gulio* (Hamilton, 1822) from the coastal water in Bangladesh. *Journal of Bio-Science*, 29(1), 111-122. <https://doi.org/10.3329/jbs.v29i0.54827>
8. Sabbir, W., Rima, F. A., Hossain, M.Y., Rahman, M. A., Tanjin, S., Hasan, M. R., Mawa, Z., Islam, M. A., & Khan, M. N. (2021). Estimation of Morphometric relationships for flathead sillago, *Sillaginopsis panijus* (Hamilton, 1822) in the Bay of Bengal (Bangladesh) using multi-linear dimensions. *Indian Journal of Geo-Marine Sciences*, 50(03), 253-257. (**Impact factor 0.496**)
9. Tanjin, S., Sabbir, W., Hossain, M. Y., Rahman, M. A., Mawa, Z., Hasan, M. R., Rima, F. A., Rahman, O., Sarmin, M. S., Sarker B. K. & Habib, K. A. (2021). Morphometric and Meristic Features of Gangetic hairfin anchovy, *Setipinnaphasa* (Hamilton, 1822) in the Bay of Bengal (Bangladesh). *Journal of King Abdulaziz University - Marine Sciences*, 30 (02), 71-83. (**Q4, SJR 0.11**)
10. Sabbir, W., Hossain, M. Y., Rahman, M. A., Hasan, M. R., Mawa, Z., Tanjin, S., Hassan, H. U. & Ohtomi, J. (2020). First Report on Condition Factor of *Panna heterolepis* (Trewavas, 1977) in the Bay of Bengal (Southwestern Bangladesh) in Relation to Eco-Climatic Factors. *Egyptian Journal of Aquatic Biology and Fisheries*, 24(2), 591-608. <https://dx.doi.org/10.21608/ejabf.2020.87095> (**Q4, SJR 0.22**)
11. Sabbir, W., Hossain, M. Y., Rahman, M. A., Hasan, M. R., Khan, M. N., Mawa, Z., Tanjin, S., Sarmin, M. S., Rahman, O., Nima, A. & Habib, K. A. (2020). Growth pattern of the Hooghly Croaker *Panna heterolepis* Trewavas, 1977 in the Bay of Bengal (Bangladesh) in relation to eco-climatic factors. *Egyptian Journal of Aquatic Biology and Fisheries*, 24(7-Special issue), 847-862.

<https://dx.doi.org/10.21608/ejabf.2020.132074> (Q4, SJR 0.22)

12. Sabbir, W., Hossain, M. Y., Mawa, Z., Hasan, M. R., Rahman, M. A., Islam, M. A., Tanjin, S.,
13. Rahman, M. A., Sarker, B. K. and Khan, M. N. (2020). New maximum size record, length–weight relationships and form factor of Hooghly Croaker *Panna heterolepis* Trewavas, 1977 from the Bay of Bengal (Bangladesh). *Lakes & Reservoirs: Research & Management*, 25(3), 346-349. <https://doi.org/10.1111/lre.12333> (Q3, SJR 0.30)
14. Rahman, O., Hossain, M.Y., Islam, M.A., Rahman, M.A., Khatun, D., Parvin, M.F., Sarmin, M.S., Tanjin, S., Rahman, M.A., Mawa, Z. and Hasan, M.R.(2020). Life-history traits of long whisker catfish *Mystusgulio* (Siluriformes: Bagridae) in the coastal water (Maloncho river) of southern Bangladesh. *Pakistan Journal of Marine Science*, 29(2), 99-114.
15. Rahman, M. A., Hossain, M. Y., Tanjin, S., Mawa, Z., Hasan, M. R., & Jasmine, S. (2021). Effects of COVID-19 pandemic on *Baor* (Oxbow lake) fisheries: Decreased economic livelihoods and food security. *Lakes & Reservoirs: Research & Management*, 26, e12374. <https://doi.org/10.1111/lre.12374> (Q3, SJR 0.30)
16. Dutta, N. K., D. Sarker., K. Begum, M. A. Sarkar., M. I. Islam & M. M. Rahman. 2019. First record of the invasive rugose spiraling whitefly, *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae) in Bangladesh with its host range and status as coconut pest. *Bangladesh j. entomol.* 29(2): 73-83.
17. Amin MN, Gulandaz MA, Sabuz AA, et al. Use of non-chlorine sanitizer and low-cost packages enhancing microbial safety and quality of commercial cold-stored carrots. *J Food Process Preserv.* 2021; 45: e15065.
18. <https://doi.org/10.1111/jfpp.15065> (Impact Factor: 1.405)
19. Md. Nazrul Islam, Eshita Shahanaz, Md. Nurul Amin, Md. Alim Uddin and Ashfak Ahmed Sabuz and Md. Latiful Bari. 2021. A study of low-cost integrated postharvest technologies for maintenance of quality and safety and reducing postharvest losses of brinjal. *Journal of postharvest Biology and Technology* (under review) (Impact Factor: 5.537)
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21. Rahman MM, Rahman MA, Monir MS, Haque ME, Siddique MP, Khasruzzaman AK, Rahman MT, Islam MA. 2021. Isolation and molecular detection of *Streptococcus agalactiae* from popped eye disease of cultured Tilapia and Vietnamese koi fishes in Bangladesh. *Journal of Advanced Veterinary and Animal Research.* 8(1):14 (Impact Factor: 1.35)
22. Mohummad Muklesur Rahman, Md. Ashikur Rahman, Muhammad Tofazzal Hossain, Mahbubul Pratik Siddique, Md. Enamul Haque, A. K. M. Khasruzzaman and Md. Alimul Islam. First time development and validation of the injectable and feed based bacterial vaccines against popped eye disease of cultured Tilapia and Vietnamese Koi fishes in Bangladesh. Submitted to *Saudi Journal of Biological Sciences* for publication. **Impact Factor:** 4.219
23. M.A. Rahman¹, M.M. Ahmed^{1*}, M.R. Alam¹, A.M.S. Rahman¹ and S. Biswas². 2021. Morphological Diversity of some Locally Collected Germplasm of Sugarcane. *Bangladesh J. Sugarcane.* 41: 61-66.
24. Badrunnesa, A., Roy, T.S., Chakraborty, R., S. C. Sarker, Kundu, B.C. and Malek, M. 2021. Yield and grading of potato tuber for processing purpose as affected by vermicompost and potassium sources. *Journal of Agriculture, Food and Environment.* 2(2): 57-61 (Impact Factor: 0.34)
25. Ferdous, J., Roy, T. S., Chakraborty, R., Mostofa, M., Kundu, B. C. and Delowar, H. K. (2019). Vitamin C, Antioxidant and Polyphenol Activity of Some Selected Potato Varieties as Influenced by Vermicompost. 2021. *Journal of Experimental Agriculture International*, 33(1): 1-

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27. Islam, R., B Hossain, M., & Islam, M. (2020). Nutrient Composition of Small Indigenous Fish Species (SIS) from Homestead Ponds of Noakhali Coast, Bangladesh. *Egyptian Journal of Aquatic Biology and Fisheries*, 24(7-Special issue), 943-954. (**Scopus indexed**)
28. Sarker, M. M., Hossain, M. B., Islam, M. M., Mustafa Kamal, A. H., & Idris, M. H. 2021. Unravelling the diversity and assemblage of phytoplankton in homestead ponds of central coastal belt of Bangladesh. *Aquaculture Research*, 52(1), 167-184 (**Impact Factor:2.08**)
29. Hossain, M. B. (2021). Pond Fishes of Greater Noakhali: Taxonomy and Nutrition. Department of Fisheries and Marine Science, Noakhali Science and Technology University, Noakhali 3814, Bangladesh, 71 pp (Taxonomy Book)
30. Jasmin, A., **Jewel, M.A.S.**, Hossain, M.A., Haque, M.A. and Siddique, M.A.B. 2020. Determination of suitable species for cage fish farming in Chalanbeel, Bangladesh. *International Journal of Fisheries and Aquatic Studies*, 8(2):315-320.
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32. Azam, MG; Uddin, MS; Chowdhury, SMK; Rashid, ASM; Barua, H; Chhanda, RA; Rahman, S; Begum, SA; Shamsunnahar, M and Islam, MN. 2020. Variability studies of guava (*Psidium guajava* L.) genotypes for growth, yield and quality attribute in Chattogram region of Bangladesh. *Bangladesh Journal of Agricultural Science & Engineering Innovation*, 1(1):3-9, <http://doi.org/10.5281/zenodo.4131424>
33. M. Moksedur Rahman, MG Neugi, M. Earuque H. Mollah, AKM Salauddin, Md. Ruhul Amin and Abdul Hamid. 2019. Socio-Economic and Biophysical Constraints of Dry Season Cropping in Tidal Floodplains of Bangladesh. *Journal of Applied Agricultural Economics and Policy Analysis*, Vol.2, No.1, 40-46. <http://pubs.sciepub.com/2/1/6>, DOI:10.12691/jaaepa-2-1-6
34. Soma Dey, Mohammed Kamal Hossain and Md. Danesh Mia. 2021. Germination and Initial Growth Performance of *Aphanamixis polystachya* (Wall) Parker-A Threatened Medical Tree Species in Bangladesh. *Journal of homepage:www.curreweb.com*. Page:95-102. DOI:10.3632/ije/2021.10.2.9
35. Roy, D.K., Biswas, S.K. and Murad, K.F.I. 2021. Groundwater Level Forecast Via a Discrete Space-State Modelling Approach as a Surrogate to Complex Groundwater Simulation Modelling. *Water Resources Management*, 35(6): 1653 – 1672. **Impact Factor: 3.718**

