ANNUAL REPORT 2019-2020

Bangladesh Agricultural Research Council

New Airport Road, Farmgate, Dhaka-1215

www.barc.gov.bd

National Agricultural Research System (NARS)

Institute	Ministry	Areas of Research
Bangladesh Agricultural Research Council (BARC), Dhaka www.barc.gov.bd	Agriculture	Strengthen the national agricultural research capability through research planning, coordination, integration and resource allocation
Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur www.bari.gov.bd	Agriculture	Basic, applied and adaptive research on cereals (other than rice), pulses, oilseeds, vegetables, horticultural crops etc.
Bangladesh Rice Research Institute (BRRI), Joydebpur, Gazipur www.brri.gov.bd	Agriculture	Basic, applied and adaptive research on rice
Bangladesh Jute Research Institute (BJRI), Sher-e-Bangla Nagar, Dhaka www.bjri.gov.bd	Agriculture	Basic, applied and adaptive research on jute production and utilization
Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh www.bina.gov.bd	Agriculture	Application on nuclear technology in agriculture
Bangladesh Sugarcrop Research Institute (BSRI), Ishurdi, Pabna www.bsri.gov.bd	Agriculture	Applied and adaptive research on sugarcrops
Soil Resource Development Institute (SRDI), Farmgate, Dhaka www.srdi.gov.bd	Agriculture	Soil survey, soil classification and soil characterization
Cotton Development Board (CDB), Khamarbari, Farmgate, Dhaka www.cdb.gov.bd	Agriculture	Cotton production and research
Bangladesh Wheat and Maize Research Institute (BWMRI), www.bwmri.gov.bd	Agriculture	Basic, applied and adaptive research on wheat and Maize
Bangladesh Fisheries Research Institute (BFRI), Mymensingh www.fri.gov.bd	Fisheries and Livestock	Marine and freshwater fisheries research
Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka www.blri.gov.bd	Fisheries and Livestock	Basic and applied research on cattle, buffalo, sheep, goats, poultry, duck, etc.
Bangladesh Forest Research Institute (BFRI), Sholashahar, Chittagong www.bfri.gov.bd	Environment Forests and climate change	Forestry and agroforestry research
Bangladesh Tea Research Institute (BTRI), Srimangal, Moulvibazar www.btri.gov.bd	Commerce	Applied and adaptive research on tea
Bangladesh Sericulture Research and Training Institute (BSRTI), Baliapukur, Rajshahi www.bsrti.gov.bd	Textile and Jute	Research and training on sericulture

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Foreword

I am gratified to learn that BARC Annual Report 2019-2020 is peeping to be appeared. This report reflects as usual the annual activities as accomplished during the reporting period. The Bangladesh Agricultural Research Council (BARC) executes and implements its annual activities through its seven divisions, seven units and one center.

The annual reveals that each of the divisions units and the center has done completely a lot of scheduled and unscheduled works within time frame. Upon consideration of facilitating research improvement and of serving time-need, several development project proposals have been submitted to the Ministry of Agriculture. Further, two special funded projects are under preparation by the Planning and Evaluation Division of BARC. Besides, BARC with NARS institutes and agricultural universities has been implementing a good number of cordinated programs funded by NAPT-2.

Agriculture with its allied sectors is unquestionably the largest livelihood provider in Bangladesh. It also contributes a significant share to the country GDP in achieving SDGs to end all forms of hunger and malnutrition by 2030, we must think about poverty reduction, food security, soil conservation, sustainable natural resource management and biodiversity conversation. With this view, some activities are under way of which a project on "Seaweed Cultivation in Coastal Areas" is under implementation which shows promising results in identifying medicinal, nutritionally rich and commercially viable species of sea weeds. Thrust on biotechnological interventions to develop varieties and Production technologies suitable to address biotic and abiotic stress has received higher priority nationally and institutionally.

Improvement of crops through conventional methods, and to fit the developed varieties under varied environment has been a challenge and will remain so in future. Therefore, various programs on adaptive trials of different production technologies and varieties of crops are under implementation and expasion. Maximization and intensification of land utilization is another focused area with cropping pattern improvement and soil health management. Nutrition improvement of consumers through plant and animal origin food is another challenging area to be focused. Cost effective livestock production for increased supply of animal origin food and for productivity improvement of animals are our targets. I am glad that EC, BARC is Chief Operating Officer, GIFS, Canada signed Memorandum of Understanding (MoU) between BARC, Ministry of Agriculture, Bangladesh and GIFS, University of Saskatchewan, Canada for establishing Bnagabandhu Chair as we are celebrating Birth Centennial of Father of the Nation Bnagabandhu Sheikh Mujibur Rahman. I appreciate that Soil Unit has taken two important projects on 'Determination of Critical Limit of Nutrients for Soils and Crops' and 'Improvement of Soil Health and Crop Productivity in Climate Vulnerable and Polluted Areas Through Organic Amendments' with the broader objectives of determination of critical limit of different nutrients for cereal, vegetables and oilseed crops and Development of climate smart technology packages for major crops and cropping patterns in Bangladesh.

However, the report has narrated the success of all the activities that BARC have successfully accomplished. Every division, unit, and the center has done quite appreciating jobs during 2019-2020. The scientists, officers, and staffs have worked in innovative, collaborative and inclusive way to make the annual report impressive. I congratulate and thank them for their whole-hearted cooperation and activities during the reporting period. As this Annual Report reflects the spirit of continuous innovation, I believe, it will pave more ways for new strategies in the coming year. Finally, I thank those associated with compiling, editing, and printing the annual report.

I believe the annual report 2019-2020 will provide useful information to the diverse stakeholders and prove to be a helpful compilation for planning future research programmers for national agricultural research system in Bangladesh.

(Dr. S. M. Bokhtiar)
Executive Chairman

Executive Summary

The Annual Report 2019-2020 provides an overview of huge activities of Bangladesh Agricultural Research Council associated with its governance, management and development of research programmes accomplished by the National Agricultural Research System. The highlights of research proposals and research progress during 2019-2020 have been focused in this report.

The present report covers a few new issues. The 4th Governing Body (GB) meeting held on 14 November 2019 approves the minutes and the progress of implemention of the decisions taken in the 3rd meeting. Moreover, three EC meetings were held in October, December 2019 and March 2020. Research attainment by BARI, BLRI, SRDI, BFRI, and CDB during 2017-2018, research progress in 2018-19, research proposal and budget for 2019-20 and approval of the project titled: PBRG of PIU-BARC was formally presented in the EC meetings. The meetings ratified the recommendations of BARC Recruitment and Promotion Committee. Provision of Retirement Allowance and Retirement Benefit (Gratuity) for the BARC employeesas as per government rules was also approved. One audit objection raised in 2018-19 has formally been settled during the reporting time.

The proposal for fund releasing from the government as per approved annual budget allocation was make on quarterly basis. BARC received Tk. 2860.00 lakh for staff salary and allowances, supply and services, technology transfer, manpower development and capital fund in 2019-2020. According to the budget plan, necessary funds were released to the agricultural research institutes and other associated organizations to implement the activities like technology transfer and manpower development etc. Planning and Evaluation Division monitored special funded projects of NARS institutes and CRG-PBRG sub-projects under PIU NATP-2 and BARC timely and properly. BARC is committed in accelerating agricultural research through launching path way programmes. Two Development Project Proposals titled "Strengthening of Research and Development of Bangladesh Agricultural Research Council" and "Research and Development of Seaweed Cultivation in Coastal Areas of Bangladesh" have been submitted to the Ministry of Agriculture (MoA). "Capacity Building for Conducting Adaptive Trials on Seaweed Cultivation in Coastal Areas" project funded by Krishi Gobeshona Foundation (KGF) from 01 January 2016 to 30 September 2019 was also completed successfully. Under the project, seaweeds were successfully cultivated in "Land-based" (Nursery) and "Open-seawaters" using "One-step" (a portion of the seaweed that is attached to ropes) and "Multi-step" (producing spores) "seeds" attached to synthetic floating ropes.Two PBRG subprojects titled "Groundwater resources management for sustainable crop production in northwest hydrological region of Bangladesh" and "Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh (ID-001)" were updated in collaboration of BARC scientists and experts.

Programme Based Research Grant Project titled "Collection, Conservation and Characterization of Important Plant Genetic Resources" funded by NATP Programme-2, PIU, BARC is being coordinated by Crops Division, with eight components, namely, BARI, BRRI, BINA, BJRI, BSRI, BSRTI, CDB and BAU, was materialized. The division organized a discussion meeting on 'Locust Outbreak Management' on 04 June 2020 to create awareness locust management among stakeholders.Two papers on 'Global Desert Locust Situation with Special Emphasis to Southeast Asia including Bangladesh' and'Insect-Pest Problem at Teknaf, Cox's Bazar', were presented in the meeting. The meeting recommended for formatting a 'National Task Force' to tackle the possible invasion of the locust.

Innovation of new farming technology is the obligation of BARC. Computer and GIS Unit organized training on "Free and Open Source Software for Agro-Geoinformatics (FOSS4AG)" at Computer lab of BARC on 12-13 February 2020. Participants from BARC, BARI, BRRI, SRDI, DAE, BWDB attended the program. Fruitful delivery on free and open software was rendered by the resource speaker, Aniruddho Davis from University of California, USA. It also organized an workshop at BINA, Mymensingh on 26 February 2020. BINA scientists, extension officials both from Mymensin Kishoreganj

region and a few teachers from the department of Soil Science at BAU attended the program. Some activities like contamination and adulteration of food and food products, process, chain and mollification, value addition and standardization of nutritional level in selected food items to mitigate malnutrition, food-based initiative for improving household food security, income generation and value addition and standardization of nutritional level in selected food items from poultry origin etc. were performed by Nutrition Unit, BARC. Besides, the unit organized different training programmes to create awareness building on nutrition knowledge, promote nutrition rich agricultural crops production and means to increase knowledge on nutrition through capacity building.

The annual report recognized some priority areas of different divisions which have been identified as important during the reporting period. A number of projects such as sustainable fisheries development for Haor and Beel community through improved management approach, improvement of existing fattening technology of carp and high value small indigenous species (SIS) through good aquaculture practices (GAP) in different agro-ecosystems etc. have been developed under the Fisheries Division. The Livestock Division is committed to improve nutrition status of general mass through different activities. It is also engaged in supporting national avian influenza/bird flue prevention.

AERS During organized a training programme titled "Applications of Econometrics in Agricultural Research" during 10-14 March 2019 at BARC with of twenty scientists (Agricultural Economist) of NARS Institutes. Agricultural Information Centre, BARC organized a 5-day training program on Technical Report Writing and Editing during 8-12, 2020. The main objective of the training program was to make the NARS scientists and officers skilled in scientific and modern techniques of technical report writing and journal paper editing and make themselves involved in publication efforts.

HIGHLIGHTS OF RESEARCH AND DEVELOPMENT
CROPS DIVISION

Research Program Development of NARS institutes

- Provided technical support through arranging research progress review 2018-19 and program planning 2019-20 workshop on (i) Crop Improvement, (ii) Crop Production, (iii) Disease Management, (iv) Insect Management and (v) Biotechnological research program based on `National Agriculture Policy 2018 and SDG's towards climate resilient technology development.
- Member Director (Crops) participated different programs as Session Chair and Expert Member in the Internal Review of BARI and BRRI and offered technical directions.
- Chief Scientific Officer participated in different research program of BSRI, BARI and BTRI as a representative of BARC and provided technical suggestions.

Monitoring and Evaluation of Research Projects

a. Scientists of Crops Division monitored activities of PGR Sub-project implemented by seven NARS institutes and BAU.
b. Scientists of crops division reviewed half-yearly reports and annual reports of PBRG Sub-Projects implemented by different organizations.
c. Under NATP Phase-II, Crops division recruited, 05 Scientific Officer, 03 Scientific Assistant, 2 Computer Operator, 1 Accountant, 2 Lab technician and 3 Field assistant during last financial year (2019-20) under different PBRG sub projects.

Regional and International Collaboration & Cooperation

a) Eighth Session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture

Dr. Md. Abdus Salam, Chief Scientific Officer (Crops), Bangladesh Agricultural Research Council and National Focal Point (NFP) of ITPGRFA, Bangladesh attended the eighth session of the Governing Body (GB) of the International Treaty on Plant Genetic Resources for Food and Agriculture held in Rome, Italy on 11-16 November 2019.

Dr. Md. Abdus Salam, CSO (Crops) and National Focal Point of ITPGRFA made following statements on Agenda 5. 'Report of the Chairperson of the Governing Body' (IT/GB-8/19/5) on behalf of Asia Region.

Fig.1: **Eighth Session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture**

- The International Treaty on Plant genetic Resources for Food and Agriculture (ITPGRFA) is one of the key internationally agreed instruments governing conservation and sustainable use of agricultural crops, and sharing benefits that arise from their use to ensure global sustainable food security.
- Asia welcomes the opportunity to address the report of the Chairperson of the GB of ITPGRFA. First of all, Asia would like to thank the Chairperson to organize the important and timely gathering of the 8th Session.
- Asia would also like to thank Ms. Christine Dawson for her excellent work in her term as a Chairperson of the GB.
- We are pleased that under your guidance we celebrate the 15th Anniversary of the entry into force of the International Treaty, and that we have a structured Multi-Year Program of Work (MYPOW), which includes consideration of issues such as 'digital sequence information' for this session.
- We appreciate the approval of 20 projects under the Benefit-sharing Fund (BSF) for this biennium, and acknowledge the initiative on outlining a capacity development strategy for the International Treaty.

- We believe the discussion on procedures for the appointment and renewal of the Secretary of the International Treaty on Plant Genetic resources for Food and Agriculture is timely, and due for finalization.
- Asia also recognizes the importance of continued partnership and collaboration with the Commission on Genetic Resources for Food and Agriculture (CGRFA), Convention on Biological Diversity (CBD), Svalbard Global Seed Vault and the Global Crop Diversity Trust.
- Our region recognizes that "the treaty is facing a turning point," and we are willing to seriously help overcome the situation. Finally, Asia applauds the extensive work carried out by the Chairperson over the biennium and would like to commend her efforts and achievements.

b) Linkage with International Organizations and Development Partners in Bangladesh (MoU's implementation)

Drafted Memorandum of Understanding (MoU) on Agricultural Cooperation between:
- Bangladesh and Indonesia and sent to Ministry of Agriculture
- Ministry of Agriculture, the People's Republic of Bangladesh and the Ministry of Agriculture, Forestry and Fisheries, Government of the Japan and sent to Ministry of Agriculture
- Bangladesh and Afghanistan on Agricultural Cooperation and sent to Ministry of Agriculture
- Bangladesh and Tanzania on Agricultural Cooperation and sent to Ministry of Agriculture

Drafted and Revised MoU on Agricultural Cooperation:
- Bangladesh and CIRDAP on Agricultural Cooperation, later on revised based on the comments and suggestion of Ministry of Foreign Affairs and Legislative and Parliamentary Affairs Division, Ministry of Law, Justice and Parliamentary Affairs and sent to and sent to Ministry of Agriculture
- Bangladesh and Philippines on Agricultural Cooperation, later on revised based on the comments and suggestion of Ministry of Foreign Affairs and Economic Relation Division and sent to Ministry of Agriculture
- Bangladesh and Argentina on Agricultural Cooperation, later on revised based on the comments and suggestion of Ministry of Foreign Affairs and sent to Ministry of Agriculture
- Bangladesh and Oman on Agricultural Cooperation, later on revised based on the comments and suggestion of Ministry of Foreign Affairs and sent to Ministry of Agriculture

Joint Working Group (JWG) Committee:
- Bangladesh and Bhutan
- Bangladesh and Brunei

Arranged training under the signed MoU:
- Training Program arranged at BARI for Sri Lanka Council for Agricultural Research Policy (SLCARP) scientist under the signed MoU between BARC and SLCARP.

Comments provided on Memorandum of Understanding (MoU):
- Comments on draft MoU between BARI and CIMMYT
- Comments on draft MoU between BARC and CIRDAP

AFACI Projects

i) Selection and Dissemination of Elite Salinity Tolerant Rice Varieties of AFACI Member Countries-Salt Tolerant Rice Program:

BARC is implementing an AFACI funded project titled 'Selection and Dissemination of Elite Salinity Tolerant Rice Varieties of AFACI Member Countries' from June 2019 to July 2021. The "AFACI Program Workshop on Horticulture, Extension and Food Crops" held at Phnom Penh, Cambodia during 2-6 September 2019. Dr. Md. Harun-ur-Rashid, PI of the AFACI funded project titled 'Selection and Dissemination of Elite Salinity Tolerant Rice Varieties' of AFACI member countries attended the workshop.

The workshop objective is to create high-impact results on rice and horticultural crops among member countries; assess the project progress; and to discuss the plans of year. He presented the country report and actively participated in discussion of future planning of the project. Bangladesh is intended to select elite advance lines of salt tolerant rice that can tolerate more than 8 dS/m at critical stages. BARC in collaboration with Bangladesh Rice Research Institute and Bangladesh Institute of Nuclear Agriculture has been implementing the project in the saline area of Satkhira.

Fig.2: Participants of AFACI Salt Tolerant Rice Project, Phnom Penh, Cambodia, 2019

ii) "AFACI Program Workshop on Horticulture, Extension of Food Crops and Good Agricultural Practices (GAP) Program

BARC implemented an AFACI funded project titled 'Development of Locally Appropriate GAP Programs and Agricultural Produce Safety Information System of selected crops in Bangladesh' during 2016-18 as second phase. Dr. Shah Md. Monir Hossain, Principal Scientific Officer, Crops Division, BARC participated the 'AFACI Program Workshop on Horticulture, Extension and Food Crops (GAP Program)' held in Phnom Penh, Cambodia during 02-06 September 2019. The objective of the workshop was to create high-impact results on Good Agricultural Practices (GAP) among AFACI member countries, assess the progress of the projects and to review Project Completion Report. Principal Investigator (PI) and representative of the AFACI-GAP project from thirteen member countries viz., Bangladesh, Bhutan, Cambodia, Indonesia, Lao PDR, Mongolia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam and Korea attended the workshop and presented their final report. Dr. Shah Md. Monir Hossain presented final country report on 'Development of Locally Appropriate GAP Programs and Agricultural Produce Safety Information System of Selected Crops (brinjal, bitter gourd, banana and guava) in Bangladesh'.

Fig.3: Participants of AFACI Program Workshop on Horticulture, Extension and Food Crops (GAP Program), Phnom Penh, Cambodia, 2019

iii) "AFACI Program Workshop on Horticulture, Extension and Food Crops"
-Post-harvest Technology program

AFACI funded project entitled "Establishment of Network and Model Manual on Post-harvest Technology of Horticultural Crops in Bangladesh" was implemented by Bangladesh Agricultural Research Council (BARC) in collaboration with Bangladesh Agricultural Research Institute (BARI) during January 2016 to December 2018 as second Phase. Dr. Md. Abdus Salam, Chief Scientific Officer (Crops), BARC and Co-principal Investigator of the project participated in the "AFACI Program Workshop on Horticulture, Extension and Food Crops" held on September 2-6, 2019, in Phnom Penh, Cambodia. The objective of the program workshop is to create high-impact results on Horticulture Program among AFACI member, countries; assess the progress of the projects and reviw Project Completion Report. Participants of 14 member countries including Bangladesh, Cambodia, Lao PDR, Indonesia, Kyrgyzstan, Mongolia, Nepal, Philippines, Sri Lanka, Thailand, Vietnam, Korea, Bhutan and Myanmar attended the workshop. Dr. Md. Abdus Salam presented country report on "Establishment of Network and Model Manual on Post-harvest Technology of Horticultural Crops in Bangladesh". The outcome of the project was that trained farmers followed improved postharvest handling technologies, which resulted postharvest losses down from 28.12 to 12.68%, and farmer's income increased USD 339 per season, ultimately the livelihood of trained farmer's improved.

Fig.4: Group photograph of the participants of AFACI Program Workshop on Horticulture, Extension and Food Crops" Phnom Penh, Cambodia, 2019

Study Tour

i) Study Tour to Vietnam on Improved post-harvest handling and processing techniques for value addition of cashew nuts and coffee:

Six members of Bangladesh team comprising representatives from coffee and cashew farmers' of Lama and Ruma, Bandarban Hill District, officials from Ministry of Agriculture, Bandarban Hill District Council and Bangladesh Agricultural Research Council visited Vietnam during 29 September to 12 October 2019 to know 'Improved post-harvest handling and processing techniques for value addition of cashew nuts and coffee'. The team collected information through discussion meetings with officials and visited different organizations, fields and processing centre. The team members learnt about best practices of production, processing and marketing of cashew nuts and coffee. The team also acquired knowledge on the policy frameworks for processing and marketing of coffee and cashewnut and the support system therein to encourage farmers and processors. The study tour was organized by FAO Dhaka, Bangladesh in collaboration with FAO Vietnam and Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD), Vietnam. On behalf of the team, Dr. Shah Md. Monir Hossain, Principal Scientific Officer, Crops Division, BARC prepared a report and submitted to Ministry of Agriculture.

Fig.5: Study tour team visited different organization in Vietnam

Research Project Development & Evaluation

a) DPP and PBRG project Concept note evaluation

- DPP Evaluation: "Development of hybrid rice, research modernization and dissemination" Project submitted by Bangladesh Rice Research Institute was evaluated.
- Technical committee of Crops division, BARC evaluated two PBRG sub-projects.

b) Coordination of 'Collection, Conservation and Characterization of Important Plant Genetic Resources' under PIU-BARC, NATP-II

PIU-BARC, NATP-2 funded PBRG project titled 'Collection, Conservation and Characterization of Important Plant Genetic Resources' coordinated by Crops Division, with eight components viz., BARI, BRRI, BINA, BJRI, BSRI, BSRTI, CDB and BAU is under implementation from Feb. 2018- June 2021.

Achievement of Major activities performed by the implementing organizations:

Organization	GP Collection		GP Conservation		Morphological Characterization		Molecular Characterization	
	Target	Achievement	Target	Achievement	Target	Achievement	Target	Achievement
BARI	600	450	600	450	250	501	76	23
BRRI	300	241	300	241	300	216	300	216
BJRI	90	35	90	35	90	97	60	2
BSRI	50	41	50	41	50	50	40	-
BINA	198	158	198	158	98	41	53	20
CDB	-	-	-	-	360	360	-	-
BSRTI	-	-	-	-	60	45	-	-
BAU	30	30	120	125	120	130	90	95
Total	**1268**	**955**	**1358**	**1050**	**1328**	**1440**	**619**	**376**

GP: Germplasm

c) Coordination of 'Capacity Building for Conducting Adaptive Trials on Seaweed Cultivation in Coastal Areas' project

A coordinated project titled 'Capacity Building for Conducting Adaptive Trials on the Seaweed Cultivation in Coastal Areas' implemented by BARC and BARI during 01 January 2016 to 30 September 2019 with objectives, a) mapping/situation analysis of seaweed farming along Teknaf/ Cox's Bazar coasts; b) screening for potential species for farming in land-based 'nursery' and in open-sea; c) feasibility of commercially important seaweed production year-round, including biology study d) processing and determining nutritional and food values, industrial use and production of bio-fertilizer and e) capacity building of researchers, extension personnel and local farmers. The study revealed that Teknaf/ Cox's Bazar coast is a suitable natural seaweed habitats which should be 5 km away from any river estuary and *G. tenuistipitata var. liui* could be grown from October to April (seven months). The monsoon period is not suitable for seaweed cultivation as salinity level goes below 20% with increased turbidity above 40 Nephelometric Turbidity unit (NTU). Seeding and transplanting in open-seawater must be completed three days after full moon and harvesting three days before next full moon to avoid risk of being washed away by high tides and waves. The seaweed residue after decomposition may be used as bio-fertilizer for increasing organic matter content of soil. Two seaweed namely *Hypnea sp. and Gracilaria tenuistipitata* out of eight test species were identified for open sea cultivation. The Project Completion Report (PCR) was submitted to funding organization, Krishi Gobeshona Foundation.

Fig.6: Project Area and Project Completion Report

d) Coordination of 'Development of Upazila Land Suitability Assessment and Crop Zoning System of Bangladesh' project

Member Director (Crops), coordinated a project titled 'Development of Upazila Land Suitability Assessment and Crop Zoning System of Bangladesh' implemented 19 June 2017 to 18 June 2021 with financial support of KGF. The study is aimed to be conducted 300 upazilas.

The main purpose of this study is to develop an application system using Geographic Information System (GIS) based technology with a view to delivering location based information on suitable crops and cropping patterns ensuring sustainable use of scarce land and water resources. In the meanwhile, the application system named Crop Zoning Interactive Information System (CZIIS) has been developed. The CZIIS software developed for crop suitability assessment and zoning assist in identifying land capable of producing high agricultural output and for expansion of areas with a range of nominated crops. An Mobile app's has also been developed and integrated into the CZIIS for dissemination of land parcel based information on suitable crop/cropping pattern to the farmers that gives an option to choose crop to grow. In addition, crop specific fertilizer recommendation is also provided to the farmers through mobile apps. Thus, it would ensure cultivation of suitable crop alongwith recommended fertilizer, thereby, increased crop yield and maximize farmers' income.

The fertilizer recommendation provided to the farmers on crop/crop variety is determined based on soil fertility status data of Upazila Nirdeshika. Considering its importance in crop production system, an initiative had been taken for validating the effectiveness of crop specific fertilizer recommendation through demonstration trial on Boro rice in 2019. The demonstration trials were conducted by BARI, BRRI, BINA and SRDI in farmer's field at 4 locations under different agro-ecological zones (AEZ). The objective of the trial was to observe the effects of fertilizer on Boro rice yield under three different treatments which were (i) fertilizer application based on soil fertility status of Upazila Nirdeshika (followed in crop zoning study), (ii) AEZ based fertilizer application as stated in Fertilizer Recommendation Guide-2018 and (iii) Farmers' practice.

The results of the demonstration trials showed higher yield in case of fertilizer recommendation based on soil fertility status of Upazila Nirdeshika (followed in crop zoning study). The yield difference ranged from 100 to 1000 kg/ha compared to FRG-2018 recommendation based on AEZ. In case of fertilizer recommendation based on soil fertility status, the average yield of four locations is 6.61 t/ha whereas the national average yield of Boro is 4.03 t/ha during 2017-18 (BBS, 2019).The output of the demonstration trial clearly indicates that if fertilizer recommendation based on soil fertility status is followed, the yield gap could be minimized to a greater extent.

At present, crop suitability information of 80 upazilas out of 300 have been available in CZIIS software which can be accessed online through web address http://geo.iwmbd.com:4000/. However, a Mobile Apps named 'Khamari' has been developed for dissemination of land parcel based information on suitable crops and fertilizer recommendations. The Mobile Apps can be downloaded from Google Play Store.

It is expected that the project output would be highly supportive for agricultural land use planning and sustainable use of agricultural land resources taking into consideration suitable crop and balanced fertilizer use. As a result, the crop productivity would be increased, thereby, meeting food demand of growing population.

Preparation of Policy Documents and providing inputs
A vavied policy documents, comments and imputs are either drafted or provided as per desire of MoA as follows:

Policy Documents

১। বীজ আলুর টিস্যুকালচার ল্যাবরেটরি স্থাপন, মূল্যায়ন এবং নিবন্ধন নির্দেশিকা-২০১৯ (গেজেট প্রকাশ: ১১ ডিসেম্বর ২০১৯)

২। বাংলাদেশ কৃষি জিনোমিক্স ইনস্টিটিউট আইন-২০১৯ (খসড়া) প্রণয়ন ও কৃষি মন্ত্রণালয়ে প্রেরণ

৩। বাংলায় গেজেটকৃত উদ্ভিদের জাত সংরক্ষণ আইন, ২০১৯ ইংরেজিতে প্রণয়ন/অনুবাদ করে Plant Variety Protection Act -২০১৯ কৃষি মন্ত্রণালয়ে প্রেরণ

৪। উত্তম কৃষি চর্চা নীতিমালা-২০২০ (খসড়া) প্রণয়ন ও কৃষি মন্ত্রণালয়ে প্রেরণ

৫। বাংলাদেশ উদ্ভিদ কৌলিসম্পদ ইনস্টিটিউট আইন-২০২০ (খসড়া) প্রণয়ন কমিটির মতামতের আলোকে প্রণীত চূড়ান্ত প্রতিবেদন কৃষি মন্ত্রণালয়ে প্রেরণ

Report

- Report and PPT presentation for Bangladesh development Forum (BDF).
- Composed 'Recommendation on efforts required for promotion of agriculture commodity by Hortex Foundation.
- Country Report Establishment of network and Model Manual on Post-harvest Technology of Horticultural Crops in Asia.
- Report of National Technical Committee on Crop Biotechnology Core Committee meeting (NTCCB) on Bt Cotton.
- Monthly progress report following directives of Honourable Prime Minister and sent to P&E Division, BARC

Comments on policy documents

- AIS and CABI plant wise partnership and sent to MoA.
- "National Biotechnology Policy and workplan-2019" and sent to the MoST.

Inputs for Hon'ble President / Prime Minister's Visit to different states:

- The visit of the Honourable President of Bangladesh to the Kingdom of Nepal
- The visit of the Honourable Prime Minister's of Bangladesh to Japan
- The visit of the Honourable Prime Minister's of Bangladesh to India
- The visit of the Honourable Prime Minister's of Bangladesh to UAE
- 10th D-8 Dhaka summit to be held in 2020

Inputs for Hon'ble Agriculture Minister meeting with counterparts delegates:

- Agriculture Minister, Saskatchewan, Canada
- Investment Advisor to the Prime Minister of Lebanon
- Chief Minister, Meghalaya, India
- Foreign Minister, Nepal
- Delegates from the Australia
- Delegates from the USA (USAID)
- Delegates from the Russia
- Delegates from the Argentina
- Delegates from the China
- Delegates from the Chile
- Delegates from the Qatar
- Delegates from Nigeria

Inputs for Ministry of Agriculture

- 2nd Bangladesh-Finland Bilateral Consultations on Agriculture
- 4th Foreign Office Consultation of Bangladesh with Belarus
- 1st Foreign Office Consultation between Bangladesh and Ethiopia
- Updating Bangladesh & China Bilateral relations in Agriculture
- Bangladesh and South Korea bilateral relations in agriculture
- Implementation progress of Bangladesh-Russia protocol
- GM trail/Transgenic research in Bangladesh.
- Comments of Bangladesh Agricultural Research Council on Import of GMO Product
- Comments on South-South East Asian Diagnostic Network (SSEADN) for Ensuring Biosecurity and Biosafety

Workshop/Meeting/Seminar

a) Review workshop on Crop Improvement Program of NARS Institutes: Research Progress 2018-19 & Research Program 2019-20

Review workshop on "Crop Improvement Program of NARS institutes: Research Progress 2018-19 and Research Program 2019-20 was held at BARC during 22-23 September, 2019. Dr. Md. Kabir Ikramul Haque, Executive Chairman of BARC was present as Chief Guest and Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC chaired the inaugural session. Dr. Md. Abdus Salam, Chief Scientific Officer (Crops), welcomed and briefed the recommendation of review workshop 2018. Respective scientists of seven NARS institutes presented their research progress (2018-19) and research program (2019-20) on crop improvement.

Fig.7: Inaugural Session of the Review Workshop on Crop Improvement Program of NARS Institutes

Finally, some general as well as institute-wise recommendations were compiled following comments and suggestions from experts and forwarded to respective institute for implementation.

b) Review workshop on Crop Production Program of NARS Institutes: Research Progress 2018-19 & Research Program 2019-20

Review workshop on 'Crop Production program of NARS Institutes: Research Progress 2018-19 and Research Program 2019-20' was held at BARC during 24-25 September, 2019. The objective of the workshop was to review the progress 2018-19 and research program 2019-20 of nine NARS Institutes to avoid duplication of research and in alliance with different vision documents and priority research. Scientists and academia of the relevant fields of Research Institutes and Agricultural Universities were present as expert members in the workshop. The inaugural session was chaired by Dr. Md. Aziz Zilani Chowdhury, Member-Director, (Crops) and Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC was the chief guest. Dr. Md. Harunur Rashid, Principal Scientific Officer (Crops), BARC welcomed the participants. He briefed the formats of reporting and power point presentation provided to the focal point of the participating institutes. The chief guest emphasized that the crop production research should be aligned with different vision documents. He also advised to become ready with the technology to cope with the probable trade threat due to becoming a middle-income country. The Session Chair, Dr. Md. Aziz Zilani Chowdhury stressed for the research to cope up with negative impacts of climate change. There were five technical sessions in the workshop which were chaired by Dr. Md. Rafiqul Islam Mondal, former DG,

Fig.8: Inaugural Session of the Review Workshop on Crop Production Program of NARS Institutes

BARI, Professor Dr. Abdul Hamid, Former Professor, Department of Agronomy, BSMRAU, Dr. Md. Abdur Razzaque, former Executive Chairman, BARC, Dr. Md. Aziz Zilani Chowdhury, Member Director, (Crops) and Professor Dr. Md. Abdus Siddique, former Professor, Department of Horticulture, BAU. The concluding session was chaired by Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC. Following threbare discusicon, some recommendations were made and sent to the participating institutes for integration.

c) Review workshop on Biotechnology Program of NARS Institutes: Research Progress 2018-19 & Research Program 2019-20

Fig.9: Inaugural Session of the Review Workshop on Biotechnology Program of NARS Institutes on 26 September 2019

Review workshop on "Annual Review Workshop on Biotechnology Research of NARS Institutes, Universities and Private Sector" was held for second time at BARC on 26 September, 2019. The Executive Chairman of BARC, Dr. Md. Kabir Ikramul Haque graced the occasion as the chief guest Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), chaired the inaugural session. Dr. Md. Harunur Rashid, Principal Scientific Officer (Crops), BARC welcomed the participants and discussed the formats for reporting and presenting the annual research progress and program. The chief guest emphasized technology development for stress environment using biotechnology and nanotechnology. The Session Chair, Dr. Md. Aziz Zilani Chowdhury stressed on capacity development of respective NARS scientists, strengthening cooperation and integration among NARS institutes, agricultural universities and private sector.

There were three technical sessions where scientists of NARS institutes viz., BRRI, BARI, BINA, BJRI, BSRI, BSRTI and CDB, faculty members of Bangladesh Agricultural University and Institute of Biotechnology and Genetic Engineering, Bangabandhu Sheikh Muzibur Rahman Agricultural University and scientists of ACI Limited participated the workshop. Professor Dr. Rakh Hari Sarkar, Department of Botany, Dhaka University; Dr. Md. Amzad Hossain, Director General, BSRI and Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops) chaired the Technical Session I, II and III respectively. Professor Dr. Rakha Hari Sarkar, Department of Botany, DU; Dr. M. Amzad Hossain, DG, BSRI; Professor Dr. Md. Shahidul Haque, Department of Biotechnology BAU, Professor Dr. Fahmida Khatun, Department of Biotechnology, BAU and Dr. Md. Shamsher Ali, former DG, BINA were present as expert members. The suggestions provided by the expert member were sent to NARS institutes for further improvement of peseach programs.

d) Review workshop on Insect Management Program of NARS Institutes: Research Progress 2018-19 & Research Program 2019-20

Fig.10: Inaugural Session of the Review Workshop on Insect Management Program of NARS Institutes

Review Workshop on Insect Management Program of NARS Institutes: Research Progress 2018-19 andResearch Program 2019-20 was held on 30 September 2019 at BARC conference room. The workshop was aimed to avoid duplication of program among NARS institutes, develop programs based on the national priority and to bring into notice of NARS scientists of current research activities through a participatory discussion. Dr. Md. Kabir Ikramul Haque, Executive Chairman of BARC was present as Chief Guest. The inaugural session of the workshop was chaired by Dr. Md. Aziz Zilani Chowdhury, Member Director, Crops Division, BARC. In the inaugural session Dr. Md. Abdus Salam, Chief Scientific Officer (Crops), held in

2018welcomed and briefed recommendation of 2018 workshop. Three attending expert members put forward their opinions on research programs based on current perspectives. Proceedings prepared based on the comments and opinion forwarded to the respective institutes for necessary actions.

e) Review workshop on Disease Management Program of NARS Institutes: Research Progress 2018-19 and Research Program 2019-20

Review Workshop on Disease Management Program of NARS institutes for Research Progress 2018-19 and Research Program 2019-20 was held on 29 September 2019 at Conference Room-l of Bangladesh Agricultural Research Council (BARC). The workshop aimed to avoid duplication of programs among NARS institutes and to develop programs based on the national priority. The inaugural session of the workshop was chaired by Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC. In the inaugural session Dr. Md. Abdus Salam, Chief Scientific Officer (Crops), BARC welcomed and briefed the last year's recommendation of the workshop. Scientists of NARS institutes viz., BARI, BRRI, BJRI, BSRI, BINA, BWMRI, CDB and BSRTI presented their research progress (2018-19) and research programs (2019-20) on disease management of different crops. After threadbare discussion, the expert opinions/recommendations were made where disease surveillance and monitoring was highlighted due to resurgence and emergence of new diseases in respect of climate change. The recommendations as proceeding of the review workshop was forwarded to respective institutes for improvement of research programs.

Fig.11: Inaugural Session of the Review Workshop on Disease Management Program of NARS Institutes

f) Workshop on Biotechnology Research based on Biotechnology Policy 2012

The Progress Review Workshop (8th) on Biotechnology Research based on the Biotechnology Policy 2012 was held at BARC on 22 December 2019 funded by PIU-BARC, NATP-2. Under the guidance of the Plant Biotechnology Technical Committee, the crop-related NARS institutes, agricultural universities and private sector have prepared a short (2017-19), mid (2017-22) and long term (2017-2027) biotechnology research plan based on Biotechnology Policy 2012. The research areas of the time-bound plan are-i) Developing standard of tissue culture/micropropagation method for prompt production of high quality and disease-free seed/sapling of important plants crops, bamboo and timber, ii) Selection/ reproduction of very important crops (paddy, wheat, pulse, oilseed, etc.) by marker for specific use, iii) Developing nutritional value of crops; producing transgenic plants which are resistant to insects and diseases, abiotic stress-tolerant and harmonious to climate change, iv) Identification, differentiation and determination of characteristics of necessary genes in order to develop variety of plants by transferring genes, v) Determination and conservation of molecular characteristics of plant (including medicinal plants) genetic resources and necessary microorganisms in agriculture sector, vi) Revealing genome of important crops and forest plants for specific use, vii) Introduction, evaluation and testing of transgenic crops and viii) Molecular diagonestic of plant diseases Dr. Md. Kabir Ikramul Haque, the Executive Chairman of BARC and the Convener of the Plant Biotechnology Technical Committee was present as the Chief Guest. The inaugural session of the workshop was chaired by Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC. Dr. Mian Sayeed Hassan, Director, PIU-BARC, NATP-2 was present as a special guest. The technical sessions were chaired by Dr. Md. Aziz Zilani Chowdhury, Member Director, Crops Division BARC and Professor Dr. Rakha Hari Sarker, Department of Botany, University of Dhaka. The achievements of the short-term programme of the related organizations and the lessons learned during the implementation of the activities were discussed. The progress of mid term and the long term activities were highlighted in the workshop. The workshop was coordinated by Dr. Md. Harunur Rashid, Chief Scientific Officer (CC), Crops Division.