List of PhD scholars with research article and journal name/link

Sl No	Scholars' Name & Address		Title of the published scientific paper	Journal name/ link & IF
	Foreign PhD			
1.	Ahmed Numery Ashfaqul Haque SSO, BINA: enrolled at UPM, Malaysia	1	Assessing the increase in soil moisture storage capacity and nutrient enhancement of different organic amendments in paddy soil.	<i>Agriculture</i> 2021, 11, 44 https://doi.org/10.3390/agriculture11010044 [Q2, Impact Factor: 2.07]
		2	Biochar with Alternate Wetting and Drying Irrigation: A Potential Technique for Paddy Soil Management.	<i>Agriculture</i> 2021, 11, 367. https://doi.org/10.3390/agriculture11040367 [Q2, Impact Factor: 2.07]
2.	Mehnaz Mosharraf SO, SRDI: enrolled at UPM, Malaysia	3	Integrated use of biochar and lime as a tool to improve maize yield and mitigate CO ₂ emission: A review.	<i>Chil. J. Agric. Res.</i> 2021, 81, 1. Impact factor: 0.883 (Q3)
		4	Changes in Acidic Soil Chemical Properties and Carbon Dioxide Emission Due to Biochar and Lime Treatments.	<i>Agriculture</i> 2021, 11, 219. Impact factor: 2.92 (Q1)
		5	Combined Application of Biochar and Lime Increases Maize Yield and Accelerates Carbon Loss from an Acidic Soil.	<i>Agronomy</i> , 2021, 11, 1313. Impact factor: 3.41 (Q1)
3	Mohammad Ziur Rahman, SO, BARI: enrolled at UPM, Malaysia	6	Biology, Diversity, Detection and Management of <i>Fusarium oxysporum</i> f. sp. <i>niveum</i> Causing Vascular Wilt Disease of Watermelon (<i>Citrullus lanatus</i>): A Review	<i>Agronomy</i> 2021, 11, 1310. https://doi.org/10.3390/agronomy11071310 Impact factor: 2.6, Q1 (JCR)
4	Md Imam Hossain SSO, BSRI: enrolled at UPM, Malaysia	7	Current and Prospective Strategies on Detecting and Managing <i>Colletotrichum falcatum</i> Causing Red Rot of Sugarcane	<i>Agronomy</i> 2020, 10, 1253. Impact factor: 2.6, Q1 (JCR)
5	Md. Munir Hossain SSO, BJRI: enrolled at UMS, Malaysia	8	Bacterial retting agents: Sustainable bioremediation of bast fiber farming strains	Elsevier: <i>Microbes and Microbial Biotechnology for Green Remediation</i> (Book chapter)
		9	Critical factors for optimum biodegradation of bast fiber's gums in bacterial retting: a review	<i>Fibers</i> : 1105252 MDPI, Switzerland Q1 journal Cite score: 4.6
6	Md. Al-Mamun PSO, BJRI: enrolled at UPM, Malaysia	10	Genetic Diversity among Kenaf Mutants as Revealed by Qualitative and Quantitative Traits	<i>Journal of Natural Fibers</i> (Q1, Impact factor: 5.323)
7	Md. Shirajum Monir SSO, BFRI: enrolled at UPM, Malaysia	11	Vaccination of Tilapia against Motile Aeromonas Septicemia: A Review	<i>Journal of Aquatic Animal Health</i> (Wiley) ISSN: 0899-7659 print / 1548-8667 online DOI: 10.1002/aah.10099
		12	Haemato-immunological responses and effectiveness of feed-based bivalent vaccine against <i>Streptococcus iniae</i> and <i>Aeromonas hydrophila</i> infections in hybrid red tilapia (<i>Oreochromis mossambicus</i> × <i>O. niloticus</i>)	<i>BMC Veterinary Research</i> (Q-1 & Impact Factor-1.86)' Journal. Full paper can be accessed via https://rdcu.be/b5rE5

SI No	Scholars' Name & Address		Title of the published scientific paper	Journal name/ link & IF
		13	Immuno-protective efficiency of feed-based whole-cell inactivated bivalent vaccine against Streptococcus and Aeromonas infections in red hybrid tilapia (<i>Oreochromis niloticus</i> × <i>Oreochromis mossambicus</i>)	Fish & Shellfish Immunology Journal' (Q-1, Impact Factor- 3.298). https://doi.org/10.1016/j.fsi.2021.04.006
8	Sheik Mohammad Robiul Alam SRO, BFRI: enrolled at UMT, Malaysia	14	A Rule-Based Classification Method for Mapping Saltmarsh Land-Cover in South-Eastern Bangladesh from Landsat-8 OLI.	Canadian Journal of Remote Sensing, 0(0), 1–25. Q1 journal Impact Factor: 2.126 DOI: https://doi.org/10.1080/07038992.2020.1789852
9	Amdadul Haque SSO, BARI: enrolled at UPM, Malaysia	15	Foliar Urea with N-(n-butyl) Thiophosphoric Triamide for Sustainable Yield and Quality of Pineapple in a Controlled Environment	Sustainability Impact Factor: 3.251
10	Md. Mahmudul Hassan, SO, BARI: enrolled at UPM, Malaysia	16	Genetic variability, heritability, and clustering pattern exploration of Bambara groundnut (<i>Vigna subterranea</i> L. Verdc) accessions for the perfection of yield and yield-related traits	Biomed Research International JCR Impact Factor: 2.276
		17	Genetic analysis and selection of Bambara groundnut (<i>Vigna subterranea</i> [L.] Verdc.) landraces for high yield revealed by qualitative and quantitative traits	Scientific reports: JCR Impact Factor: = 3.99
		18	Bambara Groundnut (<i>Vigna subterranea</i> L. Verdc): A Crop for the New Millennium, Its Genetic Diversity, and Improvements to Mitigate Future Food and Nutritional Challenges	<i>Sustainability</i> JCR Impact Factor: = 2.576
11	Shahzad Kuli Khan SSO, BFRI: enrolled at AIT, Thailand	19	Effect of stocking densities on the growth performance, cannibalism and survival of Asian seabass <i>Lates calcarifer</i> (Bloch, 1790) fry in different nursery rearing system	Wiley, Aquaculture Research, Impact Factor: 1.748
12	Remi Chakma SSO, BARI: enrolled at AIT, Thailand	20	Foliar application and seed priming of salicylic acid affect growth, fruit yield, and quality of grape tomato under drought stress	Scientia Horticulturae Impact Factor: 2.769 Publisher: Elsevier
13	Mohammad Mamunur Rashid Sarkar, SSO, BARI: enrolled at University of Leeds, UK	21	A farming system typology for the adoption of new technology in Bangladesh	Food and Energy Security" - John Wiley & Sons Ltd. Q1, IF- 5.242
14	Motasim Ahmmed SSO, SRDI: enrolled at UPM, Malaysia	22	Gaseous Nitrogen Losses from Tropical Soils with Liquid or Granular Urea Fertilizer Application	MDPI- Sustainability, Q2 (JCR indexed) journal Impact Factor: 2.576
		23	Nitrogen Dynamics in Tropical Soils	Agriculture (Basel)

SI No	Scholars' Name & Address		Title of the published scientific paper	Journal name/ link & IF
			Treated with Liquid and Granular Urea Fertilizers	Q2, Impact Factor: 2.072
15	Md Ekhlaur Rahman, SO, SRDI: enrolled at UPM, Malaysia	24	Design, Operation and Optimization of Constructed Wetland for Removal of Pollutant	Environmental Research and Public Health, Q1, JCR impact factor is 2.849
16	Mohammed Sirajul Islam, SSO, BLRI: enrolled at UPM, Malaysia	25	Growth and Reproductive Performance of the Indigenous Kedah-Kelantan (KK) Cattle: A Review	Tropical Agricultural Science Impact factor is 0.65
17	Mohammad Shariful Islam, SSO, BARI: enrolled at UPM, Malaysia	26	Changes in Chemical Properties of Banana Pseudostem, Mashroom media waste, and Chicken Manure through the Co-composting Process	MDPI- Sustainability, Q2 (JCR indexed) journal Impact Factor: 2.576
	In-country PhD			
18	Mohammad Shamsul Alam, SO, BARI: enrolled at BAU, Mymensingh	27	Livelihood Vulnerability to Flood Hazard: Understanding from the Flood-prone Haor Ecosystem of Bangladesh	Springer: Environmental Management Impact factor: 2.810
19	Sukalpa Das ADD, DAE: enrolled at BAU, Mymensingh	28	Functional evaluation of culture filtrates of <i>Bacillus subtilis</i> and <i>Pseudomonas fluorescens</i> on the mortality and hatching of <i>Meloidogyne javanica</i>	Saudi Journal of Biological Sciences 28(2):1318-1323 Impact Factor: 4.219
		29	Evaluation of the effect of different concentrations of organic amendments and botanical extracts on the mortality and hatching of <i>Meloidogyne javanica</i>	Saudi Journal of Biological Sciences 28(7):3759-3767 Impact Factor: 4.219
20	Sayed Shams Tabriz PSO, BSRI: enrolled at BAU, Mymensingh	30	Prospects and challenges of conservation agriculture in Bangladesh for sustainable sugarcane cultivation	Springer: Environment, Development and Sustainability Impact Factor: 2.191
21	Shahnaz Pervin SO, BARI: enrolled at BAU, Mymensingh	31	Kinetics of dehydration and appreciation of the physiochemical properties of osmo-dehydrated plum	Willy: Food Science and Nutrition Impact Factor: 1.797

List of Publication of Foreign & Local PhD Scholars in the Peer Reviewed Journals