Fig.12: Inaugural Session of the Review Workshop Biotechnology Research Based on Biotechnology Policy 2012 on 22 December 2019

Recommendations of the workshop

- A good number of modern TC laboratories should be established at both public and private level for commercial production of quality TC-based planting materials of high value crops.
- Applied and basic research should be conducted on callus, embryo, pollen, protoplast, somaclonal variation and cryopreservation to develop stress tolerant high value crop varieties by the Universities and NARS Institutes.
- Adequate business-friendly government policies are to be formed for developing marketing facilities of TC derived planting materials.
- Linkages among public, private, food industries and NGOs' are to be strengthened for clean plantlet production, safe food processing, and distribution & marketing of TC-derived planting materials.
- Horticultural extension personnel, progressive workers and women are to be trained in modern TC techniques to promote use of quality seedlings/plantlets.
- Standard cold storages are to be established throughout the country for preservation of seed potatoes.
- Evaluation and monitoring system should be strengthened for assurance of seed quality.
- Liberal policy may be adopted towards import of potassium nitrate and ammonium nitrate for TC purposes.

g) Workshop on 'Promoting collective actions for strengthening value chain of safe and nutritious food in Bangladesh

Fig.14: Inaugural Session of Workshop on 'Promoting collective actions for strengthening alue chain of safe and nutritious food in Bangladesh on 25-26 March 2020

BARC and Bangladesh Safe Agro Food Efforts (BSAFE) Foundation jointly organized a workshop on 'Promoting collective actions for strengthening value chain of safe and nutritious food in Bangladesh during 25-26 February, 2020 at BARC sponsored by Project Implementation Unit-BARC, National Agricultural Technology Program Phase II project. The objectives of workshop were to identify strengths and weaknesses of the value chain of safe and nutritious food, discuss and outline common role of individual stakeholders and collective action to reinforce the value chain. In the inaugural session, Dr. Md Abdur Razzaque MP, Hon'ble Minister for Agriculture, Government of the People's Republic of Bangladesh was present as chief guest, while Dr. Hossain Zillur Rahman, Chairman, BRAC, Md. Mahbub Kabir, Chairman, BFSA and Dr. FH Ansarey, Managing Director and CEO, ACI Limited were present as special guests. The season was chaired by Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC. Three hundred participants from different ministries, NARS institutes, DAE, BADC, Universities, development partners and private organizations attended the workshop. The occasion put together relevant professors, researchers, representatives from industries and policy makers, private entrepreneur's, extension workers as participants and provided guidelines for the policy makers to ensure safe and nutritious food for all.

h) Discussion Meeting of National Task Force on Fall Armyworm Management

Crops Division, organized six discussion Meeting (31 July 2019, 28 August 2019, November 2019, December 2019, 27 January 2020 and 27 February 2020) at BARC, Dhaka on behalf of National Task Force on 'Fall Armyworm Management' and two zoom meeting (23 May 2020 and 24 June 2020). Dr. Md. Abdur Rouf, Additional Secretary (PPC), Ministry of agriculture was present as chief guest. Executive Chairman of BARC Dr. Md. Kabir Ikramul Haque chaired the 1st, 2nd, 3rd and 4th meeting and Dr. Shaikh Mohammad Bokhtiar chaired the 5th, 6th, 7th and 8th meeting. The objective of the workshop was to create awareness regarding insect management among stakeholders to take necessary action as required.

Fig.15: Discussion Meeting of National Task Force on Fall Armyworm Management

i) Dissuasion Meeting on "Locust Outbreak Management"

Crops Division, BARC organized a discussion meeting on 'Locust Outbreak Management' on 04 June 2020 at BARC, Dhaka. The meeting was graced by Dr. Md. Abdur Rouf, Additional Secretary (PPC), Ministry of Agriculture and Mr. Kamalaranjan Das, Additional Secretary (Research), Ministry of Agriculture as chief guest and special guest, respectively, ettended the session and Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, Bangladesh Agricultural Research Council was in the chair. Dr. Nur Ahamed Khondaker, Assistant Representative (Program), FAO-Bangladesh and Dr. Nirmal Kumar Dutta , Principal Scientific Officer, Entomology Division, Bangladesh Agricultural Research Institute presented papers on 'Global Desert Locust Situation with Special Emphasis to Southeast Asia including Bangladesh' and 'Insect-Pest Problem at Teknaf, Cox's Bazar', respectively. The objective of the workshop was to create awareness regarding management of the locust among the stakeholders. About 28 participants representing policy makers, scientists and officers from different organization attended the workshop. The meeting recommended for formation of a 'National Task Force' to tackle the possible invasion of the locust.

Fig.16: Discussion Meeting on Locust Outbreak Management' on 04 June 2020

j) Coordination Meeting on Dissemination of Elite Salinity Tolerant Rice Varieties of AFACI Member Countries

The Crops Division organized two coordination meeting for reviewing the plans and the progress of the AFACI funded Salt Tolerant Rice project. The first meeting was organized to plan the project activities and modality among the coordinating and implementing organizations. In the second coordination meeting, it was decided to continue the trial in the next Boro season in usual planting time. Inernational Rice Research Institute is pleased to supply the required volume of seed.

k) Sub Committee of Pesticide Technical Advisory Committee (Sub PTAC) Meeting

Dr. Md. Abdus Salam CSO (Crops), Dr. Md. Harunur Rashid, CSO (Crops) and Dr. Shah Md. Monir Hossain PSO (Crops), participated the Sub-PTAC Committee Meeting.

l) Meeting on national biotechnology action plan

Two meetings were conducted to finalize the time bound Biotechnology Policy-2012. The compiled action plan was forwarded to the ministry of agriculture for necessary action.

m) Meeting on establishment of Bangladesh Agricultural Genomics Institute (BAGI)
Organized two meetings for developing a draft act on establishment of BAGI 2019.

n) Tissue culture laboratory guidelines
Cops Division organized two meetings to finalize the 'Establishment of tissue culture laboratory, evaluation, and registration guidelines 2019; These were aimed to facititate quality planting materials towards production boosts up.

o) Coordination Meeting on PBRG- PGR Project
As a coordinating organization, BARC organized three coordination meetings on 21 October 2019, 03 February 2020 and 09 March 2020 to review the technical and financial progress of the PBRG-PGR (ID: 128) project.

p) National Technical Committee on Crop Biotechnology (NTCCB) Core Committee meeting
Crops Division organized three NTCCB Core Committee meetings for reviewing and evaluating the application submitted by CDB regarding Bt cotton and BARI regarding transgenic potato research following recommendation prepared for MoA.

Training

a) Training on "Global Global Plan of Action Reporting and Collection, Documentation of Plant Genetic Resources in Bangladesh"

A training on "Global Plan of Action Reporting and Collection, Documentation of Plant Genetic Resources in Bangladesh" held on 18-19 December 2019 at BARC, Farmgate, Dhaka-1215 with funding from PIU, BARC. Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops) and Dr. Md. Abdus Salam, Chief Scientific Officer (Crops) were Course Director and Coordinator, respectively. The overall objective of the training is enhancing quality and coverage of reporting on the Second Global Plan of Action (GPA) and capacity development of stakeholder on Plant Genetic Resources (PGR) management. About 40 participants from different NARS Institutes, Agricultural Universities and Private sectors attended the training.

Fig 17: Inaugural Session of the Training

Deliberations focused on:

- Reporting format for monitoring the Implementation of the Second Global Plan of Action for Plant Genetic Resources for Food And Agriculture;
- Plant Genetic Resources and its National and International Perspective;
- Exploration and Collection of PGR;
- Biodiversity for Food and Nutritional Security;
- ITPGRFA and lessons learnt from the 8th GB;
- Characterization and Evaluation of Plant Genetic Resources;
- Geographical Indications: Scope, Limitations, Benefits and Registration;
- Plant Genetic Resources: Legal Issues and
- Conservation and Utilization of Plant Genetic Resources.

b) Training on "Variety Profile of Important Crops":
Training on "Variety Profile of Important Crops" was held at BARC during 29-31 December 2019 with funding from PIU-BARC, NATP-2. The training program was coordinated by Dr. Md. Aziz Zilani Chowdhury, Member Director and Dr. Md. Harunur Rashid, CSO of Crops Divsion, respectively. Thirty-seven participants from the NARS institutes were participated in the training. There were 18 sessions in the training program. The topics of the training was 'Introduction to variety profile', 'Components and minimum data requirement of a variety profile', 'Major ecosystems for variety profile', 'Variety profile of

major crops in relation to SDGs', 'Ecosystem (favourable, drought, saline etc.) and 'Cropping pattern wise popular and potential rice varieties and the magnitude of risk associated with each variety (high, low, very low, not known)', 'Ecosystem (favourable, drought, saline etc.) and cropping pattern based popular and potential varieties of pulses, oilseeds and tuber crops and the level of risk associated each variety.

Fig.18: Training on Variety Profile of Important Crops on 29-31 December 2019

'Data capturing for constructing variety profile (growth duration, height, seed size, grain/ product quality, biotic and abiotic stress resistance/tolerance level, yield and risk associated with selected variety of rice, wheat, sugarcane, pulses, fibre crop, and their cost and return)' and 'Validation of data, Draft variety profile preparation', 'Validation of prepared draft variety profile' etc. The participants were grouped into in to five such as rice, wheat, sugarcane, pulses and fibre crops for capturing data and preparing the variety profile. The participants prepared five draft variety profile for rice, wheat, sugarcane, jute, mungbean emphasizing characters like yield, location, biotic and abiotic stresses, and were validated by the expert trainer Professor Dr. Moin-Us-Salam and finally were presented in closing session with Dr. Md. Aziz Zilani Chowdhury, the Member-Director (Crops) Division, BARC as Chairperson.

c) Participation of Crops Division Scientists as a Resource Person in different Training course

- Dr. Md. Aziz Zilani Chowdhury, MD (Crops) and Dr. Md. Harunur Rashid were resource speakers of the training on Variety Profile of Important Crop Varieties organized by Crops Division, BARC.
- Dr. Md. Harunur Rashid as a resource person spoke on 'How to publish a paper in an impact factor journal' under a the training program titled "Technical Report writing and editing for the NARS Scientists" organized by AIC, BARC

Regular/Routine Activities

Scientist of Crops division actively worked for the following committees:

- Member secretary for the Committee of Ecosystem based rice production plan.
- Expert Member for the Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources.
- Member for the Agricultural Research Award 2015 policy revision committee.
- Focal point of the Technical Committee on Agriculture and Rural Development of SAARC.
- Member for 'Committee on Feasibility Hybrid Rice Variety Development, Research Modernization and Dissemination of Released Variety'
- Member for drafting 'Bangladesh Agricultural Genomics Institute Act, 2019'
- Convener for finalize the 'Establishment of tissue culture laboratory, evaluation, and registration guidelines'.
- Member, 'The Innovation Team' of BARC
- Convener and Member Secretary, Plant Variety Protection Rules Committee-2019.
- Member, National Seed Vision Committee-2030.
- Invited member in feasibility study on project titled 'Seed development, multiplication, quality control, technology transfer through biotechnology 'of BADC.
- Invited member for feasibility study on project titled 'Establishment of Accreditation lab at BADC .
- Invited Member in formulating document titled 'Wheat Blast Learning Curricula in Agricultural Universities in Bangladesh' coordinated by CIMMYT-Bangladesh.

Following regular/routine activities are performed by the scientists of crops division:

- Preparation of technical reports, comments, inputs and talking points for Ministry of Agriculture and other Ministries
- Drafting and Commenting on MoUs and bilateral agreements with different countries, national, regional and international organizations
- Out lining peach on different national and international events (e.g. World Food Day, Vegetables Fair, Fruits Fair etc.)
- Acted as a member/member secretary in different committees formed for observing national and international days and prepared proceedings of different meetings and seminars.

Publications

i) Annual report preparation and newsletter write up

Prepared annual report (2018-19) and newsletter write up (2019-20), submitted to AIC, BARC

ii) AFACI-STR Project Completion Report

- Prepared AFACI- GAP-Bangladesh Project Final Report (2016-2018) and sent to AFACI secretariat, South Korea.
- Prepared AFACI- Post-harvest Technology -Bangladesh Project Final Report (2016-2018) and sent to AFACI Secretariat, South Korea.
- Prepared Survey report on AFACI Project Performance (AFACI GAP-Bangladesh and Post-harvest Technology- Bangladesh) and sent to AFACI Secretariat, South Korea.
- Prepared AFACI-Salt Tolerant Rice-Bangladesh Annual Report (2018-19) and sent to AFACI Secretariat, South Korea.

iii) Scientific publications

- Rashid, M.H., M.K.I, Rony, D. Mahalder, P.C. Goswami. 2019. Rice production technology adoption in Coastal Region of Bangladesh through community training. International Journal of Agricultural Sciences and Veterinary Medicine, 7(2):1-7.
- Rashid, M.H., M.K.I, Rony, D. Mahalder, P.C. Goswami. 2019. Adoption of improved production practices in lowland rice through community training. SAARC Journal of Agriculture, 17(1): 1-11.
- Molla, R., I. Ahmed., A. Hossain., S. Islam., M.A.Z. Chowdhury., D. Shabnam., and M. Rohman. 2019. Morphological characterization and Simple Sequence Repeats (SSRs) based DNA fingerprinting of selected mango (Mangifera indica L.) genotypes in Bangladesh. Journal of Horticulture and Forestry, 11(7), 104-119. DOI: 10.5897/JHF2019.0597.
- Quamruzzaman, A.K.M., M.M.R. Salim, L. Akhter, M.M. Rahman and M.A.Z. Chowdhury. 2020. Heterosis, combining ability and gene action for yield in bottle gourd. American J. of Plant Sciences, 11:642-652 (https://www.scrip.org /journal/aips.2020.115048)

iv) Other publications and technology transfer activities:

Prepared Training Manual titled as follow:

- 'Global Plan of Action of International Treaty on Plant Genetic Resources for Food and Agriculture'
- 'Variety Profile of Important Crops'

Technology Transfer and Monitoring Unit (TTMU)

1. Name of Professionals at the beginning of the report

	Name of Professionals	Designation
1	Dr. FauziaYasmin	Director
2	Dr. Suraya Parvin	Senior Scientific Officer
3	Dr. Zakiah Rahman Moni	Senior Scientific Officer

TTMU established at BARC in 1989. Now it is working to facilitate swift transfer of modern technologies generated by the National Agricultural Research System (NARS) to the farmers through Department of Extension (DAE), Department of Fisheries (DoF), Department of Livestock (DLS), and private organizations. it is also coordinating to strengthen the linkages among research, extension and farmers. On this background during the reporting period (July 2019-June 2020) it organized three training programmes, two workshops, 11 monitoring tours and one PBRG sub project on "Transfer of Agricultural Technologies to Farmers Level for Increasing Farm Productivity" ID: 005 of NATP-2. In addition, "Transferable technologies Developed by NARS Institutes (2016-17 and 2017-18)" book and three training manual is published. The brief descriptions of those activities are given below:

Project Implementation

Dr. Fauzia Yasmin, Director TTMU, as Coordinator and Dr. Zakiah Rahman Moni SSO (TTMU) is a associate coordinator involved in this project. Ten NARS institutes (BARI, BINA, BFRI, BJRI, BLRI, BSRI, SRDI, BRRI, CDB, BWMRI) are the components of this project.

Technology transfer and field monitoring activities:

TTMU transferred 63 economically viable technologies generated by NARS instituts for higher productivity and profitability at farm level.

Field Monitoring of PBRG Sub-project (ID-005) at 10 NARS Institutes during July, 2019 to June, 2020

SRDI component**:**
Dr. FauziaYasmin, Coordinator monitored the technology of SRDI's Updated Land and Soil Resources Utilization Guide based balanced fertilizer application in Boro -T. Aman pattern dessiminated among 5 farmers at Isapura village of Sholonol union at Burichong, Cumilla on 18 March, 2020. Performance crops of trial plots was good.


Monitored at SRDI, Cumilla on 18 March, 2020

BINA component**:**
Dr. Fauzia Yasmin, Coordinator monitored BINA developed Improved Cropping pattern: Early T. aman rice (variety: Binadhan-7/ Binadhan-17), - mustard (variety: Binasarisha-4/ Binasarisha-9) - lateboro rice (variety: Binadhan-10) of twelve farmers at Mirkandapara village of Parangonj union of Sadar Upazila of Mymensingh district on 15 March, 2020. Performance of the pattern promising was found.


Monitored at BINA, Mymensingh 15 March, 2020

BLRI component**:**
Dr. Fauzia Yasmin, Coordinator monitored BLRI developed preservation of Green grasses/fodder (Var. BLRI Napier 1, 4) through Silage Technique practiced by four of farmers at Tiarbond village of Potajia union of Shahjadpur upazila of Sirajgonj district on 12 March, 2020. The Performance of the varieties were incrative.


Monitored at BLRI, Sirajgonj on 12 March, 2020

BSRI component**:**
Dr. Fauzia Yasmin, Coordinator monitored BSRI developed BSRI Akh 42 variety (chewing type) and BSRI Akh 45 variety (gur purpose) trial plots of five farmers at Garudaho village of Sadar upazila, Boroibagh and Kaliabil village of Raigonj upazila under Sirajgonj district on 05 March, 2020. The Performance of the varieties were increative.


Monitored at BSRI, Sirajgonjon 05 March, 2020

BRRI component**:**
Dr. Fauzia Yasmin, Coordinator monitored BRRI recently developed Boro rice varieties i.e., BRRI dhan58, 67, 81, 84, 88 & 89 in six farmers plot at Labankutha village of Habirbari union of Valuka upazilla under Mymensingh district on 13 February, 2020. The varieties apprently looked potential.


Monitored at BRRI, Mymensingh on 13 February, 2020

BJRI component**:**
Dr. FauziaYasmin, Coordinator Monitored BJRI developed BJRI Tossa Pat-8 (Rabi-1) variety trial plot in six farmer's plot at Diaragolra, Chandirchar & Kamardia villages of Jagir union of Sadar and Fukurhati village of Saturia upazila of Manikgonj district on 24 December, 2019. It looked that the variety has potentiality to be disseminated further.


Monitored at BJRI, Manikganj on 24 December, 2019

BWMRI component:
Monitored BARI Gom33 and WMRIGom1 variety trial plot in four farmer's field at Vushir Bandor village of Chirirbandor upazila and Itua village of Kaharole upazila of Dinajpur district during 21-23 December, 2019. The variety shwed promising to be expanded further.


Monitored at BJRI, Manikganj on 24 December, 2019

CDB component**:**

Dr. Zakiah Rahman Moni, Associate Coordinator monitored CDB developed CB-14 trial plots of six farmers at Majar Para, Mongpru Chara village of Sadar upazilla of Bandorban district during 20-22 December, 2019. The variety demonstrate protential performance

Monitored at Bandorban, CDB on 22-22 December, 2019

BARI component**:**

Monitored newly established fruit orchard of farmers and also attended input (fertilizer) distribution ceremony at Babugonj, Barisal during 10 -12 December, 2019. The orchared could be a potential source by farm income.