#	Scholars' Name & Address	Title of the published scientific paper	Impact Factor
A. List of publication of Foreign PhD scholars in the peer reviewed journal			
1.	Ahmed NumeryAshfaquHaque SSO, BINA & enrolling at UPM, Malaysia	1. Haque, A.N.A. ; Uddin, M.K.; Sulaiman, M.F.; Amin, A.M.; Hossain, M.; Zaibon, S.; Mosharrof, M. Assessing the increase in soil moisture storage capacity and nutrient enhancement of different organic amendments in paddy soil. <i>Agriculture</i> 2021, 11, 44. https://doi.org/10.3390/agriculture11010044	2.07
		2. Haque, A.N.A. ; Uddin, M..K.; Sulaiman, M.F.; Amin, A.M.; Hossain, M.; Solaiman, Z.M.; Mosharrof, M. Biochar with Alternate Wetting and Drying Irrigation: A Potential Technique for Paddy Soil Management. <i>Agriculture</i> 2021, 11, 367. https://doi.org/10.3390/agriculture11040367	2.07
2.	MehnazMosharraf SO, SRDI & enrolling at UPM, Malaysia	1. Mosharrof, M. ; Uddin, M.K.; Shamshuddin, J.; Sulaiman, M.F.; Shamsuzzaman, S.M.; Haque, A.N.A. Integrated use of biochar and lime as a tool to improve maize yield and mitigate CO ₂ emission: A review. <i>Chil. J. Agric. Res.</i> 2021, 81, 1	0.883
		2. Mosharrof, M. ; Uddin, M.K.; Jusop, S.; Sulaiman, M.F.; Shamsuzzaman, S.M.; Haque, A.N.A. Changes in Acidic Soil Chemical Properties and Carbon Dioxide Emission Due to Biochar and Lime Treatments. <i>Agriculture</i> 2021, 11, 219	2.92
		3. Mosharrof, M. ; Uddin, M.K.;Sulaiman, M.F.; Mia, S; Shamsuzzaman, S.M.; Haque, A.N.A. Combined Application of Biochar and Lime Increases Maize Yield and Accelerates Carbon Loss from an Acidic Soil. <i>Agronomy</i> , 2021, 11, 1313.	3.41
3	Mohammad Ziaur Rahman SO, BARI & enrolling at UPM, Malaysia	Rahman, M. Z. ; Ahmad, K.; Bashir Kutawa, A.; Siddiqui, Y.; Saad, N.; Geok Hun, T.; Hata, E.M.; Hossain, M.I. Biology, Diversity, Detection and Management of <i>Fusariumoxysporum</i> f. sp. <i>niveum</i> Causing Vascular Wilt Disease of Watermelon (<i>Citrulluslanatus</i>): A Review. <i>Agronomy</i> 2021, 11, 1310. https://doi.org/10.3390/agronomy11071310	: 2.6
4	Md Imam Hossain SSO, BSRI & enrolling at UPM, Malaysia	Hossain, M. I. , Ahmad, K., Siddiqui, Y., Saad, N., Rahman, Z., Haruna, A. O., And Bejo, S. K. (2020). Current and Prospective Strategies on Detecting and Managing Colletotrichumfalcatum Causing Red Rot of Sugarcane. <i>Agronomy</i> , 10(9), 1253.	2.6
5	Md. Munir Hossain SSO, BJRI & enrolling at UMS, Malaysia	Hossain, M. M. , Siddiquee, S., & Kumar, V. (2021). Critical Factors for Optimum Biodegradation of Bast Fiber's Gums in Bacterial Retting. <i>Fibers</i> , 9(8), 52. https://www.mdpi.com/2079-6439/9/8/52	4.6
6	Md. Al-Mamun PSO, BJRI & enrolling at UPM, Malaysia	Al-Mamun, M. , Rafii, M., Oladosu, Y., Misran, A.B., Berahim, Z., Ahmad, Z., Arolu, F. and Khan, M.H., 2020. Genetic Diversity among Kenaf Mutants as Revealed by Qualitative and Quantitative Traits. <i>Journal of Natural Fibers</i> , pp.1-18. https://doi.org/10.1080/15440478.2020.1856268	5.323
7	Md. ShirajumMonir SSO, BFRI & enrolling at UPM, Malaysia	1. Monir, M. S. , Yusoff, S. M., Zulperi, Z. M. Z., Hassim, H. A., Zamri-Saad, M., Amal, M.N.A., Salleh, A., AslahMohamad, A., Yie, L. J. &Ina-Salwany, M. Y. (2021). Immuno-protective efficiency of feed-based whole-cell inactivated bivalent vaccine against <i>Streptococcus</i> and <i>Aeromonas</i> infections in red hybrid tilapia (<i>Oreochromisniloticus</i> × <i>Oreochromismossambicus</i>). <i>Fish & Shellfish Immunology</i> , 113, 162-175. https://doi.org/10.1016/j.fsi.2021.04.006	4.58

#	Scholars' Name & Address	Title of the published scientific paper	Impact Factor
		2. Monir, M. S. , Yusoff, S. M., Zulperi, Z. M. Z., Hassim, H. A., Mohamad, A., Ngoo, M. S. M. H. & Ina-Salwany, M. Y. (2020). Haemato-immunological responses and effectiveness of feed-based bivalent vaccine against <i>Streptococcus iniae</i> and <i>Aeromonashydrophila</i> infections in hybrid red tilapia (<i>Oreochromismossambicus</i> × <i>O. niloticus</i>). <i>BMC Veterinary Research</i> , 16 (226), 1-14. DOI: 10.1186/s12917-020-02443-y	2.74
		3. Monir, M. S. , Yusoff, S. M., Mohamad, A., & Ina-Salwany, M. Y. (2020). Vaccination of tilapia against motile aeromonas septicemia: a review. <i>Journal of Aquatic Animal Health</i> , 32(2), 65-76. DOI: 10.1002/aah.10099	1.62
		4. Monir, M. S. , Yusoff, S. M., Zulperi, Z. M. Z., Hassim, H. A., Zamri-Saad, M., Amal, M.N.A., Salleh, A., AslahMohamad, A., Yie, L. J. & Ina-Salwany, M. Y. (2021). Feed-based bivalent vaccine induced expressions of immune genes and antibody responses in systemic and mucosal tissues of red hybrid tilapia (<i>Oreochromisniloticus</i> × <i>O. mossambicus</i>) against <i>Streptococcus iniae</i> and <i>Aeromonashydrophila</i> . <i>Aquaculture</i> (In press)	4.24
		5. Azzam-Sayuti, M., Ina-Salwany, M. Y., Zamri-Saad, M., Yusof, M. T., Annas, S., Najihah, M. Y., Liles, M. R., Monir, M. S. , Zaidi, Z., & Amal, M. N. A. (2021). The prevalence, putative virulence genes and antibiotic resistance profiles of <i>Aeromonas</i> spp. isolated from cultured freshwater fishes in peninsular Malaysia. <i>Aquaculture</i> , 540, 736719. https://doi.org/10.1016/j.aquaculture.2021.736719	4.24
		6. Mohamad, A., Zamri-Saad, M., Amal, M. N. A., Al-Saari, N., Monir, M. S. , Chin, Y. K., & Ina-Salwany, M. Y. (2021). Vaccine efficacy of a newly developed feed-based whole-cell polyvalent vaccine against vibriosis, streptococcosis and motile aeromonad septicemia in asian seabass, <i>Lateolabrax niloticus</i> . <i>Vaccines</i> , 9(4). https://doi.org/10.3390/vaccines9040368	4.42
		7. Azzam-Sayuti M., Ina-Salwany M.Y., Zamri-Saad M., Yusof M.T., Annas S., Najihah M.Y., Liles M.R., Monir M.S. , Zaidi, Z., & Amal, M. N. A. (2021). Comparative pathogenicity of <i>Aeromonas</i> spp. in cultured red hybrid tilapia (<i>Oreochromisniloticus</i> × <i>O. mossambicus</i>). <i>Journal of Biology</i> . 10. https://doi.org/10.3390	3.79
		8. Monir, M. S. , Yusoff, S. M., Zulperi, Z. M. Z., Hassim, H. A., Zamri-Saad, M., Amal, M.N.A., Salleh, A., AslahMohamad, A., Yie, L. J. & Ina-Salwany, M. Y. (2021). Effect of feed-based bivalent vaccine on immune response and immune gene profiling in vaccinated red hybrid tilapia (<i>Oreochromisniloticus</i> × <i>Oreochromismossambicus</i>) during infections with <i>Streptococcus iniae</i> and <i>Aeromonashydrophila</i> . <i>Saudi Journal of Biological Sciences</i> . (In press)	4.21
8	Sheik Mohammad Robiul Alam SRO, BFRI & enrolling at UMT, Malaysia	Alam, S. M. R. , & Hossain, M. S. (2020). A Rule-Based Classification Method for Mapping Saltmarsh Land-Cover in South-Eastern Bangladesh from Landsat-8 OLI. <i>Canadian Journal of Remote Sensing</i> , 0(0), 1–25. DOI: https://doi.org/10.1080/07038992.2020.1789852	2.126
9	Amdadul Haque SSO, BARI & enrolling at UPM, Malaysia	Haque, M.A. ; Zaharah, S.S.; Ding, P.; Jaafar, N.M.; Yusop, M.K.; Sarker, B.C. 2021. Foliar urea with n-(n-butyl) thiophosphoric triamide for sustainable yield and quality of pineapple in a controlled environment. <i>Sustainability</i> , 13: 1-17. DOI: https://doi.org/10.3390/su13126880	3.251