Monitored at Barisal, BARI on 0-12 December, 2019

BFRI component**:**

Dr. FauziaYasmin, Coordinator monitored the technology titled Pabda and Gulsha with Rui and Shing fish at Tegouri village of Gouradar union of Nakla, Sherpur on 19 October, 2019. fish farming was founded economically viable for income rising.

Monitored at Sherpur, BFRI on 19 October, 2019

The programe was telecast on BTV, Matio o Manus; and youtube link (https://youtu.be/SZ7J8twgdHs).

Monitored at Shepur, BARI on 19 October, 2019

Collection of Technology Data

The data base scenarios of transferred and non-transferred technologies generated by the researchers from the inception of 10 NARS institutes have collected through questionnaire. Information from CDB, SRDI, BSRI, BRRI, BFRI, BINA, BWMRI has already been collected except BARI, BLRI and BJRI. Technology data entry is going on for analysis.

Discussion with Dr. Md. Habibur Rahman, PSO, Soil Science Division, BINA

Annual Review Workshop (PBRG, ID-005):

Annual Review Workshop of the project was organized on 02 October, 2019

Annual Review Workshop (PBRG-ID 005) 02 October, 2019

Coordination meeting:

For the smooth continuation of the project, a day-long coordination meeting was held on 05 December 2019. Dr. Fauzia Yasmin, Director TTMU and coordinator presided over the meeting. PI and Co-PI of ten components of NARS (BARI, BWMRI, BRRI, BINA, BFRI, BSRI, BLRI, BJRI, SRDI & CDB) were present in this meeting.

3. Preparation Policy Document and Inputs:

Coordination meeting (PBRG-ID 005) 05 December 2019

A. Inputs/Comments

BARC comments on:

- Opinion to formulate strategy/planning for specific target based crop production in 2021.
- Japanese technology Clibao on toxic free crop production.
- Agriculture production/formulate research planning by offices/organizations under Ministry of Agriculture.

B. Drafting Proceedings

- Proceedings of Food fair 2019 held on 16/10/2019.
- Proceedings of National vegetable fair 2020 held on 03/01/2020.
- Proceedings of National bee fair 2020 held on 17/02/2020.

C. Speech writing

- Welcome address of chairperson of "Food Fair" 2019 held on 16/10/2019.
- Welcome address of chairperson and speech of chief guest of "National Vegetable Fair" 2020 held on 03/01/2020.
- Welcome address chairperson and speech of chief guest "National Mau Fair" 2020 held on 17/02/2020.

4. Activities of Innovation Team, Computer & GIS, BARC for of Agriculture Ministry

Dr. Fauzia Yasmin, Director (TTMU) attended monthly meeting and prepared innovation idea as a member of Innovation team.

An Innovation Idea:

The way of simplification of publishing book on "Transferable Matured Technologies developed by NARS institutes" an innovation workshop was held on Innovation Idea organized by MoA.

Dr. Fauzia Yasmin, as team leader and Dr. Zakiah Rahman Moni, submitted Innovation Idea at Computer and GIS Unit of BARC and MoA on 04-08-2020

5. Training, workshop, seminar, etc.(Foreign and local) organized

A. Training: Three (TOT) Programs on Livestock, Fisheries & Crop Technologies

i) Training on "Transferable matured Technology of Livestock for hoar areas"

The following ten different technologies of Livestock for hoar area were transferred for Officers from DLS (20) in two days programme at BLRI, Savar on 27-28/11/2019 where Dr. Fauzia Yasmin was Course Director and Dr. Zakiah Rahman Moni was Course Coordinator

1. Wet straw preservation technique
2. Preservation of green grass by Dol technique
3. Goat and Sheep rearing by semi intensive method
4. Pasteurization and preservation of milk using mini pasteurization technique
5. Fodder production and preservation technique in hoar area
6. Deworming technique of livestock
7. Contagious diseases control technique of livestock
8. Scientific production and rearing technique of duck in hoar ecosystem
9. Cattle fattening packages
10. Hygienic improved chick brooder

ToT at BLRI, Savar on 27-28/11/2019

ii) Training on "Transferable matured Fisheries Technology for hoar areas"

The following ten different technologies of fisheries for hoar area were transferred for Officers from DoF

(20) in two days programme at BFRI, Mymensingh on 18-19/12/2019 where Dr. Fauzia Yasmin was Course Director and Dr. Suriya Parvin was Course Coordinator.

1. Application of BFRI evolved technologies for fish production of in Haor and Beel areas
2. Conservation and Management of Haor Fisheries Resource
3. Water Quality and Diversity of Fisheries of Haorand Beel areas
4. Fish Cultivation in Cage
5. Social Based Fish Farming in Haor Areas
6. Importance of Quality Fish Pots for Increasing Production of Fish in Haor and Beel Areas
7. Pen Fish Culture
8. Mixed Culture of Fish and Pearl in Pond
9. Fish Culture and Management of Extinct fish
10. Fish Diseases and Health Management

ToT at BLRI Savar on 27-28/11/2019

iii) Training on "Transferable matured crop technologies for hoar areas"

The following nine different technologies of crops for hoar area were transferred for Officers from DAE (20) in two days programme at BRRI, Gazipur on 28-29/01/2020 where Dr. Fauzia Yasmin was Course Director and Dr. Zakiah Rahman Moni was Course Coordinator.

1. Crops and cropping pattern in Haor areas of Bangladesh and strategies in relation to increase its cropping intensity
2. Rice varieties and Production Technologies in Haor areas
3. Insect pest management technology of different crops in Haor areas of Bangladesh
4. Disease management for crop cultivation in Haor areas
5. Cultivation technique of floating agriculture in Haor areas
6. Major fruits and vegetable cultivation in Haor areas
7. Fertilizer management of major crops in Haor areas
8. Farm mechanization in relation to crop cultivation in Haor areas
9. Agronomic manipulations of production technique in relation to improve crop productivity in Haor areas

ToT at BARI, Gazipur on 28-29/01/2020

B. Workshop

Transferable technologies on "Safe food production" developed by NARS institutes"

To transfer safe food production technologies throughout the country ensuring product quality and consumers' safety food, a day long workshop was held on 5 February 2020; funded by PIU- BARC, NATP-2. This workshop was chaired by Dr. Fauzia Yasmin, Director (Technology Transfer and Monitoring Unit). The honorable Executive Chairman of BARC Dr. Shaikh Mohammad Bokhtiar was present as Chief Guest and Dr. Mian Sayeed Hassan was present as Special Guest in the inaugural session. Among 173 technologies; 70, 26, 10, 10, 10, 19, 10, 8 and 10 from BARI, BWMRI, BSRI, BLRI, SRDI, BRRI, BFRI (Fish), BFRI (Forest) and BINA respectively were presented by the NARS scientists.

"Safe food production" Workshop on 05 February 2020

C. Meeting Organized

A meeting of ATECC (Agriculture Technology Extension Coordination Committee) was held at BARC on 05 August, 2019 for Kharif-2 Season/2019. The meeting was presided by Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC. Dr. Md. Abdul Muyeed, DG, DAE and Md. Hamidur Rahman, Ex DG, DAE attended This meeting. All the participants of ATECC from NARS institutes (BARI, BRRI, BINA, BSRI, BJRI, CDB, SRDI), DAE, DAM, BADC, AIS, BIRTAN, SCA, Hortex foundation and BARC attended the meeting. Dr. Fauzia Yasmin, Director (TTMU) from BARC attended in this meeting.

"ATECC" meeting on 05 August 2019

A meeting of ATECC was held at BARC on 06 November, 2019 for Rabi Season/2019. The meeting was presided by Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC. Mr. Chandi Das Kundu, Director, Field Service wing, DAE attended the meeting. Participants of ATECC were from NARS institutes (BARI, BRRI, BINA, BSRI, BJRI, CDB, SRDI), DAE, DAM, BADC, AIS, BIRTAN, SCA, Hortex foundation and BARC Dr. Fauzia Yasmin, Director (TTMU) from BARC attended the meeting. Md. Abdul Majid, Deputy Director (Extension), DAE presented a number of activities on crop demo, technology demo, field day and training.

"ATECC" meeting on 06 November 2019

6. Training (Foreign and local) Attended

Foreign Training: Training on "Agroforestry Research and Development: Policy, Practice and Impact"

The 39th FTF ITT Training program was organized by World Agroforestry Center at three different places viz ICRAF New Delhi, CAFRI, Jhansi and FCRI, Mettupalayam, Tamilnadu, India. Dr. Zakiah Rahman Moni, Senior Scientific Officer (Technology Transfer and Monitoring Unit), Bangladesh Agricultural Research Council (BARC), Bangladesh attended the training.

Training Program at CAFRI, Jhansi, India

7. National and International Linkage (MoU/Agreement)

Assisted to the activities/Technical support:

- Helped in office activities of Executive Chairman, BARC
- Provided technical and official support to other divisions as a part of good cooperation and good Interdivisional relationship.

Activities with other organizations:

- Attended inaugural session of SAC, governing body Meeting
- Participated and Cooperated actively for observance of SAARC Charter Day-2019
- Coordinated with the personnel of DAE, DoF, DLS

Other Activities

The officers of TTMU attended a good number of workshops, seminars, training and meetings organized by different divisions and units of BARC.

8. Publication(s)

TTMU, BARC published one book, three training manuals, and two workshop proceedings as mentioned bellow

Book (01)

"নার্সভুক্ত গবেষণা প্রতিষ্ঠান কর্তৃক ২০১৬-১৭ ও ২০১৭-১৮ অর্থবছরে উদ্ভাবিত হস্তান্তরযোগ্য প্রযুক্তিসমূহ" শিরোনামে একটি বই জুন ২০২০ এ প্রকাশিত হয়েছে।

Training Manual: (03)

- হাওড় এলাকার উপযোগী প্রাণিসম্পদ প্রযুক্তি বিষয়ে প্রশিক্ষক প্রশিক্ষণ, ২৭-২৮ নভেম্বর ২০১৯
- হাওড় এলাকার উপযোগী মৎস্য প্রযুক্তি বিষয়ে প্রশিক্ষক প্রশিক্ষণ, ১৮-১৯ ডিসেম্বর ২০১৯
- হাওড় এলাকার উপযোগী ফসল উপযোগী প্রযুক্তি বিষয়ে প্রশিক্ষক প্রশিক্ষণ, ২৮-২৯ জানুয়ারী ২০২০

Pictorial view of Training manual during the reporting year

Workshop Proceeding: 02

- Yasmin, F., Suriya, P., Moni, Z. R : (2019-2020): Transferable technologies on "Safe food production" developed by NARS institutes on 05 February 2020. Technology Transfer and Monitoring Unit, BARC, Farmgate, Dhaka

- Yasmin, F., Moni, Z. R., Morshed, R.M. (2019-2020): "Annual progress Review workshop of PBRG sub-project "Transfer of Agricultural Technologies to Farmers Level for Increasing Farm Productivity"ID: 005 of NATP-2 on 02 October 2019. Technology Transfer and Monitoring Unit, BARC, Farmgate, Dhaka

9. Publications as report

A. Field Monitoring Report

i. Yasmin, F., Morshed, R.M. (2020). Report on Field Monitoring of PBRG sub project NATP-2 of BARC implemented in Mymensingh by BRRI monitored with Monitoring Team of coordination Unit.

ii. Yasmin, F., Morshed, R.M. (2019). Report on Field Monitoring of PBRG sub project NATP-2 of BARC implemented in Manikgonj by BJRI monitored with Monitoring Team of coordination Unit.

iii. Moni, Z. R. (2019). Report on Field Monitoring of PBRG sub project NATP-2 of BARC implemented in Bandorban by CDB monitored with Monitoring Team of coordination Unit.

iv. Yasmin, F., Morshed, R.M. (2020). Report on Field Monitoring of PBRG sub project NATP-2 of BARC implemented in Cumilla by SRDI monitored with Monitoring Team of coordination Unit.

v. Yasmin, F., Morshed, R.M. (2019). Report on Field Monitoring of PBRG sub project NATP-2 of BARC implemented in Sherpur by BFRI monitored with Monitoring Team of coordination Unit.

vi. Yasmin, F., Morshed, R.M. (2020). Report on Field Monitoring of PBRG sub project NATP-2 of BARC implemented in Sirajganj by BLRI monitored with Monitoring Team of coordination Unit.

vii. Yasmin, F., Morshed, R.M. (2020). Report on Field Monitoring of PBRG sub project NATP-2 of BARC implemented in Sirajganj by BSRI monitored with Monitoring Team of coordination Unit.

viii. Yasmin, F., Morshed, R.M. (2020). Report on Field Monitoring of PBRG sub project NATP-2 of BARC implemented in Mymensingh by BINA monitored with Monitoring Team of coordination Unit.

ix. Morshed, R.M. (2019). Report on Field Monitoring of PBRG sub project NATP-2 of BARC

implemented in Barisal by BARI monitored with Monitoring Team of coordination Unit.

x. Morshed, R.M. (2019). Report on Field Monitoring of PBRG sub project NATP-2 of BARC implemented in Dinajpur by BWMRI monitored with Monitoring Team of coordination Unit.

B. Progress and Work Plan Report

- Yasmin, F., Moni, Z. R Morshed, R.M. (2019-2020): Half yearly progress report on PBRG sub-project "Transfer of Agricultural Technologies to Farmers Level for Increasing Farm Productivity"ID: 005 of NATP-2. Transfer and Monitoring Unit, BARC, Farmgate, Dhaka

- Yasmin, F., Moni, Z. R Morshed, R.M. Annual Progress Report (2019-2020): on PBRG sub-project "Transfer of Agricultural Technologies to Farmers Level for Increasing Farm Productivity" ID: 005 of NATP-2. Transfer and Monitoring Unit, BARC, Farmgate, Dhaka

- Yasmin, F., Suriya, P., Moni, Z. R Annual Progress and Work-plan Report: (2019-2020): "Annual progress (2019-2020) and future work-plan (2019-20)", Technology Transfer and Monitoring Unit, BARC, Farmgate, Dhaka

- Budget Report according to Work-plan: (2019-2020): "Budget for future work-plan (2019-20). Technology Transfer and Monitoring Unit, BARC, Farmgate, Dhaka

- Annual Plan Agreement (APA) Report: (2019-2020): APA Report of Technology Transfer and Monitoring Unit, BARC, Farmgate, Dhaka

10. Others

Four quarterly reports three month (July-September, October-December, January-March and April-June) were published in BARC News Letter for 2019-2020

11. Regular Activities

❑ TTMU staf attended a good number training, workshop, seminar, meeting.
❑ Innovation Team attended monthly meetings
❑ Rapporteur report/Speech writing
❑ Drafting meeting minutes

PLANNING AND EVALUATION DIVISION

Project Development/Project Financing

Two Development Project Proposals (DPP) and six research proposals have been submitted to Ministry of Agriculture. and The title of the DPPs are as follows:

i. Research and Development of Seaweed in Coastal Areas of Bangladesh.
ii. Strengthening of Bangladesh Agricultural Research Council

Project Implementation

A. Integrated Farming Research and Development for Livelihood Improvement in the Plainland Eco-system (Project ID: 061)

Livelihood encompasses people's capabilities, income, assets and activities required to secure the necessities of life. The sustainable livelihood is an approach to poverty eradication. Integrated farming is now gaining priority to ensure food, nutrition and income security of resource poor farm households with the rapid increasing of population and declining natural resources. From the views, a coordinated project on "Integrated Farming Systems Research and Development for Livelihood Improvement in the Plain land Eco-system" has been coordinating by Planning and Evaluation Division of BARC in partnership with On-Farm Research Division (OFRD) of BARI, BRRI, BFRI, from February 2018. The program was undertaken to develop integrated farming technologies, fine tune the technologies generated by NARS institutes, integrate component technologies with efficient use of farm resources and thereby improve family income and livelihoods. Project Implementation Unit (PIU)-BARC, NATP: Phase 2 has been financing the PBRG project. Cordoning unit planning and evaluation Division has been conducting the following activities in order to achieve the output and outcome of the project during July 2019- June 2020:

1. Coordinating FSRD programs of all participating institutes.
2. Organised one National Task Force meeting
3. Three Coordination meeting were organized with the PIs and CoPIs
4. Arranged first year annul review and planning workshop,
5. Two training program were conducted on Farming systems Research and development and
6. Six field visits has organized during reporting period at six FSRD sites, Rangpur, Pabna, Tangail, Sherpur and Faridpur under OFRD BARI component and Mymenshing under BFRI component.

The integrated farming programs were started from February 2018 at 5 Farming Systems Research and Development (FSRD) Sites viz., Ajoddhapur (Rangpur), Gangarampur (Pabna), Sholakundu (Faridpur), Atia, Delduar (Tangail) and Tarakandi (Sherpur). The activities continued during July 2019-Jane 2020. A total of eighty types of research and developement activities were conducted for maximizing total productivity using the existing resources of sixty farmers, where twelve from each location comprising of four from each of marginal, small and medium farmers group considering homestead vegetables and fruits, field crops, poultry and livestock, fisheries and off-farm component. All components were brought under improved technological intervention and accordingly incomes were increased from these components. The average homestead size was 0.05, 0.14, 0.09, 0.13 and 0.07 ha at FSRD site Rangpur, Pabna, Faridpur, Tangail and Sherpur, respectively.

a. Homestead vegetables and fruit production

In homestead component, four types of activities were carried out with year round vegetables and fruits production, new plantation and fruit tree management. The average vegetables produced per homestead was 687 kg after intervention (AI), which was only 167 kg before intervention (BI). The average vegetables consumption during AI was 251g head-1d-1, which was 382% higher than BI. The average fruits produced per homestead 575 kg, which was only 290 kg during BI. The daily nutritional requirements of a family members were supplemented considerably, especially, carotene and Vit-C due to increased consumption of homestead grown vegetables and fruits.

TTMU monitored Technology transfer activities in ten sites as below:

Fig. Homestead vegetable and fruit production at different FSRD sites during July 2019 – June 2020

Fruit tree management has created a good impact and a total of 611 fruit trees were brought under pest management and in total 1664 saplings of different fruits were distributed among farmer's of different FSRD sites. Women participation in agricultural activities increased to a great extent that showed some positive effect on gender equity within family.

Fig. Fruits sapling distribution and existing fruit trees management

Homestead gardening is a sector where all family member can work in a group. Homestead production system gave an opportunity for women employment and empowerment. It was revealed that women had a good involvement in seed/-seedling preparation and planting, intercultural operation, harvesting and marketing of vegetable and fruits. It is revealed that women are coming forward and participating more in income generation system. Hard and harsh activites were neing taken care of by preparation mostly by men. Children were also help at men and women in the production systems especially in non-hard-jobs. It was noticed that homestead gardening has created a good opportunity to utilize unused labor of women and children appropriately, help to produce more crop and earn more money by a resource poor farm family.

b. Crops and Cropping System

The average crop land size was 0.62, 0.84, 0.64, 0.61 and 0.54 ha in Rangpur, Pabna, Faridpur, Tangail and Sherpur area, respectively. In field crops component, a total of 10 types cropping pattern (CP) improvement and 15 types of on-farm trials were conducted. Two or three crops-based CP could be successfull replaced by three to four crops based CP. Among these potato included 4 crop based CP T. Aus-T.Aman-Potato/Sweet gourd and T. Aus-T.Aman-Potato-Mungbean produced higher REY 40.68 and 32.96 t ha-1, repectively where sole crop Tomato gave maximum gross margin (Tk. 662000 ha-1).

Fig. Three crops based improvd a croping pattern

Fig. Four crops based improved croping pattern

c. Livestock component

Twelve types activities are in progress on in the livestock component. After deworming and vaccination, the frequency of major diseases e.g. Anthrax, FMD, PPR, BQ etc. were reduced by less than 5% and addition of vitamin ADE increased the lactation period and yield remarkably. Cattle fattening and calf rearing programs creating interest among the farmers due to remarkable gain of cattle body weight (34-65%). In poultry system, Sonali chicken, Naked-neck chicken, Khaki Campbell duck, Turkey bird and pigeon rearing in homestead created a good impact as a good source of income and child nutrition. Mortality of poultry reduced to (64-100%) after vaccination. Farm yard manure (5375 kg/homestead) and green fodder (52 tha) production were found encouraging.

Ajoddhapur, Rangpur | Gangarampur, Pabna | Sholakundu, Faridpur | Atia, Delduar, Tangail | Tarakandi, Sherpur

Fig. Vaccination programe on cattle and poltry at five location during July 2019 – June 2020

Ajoddhapur, Rangpur | Gangarampur, Pabna | Sholakundu, Faridpur | Atia, Delduar, Tangail

Fig. Deworming and vitamin ADE injection at different FSRD sites during July 2019 – June 2020


Ajoddhapur, Rangpur


Gangarampur, Pabna


Tarakandi, Sherpur


Visitor at Rangpur

Fig. Cattle fattening and calf rearing programsat different FSRD sites during July 2019 – June 2020


Gangarampur, Pabna
Poltry rearing


Tarakandi, Sherpur
Naked neck Poltry rearing


Ajoddhapur, Rangpur
Turky rearing


Atia, Delduar, Tangail
Duck rearing


Ajoddhapur, Rangpur
Pegion rearing

d. Fisheries component

The average pond size was 0.04-0.06 ha over test locations. Seasonal carp polyculture gave a satisfactory fish yield (avg. 176 kg pond-1) and gross margin (avg. Tk. 12513 pond-1) at farmers' level.


Ajoddhapur, Rangpur


Gangarampur, Pabna


Sholakundu, Faridpur


Atia, Delduar, Tangail


Tarakandi, Sherpur

Fig. Fish production at different FSRD sites during July 2019 – June 2020

e. Farm yard manure

Household wastage, negligible to most of the farm household, is a valueable resource for homestead and field crop production as manure. Farm yard manure produced in well managed compost pit was found very important nutrient source for crop production, especially, for homestead vegetables and fruits production. In different FSRD sites, partial supports were provided to the farmers for preparing well compost shade. Previously, most of the cowdung was used as fuel and very few was used for farm yard manure production, whereas after project intervention, most of the cowdung and household wastage are using for FYM production. It was found that on an average 5375 kg FYM was produced per homestead after program intervention where it was only 2850 kg before intervention. It may also help to keep clean environment of the homestead area and produce relatively safe vegetables.


Ajoddhapur, Rangpur


Gangarampur, Pabna

Fig. Production of farm yard manure for homestead vegetable and fruit production at different FSRD sites during July 2019 – June 2020

From different types of off-farm activities (e.g. weaving Katha, sewing cloths, making handicrafts & Kumra Bora, grocery shop, pulling van/rickshaw etc.), farmers also earned some extra money (avg. gross margin Tk. 5882 household-1).


Ajoddhapur, Rangpur


Gangarampur, Pabna


Tarakandi, Sherpur


Visitor at Rangpur

Fig. Off farm activities at different FSRD sites during July 2019 – June 2020

f. Local Service Provider (LSP)

Sustainable integrated farming program is a great challenge. Homestead gardening and other components management is a continuous work and needs skills in production techniques of different components. Besides, round the year collection and preservation of very small amount of quality seeds of different vegetables (about 33 types) are quite tough for an individual farmer. Moreover, vaccination of poultry and livestock is very effective but very tough to manage by an individual farmer, which can easily bd solved by a simple group initiative at the local level. From these views, initiative was taken at FSRD site, Ajoddhapur, Rangpur to develop one male and one female Local Service Provider (LSP). The male LSP produced, preserved or collected seeds from other farmer or market or other sources and prepared a package as per season and per household-wise required amount and types of seeds. These packages of seeds were served by the LSP among the cooperative farmers and vice versa the cooperative farmers were returned back a small part of their produce (seeds, vegetables, fruits, egg, milk, fish etc.). The male and female LSP both were worked on motivation for the farmers to produce and prepare the healthy and safe food, sanitation, off-farm activities, vaccination of poultry and livestock etc. These chronological activities of LSP have been started at FSRD site, Ajoddhapur, Rangpur where the male LSP also develop a mini nursery for producing seedlings of different vegetables. During 2019-20, the male LSP produced a total of 22830 seedlings with Bottle gourd, Bitter gourd, Brinjal, Tomato, Cabbage, Cauliflower, Chilli, Napier cutting etc., which were distributed among the co-operative farmers and sold to the neighbor farmers. Through such enterprises gross margin was was Tk. 23660.

g. Income Enhancement

By integrating year round vegetables and fruits production, HYV seeds, improved cropping patterns and production technologies, de-worming, vaccination program, FYM, polyculturing of fish, the resources (land, labour, capital, etc) of the farmers have used optimally and therefore farmer's income and livelihood have been increased. Gross margin was varied in different FSRD sites. Before intervention of the project, an average per farm gross margin ranged Tk. 37812-157515 whereas it ranged Tk. 113583-250910 after intervention.

h. Training and Field days

Field days organized during rainy season on homestead gardening and also on T. Aus rice production created a positive impact in the locality.

Title (Higher degree/ training)	Status		No. of participar	Identity of incumbent / resource persons	Remarks
	Target	Actual			
Farmers training				Incumbent – Farmers	
Rangpur	02	02	40	Resource person - Scientist	28-06-2019 19-07-2019
Pabna	02	02	40		30-06-2019
Tangail	01	01	20		30-06-2019
Sherpur	01	01	20		25/06/2019
Field day					
Rangpur	01	01	100	Farmers, NGOs, Local Leader, Extension Personnels, Researchers	18-07-2019
Pabna	01	01	100		30-06-2019
Faridpur	01	01	50		12-07-2019
Tangail	01	01	100		25-06-2019
Sherpur	01	01	120		27-06-2019

II. BRRI component

Rice Farming Systems Division has been studying farming system research and development under the coordinated sub-project entitled "Integrated Farming Research and Development for Livelihood Improvement in the Plain Land Ecosystem" at Tengra village, Sreepur, Gazipur from February 2018 tile date. In total 18 farming system research and development activities were conducted during July 2019-2020. The activities were homestead production system, crops and cropping system, livestock production system, and fisheries system, fruit sapling distribution and fruit tree management.

a. Homestead production system component

BARI developed Goyeshpur model followed in homestead production systems with 12 farmers. In total productions of vegetables during reporting period was 2417 kg. Among the produced vegetables 1147 kg, 1012 kg and 243 kg were sold, consumed and distributed respectively. Total cost of production was Tk 20,700/- and gross margin from homestead vegetables production was Tk 60,050/-. Consumption, distribution and selling of vegetables increased about 10%, 43% and 134% respectively. Women specially showed interest in homestead vegetable production and willingly took part in cultural operations. Due to improve management of fruit trees, yield of fruit was increased and as well as consumption, distribution and selling of fruits were also increased.

Fig. Year round vegetables production in the homestead

Zinger and turmeric were grown under shady place and about 100 kg gingers and 210 kg turmeric was harvested from 200 m^2. Gross margins from ginger and turmeric were Tk 7700/- and Tk 21600/-, respectively. Chewing type sugarcane was cultivated in the homestead. The variety was Turag, Rongbilash, Amrita and China. Based on the result and farmers opinion Turag and Rongbilash can be cultivated inhomestead for higher yield and sweetness which will increase farmer's income as well as improve the nutritional status of farm families.

Fig. Chewing type sugarcane production

b. Crop and cropping system component

In crop component improvement of the existing cropping system through replacement of local and low yielding variety with high yielding newly BRRI released Aus and T. aman varieties were introduced in the existing cropping pattern. To increase total productivity, mustard and mungbean were introduced in the existing cropping pattern, Boro-Fallow-T. Aman. The improved cropping pattern was Mustard-Boro-T. Aman and Mustard-Mungbean-T. Aus-T.Aman. From the economic analysis it was observed that the highest gross margin (GM) 61300 Tk/ha was obtained from Mustard-Mungbean-T. Aus-T.Aman.The gross margin from Mustard-Boro-T. Aman was 48100 Tk/ha. The Mustard-Mungbean-T.Aus-T.Aman and Mustard-Boro-T. Aman gave about 350% and 253% higher GM compared to the existing pattern, Boro-Fallow-T. Aman.

High yielding newly released Aus varieties were introduced in this area through on-farm trial BRRI dhan 48, BRRI dhan 82 and BRRI dhan 83 yielded 4.6, 4.41 and 4.27 t/ha, respectively, on an average. For production program five newly released BRRI varieties for Aman season viz., BRRI dhan51, BRRI dhan57, BRRI dhan71, BRRI dhan75 and BRRI dhan87 were cultivated in the FSRD site. The production program were implemented in about 9.0 hectare of 13 farmers. The highest grain yield (5.21 t/ha) was obtained from BRRI dhan75 and the lowest yield (3.68 t/ha) from BRRI dhan51.

BRRI dhan51 BRRI dhan71 BRRI dhan75 BRRI dhan87

Fig. Rice as compouert of crrpping system.

c. Livestock component

In livestock component, turkey rearing under scavenging system seems to be a promising option to increase farmers' income. Pigeon and goat rearing is going on to increase farm income and livestock products of the farmers' increased significantly. Turkey farming is more profitable than poultry farming as it take less space and less diseases risk. The most profitable turkey farming with small time and short investment has opened the possibility of meeting the economic potential as well as meeting the needs of protein. Seventy turkey chickens were distributed among 7 farmers at the FSRD site, Sreepur, Gazipur in September 2018. After 16 months of

rearing average body weight became 7.5 kg. The market value of the birds after 16 months was about Tk 24,000/- and total cost was about Tk 14,000/-. The results indicated that turkey production is profitable.

Fig. Turkey checks

Fig. Turkey scavenging at field

Fig. Adult Turkey

Goat is economically and ideally suited for poorer rural folk especially for marginal and landless laborers due to its low cost maintenance, short-term return with low risk capital-investment. The importance of goat in the rural economy is evidenced by its unparalleled economic traits. After 6 months of rearing average weight gained is about 15 kg and the market value increased is about Tk. 4,200/-. During reporting period one goat gave birth of two kids.

Fig. Goat Rearing

Pigeon is a very good source of protein and rapid income generation as it is very prolific breeder and its meat is very tender and loved by all. Generally people rear pigeon for meat purpose. Pigeons were distributed to increase family income through squab production and to increase nutritional supply to family members. The average body weight per pigeon was 350g after three months of rearing. Produced squabs were sold and consumed by the farmers. Average price of squab per pair was Tk. 250.

Vaccines are expected to reduce the severity of disease in infected animals or limit the frequency of disease. Vaccines can prevent a wide range of diseases that cause reduced production, fertility or death in cattle, goat and chicken and economic losses. There are some common diseases that animals should be routinely protected. FMD for cattle, PPR for goat and Ranikhet vaccine for chicken, duck and pigeon were provided among the farmer's animal. Two hundred and fifty eight cattle, about eighty goats, three hundred and fifty chickens, ninety ducks and fifty five pigeons were vaccinated. The mortality rate of the cattle, duck and chicken before intervention was very much higher but after intervention mortality decreased.

Fig. Cattle and goat vaccination

d. Fisheries component

Semi-aquatic production system of vegetables, fish and fruit in mini pond: In many homestead areas there is a pond and a considerable fallow land around the homestead pond which can be used for vegetables production. By establishing a mixed farming system, a marginal or poor family can grow enough vegetables and fish. In mixed farming system, different kind of vegetables can be grown on the bank of a mini pond throughout the year and aroid can be grown in the pond along with fishes to meet the family nutritional requirements. BARI panikachu-3 was transplanted following BARI recommendation. About 50 days after transplanting different kind of fishes e.g monosex tilapia, curp, shing, magur fishs were released in the pond and maintained stocking density 200 piece/decimal. Different vegetables and fruits on the bank of the pond were planted. From the cost and return analysis it was observed that the average benefit cost ratio is 3.23.

Fig. Semi-aquatic production system in derelict pond

e. Rearing of high value fish in farmers pond

Pabda (Ompok pabda) and gulsha (Mystus cavasius) Many important indigenous fish are greatly threatened and a few such as pabda (Ompok pabda) and gulsha (Mystus cavasius) are on the verge of extinction. These species generally grow in natural water body. These two types of fishes are favorite to consumers because of its delicious taste but high price in the market. These fishes have been cultivating in the farmers pond at FSRD site following recommendation of BFRI. It will be harvested very soon.

Fig. Rearing of high value fish on Farmers pond

Other activities like drumstick plantation, utilization of fallow land under orchard, spraying of fruit trees is in progress. Fruit sapling distribution, chewing type sugarcane cultivation at homestead, Palmyra seed sowing etc. were also done. About 150 seeds of palmyra palm tree were sown at different places in Tengra village of Telihati union on October 7, 2018 and 94% of them survived.

Fig. Palmyra plantation

Management of mango tree during fruit setting is very important. Generally insect like hopper and fungus like powdery mildew infect at flowering stage. As a result yield become low. Mango trees are highly susceptible to powdery mildew and anthracnose. Fungal pathogens make havoc on new flowers and fruits in the study project area. Fungicide applied before disease sets is found very much effective for disease control.

Fig. Spraying of pesticide in mango tree

Flower-inducing chemical sprays were used to encourage higher fruit yields. By mixing Rivcord 250EC and Tilt 250 EC were sprayed in the mango tree. After two weeks of first spray only Rivcord 250EC was sprayed. About 200 mango trees were sprayed during reporting period.

f. Field day Observation

A `Field Day' on BRRI dhan75 was organized at FSRD site in November 2019. The field day was arranged by Rice Farming System (RFS) Division of Bangladesh Rice Research Institute with the help of Department of Agricultural Extension and funded by NATP-2, BARC. BRRI dhan75 yielded 5.21 t/ha and farmers were satisfied with the yield. Other farmers showed their interest to cultivate the rice variety during Aman season.

Fig. Field day at project site

III. Bangladesh Fisheries Research Institute (BFRI) component

BFRI has been conducting farming system research and development at Mokamia village, Fulpur, Mymensingh from February 2018 to till date. Technologies were intervened among small, marginal and resource-poor farmers. The main research and development activities on homestead, fisheries, crops and cropping system and livestock production system were tried in the project area. Under this component 11 research and development activities were conducted during July 2019 to Jane 2020.

a. Fisheries component

Culture of Pabda and Gulsha with carp in farmer's pond were tried to evaluate the production performances of pabda (Ompok pabda) and Gulsha (Mystus cavasius) with carp in pond during June to November 2019 for period of six months. In the polyculture system Pabda, Gulsha, Rui and Silver Carp were cultured in the pond. Average net benifit/profit 1736245t/ha was obtaine dafter six month of rearing. The fish farmer would get opportunity to sell the high valued fish Pabda and Gulsha at a higher price in the market and they would also get an opportunity to consume the fish.


Fig. Hauling of Pabda and Gulsha with carps in polyculture pond

Culture of Monosex GIFT (Oreochromis niloticus) with Shing (Heteropneustes fossilis) and Magur (Clarias batrachus) in farmer's pond for four month. Average size of the pond was 0.25 acre. After six months the average production was 12913kg/ha. The higher production was obtained where the share of Shing and Magur were 10.50%. The net profit was 490352Tk/ha. Shing (H. fossilis) were cultured with other species which contributed to increase the total production as well as net income.


Fig. Harvested Magur, Shing and GIFT Tilapia in culture pond

Polyculture of Carp with GIFT and Shing were cultured in two farmer's ponds at Mokamia, Fulpur, Mymensingh during May to November 2019 for estimating the production of carp with GIFT and Shing. Average fish productions after six month were 750kg/pond. The contribution of GIFT and Shing in the total production was 45.0 %. Average net profit was 94060 Tk / pond. It may be concluded that the production and economic return of carps with GIFT tilapia and Shing in polyculture system was encouraging. Farmers were very much impressed by Polyculturing of Carp with GIFT and Shing.


Fig. Hauling of Carps with Tilapia & Shing in pond

b. Homestead production system component

For year round vegetables production in homestead areas eight farmers were selected. The activity was carried out from July 2019 to June 2020. The average size of each homestead was about 15 decimal. Before intervention average production of vegetables was 1241kg and income was 30406 Tk per farmer. After intervention average vegetables production was 2253kg and income was 67571Tk. per farmer. After intervention vegetables production was increased 61.78% per farmer. Each farm family consumed 453 kg and sold 1799 kg vegetables. Average net income was Tk. 41908 per farmer. The monthly average net income per farm family was Tk. 3492. It was observed that the income was used for other crop production, luxury goods, house repairing, children's education and sanitation etc.

Fig. Bottle Gourd

Fig. Cabbage in the homestead

Fig. Field visit by PIU-BARC, NATP-2 monitoring team

Cultivation of cucumber in nearby homestead areas during March-June 2019: The variety was HYV Cucumber's (var. Field King). The average yield of cucumber was about 45.72 t/ha. It was observed that 90% cucumber was sold in the market and the rest 10% was consumed. The average net income from cucumber production was Tk. 486250/ha.

Integrated Rice-fish Culture was demonstrated in three farmer's field. The plot sizes ranged from 50-100 decimal during T.aman season. A one meter deep ditch covering in 2% of the rice plot area was dug on the low-lying side and used excavated soil in strengthening the dikes, to hold water for fish farming and to prevent fish escaping. The average yield of rice and rajpunti were 4630 and 214 kg/ha, respectively. The average net return from rice and fish were Tk. 17940 and 8050 /ha respectively. While, the average yield of rice and gulsha fish were 4610 and 55 kg/ha, respectively. In this system, the average net return from rice and gulsha fish were Tk. 17780 and 7763/ha, respectively with an additional return from fish by 51.44%.

Adaptability trail of HYV of Aus rice after Boro rice was conducted during reporting period. After Boro the field became fallow. Generally, Aus rice was not cultivated in the farming system area. It was first time, Aus rice BINA Dhan 19 was cultivated in the area. Average yield of Aus rice was 4.76 t/ha and net return was Tk. 22025/h. The yield as well as net profit from integrated rice-fish culture encouraed farmers. They are very happy for getting straw as byproduct for their cattle in the lean period. However, farmers were convinced to cultivate Aus rice in the next season for getting higher yield and profit.

Fig. Aus rice variety BINA Dhan 19

Fig. Integrated Rice- fish culture field

c. Livestock Component

Rearing 'Sonali' chicken in farmer's management was practiced at FSRD site, during July, 2019 to june 2020. Each farmer was given 10 Sonali chickens (hen 09+ cock 01). For disease prevention, chicken were

routinely vaccinated against Fowl Cholera, RDV and Fowl Pox at three month interval. It was found that the average monthly egg production and consumption/family were 171 and 50, respectively. On an average 29.24% egg were consumed/farm family. The average monthly income from eggs was Tk. 1370/family. Farmers earned 70% higher income from Sonali chicken than indigenous chicken

Egg production performance of indigenous and Jinding duck under farmer's condition was evualuated during May, 2019: Six farmers were selected for this program. Ten Jinding ducks (Duck 09+ Drake 01) were given to each farmer. Vaccination was applied against Duck Plague and Fowl Cholera at three month interval. The average monthly egg production and consumption/family were 137 and 30, respectively. The average monthly income from eggs was Tk. 2000/family. Average monthly income/farm family increased by 45.98% and egg production by 51.51% from rearing of Jinding duck compared to indigenous duck.