#	Scholars' Name & Address	Title of the published scientific paper	Impact Factor
10	Md. Mahmudul Hassan SO, BARI & enrolling at UPM, Malaysia	1. Khan, M. M. H. , Rafii, M. Y., Ramlee, S. I., Jusoh, M., & Mamun, A. (2020). Genetic variability, heritability, and clustering pattern exploration of Bambara groundnut (<i>Vignasubterranea</i> L. Verdc) accessions for the perfection of yield and yield-related traits. <i>BioMed research international</i> , 2020.	2.276
		2. Khan, M. M. H. , Rafii, M. Y., Ramlee, S. I., Jusoh, M., & Al Mamun, M. (2021). Genetic analysis and selection of Bambara groundnut (<i>Vignasubterranea</i> [L.] Verdc.) landraces for high yield revealed by qualitative and quantitative traits. <i>Scientific Reports</i> , 11(1), 1-21.	3.99
		3. Khan, M. M. H. , Rafii, M. Y., Ramlee, S. I., Jusoh, M., & Al-Mamun, M. (2021). Bambara Groundnut (<i>Vignasubterranea</i> L. Verdc): A Crop for the New Millennium, Its Genetic Diversity, and Improvements to Mitigate Future Food and Nutritional Challenges. <i>Sustainability</i> , 13(10), 5530.	2.576
11	ShahzadKuli Khan SSO, BFRI& enrolling at AIT, Thailand	Khan, M. S. K. , Salin, K. R., Yakupitiyage, A., Siddique, M.A.M. (2021). Effect of stocking densities on the growth performance, cannibalism and survival of Asian seabass <i>Latescalcarifer</i> (Bloch, 1790) fry in different nursery rearing system. <i>Aquaculture Research</i> , 00, 1–8. https://doi.org/10.1111/are.1540	1.748
12	RemiChakma SSO, BARI & enrolling at AIT, Thailand	1. Chakma, R. , Biswas, A., Saekong, P., Ullah, H., Datta, A., 2021. Foliar application and seed priming of salicylic acid affect growth, fruit yield, and quality of grape tomato under drought stress. <i>Sci. Hortic.</i> 280, 1-11. https://doi.org/10.1016/j.scienta.2021.109904	2.769
		2. Chakma, R. , Saekong, P., Biswas, A., Ullah, H., Datta, A., 2021. Growth, fruit yield, quality, and water productivity of grape tomato as affected by seed priming and soil application of silicon under drought stress. <i>Agric. water manag.</i> 256, 1-11.	4.516
		3. https://doi.org/10.1016/j.agwat.2021.107055	
13	Mohammad Mamunur Rashid Sarkar SSO, BARI & enrolling at University of Leeds, UK	Sarker M. R. , Galdos V. M., Challinor J. A., Hossain A. A farming system typology for the adoption of new technology in Bangladesh (2021). https://doi.org/10.1002/fes3.287	5.242
14	MotasimAhmmed SSO, SRDI & enrolling at UPM, Malaysia	1. Motasim, A. M. , Samsuri, A. W., Abdul Sukor, A. S., & Adibah, A. M. (2021). Gaseous Nitrogen Losses from Tropical Soils with Liquid or Granular Urea Fertilizer Application. <i>Sustainability</i> , 13(6), 3128. http://doi.org/10.3390/su13063128	2.576
		2. Motasim, A.M. ; Samsuri, A.W.; Abdul Sukor, A.S.; Adibah, A.M. 2021. Nitrogen Dynamics in Tropical Soils Treated with Liquid and Granular Urea Fertilizers. <i>Agriculture</i> , 11(6): 546. https://doi.org/10.3390/agriculture11060546	2.072
15	MdEkhlasur Rahman SO, SRDI & enrolling at UPM, Malaysia	Rahman, M. E. , Bin Halmi, M. I. E., Bin AbdSamad, M. Y., Uddin, M. K., Mahmud, K., AbdShukor, M. Y., Sheikh Abdullah, S. R. & Shamsuzzaman, S. M. (2020). Design, operation and optimization of constructed wetland for removal of pollutant. <i>International Journal of Environmental Research and Public Health</i> , 17(22), 8339.	2.849
16	Mohammed Sirajul Islam SSO, BLRI & enrolling at UPM, Malaysia	1. Islam, M. S. , Yimer, N., Haron, A. B., Jesse, F. F., Hiew, M. W. H., & Fitri, W. N. (2021). Growth and Reproductive Performance of the Indigenous Kedah-Kelantan (KK) Cattle: A Review. <i>Pertanika Journal of Tropical Agricultural Science</i> , 44 (1): 25 – 48. DOI: https://doi.org/10.47836/pjtas.44.1.02	0.65

#	Scholars' Name & Address	Title of the published scientific paper	Impact Factor
		2. Islam, M. S. , Yimer, N., Haron, A. B., Jesse, F. F., Hiew, M. W. H., Kamat-Hamidi, K., Fitri, W. N., & Kaka, U. (2021). Growth performance and sexual maturity in Malaysian Kedah-Kelantan and Kedah-Kelantan × Brangus bulls. Accepted by the Advances in Animal and Veterinary Sciences	Q2 Scopus indexed
17	H. M Khairul Bashar SSO, BARI & enrolling at UPM, Malaysia	Bashar, H.M.K. ; Juraimi, A.S.; Ahmad-Hamdani, M.S.; Uddin, M.K.; Asib, N.; Anwar, M.P.; Rahaman, F. A Mystic Weed, <i>Parthenium hysterophorus</i> : Threats, Potentials and Management. <i>Agronomy</i> 2021 , <i>11</i> , 1514. https://doi.org/10.3390/agronomy11081514	2.6
18	Md. Shariful Islam SSO, BARI & enrolling at UPM, Malaysia	Islam, M. S. , Kasim, S., Alam, K. M., Amin, A. M., Geok Hun, T., & Haque, M. A. (2021). Changes in chemical properties of banana pseudostem, mushroom media waste, and chicken manure through the co-composting process. <i>Sustainability</i> , <i>13</i> (15), 8458.	2.576
19	Hafizur Rahman SSO, BARI & enrolling at EU, Japan	ShutaKurokawa, Hafizur Rahman , Naoshi Yamanaka, ChisatoIshizaki, Shaikhul Islam, Tsuyoshi Aiso, Shunya Hirata, Mayuka Yamamoto, Kappai Kobayashi, Hidetaka Kaya, A Simple Heat Treatment Increases SpCas9-Mediated Mutation Efficiency in Arabidopsis, <i>Plant and Cell Physiology</i> , 2021;, pcab123, https://doi.org/10.1093/pcp/pcab123	: 4.93
20	Md. Rowsan Ali SRO, BFRI & enrolling at UPM, Malaysia	Ali, M.R. ; Abdullah, U.H.; Ashaari, Z.; Hamid, N.H.; Hua, L.S. Hydrothermal Modification of Wood: A Review. <i>Polymers</i> 2021, <i>13</i> , 2612. https://doi.org/10.3390/polym13162612	4.329

B. List of publication of In-country PhD scholars in the peer reviewed journal

1	Mohammad Shamsul Alam SO, BARI & enrolling at BAU, Mymensingh	Hoq, M.S. , Raha, S.K. & Hossain, M.I. Livelihood Vulnerability to Flood Hazard: Understanding from the Flood-prone <i>Haor</i> Ecosystem of Bangladesh. <i>Environmental Management</i> 67 , 532–552 (2021). https://doi.org/10.1007/s00267-021-01441-6	2.810
2	Sukalpa Das ADD, DAE & enrolling at BAU, Mymensingh	1. Das S , Wadud MA, Khokon MAR (2021) Functional Evaluation of culture filtrates of <i>Bacillus subtilis</i> and <i>Pseudomonas fluorescens</i> on the mortality and hatching of <i>Meloidogyne javanica</i> . <i>Saudi Journal of Biological Sciences</i> 28 (2):1318-1323. doi: 10.1016/j.sjbs.2020.11.055	4.219
		2. Das S , Wadud MA, Khokon MAR (2021) Evaluation of the effect of different concentrations of organic amendments and botanical extracts on the mortality and hatching of <i>Meloidogyne javanica</i> . <i>Saudi Journal of Biological Sciences</i> 28 (7):3759-3767. doi: 10.1016/j.sjbs.2021.03.041	4.219
		3. Das S , Wadud MA, Khokon MAR (2021). Genetic variation of <i>Meloidogyne</i> spp. of brinjal reveals their difference in pathogenicity and hatching. <i>Archives of Phytopathology and Plant Protection</i> . <i>Saudi Journal of Biological Sciences</i> (Accepted)	4.219
3	Sayed Shams Tabriz PSO, BSRI & enrolling at BAU, Mymensingh	Tabriz, S.S. , Kader, M.A., Rokonzaman, M., Hossen M. S., Awal M. A. Prospects and challenges of conservation agriculture in Bangladesh for sustainable sugarcane cultivation. <i>Environ Dev Sustain</i> (2021). https://doi.org/10.1007/s10668-021-01330-2	2.191
4	Shahnaz Pervin SO, BARI & enrolling at BAU, Mymensingh	Pervin, S. , Aziz, G. M. Miaruddin, M. Kinetics of dehydration and appreciation of the physiochemical properties of osmo-dehydrated plum (2021). <i>Food Sci. & Nutri</i> . DOI: 10.1002/fsn3.2191	1.797

#	Scholars' Name & Address	Title of the published scientific paper	Impact Factor
5	Md. AbdusSattar Bag, ULO (LR), DLS enrolling at BAU, Mymensingh	M. A. S. Bag. , M. S. R. Khan., M. D. H. Sami., F. Begum., M. S. Islam., M. M. Rahman., M. T. Rahman., J. Hassan. 2021. Virulence determinants and antimicrobial resistance of E. coli isolated from bovine clinical mastitis in some selected dairy farms of Bangladesh. Saudi Journal of Biological Sciences. https://doi.org/10.1016/j.sjbs.2021.06.099	4.219
6	AkheryNima, SSO, BFRI & enrolling at RU, Rajshahi	1. Nima, A. , Hossain, M. Y., Rahman, M. A., Hasan, M. R., Mawa, Z., Tanjin, S., Islam, M. A., Rahman, M. A., Rahman, O., Sabbir, W., Bashar, M. A. & Mahmud, Y. (2021). Temporal Variation of Growth Pattern and Physiological Status of Hilsa Shad, Tenualosailisha (Hamilton, 1822) in the Meghna River (Bangladesh). Egyptian Journal of Aquatic Biology and Fisheries, 25(2), 177	0.74
		2. Nima, A. , Hossain, M. Y., Rahman, M. A., Mawa, Z., Hasan, M. R., Islam, M. A., Rahman, M. A., Tanjin, S., Sabbir, W., Bashar, M. A. & Mahmud, Y. (2020). Temporal variations of length, weight, and condition of Hilsa shad, Tenualosailisha (Hamilton, 1822) in the Meghna River, Southeastern Bangladesh. Egyptian Journal of Aquatic Biology and Fisheries, 24(2), 481	0.74

List of 23 beels with number of beneficiaries selected for development of open water fisheries up to June 2021

Sl. no.	District	Upazila	Name of the Beel	No. of beneficiary			Mean Area (ha)	Fishing code implementation	Habitat Improvement	Est. of Fish Sanctuary	Beel Nursery	Fingerling stocking
				M	F	Total						
1							143.50	Continued	Done	Done	3 times	2 times
2	Kishoreganj	Itna	Beel Haria	91	9	100	13.16	Continued	Done	Done	3 times	2 times
3		Tarail	Sadia Kawnia Beel	65	35	100	41.00	Continued	Done	-	3 times	2 times
4		Pakundia	Nobogia Beel	75	45	120	36.34	Continued	Done	-	3 times	2 times
5		Mithamoin	ChotoDigha Beel	66	43	109	54.50	Continued	Done	Done	3 times	2 times
6	Madaripur	Sadar	Jajira Beel	120	80	200	17.00	Continued	Done	Done	3 times	2 times
7		Kalkini	Shashikar Beel	130	70	200	250.50	Continued	Done	-	3 times	2 times
8		Khilgram Beel	125	75	200	92.50	Continued	Done	-	3 times	2 times	
9	Gopalganj	Kashiani	Orakandi Beel	227	123	350	350.00	Continued	Done	Done	3 times	2 times
10		Kotalipara	Baghiar Beel	432	288	720	360.00	Continued	Done	Done	3 times	2 times
11			Hiron Beel	290	143	433	215.00	Continued	Done	Done	3 times	2 times
12		Tungipara	Nasukhali Beel	350	175	525	750.00	Continued	Done	Done	3 times	2 times
13			Chailabola Beel	320	170	490	725.00	Continued	Done	Done	3 times	2 times
14	Netrokona	Kendua	Kashian Beel	110	50	160	45.00	Continued	Done	Done	3 times	2 times
15		Madan	Nakdora Beel	80	50	130	12.00	Continued	Done	Done	3 times	2 times
16		Kolmakanda	Bishorpasha Haor	227	123	350	140.00	Continued	Done	Done	3 times	2 times
17		Barhatta	Dharam Beel	78	42	120	8.25	Continued	Done	Done	3 times	2 times
18	Habiganj	Baniachang	Barang River Beel	73	39	112	56.00	Continued	Done	Done	3 times	2 times
19	Sunamganj	Dirai	Boromedi Beel	82	33	115	183.01	Continued	Done	Done	3 times	2 times
20	Brahmanbaria	Nasirnagar	HuroI Beel	228	122	350	340.00	Continued	Done	Done	3 times	2 times
21	Pabna	Atghoria	Beel Chatra	200	100	300	66.50	Continued	Done	Done	3 times	2 times
22		Chatmohor	Shawladaha Beel	90	37	127	81.97	Continued	Done	Done	3 times	2 times
23		Faridpur	Beel Ruhul	50	30	80	60.50	Continued	Done	Done	3 times	2 times
Grant Total				3631	1960	5591	4041.70					
Percent of Female Beneficiary							53.58%					

Productivity of 23 Beels up to 2020-21

Sl. no.	District	Upazila	Name of the Beel	Production							
				2017-18 (Baseline)		2018-19		2019-20		2020-21	
				Total (kg)	Unit (kg/ha)	Total (kg)	Unit (kg/ha)	Total (kg)	Unit (kg/ha)	Total (kg)	Unit (kg/ha)
1	Tangail	Kalihati	Charan Beel	99328	692.18	98035	683.17	148695	1036.2	151261	1054.1
2		Itna	Beel Haria	9295	706.31	9205	699.47	16800	1276.6	17900	1360.2
3	Kishoreganj	Tarail	Sadia Kawnia Beel	28995	707.20	28380	692.2	48200	1175.61	52350	1276.8
4		Pakundia	Nobogia Beel	25300	696.30	24650	678.41	42300	1164.17	47120	1296.8
5		Mithamoin	ChotoDigha Beel	38020	697.61	39100	717.43	60240	1105.32	70260	1289.2
6		Sadar	Jajira Beel	12025	707.35	11260	662.35	20242	1190.71	22780	1340
7	Madaripur	Kalkini	Shashikar Beel	176240	703.55	172700	689.42	209500	836.327	226750	905.19
8			Khilgram Beel	64080	692.76	61380	663.57	88580	957.622	93900	1015.1
9		Kashiani	Orakandi Beel	243120	694.63	237310	678.03	318600	910.286	386905	1105.4
10	Gopalganj	Kotalipara	Baghiar Beel	254321	706.45	245130	680.92	306300	850.833	378300	1050.8
11			Hiron Beel	146980	683.63	143970	669.63	192670	896.14	235950	1097.4
12		Tungipara	Nasukhali Beel	525650	700.87	517340	689.79	635128	846.837	685603	914.14
13			Chailabola Beel	515200	710.62	500765	690.71	590715	814.779	680010	937.94
14		Kendua	Kashian Beel	31400	697.78	29870	663.78	52540	1167.56	60370	1341.6
15	Netrokona	Madan	Nakdora Beel	8593	716.08	8460	705	15380	1281.67	17430	1452.5
16		Kolmakanda	Bishorpasha Haor	94924	678.03	91873	656.24	136991	978.507	150624	1075.9
17		Barhatta	Dharam Beel	5800	703.03	5540	671.52	16780	2033.94	20590	2495.8
18	Habiganj	Baniachang	Barang River Beel	38760	692.14	37578	671.04	72920	1302.14	80525	1437.9
19	Sunamganj	Dirai	Boromedi Beel	129180	705.88	124200	678.67	155100	847.518	181350	990.96
20	Brahmanbaria	Nasirnagar	Hurol Beel	237200	697.65	236386	695.25	295300	868.529	336400	989.41
21		Atghoria	Beel Chatra	46985	706.54	47610	715.94	72630	1092.18	80419	1209.3
22	Pabna	Chatmohor	Shawladaha Beel	57500	701.52	55938	682.46	79016	964.021	86600	1056.5
23		Faridpur	Beel Ruhul	42796	707.37	41148	680.13	52820	873.058	58360	964.63
Grant Total				2831692	700.24	2767828	683.27	3627447	1072.61	4121757	1202.5

FY2020-21 Volumes of agri-commodities marketed through the CCMCs & CPs

No.	Name of Vegetable/fruit	Volume (kgs)	No.	Name of Vegetable/fruit	Volume (kgs)
1.	Rice	1507,245	30.	Taro Stolon	71,786
2.	Brinjal	1157,607	31.	Red Amaranth	70,136
3.	Country Bean	912,444	32.	Jujube	68,411
4.	Banana	826,408	33.	Ridged Gourd	63,386
5.	Potato	810,229	34.	Malta	51,631
6.	Lemon	565,286	35.	Jackfruit	43,655
7.	Guava	504,575	36.	Sponge gourd	39,423
8.	Tomato	372,447	37.	Okra	35,679
9.	Pointed Gourd	329,612	38.	Jute leaf	35,301
10.	Teasel Gourd	297,574	39.	Watermelon	29,552
11.	Amaranth	242,912	40.	Spinach	28,175
12.	Cucumber	222,539	41.	Coriander	27,066
13.	Bottle Gourd	213,224	42.	Blackberry	19,152
14.	Cauliflower	194,314	43.	Palmyra palm (Taal)	16,869
15.	Bitter Gourd	179,230	44.	Hog Plum	16,598
16.	Sweet Gourd	166,778	45.	Turnip	15,880
17.	Cabbage	158,040	46.	Burmese Grape	11,175
18.	Long Bean	148,838	47.	Grape Fruit	7,648
19.	Indian Amaranth	145,104	48.	Aonla	6,851
20.	Mango	136,287	49.	India Olive	4,766
21.	Radish	108,505	50.	Pea	4,748
22.	Chilli	106,962	51.	Dragon fruit	4,680
23.	Papaya	106,787	52.	Bael	2,334
24.	Snake gourd	102,695	53.	Moringa (stick)	2,279
25.	Taro/Eddo/Aroid	81,398	54.	Amla	1,857
26.	Broccoli	80,600	55.	Onion	1,575
27.	Ash Gourd	79,130	56.	Sapota	350
28.	Pineapple	75,697	57.	Golden Apple	230
29.	Litchi	75,537	58.	Carrots	204
Total = 10,589,401 kgs (10589.40 tons)					

Progress of pureline brood development and seed multiplication program as of June, 2021

Name of hatchery	Fish species	Number received from BFRI	Up to December 2020							Up to June 2021						
			Status of Fingerling production (Number)			Rearing as brood for next generation	Number of beneficiary purchased fingerling			Status of Fingerling production (Number)			Rearing as brood for next generation	Number of beneficiary purchased fingerling		
			Target	Produced	Sold		Farmer	Nursery	Hatchery	Target	Produced	Sold		Farmer	Nursery	Hatchery
Nimgachi Aquaculture project, Raiganj, Sirajganj	Vietnamese Koi	200	200000	203000	200000	200	23	2	0	286,000	289,000	289,000	200	38	2	-
	Vietnamese Pangas	447	0	0	0	447	0	0	0	-	-	-	447	-	-	-
	GIFT (Tilapia)	2000	50000	50200	50000	2000	2	0	0	131,000	131,200	131,200	2000	18	-	-
Carp hatchery complex, Katiardi, Kishoreganj	Vietnamese Koi	200	200000	205000	202000	175	3	0	0	320,000	326,000	325,000	1000	7	2	1
	Vietnamese Pangas	650	0	0	0	500	0	0	0	-	-	-	500	-	-	-
	GIFT (Tilapia)	2000	70000	75000	70500	1,500	5	0	0	130,000	135,500	120,000	1000	8	1	1
Carp hatchery complex, Shantiganj, Sunamganj	Vietnamese Koi	2250	250000	250000	250000	1,400	9	0	1	350,000	300,000	280,000	1400	11	-	1
	Vietnamese Pangas	3800	0	0	0	3,050	0	0	0	-	-	-	3050	-	-	-
	GIFT (Tilapia)	2450	50000	51400	51400	1,950	12	0	1	150,000	151,400	131,400	1950	36	-	1
Fish Hatchery and Training Center, Raipur, Laxmipur	Vietnamese koi	5000	50000	53000	52025	3500	11	0	0	150,000	153,492	153,492	150	56	-	-
	Vietnamese pangus	2000	0	0	0	150	0	0	0	-	-	-	2415	-	-	-
	GIFT (Tilapia)	8000	50000	52000	50350	4,000	15	0	0	150,000	202,016	202,016	2000	51	-	-
Total	*Vietnamese Pangas	9897	0	0	0	7,497	0	0	0	0	0	0	6412	0	0	0
	Vietnamese Koi	4650	700000	711000	704025	1,925	46	2	1	1,106,000	1,068,492	1,047,492	2750	112	4	2
	GIFT (Tilapia)	14450	220000	228600	222250	9,450	34	0	1	561,000	620,116	584,616	6950	113	1	2
	Total	28997	920000	939600	926275		80	2	2	1,667,000	1,688,608	1,632,108		225	5	4
	% of total		100	102.13	100.68											