Fig. Sonali chicken rearing

Fig. Duck (Jinding) rearing

Thirty farmers were selected for improvement of health condition of their cattle through deworming. Cattles were dewormed at two months interval. After eight month average body weight of dewormed cattle was increased by 82% than nontreated cattle. Through the program, farmers are motivated towards benifits of cattle deworming.

Under vaccination program 50 cattles, 30 goats, 200 chickens, 200 ducks, and 50 pigeons were vaccinated at three month interval. The mortality rate of cattle, goat, chicken, duck and pigeon before vaccination was 1.75, 4, 3.9, 4.4 and 10%, respectively. After vaccination the mortality rate of cattle, goat, chicken, duck, pigeon downed to 0, 0, 1.4, 2.5 and 10%, respectively. After vaccination the mortality rate was reduced significantly as well as income of the farmer was increased.

Women participation in agricultural activities at seven locations increased to a greater extent showing some positive impact on gender equity within the family. The daily nutritional requirements of the family members were supplemented considerably due to increased consumption of vegetables and fruits from the homestead gardening and also from fish, chicken and livestock production. Active participation of the farmer's and integration of their available resources in planned way has impacted positively impact in improving livelihood of resource poor farm households.

It is anticipated that if interventions made in different componentss are continued with active participation of the farmers' and integration of their available resources in planned way may create a positive impact on improving livelihood after the project duration.

B. Improvement of Farm Productivity through Intervention with Improved Agricultural Technologies in Char land Eco-System (Project ID: 096)

Char is a deposit of mud mostly sand as islands within the river, faces the flash flood along with other natural disasters due to climate change. The modern agricultural technologies are not properly disseminated in the char areas due to scattered, isolated and disconnected transport network. Char areas are also a hub of hydro meteorological disasters like unpredictable flash flood, seasonal drought, soil erosion and so on. Keeping the issues in mind, the project activities were identified and prioritized to maximize the farm

productivity and farmers benefits with efficient use of famer's existing resources. For this reason a coordinated project titled"Improvement of Farm Productivity through Intervention with Improved Agricultural Technologies in Char land Eco-System" has been implementing by Planning & Evaluation Division of BARC in partnership with On-Farm Research Division (OFRD) BARI, Gazipur, BINA, BSRI, Ishurdi, Pabna and BLRI Savar, Dhaka from February 2018 till date. Project Implementation Unit (PIU)-BARC, NATP: Phase 2 has been financing under the Programme Based Research Grant (PBRG) project. The main objective of the project is to increase farm productivity of Charland intervening whole farm activities. Coordinating unit has been conducting the following activities in order to achieve the output and outcome of the project:

1. Coordinating FSRD programs of all the component institutes.
2. Organized oneNational Task Force meeting,
3. Conducted three Coordination meeting with the PIs and Co-PIs of Component Institutes on research progress,
4. Organized one first year annul review and planning workshop,
5. One training program was conducted on Farming systems Research and development and
6. Four field visits was paid during reporting period at four FSRD sites, Bogura and Mymenshing under OFRD BARI component, Jamalpur under BINA component and Ishurdi, Pabna under BSRI component. The farming system research and development activities were implemented 60 house hold of five locations on four component institute OFRD, BARI(2 sites), BINA (one site), BSRI(one site) and BLRI (one site). Total 70 research and development activities were carried out during July 2019-2020. In each sites 12 farmers were selected for implementing research and development activities.

I. BARI Component

Total 32 research and development activities were conducted during July 2019 to June 2020 at two FSRD site of OFRD, BARI

a. Homestead production system component

For year round vegetables production 'Narekeli' and 'Goyeshpur' model developed by OFRD. BARI was followed where 7-9 niches were utilized and implemented with 24 farmers at FSRD site, Mymensingh and Bogura during July 2019- June 2020. The total vegetable production was 521.14 kg/homestead. After intervention of the improved technologies, vegetable production rosed to 344% compared to intervention before. The average vegetables intake per year per 5 member's farm family was 349.16 kg after intervention of the program and the increment was 343.94% .whereas intake was only 78.65 kg per farm family per year before intervention. After intervention, the distribution of vegetable was 57.33 kg and sell 114.65 kg per year per farm family. The total income from vegetables production per farm was recorded as Tk. 5211.40 which increased by 900%. Main stoleholders in homestead production were women and children.


Fig. Vegetables production at FSRD site Mymenshing


Fig. Vegetables production at FSRD site Bagrua

The available and un-utilized niches of the homestead area have brought under fruit production. Improved management practices such as fertilization, irrigation, pest control and pruning was suggested to some of quick growing fruits like papaya, lemon, bear, banana etc along with some existing fruit trees mango, Jackfruit, coconut, olive, wood apple etc for higher yield and quality fruit production in the homestead of FSRD site, Mymensingh and Bogura. It was observed that after intervention of improved technology, the

fruit production increased significantly. The average yield of fruits has increased by 69%. The fruits intake per farm family per year was 200 kg after intervention, whereas it was only 140 kg before intervention and it was observed that after intervention fruit consumption increased 43% per farm family. After implementation of the program, the distribution and selling tendency of fruits was increased and it was recorded as 10 kg and 375 kg, respectively, per year per farm family. After intervention the gross margin increased to 191% per farm family

For increasing nutrient intake from fruit sector by the cooperator farmer 180 quality fruit saplings were distributed among the project farmers at the FSRD sites Mymensingh and Bogura during July 2019- June 2020. Under this fruits saplings of mango, litchi, dwarf coconut, lemon, guava, papaya and dragon fruit were distributed. Besides sapling distribution, two scheduled spray for mango trees were done at flowering and fruit formation stage. Average survival rate of different fruit saplings ranged from 90-100 percent in sides.

Fig. Sapling distribution

b. Crops and Cropping System component

The crops and cropping systems in charland were tried with a view to developing improved cropping pattern and increased crop productivity by introducing new technology or variety. Following crops and cropping systems were practiced in the FSRD during 2019-2020.

Two improved cropping pattern Mustard (BARI Sarisha-14) - Boro (BRRI dhan28) - T. aman (Binadhan-11) rice and Potato (BARI Alu-25) - Boro (BRRI dhan28)-T. aman (Hybrid; Dhani gold) was tested against existing cropping pattern, Fallow- Boro (BRRI dhan28) - T. aman (BRRI dhan49) rice and Fallow - Boro (BRRI dhan28) -T. aman (Hybrid; Dhani gold) at the FSRD site, Mymensingh during the year of 2019-2020. The higher total gross margin Tk. 238670 ha-1 and BCR 1.56 was obtained from improve cropping pattern Mustard (BARI Sarisha-14) - Boro (BRRI dhan28) - T. aman (Binadhan-11) rice. The higher total gross margin Tk. 283800 ha-1 was obtained from improved cropping pattern, Potato (BARI Alu-25) - Boro (BRRI dhan28)-T. aman (Hybrid; Dhani gold) which was 500% higher than existing cropping pattern

T.aman(BRRI dhan49)	Fallow	Boro(BRRI dhan 28)	T. Aman (Binadhan-11)	Mustered (BARI Sarisha - 14)	Boro rice (BARI dhan 28)
					
Fig. Farmers existing cropping pattern			Fig. Improved cropping pattern		

T.aman(Hybrid; Dhani gold)	Fallow	Boro(BRRI dhan 28)	T. Aman (Hybrid; Dhani gold)	Potato (BARI Alu-25)	Boro rice (BARI dhan 28)
					
Fig. Farmers existing cropping pattern			Fig. Improved cropping pattern		

A four crop-based cropping pattern was tested over three crops-based cropping pattern to observe the feasibility of adapting four crops in a year sequence in the FSRD site, Bogura during 2019-20. Mustard (BARI Sarisha-14)-Boro (BRRI dhan28) -T. aus (BRRI dhan48)- T. Aman (BRRI dhan52) was introduced against the traditional cropping pattern Mustard (Tori 7) - Boro (BRRI dhan28) T. Aman (Swarna).The rice equivalent yield 33.18 tha-1 or t/ha was found in improved cropping pattern whereas 23.0 tha-1 or t/ha in the existing pattern. The gross margin of improved pattern was Tk . 370345/ ha which was 69% higher than existing pattern.

Mustard (BARI Sarisha-14)-Boro (BRRI dhan28) -T. aus (BRRI dhan48)-T. Aman (BRRI dhan52)

The production programs were carried out at FSRD site, Mymensingh during 2019-2020. The newly released varieties, technologies and management practices of BARI were demonstrated in farmers' field. The average fruit yield of snake gourd (BARI Chichinga-1) was 18.35t ha-1. Farmers are satisfied in having higher yield of snake gourd. They are interested in cultivating snake gourd due to its higher yield, shape and attractive were happy color. BARI lau-5 was cultivated following the production technology. The average fruit yield of bottle gourd (BAR lau-5) was about 25.85 t/ha. Farmers expressed their satisfaction having higher profit. The average yield of bitter gourd BARI corolla-1 was 20.46 t/ha or t/ha-1. Farmers were happy for getting higher yield and market price but insect is reconized as the main problem.The average yield of stem amaranth (BARI Danta-1) was 30.75tha-1. Farmers are satisfied having the higher yield of stem amaranth. They are interested in cultivating stem amaranth due to its softness and less fiber. The average tuber yield of potato (BARI Alu-25) was 26.30 t/ha. Farmers' expressed their satisfaction for getting higher yield and economic return but lack of storage facility and fluctuation of market price are the main constraints for extension of the technology. BARI Sarisha-14 performed well and yielded 1.75 t/ha or tha-1. Farmers were very much impressed having the higher yield of BARI Sarisha-14 and befitted in following Mustard-Boro-T. aman cropping pattern without hampering the Boro cultivation. Production programs with BARI released different crop varieties of potato, sweet potato, mustard, wheat and maize were conducted at FSRD site, Bogura during reporting period to observe their yield performance at farm level as well as popularize BARI released crop varieties. It was observed that potato, mustered sweet potato, wheat and maize produced 26 65, 1.47, 24.52, 3.62 and 7.50 t/ha, respectively.

BARI Danta-1

BARI corolla -1

BARI Alu-25

c. Livestock Component

To improve cattle health and control diseases and mortality rate proper vaccination is a key program. Proper vaccination against four major diseases reduces the mortality rate of cattle.The vaccine group Anthrax, FMD , BQ and HS were injected to 400 cattle and 920 of poultry birds were vaccinated with BCRDV, RDV, Fowl pox, cholera and Duck plague as per recommended schedule at both sites during 2019-2020. It was observed that, after vaccination the mortality rate due to foot and mouth disease produced significantly.Other activities like deworming on cattle and poultry and duck and Ram/Ewe rearing were conducted at FSRD site. A tot

number of 110 cattle were dewormed. It was found that, before deworming the frequency of disease incidence was higher whereas the average body weight, lactation yield and the lactation period increased after deworming. The gain in body weight of dewormed milking cow was observed as 40 g/day/cow whose average lactation yield was increased up to 0.4 L/day over the control.



Fig. Vaccination program

Rearing of duck was initiated both FSRD sites in Char land ecosystem of Mymensingh and Bogura during 2019-2020. The ratio of male and female was 1:7. The breed was Khaki Campbell. Initially 250g body weight ducklings were distributed among the farmers. After six month of rearing the average body weight was gained to about 2.2 kg and body weight increased by 780%. The monthly income obtained from egg per household was calculated as Tk. 480. About 62% eggs were consumed by the farm family, 6% eggs were distributed among the relatives and 32% was sold in the market to get cash income for meeting other household needs.


Fig. Duck rearing at Mymensingh site

Fig. Duck rearing at Bogura site

Duck Rearing at project sites

Ram/Ewe rearing in the farmer's household was conducted at FSRD site, Bogura during 2019-2020 with a view to improveme livelihood of rural poor. Each of two farmer was provided with single ewe for rearing at the project site. The animals were vaccinated and provided with feed. Both the adult ewe gave birth to new offspring. One ewe gave 3 kids and another one gave 2 offspring. Overall, the net present value is Tk. 23000.

Ram/Ewe Rearing at project site, Bogura

d. Fisheries component

Mono sex tilapia was cultured in FSRD site, Mymensingh whereas mixed polyculture with carp was followed in FSRD site, Bogura during 2019-2020. Three seasonal ponds were selected for mono sex tilapia

fish's culture in FSRD site, Mymensingh during 2019-2020. The average size of the ponds was 20 decimal. After four month the results revealed that, average production was 120kg and income was 14240Tk/ from 20 decimal pond. The BCR found from mono sex tilapia culture was 3.73. It was observed that, farmers sold most of the portion (89%), but also consumed (9%) and distributed (2%) among their neighbors and relatives. The farmers showed their interest in cultivating mono sex tilapia for its quick growing and more benefit. From mixed carppolyculture system the average yield was 52 kg with gross margin Tk 5180 from 12 decimel pond. The benefit increased to 157.71% than traditional culture from each pond. It was observed that, farmers consumed (32.48%), distributed to neighbors and relatives (6.48%) and sold (61.44%). The farmers were benefitted by carp polyculture system and they showed further interest in their fishes carp polyculture.

Other than agricultural activities, which called off-farm activities is also a good opportunity for increasing total income. At FSRD site Mymensingh and Bogura, besides, agricultural production, some farm families' especially the women were engaged with weaving 'Katha', sewing cloths with machine, making various handicrafts during their leisure periods. It was found that at Mymenshing and Bogura gross margin increased after intervention 144.76% and 29.44%, respectively.

II. BINA Component

Total 12 cooperating farm families, four from each category of marginal, small, and medium were selected for intervening farming systems technologies. Total 10 activities were undertaken during July 2019 to June 2020. The research activities were homestead production system, crops and cropping system, livestock production system, sapling distribution and fruit tree management.

a. Homestead production system component

BARI developed Goyeshpur model was followed for year round vegetables production in the homestead by 12 farmers with some modifications. Vegetables production was only 84 kg before intervention whichrised to 6518 kg after intervention. In case of fruit, before intervention production was 220 kg and after intervention it rosed to 347 kg. During reporting period average vegetable production was 6518 kg from which they consumed (1135 kg), distributed (617 kg) and sold (4766 kg). The gross income of each farmer from vegetables production was 85,069 Tk. Total fruit production was 347 kg among which they consumed (232 kg), distributed (68 kg) and (sold 47 kg). The gross income of each farmer from fruit production was 7,638 Tk. which ultimately increased farm income along with nutritional status of the family members. Women are very much involved in vegetables production in homestead areas.

Fig. Vegetables cultivation at different niches in Robi season

b. Crops and cropping system Component

Improvement of three cropping patterns were undertaken to increase system productivity: (i) Jute (JRO 524)-T. Aman (Binadhan-11)-Mustard (Binasarisha-9), (ii) Jute (JRO 524)-T. Aman (Binadhan-11) - Wheat (BARI Goam - 26) and (iii) Jute (JRO 524) -T. Aman (Binadhan-11) - Maize (hybrid 981) against farmers existing pattern Jute – T.Aman – Grass pea (fodder) First cycle of cropping pattern Jute (JRO 524) -T. Aman (Binadhan-11) - Maize (hybrid 981) against farmers existing pattern, Jute – T.Aman – Grass pea (Fodder) was completed. Gross margin increased by 140% in improved cropping pattern than existing cropping pattern.

Jute | T. Aman (Swarna) | Grass pea

Fig. Farmers existing cropping pattern

Jute (JRO-524) | T. Aman (Binadhan-11) | Maize (Hybrid-981)

Fig. Improved cropping pattern

c. Livestock component

At the FSRD site 150 cattles were vaccinated and dewormed. The dewormed cattle produce more milk (1.6 L/day) than non-dewormed cattle (1.0 L/day). Average body weight was increased in dewormed cattle than non-dewormed cattle. Under vaccination program the cattle were vaccinated to control major diseases. Before vaccination mortality rate was 5% after vaccination mortality rate downed to zero.

To increase the income of the farmers, 12 cattle from 12 farmers were selected for beef fattening. Feed and training were provided for beef fattening. Two round beef fattening activities have been completed. First round beef fattening was done just before the Eid-ul-Adha and second round beef fattening was done at the end of the year 2019. After completing beef fattening program it was observed that on an average body weight of the cattle was increased by 51% at first round and 52% at second round. Initially the farmers bought each cattle by Tk. 44000 and 33000 at first and second round, respectively. Body weight of cattle increased by 60-70% after three months of fattening. Each farmer, on an average, sold it by Tk. 97,000/= and 65,000/= at first and second round, respectively. Average profit per farmer was calculated to be Tk. 77,000. Farmers become happy due to getting higher profit from beef fattening.

Fig. Vaccination and De worming Program

Fig. Beef fattening

Ten selected farmers were given 40 pairs of pigeon (four pair each farmer) to increase the farmers' income and nutrition of the project farmers. Farmers get higher benefit from pigeon at present the number of pigeon was increased and the number is six pairs per farm family. On an average two pairs of pigeon were consumed by the farmer during reporting period.

For improved chicken rearing as per plan, 15 chickens at first and second batch and 20 chickens at third batch were given to each farmer. Rearing after 75 days it was observed that body weight increased raning

from 1280 to 1332 gm per chicken whereas initial body weight was in the range of 200-230 gm/chicken. In the year 2019, each farmer invested 4,760 Tk, for feed, supplemental cost (medicine and vaccination) and cost for one month old birds. Seventy five days after rearing the farmers sold three batches of chickens and earn Tk. 6,707 per farm family.

Fig. Pigeon and Chicken rearing in the farm household

Sapling of fruit trees were distributed among the farmers to increase homestead fruit production and meet up lnutrition of family member. During the reporting period 30 litchi saplings (China-3) along with 30 bay leaf and 40 hogplum saplings were distributed among the farmers. The survivability rate of fruit sapling was 92% and it is growing during reporting period.

III. BSRI Component

The farming system research and development activities were implemented by 12 selected farmers in the two villages at FSRD site Saraghat and Pakshi, Ishurdi Pabna. Fifteen research and develop activities were undertaken from homestead production system, crops and cropping system, livestock system, fisheries system, agroforestry and off farm activities during July 2019 July2020.

a. Homestead Production System component

On the basis of farmers' choice and agro-ecological suitability BARI developed 'Goyeshpur Model' was followed for year round vegetables and fruit production at FSRD site by 12 selected farmers with some modification. Different types of vegetables and fruits were grown at nine different production unit of a homestead. It was observed that vegetables production increased remarkably in homestead area due to new technology, hybrid variety and efficient use of nine production units. Before intervention farmer used only two production unit that is open sunny place and roof top in a small scale. But after intervention nine different spaces were utilized properly. It was observed that before intervention vegetables production per household was only 37 kg which was found 4740 kg after intervention. From total production (4740kg) they consumed (1,320 gk), distributed (639 kg) and sold (2,781 kg), which seemed much higher than before. The gross income of each farmer from vegetables production was 63,055 Tk. Fruits production were increased remarkably in homestead area due to improved management of fruit trees through pruning, pest control, fertilization and irrigation in quick growing fruit trees (guava, papaya, lemon, ber, banana etc.) along with other existing fruit trees (mango, litchi, jackfruit and coconut etc.) after program intervention. It was observed that before intervention fruit production per household was only143 kg which rosed to 347 kg after intervention. From the total produced fruit 347kg, consumed 218 kg, distributed 93 kg and sold 86 kg. The gross income of each farmer from fruit production was 8,955 Tk. Besides, distribution to their relatives and neighbor, farmers were more interested to sell for getting some cash money.