* Fingerlings from Vietnamese Pangas will be produced from 2021

Annex 8

A: BARI technologies identified for dissemination to the plain lands of Chattogram and Rangamati regions

Identified Technology with Major Traits/ Characteristics
BARI Hybrid Tomato-4: heat tolerant, yield 40- 45 t/ha
BARI Hybrid Tomato- 7: fruit weight 80-85g; yield 75- 80 t/ha
BARI Hybrid Tomato- 8: heat tolerant; yield 40- 45 t/ha
BARI Hybrid Begun- 5: year round; tolerant to bacterial wilt and little leaf disease; yield 50- 55 t/ha (winter), 30-35 t/ha (summer)
BARI Hybrid Begun- 6: year round; tolerant to bacterial wilt and little leaf disease; yield 50- 55 t/ha (winter), 35-40 t/ha (summer)
BARI Hybrid Mistikumra-2: Total Soluble Solid (TSS) or 'sugar content' 11.05%; flesh thickness 4.6 cm; yield 48.63 t/ha; virus resistant
BARI Hybrid Mistikumra-3: TSS 11.10%; flesh thickness 3.7 cm; yield 46.72 t/ha; virus resistant
BARI Hybrid Karolla-2: virus, powdery mildew and downy mildew disease tolerant; yield 35-37 t/ha
BARI Hybrid Karolla-3: virus, powdery mildew and downy mildew disease tolerant; yield 23.5 – 25.5 t/ha
BARI Lau-4: summer variety; fruits per plant 12-14; Av. fruit weight 2.5 kg; yield 50-55 t/ha
BARI Lau-5: early variety; bottle shaped; fruits/ plant 14-16; fruit weight 2.0- 2.5 kg; yield 50-55 t/ha
BARI Sheem-7: heat tolerant (summer variety); flat type fruits with less fiber; yield 12-13 t/ha
BARI Sheem-9 (bold seeded hyacinth bean): 100 seed weight 117-146g; pods are short, bold and whitish green in color; edible khaishya seed yield 7.3-9.5 t/ha while the other variety of country bean seed yield is only 3.5-4.5 t/ha; protein content of mature seed is about 25%
BARI Sheem-10 (bold seeded hyacinth bean): 100 seed weight 115-144g; average numbers of seeds per pod 05; edible khaishya seed yield 5.5-8.5 t/ha while the other variety of country bean seed yield is only 3.5-4.5 t/ha; protein content of mature seed is about 25%
BARI Chinal-1: cultivated in both Rabi and Kharif seasons; fruits are round and golden yellow when ripen; weight of fruit 1.3-1.4 kg; light sweet (TSS 6.67%); fruits/plant 5-6; crop duration 80-90 days; edible portion 85%; yield 20-22 t/ha (Rabi season)
BARI Sajna-1: year round production; harvesting April- November; yield: 9-10 kg/plant
BARI Kamranga Sheem -1: nutrition rich traditional crop; rich in protein, yield 20.07 t/ha
BARI Aam – 4 (hybrid): regular bearer; harvesting up to mid August; skin color slightly yellow; pulp color yellow; very sweet (TSS 24%); fruit weight 600g; yield 18 t/ha
BARI Aam – 8 (polyembryonic): regular bearer; polyembryonic ; harvesting last week of June; skin color yellow; pulp color bright yellow; very sweet TSS 22%; edible portion 73%; export potential; yield 15-16 t/ha in 8 years old tree
BARI Aam – 11: fruiting year round; fruit weight 300-350g; TSS 18.55%; edible portion 78-80%; yield 40-50 kg/plant (5 years old plant)
BARI Peyara-2: fruiting year round; white fleshed; crispy and sweet
BARI Peyara-4 : seedless and off-season variety; harvesting September- October; extended shelf life 8-10 days
BARI Malta-1: juicy and sweet (TSS 7.8%); yield 20 t/ha
BARI Malta-2: regular bearing; duration September – November; Vitamin C (48 mg/100g)

Identified Technology with Major Traits/ Characteristics
BARI Batabilebu-3: harvesting September- October; bitterless; very juicy; sweet (TSS 10%); edible portion 55%; yield 30 t/ha
BARI Batabilebu-6: late harvesting (October- December), bitterness absent and very juicy
BARI Jara Lebu-1: edible portion- 69.98%: fruit weight 882g and high yielder (22 kg per plant and 13.64 t/ha)
BARI Alu-72: individual tuber weight 95g; suitable for processing (dry matter 18.75%); yield 23-27 t/ha; tolerant to high temperature and salinity
BARI Mistialu-16 (clonal hybrid): yield 30-35 t/ha; dry matter 29%; Beta carotene content 11.15 mg/100g
BARI Felon-1: duration 125-135 days; seed coat color ash; 1000 seed weight 90-95g; protein 25-30%; yield 1,100-1,400 kg/ha
[[BARI Motor-3: high yielding (green pod 5-6 t/ha, seed 2.2-2.5 t/ha); tolerant to waterlogging at germination; suitable for relay cropping; tolerant to insect (flower thrips) and disease (powdery mildew)
BARI Sorisha-18 (Canola): duration 95-102 days; oil content 42-44%; seed yield: 2.0-2.5 t/ha; Erucic acid 1.06% (normal 14-15%); linoleic acid (Omega- 6) 24% (normal 14-15%); linolenic acid (Omega-3) 9% (normal 7-8%); Glucosinolate 14 µmol/g Canola standard (Erucic acid <2-3% and glucosinolate <20µM)
BARI Surjomukhi-3: dwarf type (height 70-80 cm) & lodging tolerant; suitable for cultivation in the southern belt; duration 100-105 days; oil content 40-45%; seed yield 1,000-1,500 kg/ha
BARI Piaz-5 (Summer): yield 22-25 t/ha; crop duration Kharif-1: 70-75 days, Kharif-2: 105- 120 days
BARI Piaz-6 (Winter): yield: 16-20 t/ha; longer shelf life (6-8 months); crop duration 114-125 days
Integrated management of Panama and nematode disease of banana: planting of healthy sucker + application of Tricho compost at 2 kg/plant + sucker treatment with Autostin at 2g/litre of water+ application of Furadan 5G at 50 g/plant + soil drenching with Autostin 3-5 times just after disease initiation
Hot water treatment of mango: dipping in hot water at 55°C for five minutes keeps the fruits free from anthracnose rot up to 13 days after harvest with an extended shelf life of five days over control

Annex 8

B: BARI technologies identified for dissemination to the hill agriculture of Chattogram and Rangamati regions

Identified Technology with Major Traits/ Characteristics
BARI Malta-1: flowering time February- March; harvesting time October- November; single fruit weight: 146g; fruit size 66 cm (diameter); TSS 8.5%
BARI Malta-2: no. of fruits/plant 145; single fruit weight 180g; TSS 7.70%; yield/plant 26 kg
BARI Litchi-5: flowering time February; harvesting time June-July; fruit weight 21.79g; edible portion 70%; TSS 17.5%
BARI Aam-4 (hybrid): harvesting up to mid August; very sweet (TSS 24%); yield 18 t/ha
BARI Aam-5 (polyembryonic): high yielding; regular bearer; mid to late season; polyembryonic; harvesting last week of June
BARI Aam-10: flowering time January-February; harvesting time June; fruit weight 250g; edible portion 64%; TSS: 16%
BARI Dragonfol-1: no. of fruits/pillar 64; yield 27.9 t/ha; individual fruit weight 272g; edible portion 76.1 TSS: 9.1%
BARI Kola-3: high yielding variety; yield 43 t/ha; hand weight 14 kg; individual finger weight 125g
BARI Jharsheem -3 (Khaishya): short and bushy plant; pods are not consumed; seeds are used as Khaishya duration 75-80 days; yield 4.5-5.0 t/ha (Rabi)
BARI Sajna- 1: harvest period/year 3-6 times (April - November); number of fruits /year 1,450 (five years old tree); yield/plant 44 kg
BARI Panikachu- 6: length of rhizome/stem: 1.0m; diameter 30-35 cm; mainly produces rhizomes; small amount of stolon is produced; yield stolon 6-7 t/ha, rhizome 80-90 t/ha
BARI Lau-3: suitable for early winter; fruit weight 2.7 kg; yield 62 t/ha
BARI Lau-4: summer variety ; ,fruit weight 2.5 kg; yield 82 t/ha
BARI Hybrid Tomato-4: high temperature tolerant summer variety; duration 90-95 days; fruit color red and round; fruit weight 35-40g; yield 20-22 t/ha (Kharif)
BARI Hybrid Tomato-10: high temperature tolerant summer hybrid variety; fruit egg shaped; duration 90-100 days; fruit weight 25-30g; yield 45-55 t/ha (Kharif); tolerant to bacterial wilt disease

C: BRRi technologies identified for dissemination to Chattogram and Rangamati regions

Identified Technology with Major Traits/ Characteristics
BRRi dhan74, 84 (zinc enriched), 88 (crop duration 140-143 days),96 (crop duration 140-145 days) & 100 (yield 7.69 t/ha)(Boro) to replace BRRi dhan28 in medium high lands of BRRi dhan28 growing areas of Feni, Noakhali, Laximpur, Chattogram, Cox's Bazar and Hill districts
BRRi dhan97 (salt tolerant) & 99 (salt tolerant) (Boro) to replace BRRi dhan47 & 67 in medium high land and medium low lands of BRRi dhan47 & 67 of coastal saline areas of Feni, Noakhali, Laximpur, Chattogram, Cox's Bazar and Hill districts
BRRi dhan89 & 92 (yield 8.5 t/ha) (Boro) to replace BRRi dhan29 in medium high lands and medium low lands of BRRi dhan29 growing areas of Feni, Noakhali, Laximpur, Chattogram, Cox's Bazar and Hill districts
BRRi Hybrid dhan5 (Boro) to replace Hybrid rice in medium high lands of eight districts (Chattogram, Cox's Bazar, Feni, Laxmipur, Noakhali, Rangamati, Bandarban and Khagrachari) of these regions
BRRi dhan48 (Aus) to replace BR21, 24 & 26 in medium high lands of Chattogram, Cox's Bazar, Feni, Laxmipur, Noakhali, Rangamati, Bandarban and Khagrachari
BRRi dhan82 (Aus) to replace BRRi dhan27, 42 & 43 in high and medium high lands of of Chattogram, Khagrachari and Rangamati
BRRi dhan55 & 83 (Aus) to replace Local varieties in high and medium high lands of hilly areas
BRRi dhan85 (tolerant to water logging) (Aus) to replace BR 26 in medium high and medium low lands of Noakhali, Laxmipur and Chattogram
BRRi dhan98 (Aus) to replace BRRi dhan48 in medium high lands of Chattogram, Cox's Bazar, Feni, Laxmipur, Noakhali, Rangamati, Bandarban, and Khagrachari
BRRi Hybrid dhan7 (Aus) (yield 6.5-7.0 t/ha) to replace hybrid varieties in medium and high lands of Chattogram, Cox's Bazar, Feni, Laxmipur, Noakhali, Rangamati, Bandarban, and Khagrachari
BRRi dhan34 & 70 (Aman) to replace Chinigura in high lands of Feni, Chattogram, Khagrachari, Rangamati and Bandarban
BRRi dhan87 (Aman) to replace BRRi dhan32 & 49 in medium high lands of Chattogram, Cox's Bazar, Feni, Laxmipur, Noakhali, Rangamati, Bandarban, and Khagrachari
BRRi dhan71 & 75 (Aman) to replace BRRi dhan33,56 & 62 in high and medium high lands of T. Aman Mustard-Boro cropping pattern
BRRi dhan52 (BR 11-sub 1:tolerant to water logged condition) & 79 (Aman) to replace BR10 & 11, BRRi dhan40,41,44 & 51 in medium low lands of Chattogram, Cox's Bazar, Feni, Laxmipur, Noakhali, Rangamati, Bandarban, and Khagrachari
BRRi dhan73 (Aman) to replace BRRi dhan40 & 41 in medium low lands of coastal saline lands of Feni, Noakhali, Laxmipur, Chattogram and Cox's Bazar
BRRi dhan93, 94 & 95 (Aman) to replace Swarna in high and medium high lands of Feni, Noakhali and Chattogram
BRRi dhan46 & 78 (Aman) to replace BR22 & 23 in medium low lands of Feni, Noakhali, Chattogram and Cox's Bazar
BRRi Hybrid dhan6 (Aman) (crop duration 110-115 days) to replace Hybrid rice in Chattogram, Cox's Bazar, Feni, Laxmipur, Noakhali, Rangamati, Bandarban and Khagrachari

Annex 8

D: BINA technologies identified for dissemination to Chattogram and Rangamati regions

Identified Technology with Major Traits/ Characteristics
Binadhan-12 (Aman): duration: 125-130 days; yield 3.4-4.5 t/ha; submergence tolerant; suitable for all Aman growing areas of Chattogram and Rangamati Regions except saline affected areas
Binadhan-19 (Aus): drought tolerant; duration 95-100 days; yield 4.5-5.5 t/ha (Jhum: 2.5-3.5 t/ha); suitable for all Aus growing areas of Chattogram and Rangamati Regions including Jhum cultivation
Binadhan-10 (Boro): salinity tolerant (tolerate up to 10-12 dS/m salinity); duration 130-140 days; yield 4.5-5.5 t/ha in saline affected areas; specialized for saline areas, but performance is notable in non-saline areas too
Binadhan-24 (Boro): long, medium slender grain; duration 140-145 days; yield 5.5-6.5 t/ha; suitable for all medium high lands of Chattogram and Rangamati Regions except saline affected areas
Binasharisha-4: tolerant to disease caused by Alternaria; blackish red grain with 44% oil content; duration 85-88 days; yield 1.5-1.7 t/ha; suitable for all mustard growing areas of Chattogram and Rangamati Regions
Binasharisha-9: tolerant to disease caused by Alternaria; black seed coat color with 43% oil content; duration 80-84 days; yield 1.0-1.6 t/ha; suitable for all mustard growing areas of Chattogram and Rangamati Regions
Binasharisha-10: black seed coat color with 42% oil content; duration 75-80 days; yield 1.5 -1.6 t/ha; suitable for all mustard growing areas of Chattogram and Rangamati Regions
Binasharisha-11: black seed coat color with 35% oil content; duration 83-87 days; yield 1.9 t/ha; suitable for all mustard growing areas of Chattogram Region
Binasoybean-3: tolerant to yellow mosaic virus; duration Rabi 110-115 days, Kharif- 2 105-110 days; yield Rabi 2.5-3.2 t/ha, Kharif 2: 2.2- 3.2 t/ha; suitable for Noakhali, Laxmipur and Feni districts
Binasoybean-5: tolerant to yellow mosaic virus; duration rabi: 105-115days, kharif- 2- 95-107 days; yield rabi 2.4-3.0 t/ha, kharif- 2 - 2.5 – 3.3 t/ha; suitable for Noakhali, Laxmipur and Feni districts
Binasoybean-6: tolerant to yellow mosaic virus; durationr 102-115 days, Kharif- 2- 100-107 days; yield rabi: 2.5-3.0 t/ha, kharif-2- 2.6-3.2 t/ha; suitable for Noakhali, Laxmipur and Feni districts
Binachinabadam-4: bold grain; seeds contain 48% oil; duration rabi 140-150 days, Kharif- 2- 100-120 days; yield rabi 2.6 t/ha, Kharif-2 - 2.0 t/ha; suitable for all groundnut growing areas of Chattogram and Rangamati Regions
Binachinabadam-8: salinity tolerant; bold grain; seeds contain 46.9% oil; duration rabi: 140-150 days; yield rabi 1.8 – 2.6 t/ha; suitable for all groundnut growing areas of Chattogram and Radngamati Regions
Binachinabadam- 10: medium bold grain; dark copper color; seeds contain 50.6% oil; duration rabi 120-130 days, kharif- 2- 110-120 days; yield- rabi 2.8 t/ha, kharif-2- 2.2 t/ha; suitable for all groundnut growing areas of Chattogram and Rangamati regions specially Noakhali
Binatil-1: branchless; seed coat white; duration 85-90 days; yield 1.3t/ha; suitable for all til growing areas of Chattogram Region
Binatil-2: light balck seed coat color; duration 91-98 days; yield 1.4 t/ha; suitable for all til growing areas of Chattogram Region
Binatil-3: short duration- 85 to 90 days; yield rabi-1.5 t/ha; suitable for all sesame growing areas of Chattogram region
Binamoog-8: tolerant to yellow mosaic virus; duration: 64-68 days; Yield 1.2- 1.8 t/ha; suitable for all mungbean growing areas of Chattogram Region

Identified Technology with Major Traits/ Characteristics
Binamoog-9: bold seeded; tolerant to yellow mosaic virus; duration 60-64 days; yield 1.8 t/ha; suitable for all mungbean growing areas of Chattogram Region
Binalebu-1: year round; seedless; scented; yield 250-300 fruits/plant in each season; suitable for slope lands of Chattogram and Rangamati Regions
Binalebu-2: year round; almost seedless; yield 150-200 fruits/plant in each season; suitable for slope lands of Chattogram and Rangamati Regions
Binaholud-1: yellow leaf blotch and rhizome rot tolerant; duration 270-300 days; yield 28-34 t/ha; suitable for hilly areas of Chattogram and Rangamati Regions

E: BFRI technologies identified for dissemination to Chattogram and Rangamati regions

Identified Technology with Major Traits/ Characteristics
Production enhancement of Carps and Tilapia in creeks of Chattogram Hill Districts : species combination Rui 14+ Catla 14+ Mrigel 12+ Monosex Tilapia 20 individuals/decimal; creek water retention capacity 1-5m depth; stocking size 7-10 cm; culture period February to November; feeding commercial feed (25-28% protein); feeding rate 10-5% of body weight; net ptofit more than Taka 4,80,000.00 /ha/year (BCR= 1: 1.59); suitable for Chattogram Hill districts
Pen culture in creeks of Kaptai Lake (1,200 creeks, about 3,887 ha): Kaptai Lake has 1,200 creeks occupying about 3,887 ha water area; poles are placed 2- 3 m apart side to side & then net attached to poles; stocking size 4 inches or more; culture period February - November; stocking density 8,000 fish seed/ha; stocking ratio Rui: Catla: Silver carp Grass carp: Common carp: Rajputi = 30:20:10:10: 5:25; net profit more than Taka 47,500.00 /ha (BCR= 1 : 2.08); suitable for adjacent area of Kaptai Lake
Cage culture in Kaptai Lake: cage size (3×3×2) m ³ ; stocking size 15 g; culture species Tilapia or Rajputi; stocking density 50 fish seed / m ³ ; survivability rate 96%; culture period 4 months; final weight 250g; net profit Taka 86,690.00; BCR=1:1.31; suitable for Kaptai Lake
Culture of Cuchia in Chattogram Hill Tract Districts: Pond size 1 decimal; stocking size 33-68 g; stocking density 10/ m ² ; culture period 6 months; final individual average weight: 200 g ; BCR = 1:1.5; suitable for Chattogram Hill districts
Improvement of dried fish products through using a Mechanical Fish Dryer: Fish dryer size 5.0 ×1.7×2.0 m ³ , square size black painted metallic plate; cover 1.2 mm celluloid polythene sheet; a motorized fan was used between the entry and the exit of the drying chamber and an exhaust fan to reduce moisture; production 300-3000 kg dry fish /fish dryer; drying performances - high nutritional quality, dehydrating rate and production cost; BCR= 1.67 : 1.80; suitable for Chattogram and Cox's Bazar