Fig. Open sunny space

Fig. Kochu at marshy land

Fig. Turmeric at partial shady place

Fig. Fruit trees at boundary

Fig. Vegetables production at different niches

Performance of chewing type sugarcane at homestead:
Chewing type sugarcane variety 'Rongbilash' was planted at 12 selected farmers homestead of FSRD site ishurdi, Pabna during 2019-2020. The program was undertaken for increased nutrition as well as income of farm family. It was found that each farm family earned Tk.3450 during reporting period.

Plantation and management of fruit tree:
A total of 192 saplings of different fruits were distributed among 12 farmers at the FSRD sites. The saplings were e.g. litchi (Bombay), mango, dragon fruit, malta, lemon, sapota and guava Fruit tree management has created a good impact and a total of 110 fruit treess prayed with insecticide and pesticide, while maximum fruit trees were mango (60).


Fig. Fruit sapling distribution at FSRD site Ishurdi, Pabna

Family labor utilization pattern in homestead production system:
Homestead production system opened an opportunity for women employment and empowerment. It was revealed that women had a good involvement in seed/seedling preparation and planting, intercultural operation, harvesting and marketing of vegetable; and fruits. It is revealed that women are increasingly coming forward and participating in income generation system. Children also helped the men and women in the production systems, especially, in non-hard-working areas. So, it was found that homestead gardening has created a good opportunity to utilize unused labor of women and children adequately, whic helped to produce more crop and earn more money by a resource poor farm family.

b. Crops and cropping system Component

Replacement of existing Sugarcane varieties by newly developed BSRI varieties at FSRD char land eco system:
The experiment was undertaken to replace the existing traditional sugarcane varieties by high yielding new varieties and increased income by cultivating newly released variety. The test varieties were Isd 34, Isd 39, Isd 40,BSRI Akh 43, BSRI Akh 44, BSRI Akh 45 and BSRI Akh 46. Seven varieties were tested at 12 farmer's field at FSRD site during 2019-20. Cost of each plot was Tk 19,600/ha and total income was Tk 39,631 and gross margin was Tk 20,031 per farmer.




Newly developed BSRI varieties

Chewing type (var. Rangbilash) sugarcane

c. Livestock component
Under Livestock component six development activities viz improvement of cattle health by deworming, beef fattening, uaccination on cattle, pigeon rearing, chicken rearing and cultivation of 'Napier' grass were carried out during July 2019- June 2020.

Improvement of cattle health by deworming, Vaccination and Beef fattening in the farmers' household: At the FSRD site 100 cattle's were dewormed. The dewormed cattle produce more milk (1.2 L/day) than non-dewormed cattle (1.0 L/day). Average body weight was increased in dewormed cattle than non-dewormed cattle. Under vaccination program, 100 cattles were vaccinated to control major diseases. Before vaccination program mortality rate was 7% after vaccination mortality rate downed to zero.To increase the income of the farmers, 12 cattle from 12 farmers were selected for beef fattening program. Feed and training were provided for beef fattening. Two round beef fattening activities have been completed. First round beef fattening was done just before the Eid-ul-Adha and second round beef fattening was done at the end of the year 2019. It was observed that average body weight of the cattle was increased by 52% at first round and 53% at second round, respectively. Initially the farmers bought per cattle by Tk. 41000 and 49000 at first and second round respectively. After three months of fattening each farmer on an average sold it by Tk. 91,000 and 105,000 at first and second round to be respectively. Average profit per farmer was calculated to be Tk. 38,025. Farmers are pleasent due to getting higher profit from beef fattening.

Fig. Milking cows

Fig. Cattle vaccination

Fig. Beef fattening program

Pigeon and Chicken rearing in the farmer's household:
Under pigeon rearing program 12 selected farmers were provided forty eight pairs of pigeon for increased income and nutrition. Two pair of pigeons were given to each farmers. The pigeon has given squib after two month. The number of pigeon has increased rapidly. Every month the pigeon given birth of squib. Rearing of four pigeon gave birth of forty piegon by now. It was also observed that on an average, four pigeon was consumed by each farm family.

Under this activity, improved chicken breed Sonali was distributed among the 12 participatory farmers for rearing in their household condition. Twelve selected farmers were given 720 chicks (Each farmer 60). As per plan 60 chicks (6 week old) were given in three batches (20 chick/batch) to each farmer. Among the distributed chicken 95% chicken survived. After three months, it was observed that body weight of the chicken increased that ranged 1590-1950 gm/chicken, whereas initial body weight ranged 200-230 gm/chick. Each house hold earned Tk. 10811, Tk. 8881and Tk. 7695 from first, second and third batches, respectively. As a result, total income from 'Sonali' Chicken was Tk. 27,387/farm/year. Farmers were interested about the new breed. Improved chicken rearing under batch system with proper management condition created a positive impact among the farmers.

Fig. Chicken and Pigeon rearing at the farmer's household

Cultivation of Napier grass:

Green fodder production in the homestead or nearby homestead areas might be a promising technology for maintaining farmers own cattle as well as earning cash. From these views, Napier grass production was started at farmers land nearby homestead and on the pond bank. Twelve farmers were selected for 'Napier' grass cultivation at FSRD site. The land area of each farmer was 33 decimal. The average yield of green fodder was t/ha or tha-152 t ha-1. It was also observed that total cost of production was Tk 4,500, and earned, Tk 15,000 with net profit Tk 10,500 from 33 decimal of land.

Fig. Napier grass at farmer's field

d. Fisheries component

A total of twelve ponds were selected from 12 cooperating farmers for carp fish polyculture. The average test pond size was 40 decimal. Six species of carp fishes eg. Rui, Katla ,Mrigal, Grass carp, Silver carp and Bata were stocked in the ponds during April 2019. The average survivability rate was 86%. The fish were harvested after 9-10 months. Average fish production was found 629 kg and net income Tk.55288 from 40 decimal pond. From the total production they consumed, distributed and sold to meet up immediate financial crisis. Mixed polyculture in seasonal ponds is very promising for its higher production because all the ecological niches of pond are effectively utilized for fish culture and never competes for food with other species of fishes. Farmers were very much motivated with the performance of mixed polyculture. The neighboring farmers showed their keen interest to follow the mixed polyculture technology.

Carp mixed poly culture at FSRD site

e. Off farm Activities

Other than agricultural activities, called off-farm activities is also a good opportunity for increasing total farm income. At FSRD site Ishurdi, Pabna, besides, agricultural production, some farm families' especially the women were engaged with weaving 'Nokshi Katha, sewing cloths, making different handicrafts during their leisure periods. It was observed that woman earn Tk. 12000/ from weaving 'Nokshi Katha' per year. If all households could introduce some off-farm activities, it would be helpful to increase total family income.

Fig. Off farm Activities at FSRD site

By integrating year round vegetables and fruits production, HYV seeds, improved cropping patterns and production technologies, deworming, vaccination program, beef fattening, chicken rearing, pigeon rearing, fish polyculture cultivation, resources (land, labor, capital, etc) of the farmers have been used optimally and therefore farmer's income and livelihood was being increased. Before intervention of the project, an average per farm net income was Tk. 20,135 whereas it rosed to Tk. 245,023 after interventions

IV. BLRI Component

Two villages (Jugnidhaho and Khamarsanila) of FSRD site Baghabari, under Regional Station of BLRI Shahjatpur, Sirajganj were selected for carrying out project activities. In conformity with the objectives of the study, farmers of three categories viz marginal, small and medium were selected for addressing integrated approach. Fourteen research and development activities on homestead production system, crops and cropping system, livestock production system and fisheries production were conducted during July 2019- June 2020.

a. Livestock Component

Milking cow rearing and beef fattening:

At the FSRD site Baghabari, Sirajganj three farmers were selected for milk production through cow rearing. Deworming and vaccination of the cattle were done regularly against major disease after intervention. Some supplementary concentered feed was also supplied to the farmers for their cow. After five month of intervention milk production increased on an average by 5-7%. Most of the products were used up by family members and a portion was being sold for extra income. The income per cow was 8000 Tk. from milk selling.

The beef fattening program are being established by the farmers with their growing cattle. Supplementary feed, logistic and technical supports were given to three selected farmers to conduct beef fattening program. Deworming and vaccination of the cattle were done regularly against major diseases after interventions. After four month of rearing the farmers sold their cattle during Eid-ul-Azha. The estimated average net income was 40000/ per cattle after four month of rearing.

Goat and Sheep rearing:

Six farmers under small and marginal group were selected and each of them was given two 'Black Bengal' goats and the sheep doe (one male two female) collected from local market. All the goat and sheep were vaccinated against PPR disease. Extensive and semi-intensive systems of goat and sheep rearing were being followed. Seventeen kids of goat were produced from six farm families in twelve months. Thirty three lambs of sheep were given birth from six farm families in eighteen months. All of the goats and sheep mothered kids from July 2018 to January 2020. Now average number of goat and sheep increased 5 and 6 per farm family respectively. Average market value of goat increased by 14500 Tk. per farm family and average market value of sheep rosed 25333Tk. per farm family. The farmers were very much pleasant for highly prolific nature production of goat and sheep. When the kids mature, they could be sold in the market and used to earn more family income.

Fig. Sheep with lamb

Fig. Goat with kids

Fig. Milking cow

Fig. Goat and Sheep rearing at FSRD site

Pigeon, Turkey, Chicken and duck rearing under semi scavenging system:

For small scale Pigeon and Turkey rearing under semi scavenging system at the FSRD site Baghabari, Sirajganj during July 2019- June 2020. Nine pair of pigeon provided among three farmers (each farming

having three pair) and 72 turkeys were provided among 12 farmers (each farmer having 6). Vaccination was carried owt on regular basisagainst major disease after intervention of the program. Supplementary feed and technical support also provided to the farmer. After six months rearing average number of pigeon increased to seven pair per farm family. Average income increased to 1500Tk per farm family. Average weight of Turkey after five month rearing was 3.5 kg per bird. The Turkey laid egg after five months each farm family got 20 eggs during reporting period. Farmers consumed (30%) and sold (70%) Turkey on an average respectively. Average value increases 4625 Tk. per farm family.

Twenty six ducks distributed among two farmers (each farmer 13) and three hundred (300) hilly chickens were distributed among 12 farmers (each farmer 25) at FSRD site Baghabari Sirajganj during 2019-20. Vaccination is being followed regularly and natural and supplied feeds are being fed. Technical supports (feeding, vaccination and other treatments) were also given as per requirement. The mortality rate of chicken was 30%. Duck laid egg after six month of rearing and each family got 155egg and gross margin was 1300 Tk. Chicken laid egg after six month of rearing and each family got 105egg and gross margin was 6100 Tk. Farmers consumed and sold chicken on an average 30%, and 70% respectively.

Turkey rearing

Pegion rearing

Hilly checiken rearing

Duck rearing

One of the development programmes of the project was prevention and control of diseases through routine vaccination programme of all livestock against FMD, BQ, Anthrax, PPR and poultry against NCD, fowl pox, gumboro, and duck plague in the project areas. After vaccination incidence of different cattle and poultry diseases decreased significantly.

Production program of BLRI-developed HYV Napier fodder:

Fodder cultivation is increasing day by day at Sirajganj district. BLRI-developed HYV Napier fodder cuttings were distributed among three co-operator farmers at FSRD site Baghabari, Sirajganj during 2019-20. The average plot size was 11 decimal. Average 490 Fodder cutting was distributed among the three farmers. Average yield was found 2.0- 2.5 t/ha from five cut. Average income per farmer was Tk.23,700 from 11 decimal land from five cuts.

Goat vaccination program at FSRD site

BLRI-developed HYV Napier fodder cultivation at FSRD site

b. Homestead production System component

Homestead vegetables, fruits, spices production programme:

For year round vegetables and fruit production BARI developed Goyeshpur Model was followed by five farm ers at FSED site Baghabari, Sirajgong during 2019-20. After intervention of 'Goyeshpur Model' vegetables production and income increased from different niches of the homestead. Before intervention vegetables and fruit production per farm family per year were 114kg and 69 kg, respectively. After intervention vegetables and fruit production increased by 168kg and 95 kg per farm family, respectively. Total productions of vegetables

in one year were 1501 kg. Total cost of production was Tk. 8750/- and gross return was Tk. 21270. Among the grown vegetables, 731 kg, 60 kg and 606 kg were sold, distributed and consumed, respectively.Homestead vegetables and fruits production as well as consumption, distribution and selling increased after intervention. Consumption, distribution and selling of vegetables increased by 45%, 57% and 40%, respectively. Women have showed special interest in homestead vegetable production and willingly took part in its cultural operations.

Fig. Winter vegetables

Fig. Creeper vegetables (country bean)

Fig. Creeper vegetables (bottle gourd)

Distribution of different sapling:

During reporting period a total 260 various types of fruits, seedling i.e.papaya, lemon, olive, drumstick, lotkon, Sapota, betel nut, wood apple, custard apple andmalta were distributed among 12 selected farmers. Recommended management practices were followed during plantation of saplings. Survival rate of saplings were about 85%. Farmer's responses were very encouraging. Growth of saplings was satisfactory.

Spices (Bay leaf)

Coconut (Dwarf variety)

Papaya (Red lady)

Lemon (BARI Labu-1)

c. Crops and cropping system component

To increase total productivity improved variety of mustard, onion, transplant aman and sesame were introduced in the existing Fallow- Boro- T. Aman cropping pattern.Two improved cropping patterns Mustard (BARI Sharisa-14) –Boro (BRRI dhan74)-T. Aman (BRRI dhan51), and Onion (BARI Piaze-1) –Sesame (BARI Til-1) - T Aman (BRRI dhan51) were tested against existing Fallow-Boro (BRRI dhan29)-T. Aman rice (local), during 2019-20 at Baghabari Sirajganj. Higher Gross margin 105318 (tk/ha) was found from improved cropping pattern Mustard (BARI Sharisa-14) –Boro (BRRI dhan74)-T. Aman (BRRI dhan51) which was 385% higher than existing pattern. Cost benefit ratio of improved cropping pattern was 1.59.

Fig. BARI Shorisa

Fig. BRRI dhan -74
Improved Cropping Pattern

Fig. BRRI dhan51

On the other hand, another improved cropping pattern Onion (BARI Piaz/e-1) -Sesame (BARI Til-1) -T Aman (BRRI dhan 51) produced higher gross margin 141170 (t/ha) which was 286% higher than existing pattern. Cost benefit ratio of improved cropping pattern was 1.97.

d. Fisheries Component

Mixed polyculture of carp fishes was conducted at FSRD site Baghabari, Sirajganj during 2019-2020 with one farmer. The pond size was 10 decimal. The fishes were harvested after five months of release. Total yield of fish after five month was 85kg/ pond. Total gross margin was 4284 Tk/ pond and cost benefit ratio was 2.29. On average farmers consumed and sold fishes 30%, and 70% respectively. Neighboring farmers showed their keen interest to follow the mixed polyculture technology in their ponds.

Fig. Onion (BARI Piaze-1)

Fig. Sesame (BARI Til-1)

Fig. T Aman (BRRI dhan51)

Fig. Improved Cropping Pattern

Women participationin in agricultural activities at five locations increased to a greater extent that showed some positive effect on gender equity within the family. The daily nutritional requirements of the family members were supplemented considerably due to increased consumption of vegetables and fruits from homestead gardening and also from fish, chicken and livestock production. Active participation of the farmers' and integration of their available resources in planned way has created a positive impact on improving livelihood of resource poor farm households.

Finally, it can be concluded that interventions made in different components exerted a visible positive impact in improving farmers' socio-economic condition and livelihood of the char land ecosystem as well.

C. Climate Resilient Farming Systems Research and Development for the Coastal Ecosystem (Project ID: 098)

Bangladesh is the third most vulnerable country in terms of population exposed to sea level rise. Coastal areas of Bangladesh are also a hub of hydro meteorological disasters including cyclones, tidal surges, floods, drought, soil salinity, saline water intrusion, waterlogging, and land subsidence. This has a direct bearing on livelihoods as agriculture provides employment for over 40 percent of the population in Bangladesh and it is a key economic activity for the 40 million inhabitants in the coastal zone. The agricultural system is heavily dependent on environmental factors such as timing, intensity and distribution of the monsoon, soil salinity and the availability of freshwater for irrigation. Anticipated climate change effects suggest that total rainfall in the coastal area is unlikely to decrease. Moreover, higher temperatures, changes in monsoon timing and predictability, sea-level rise and land subsidence driven by natural and human activities will make farming less secure as a livelihood unless there is improved farm management. In this context, it has become an urgent need to demonstrate modern agricultural technologies through "Integrated farming or Mixed Crop-Livestock System Approach" rather than seasonal or crop specific approach to that particular soil and micro-climatic conditions especially in Coasts. The subsistence farms in coastal areas are highly diversified with complex relationships among the various sub-system and the enterprises within a subsystem. While there are different production alternatives, farmers have a limited set of resources. A holistic approach to technology generation and packaging is essential to achieve this result through maximizing the complementary interactions among the different farming enterprises/ production system and the biophysical and socio-economic environment. A coordinated project on "Climate Resilient Farming Systems Research and Development for the Coastal Ecosystem" has been coordinating by Planning & Evaluation Division of BARC in partnership with On-Farm Research Division (OFRD)

BRRI and BINA, from February 2018. The main objective of the project was to develop of integrated farming technologies to maximize farm productivity and efficient use of resources, modify/fine tune on-station technologies generated by NARS institutes at different FSRD sites of coastal ecosystems and integrate component technologies (crops, livestock, fisheries, agro- forestry and homestead gardening, etc.) for

improving farm practices, establish linkage with different stakeholders. Project Implementation Unit (PIU)-BARC, NATP: Phase 2 has been financing the Programme Based Research Grant (PBRG) project.-component Planning and Evaluation Division has been conducting the following activities in order to achieve the output and outcome of the project during July2019- June 2020 :

1. Coordinating FSRD programs of all the component institutes.
2. Organized one National Task Force meeting,
3. Three Coordination meeting were conducted with the PIs and CoPIs of component institutes,
4. Conducted first year annul review and planning workshop,
5. Two training program were conducted on Farming systems Research and development and
6. Four field visits has done during reporting period at four FSRD sites, Patuakhali and Noakhali under OFRD BARI component, Shyamnagor,Satkhira under BINA component and Kaliganj,Satkhira under BRRI component.

The farming system research and development activities under this project has been implemented with 48 households of four locations with three component institute OFRD, BARI (two site), BRRI (one site) and BINA (one site). Twelve household were selected from each site for implementing research and development activities. Every site has been implementing year round vegetables and fruit production. Two cropping system experiment with three or four crop have been conducting every FSRD site. In livestock component vaccination, vitamin feeding, beef fattening, cattle, goat, sheep, chicken, duck and pigeon rearing with improve breed and management practices under farmer's condition is in progresd. In fishery component polyculture of carp fishes , Gift tilapia and mixed culture of Singh, Tilapia, Pabda, and Golsha, culture at ghare has been going on in seasonal and per annual ponds at different locations. Shrimp culture in ghare also going on at Shatkhera. Different off farm activities like Katha stiching and embroidery is in practicing-by woman help increasefamily income.