F: BLRI technologies Identified for Dissemination to Chattogram and Rangamati regions

Identified Technology with Major Traits/ Characteristics
Improved Native Chicken Rearing Model: variability under the existing harsh environment (all over the country); mortality 1-3% (in scavenging system 87%); BCR = 1: 2.04; egg production 150-180 nos./year (3 times more than indigenous); egg weight 45-47g; egg shell color white to light brown; Rearing System- feed supplementation 60 g/day (Crip feeding System); following vaccination schedule properly; artificial brooding 4 weeks; light providing 16 hours (laying stage); providing night shelter; suitable specially for Hill Tract areas
BLRI improved Common Deshi Chicken for Egg Purpose: egg production/year (nos.) foundation 110 - 120, at present 145-155, 8 weeks body weight (g) foundation 290-360, at present 580-650; mature body weight: M-2,150g, F-1,300g
Multi Color Table Chicken (MCTC): developed by using native germ plasms; feather color mixed color; day old weight 37-40 g; body weight at 8 weeks 950-1,000 g; feed intake 2,200-2,300 g; FCR 2.2-2.3; mortality 1.0-1.5 %; disease resistant; adaptable under changing climatic conditions in Bangladesh; profit/batch at 8 weeks Taka 45,000.00 -60,000.00/1000 birds ; high market demand (meat taste and color of bird); profit /year Taka 2.00 -2.70 lac (4-5 batch rearing); suitable specially for Hill Tract areas
Native Sheep Rearing Model in Hilly Areas : hilly environment is very friendly to rearing of sheep; in hilly areas, native sheep rearing is in semi-intensive or extensive system; feed resource is available in the year round (to grazing on grazing lands & there are a lot of fallow lands in hilly areas); native sheep rearing is very easy, so women and children in hilly areas can be involved; innocent and blameless; selection choice on food is very little; sexual maturity 12-14 months; kid birth weight 1.0-1.5 kg; strong immunity and mortality rate is below 5.0%; meat production 8 kg/6-8 months; meat smell is acceptable due to shearing and bath/week before slaughtering, suitable for Chattogram and Rangamati Regions

G: BSRI technologies identified for dissemination to Chattogram and Rangamati regions

Identified Technology with Major Traits/ Characteristics
<p>BSRI Akh 42, BSRI Akh 47 (for chewing); BSRI Akh 41 (for both chewing and gur making): very popular for chewing purpose and Juice production; yield 160-170 t/ha; resistant to red rot disease; drought tolerant; net income Tk. 5.50 – Tk. 6.00 lakh/ ha</p>
<p>Intercropping High Value Vegetables with Sugarcane:</p> <ul style="list-style-type: none"> ▪ Sugarcane with Intercropping of French bean and Cabbage: net return Tk. 70,000.00 - Tk. 85,000.00/ha ; suitable for Bandarban, Rangamati, Khagrachari & Chattogram Regions - Sugarcane with intercropping of French bean: net return Tk. 65,000.00 – Tk. 70,000.00/ha; suitable for Bandarban, Rangamati, Khagrachari & Chattogram Regions ▪ Sugarcane with Intercropping of cabbage: net return Tk. 80,000.00 – Tk. 85,000.00/ha; suitable for Bandarban, Rangamati, Khagrachari & Chattogram Regions ▪ Sugarcane with Intercropping of radish: net return Tk. 75,000.00 – 80,000.00/ha; suitable for Bandarban, Rangamati, Khagrachari & Chattogram Regions ▪ Sugarcane with intercropping of potato: net return Tk. 75,000.00 –Tk. 80,000.00/ha; suitable for Bandarban, Rangamati, Khagrachari & Chattogram Regions ▪ Sugarcane with intercropping of onion: net return Tk. 60,000.00 – Tk.65,000.00/ha; suitable for Bandarban, Rangamati, Khagrachari & Chattogram Regions ▪ Sugarcane with intercropping of tomato: profitability ranged from Tk. 65,000.00 to Tk.90,000.00/ha; suitable for Bandarban, Rangamati, Khagrachari and Chattogram Regions ▪ Sugarcane with 2nd Intercropping of chukai: net return Tk. 20,000.00 – Tk.25,000.00/ha ; suitable for Bandarban, Rangamati and Khagrachari
<p>Replacement of Tobacco through Sugarcane Cultivation: net income from sugarcane production per acre is Tk. 2,23,360.00, whereas net income from tobacco production per acre is Tk. 91,250.00. Therefore, sugarcane cultivation is more profitable, suitable for Bandarban Hill District</p>

H: BWMRI technologies identified for dissemination to Chattogram and Rangamati regions

Identified Technology with Major Traits/ Characteristics
BARI Gom -25: short duration (102-110 days) and heat tolerant; salt tolerant (8-10dS/m at seedling stage); resistant to leaf blight and leaf rust; white and bold grain (1,000 kernel weight-TKW 54-58g); yield 4.0-5.0 t/ha; suitable for Chattogram area
BARI Gom- 30: short duration (100-105 days) and heat tolerant; suitable for late sowing; resistant to leaf blight and leaf rust; white and medium sized grain (TKW 44-48g); yield: 4.5-5.5 t/ha; specially recommended for Chattogram area
BARI Gom -32: short height, early maturing (95-105 days); heat tolerant; resistant to leaf blight and leaf rust; white and bold grain (TKW 50-58g); yield: 4.6-5.0 t/ha; specially recommended for Chattogram area
BARI Gom- 33: blast resistant; Zn enriched (50-55ppm); white and bold grain; resistant to leaf rust and leaf blight; yield: 4.6-5.0 t/ha; specially recommended for Chattogram area
WMRI Gom -1: short duration; heat tolerant; bold grain with high TKW (52-60g); resistant to leaf rust and leaf blight; yield: 4.0-5.0 t/ha; recommended for Chattogram
WMRI Gom -2: short stature 95-105 cm and short duration (106-112 days); heat tolerant; moderately resistant to blast; resistant to leaf rust and leaf blight; yield: 4.5-5.5 t/ha; recommended for Chattogram
WMRI Gom -3: short stature 96-106 cm; blast resistant; heat tolerant; resistant to leaf rust and leaf blight; yield 4.0-5.5 t/ha; recommended for Chattogram
Power Tiller Operated Seeder (PTOS) for wheat seeding: advantage - reduce turn around time; land preparation and wheat sowing in one pass; easy for intercultural operation; reduce seed rate; recommended for certain areas of Chattogram
WMRI Baby Corn- 1: plant height: 170-180 cm; plants do not fall down or break under stormy weather; TSS in the grains of tender cobs 12.2 Brix which is low in commercial varieties (10.0 Brix); yield in rabi season 2.30-2.65 t/ha; green biomass is suitable for cattle feed; suitable area for dissemination Chattogram, Cox's Bazar, Rangamati, Khagrachari and Bandarban
WMRI Hybrid Bhutta-1: plant height 165-175 cm; plants do not fall down or break under stormy weather; tolerant to Turcicum leaf blight disease; yield in rabi season 11.0- 13.0 t/ha
Khaibhutta: crop duration rabi (125-130 days), kharif (80- 90 days); popping 95%; tolerant to Turcicum leaf blight disease; yield 3.5-4.0 t/ha (rabi), 2.5- 3.5 t/ha (kharif); suitable area for dissemination Chattogram, Cox's Bazar, Rangamati, Khagrachari and Bandarban
BARI Bhutta-7: crop duration rabi (145-155 days), kharif (100- 105 days); tolerant to Turcicum leaf blight disease; yield 6.5-7.0 t/ha (rabi), 5.0 - 6.0 t/ha (kharif); suitable area for dissemination: Rangamati, Khagrachari and Bandarban
BARI Misty Bhutta-1: collection of green Misty Bhutta by 115-120 days; seed maturity requires 140-145 days; tolerant to Turcicum leaf blight disease; yield 10 - 10.5 t/ha (rabi); green biomass is suitable for cattle feed; suitable area for dissemination Rangamati, Khagrachari and Bandarban

Composition of JPSC, PIC, Project Management Team

I. Composition of Joint Project Steering Committee (JPSC)

1	Secretary, MOA	Chair
2	Secretary, MOFL	Alternate Chair
3	Addl. Secretary (PPC), MOA	Member
4	Executive Chairman, BARC	Member
5	Division Chief, Agriculture, Water Resources and Rural Development, Planning Commission	Member
6	Director General, DAE	Member
7	Director General, DOF	Member
8	Director General, DLS	Member
9	Joint Chief (Planning), MOA	Member
10	Joint Chief (Planning), MOFL	Member
11	Representative from Ministry of Finance	Member
12	Representative from ERD	Member
13	Representative from IMED	Member
14	Representative from one of the Agricultural Universities	Member
15	Farmer representative	Member
16	NGO representative	Member
17	Representative from Agro- Business Entrepreneurs	Member
18	Project Director, PMU, NATP- Phase II Project	Member-Secretary

II. Composition of Project Implementation Committee (PIC) of PMU

1	Additional Secretary (PPC), MOA	Chair
2	Additional/Joint Secretary, MOFL	Co-Chair
3	Joint Chief (Planning), MOA	Member
4	Joint Chief (Planning), MOFL	Member
5	Member Director (P&E), BARC	Member
6	Director (Field Service), DAE	Member
7	Director (Extension), DLS	Member
8	Director, Inland Fisheries, DOF	Member
9	Director, PIU-BARC	Member
10	Director, PIU-DAE	Member
11	Director, PIU-DOF	Member
12	Director, PIU-DLS	Member
13	Project Director, PMU, NATP- Phase II Project	Member-Secretary

III. Project Director, Deputy Project Director and PIU-Directors

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