I. BARI Component

The proposed project was implemented in two new Farming System Research and Development site (FSRD) located at Subarnachar in Noakhali and Jamla, Dumki in Patuakhali. According to the aim of the project, resource poor farmers viz. marginal, small and medium having major components of farming and sizable homestead under single ownership were targeted and 12 farm households from each site covering four farmers from each category were selected. Prior to implemention the project activities, a baseline survey of individual households was carried out. The detail information regarding livelihoods pattern of each household especially total resources inventory, liabilities, technology used, level of input used, output obtained, income and expenditure status, labor availability of the farms of previous year were documented. Based on the potentials, suitable technological options were addressed to the farmers, and accordingly farmers' selected suitable technologies would be adjusted as per need for livelihood improvement. For achieving the objectives, a total of 32 research and development activities was carried out in 24 house hold at two sites during July 2019-June 2020. The research areas were: i) Homestead production system ii) Improvement of Crops and cropping system iii) Fisheries production system, iv) Livestock production system and v) Off farm activities.

a. Homestead Production System

Based on farmers' choice and agro-ecological suitability, the vegetables .production models of "Atkapalia Model" for Nokhali and "Lebukhali Model" for Patuakhali were followed. Result of this intervention was very encouraging as intake of vegetables by all types of farm families increased remarkably. In addition, most of the farmers distributed a portion of their products among their neighbors and relatives. They also sold some amount to earn cash. Women participation in homestead production activities increased largely that showed some positive effect on gender equity within the family. Different types of fruits and spices saplings were also distributed among the farmers of FSRD sites during July 2019-June 2020.

Year round Vegetables production at homestead following 'Labukhali Model' was followed at FSRD site Patuakhali during reporting period. Vegetables were produced in different niches of homestead. About 533

kg vegetables were produced per home stead. Each farm family was consumed 347 kg, distributed 103 kg and sold 121 kg. Total incomes from homestead were Tk. 15990. During this period fruit production was 142 kg of which market value was Tk.8520. The share of fruits to consumption, distribution and selling are 90 kg, 10 kg and 42 kg, respectively.

Fig. Year round vegetables production at FSRD Site Jamla, \Dumki, Patuakhali following Labukhali model

Fig. Year round vegetables production at FSRD Site Subarnachar, Noakhali following Atkapalia model

Year round Vegetables Production at homestead following 'Atkapelia Model' was follwed with 12 farm family at FSRD site Noakhali. Vegetables were produced in the different niches of homestead. About 403 kg vegetables were produced per home stead. Each farm family consumed 225kg, distributed to the relatives 71 kg and sold 107kg. Total income from homestead was Tk.2148. During this period fruit production was 148 kg of with market value Tk. 7100. Utilization pattern of fruits for each farm family were consumption 56kg, distribution 22kg and selling 70 kg. All categories of farm family earned more money as compared to before intervention of the year-round vegetables production model.

To increase nutrient intake from fruits it needs to be increased the number and quality of fruits plant in the homestead. From this view, 360 different type of quality fruit saplings were distributed among the 24 cooperating farmer e.g. Mango (BARI Aam-4 and11), Guava (BARI Peyara-2 and 3), litchi (BARI Litchi-3), Malta (BARI Malta-1), dragon fruit (BARI Dragon fruit -1), drumstick, papaya (hybrid red lady) and chewing type sugarcane during July 2019-2020). Growth of fruit sapling was satisfactory and mortality percentage was recorded to be 10-16% during reporting period.

Fig. Fruits sapling plantation at homestead

b. Crops and cropping system component

In case of crop component, short duration as well as high yielding varieties of different crops were intervened to improve the cropping system. Newly released high yielding crop varieties were also introduced through production program. Because of such interventions farmers got significantly higher crop yields and economic return compared to their existing practices. A study have been undertaken at the FSRD site Jamla, Dumki, Patuakhali to improve existing cropping pattern; Mungbean (BARI Mung-6) – Fallow - T.aman (Local) by improved cropping pattern potato; (BARI Alu-72) - mungbean (BARI Mung-6) - T.aman (BRRI dhan-49). The gross return of improved cropping pattern was Tk. 305550 which is 157% higher than the existing pattern.

Production program on sunflower (BARI Surjamukhi-2), mungbean (BARI Mung-6) and maize (BARI Hybrid Maize-9) were conducted at FSRD site Patuakhali. Average yield of sunflower (BARI Surjamukhi-2), mungbean (BARI Mung-6) and maize (BARI Hybrid Maize-9) were 1.30, 1.42 and 7.8 t/ha, respectively, Yield and gross margin were higher than existing variety is used by farmers.

Fig. BARI Sunflower-2 at Patuakhali

Fig. BARI Mung-6 at Patuakhali

Fig. Soybean seed production in Kharif II season at Noakhali

In the Sorjan system year round cultivation of vegetables and some quick growing fruits were usually grown on the high beds as well as on slopes. Selection of crops depends on the size of Sorjan, farmer's preference and demand of the local market. Vegetable production in Sorjan system conducted at FSRD site Patuakhali during April-December, 2019. At that time only BARI Lau-5 was grown in the Sorjan. Average production of vegetable was 195 kg and case income was Tk. 7800 per Sorjan. Kangkong and Panikachu were cultivated in the raised bed system among two farmers. Farmer earned Tk. 5850 from Kangkong and Panikachu in raised bed during reporting period.

On-farm verification trials on different Rabi crops conducted at the FSRD site Noakhali during 2018-19. The average yield of Boro rice (BINA dhan10), Soybean (BARI Soyben-5), Mungbean (BARI Mung-6), Cowpea (BARI Felon-1), Grass pea (BARI Khesari-2), Sunflower (BARI Surjomuki-2) and Proso millet (BARI Cheena-1) were 4.30, 1.72, 0.83, 0.89, 0.87,1.13 and 0.93t/ha, respectively.

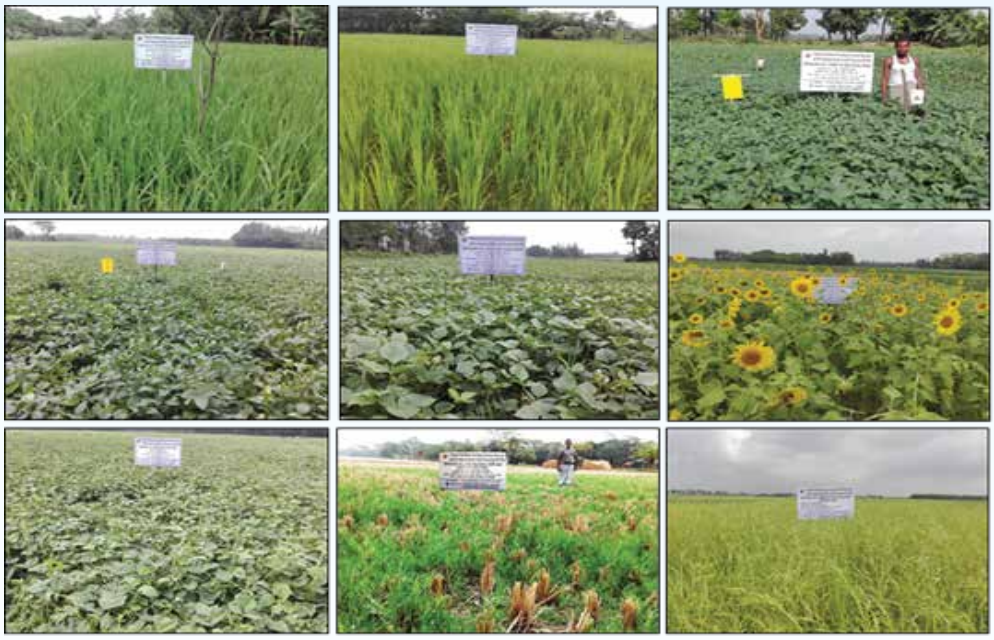


Fig. Pilot production program of different robi crops at FSRD site Noakhali

Production program of Aus rice was conducted at FSRD site Noakhali and Patuakhali during 2019-2020. Generally, co-operative farmers from both the location cultivated T. Aman in Kharif II and other cash crops during Rabi season. During Kharif I fields remain fallow due to lack of proper knowledge on modern rice. In Noakhali, highest yield (4.21 t ha-1) was obtained from BRRI dhan85 followed by Binadhan19 (3.79 t ha-1). Modern varieties could be incorporated in the cropping system instead of BRRI dhan48 as its short strature dose not suit low land. In Patuakhali, the average yield of BRRI dhan48 was found 3.56 t/ha-1.

Superimposed trail of T. Aman varieties for sustainable cropping patterns carried out at FSRD site Noakhali and Patuakhali during reporting period 2019-20. In Noakhali, BRRI dhan52 gave highest yield (4.34 t/ha or tha^{-1}) whereas second highest yield (4.3 tha^{-1} or t/ha) was obtained from BRRI dhan87. In this site, farmers usually cultivated Shorna and BRRI dhan52. BRRI dhan87 is short duration compared to other varieties and it could be fitted in the cropping: patterns Watermelon-Green manuring crops-T. Aman rice and Groundnut-T.Aus-T. Aman rice cropping patterns in the well-drained medium high land. On the other hand BRRI dhan52 produced highest yield 4.71 t/ha of tha-1 compared to BR11 and BR23 at FSRD site Patuakhali. BRRI dhan52 could be fitted in the cropping pattern Mungbean-Taus- Taman in the medium high land. Still farmers prefer BR11 and BR23 as water level in the field was high during the growing season which could be fitted in the cropping pattern: Mungbean- fallow- Taman rice in the medium low land at Patuakhali.

Quality seed production of soybean for upcoming Rabi season was undertaken during Kharif II season. The yield was 2.04 t/ha or tha-1 where total variable cost was 41,523 Tk. ha-1 and gross return was 204000 Tk. ha-1. The quality of the seed was good in respect of higher germination percentage and seed vigor compared to last year Rabi season grown seeds.

Fig. Soybean seed production in Kharif II season at Subarnachar, Noakhali

Production program of Summer tomato with of BARI Hybrid 'Summer Tomato-8', 'BARI Hybrid Summer Tomato-10' and 'BARI Hybrid Summer Tomato-11' conducted at FSRD site Noakhali during 2019-20. The average yield were 24.12t/ha (BARI Hybrid Summer Tomato-8), (BARI Hybrid Summer Tomato-10) and 19.65 t/ha, (BARI Hybrid Summer Tomato-11), from the test varities. Farmers became become impressed to grow summer tomato for higher yield and income. After cultivation of summer tomato the existing structure were used for early winter season vegetable production. Cauliflower, cabbage and broccoli were cultivated under the shade during 25-27 October, 2019. The average yield was 370kg/3 decimal. Additional income from winter vegetable was 7400Tk/3 decimal.

c. Livestock Component

Under livestock program, attempts were made to prevent/control major diseases of cattle and poultry through proper vaccination at each project sites. Deworming of cattle, done before animal fattening, showed remarkable positive effect on body weight gain and market value. Chicken and duck rearing especially in semi-scavenging system in homestead created a good impact among the farm families as a good source of income.

About two pair of pigeon, two pair of Turkey, two pair of duck, and two pair of Titir were distributed among 12 cooperating farmers during April-September 2019 at FSRD site, Noakhali. One hundred naked neck-chicks and one hundred Hill chicks were collected from BLRI, Savar during 30 November, 2019 and distributed to the 12 cooperative farmers at FSRD site, Noakhali. Mortality was more than 90% of naked neck chicks and Hill chicks. Survival capacity of Turkey was not good. The distributed Titir are tamed and scavenging like native chickens. Titir has more survival capacity than Turkey. Among the 12 cooperating farmers five months old four 'Khaki Campbell' duck were provided. Each farmer has 3 female and one male duck. After three month of rearing ducks werelaying eggs almost every day. The consumption rate of

egg was increased by the farmer as well as income by selling egg. Every farmer has hatched the eggs by the hen. Now each farmer has more than 10 ducklings, at now being in growing stage.

Vaccination program on cattle, buffalo, goat and poultry:
To reduce disease occurrence in cattle, buffalo, goat and poultry vaccination programs regular interval. A total of 100 cow and 40 buffalo vaccinated with FMD and Anthrax and 50 goat vaccinated with PPR. Before the intervention, percent of mortality in the area was 20% but after intervention no mortality was recorded. A total of 40 Turkeys, 500 chicken and their chicks were vaccinated with BCRDV and RDV. Hundred Khaki Campbell ducks were vaccinated with DPV. After regular vaccination program mortality rate decreased significantly.

Among the 12 cooperating farmers/cliens, ducks pigeon and Turkeys were distributed at FSRD, site Patuakhali during April-September'19. Each farmer was given 10 'Sonali' chicken, five Khaki Campbell ducks, two pair of pigeon and four Turkeys. Mortality of chicken, ducks, pigeon were less except Turkey (50%). By this time chicken and duck has been laying eggs and pigeon gave birth to 12 pair squib.

At FSRD site, Patuakhali six farmers were selected for cow rearing for milk production. Deworming and vaccination was done regularly against major disease after intervention of program. Some supplementary concentered feed was also supplied to the farmer for their cow. After 5 month of intervention milk production increased by on an average, 15-20%. Most of the milk was consuned by the family member and sold a portion is being old for extra income. The income per cow was 10000 Tk. from sold milk. Five (05) farmers fatten their beef through UMS and other technology. Some supplementary concentrate feed also was supplied to the farmer for beef fattening program. The farmers sold their cattle during Eid-ul-Azha after four months of rearing. The average income was after five month of rearing, 40000/ per cattle.

Fodder production is the main limitation for sustainable livestock production in saline coast including project intervention area. Six farmers were selected for fodder cultivation at FSRD site, Noakhali for growingNapierand and Sorghum. In case of Napier grass, green fodder were collected three times with yield about 8.13t/ha, it was highest during second time harvesting at 67 days after sowing (DAS) whereas 5.32 t ha-1 green fodder was harvested from Sorghum grass after 53 to 55 DAS.

Fig. Cattle and poultry vaccination program during July 2019 - June 2020

d. Fisheries component
Mixed carp and monoculture of monsex tilapia culture in the seasonal mini ponds were conducted with six farmers at FSRD site, Patuakhali during 2019. Average pond size was 10 decimal per farm family. After 7/8 months, ponds were dewatered completely to harvest all the fish. During reporting period mix carp culture was not harvested but monosex tilapia was harvested. The average production of monosex tilapia was 235kg/10 decimal pond. Utilization pattern were consumption (30kg), distribution among relatives and neighbor (22kg) and selling (183kg). The average cash income was 28755Tk/10 decimal pond and BCR was 3.01.

Monoculture of monsex tilapia and surputi in the seasonal mini ponds was conducted among three farmers at FSRD site Noakhali during 2019. Average pond size was 10 decimal per farm family. During reporting period monosex tilapia and surputi was harvested. The average production of monosex tilapia was 230kg/10 decimal pond. Utilization pattern were consumption (27 kg), distribution among the relatives and neighbor (23 kg) and selling (180 kg). The average cash income was 24,580 Tk/10 decimal pond. The average production of surputi was 161 kg /10 decimel pond. Utilization pattern were consumption (39 kg),

distribution among the relatives and neighbor (16kg) and selling 106kg. The average cash income was 15900Tk/10 decimal pond. This intervention helped towards increased income.

Fig. Fodder production at FSRD sites during July 2019 - June 2020

e. Off-Farm Activities

In Noakhali, a traditional bed mat locally called Pati (Shital pati) is commonly made from strips of a green cane known as 'Murta', also familiar as mostak, patipata grown at the edges of pond bank under partial shade. Eight (08) farm families have good numbers of Mostak plants at pond banks. Generally women and teenage girl of the farm family are traditionally involved in making various types of Shitol pati during their leisure time in summer and rainy season. Under the project dimension, various types of design and color was supplied among the members to improve the quality of the geometric pattern such as Shiki, Adhuli, Taka, Noyontara, Ashmantara, Shapla and Shonamuri. The pati is a major income source of the women. Moreover, farmers easily can make 7ft x 5ft size pati by practices the following management. Two to three persons can weave a pati within a month with decorative design. Depending on the quality and size a Shitol Pati costs Tk. 1000-5000.

Fig. Fish culture at FSRD site, Noakhali

Fig. Pati plant growing at homestead

II. BRRI Component:

A total of 16 farming system research and development activities conducted during July 2019- June 2020. The farmers groups were marginal, small and medium and have homestead, crops, livestock and fisheries component of farming systems.

A. Homestead production System

Year round vegetables and fruit production program in the homestead was undertaken to maximize vegetables production in coastal region and to ensure improved nutrition. Improved production practices along with improved verities were tested to increase total vegetables, spices and fruit production round the year using existing farm resources. Total productions of vegetables after twelve months were 5487 kg. Average production of vegetables per homestead was 610 kg. Before intervention, average year round vegetables production was 343 kg in similar area. The higher production rate consequently increased consumption rate of vegetables. After intervention, average consumption increased from 215 kg to 292 kg in last twelve months. Fruit trees are still growing stage. Among the produced vegetables, 2448 kg, 414 kg and 2628 kg were sold, distributed and consumed, respectively. The total cash income was 48960 Tk. and gross margin of 73955 Tk. was obtained from the production of vegetables at homestead. Woman and children mostly participated in homestead production system.

Vegetables production nearby homestead:

Total productions of vegetables in twelve months (Feb 19-Jan 20) were 9150 kg/93 decimal with an average of 3050 kg per farmer. From vegetables produced 5901 kg, 1104 kg and 2145 kg were sold, distributed and consumed, respectively. The total cash income was 118020 Tk, while total income was 183020 Tk and gross margin was 108020 Tk.


Fig. Homestead vegetables production


Fig. Vegetables production at nearby homestead

Growing Chui Jhal with perennial trees or wall:

The southwestern region of Bangladesh is popular for producing a spice named Chui jhal. In this region, it is one of the most popular and unique spice to cook foods especially mutton in special occasions. The chopped stems, roots and skin of Chui plant are used while cooking food. Eleven families were motivated for planting Chui jhal spices with the support of perennial trees and nearby walls. As the Chui jhal plant is one kind of climbing tree that grows in shady places. A total of forty-one stems were given to ten farmers during year (Feb 18- Jan 19). The stems are not marketable before June 2020.


Chui jhal production at the shady places of homestead

b. Crops and cropping system component

Two improved patterns Mustard (BARI sharisa 14) - Boro (BRRI dhan81) - T aman(BRRI dhan75) and Boro (BRRI dhan81) – Jute - Taman (BRRI dhan75) were tested against existing Boro-Fallow-T. Aman cropping pattern. Rice equivalent yield 15.24 and 13.94 t/ha was obtained from improved cropping pattern whereas Rice equivalent yield of existing cropping pattern was 10.42 t/ha. The short duration of T. Aman rice varieties is making opportunity to introduce extra crop in pattern. The farmers were happy with the production of the newly introduced BRRI dhan75 and its grain quality as well as the additional mustard crop.


Fig. Improvement of existing cropping pattern

South-western coastal region is one of the most salinity affected areas in Bangladesh. As a long term impact of climate change and salinity intrusion make this area unfavourable for agricultural production. This program was initiated to increase the production in the affected area at FSRD site, Satkhira. Four cropping patterns Khira + Pumpkin -Jute- BRRI dhan75; Mustard -Mungbean-Jute- BRRI dhan75; Cabbage +Spines –BRRIdhan81- BRRIdhan75 and Mustard- BRRI dhan86- Jute-BRRI dhan75 were tested against existing cropping pattern: BRRI dhan28-Fallow-BRRI dhan49. Rice equivalent yield of test pattern was found 41.14 t/ha, 18.86t/ha, 33.03t/ha, 21.54t/ha and 10.42t/ha, respectively Diversified crop production in different cropping patterns increased yield and income respectively of the coastal rural people. It will also created suitable alternative production option for salt affected area.


Fig. Development of alternate cropping pattern


Fig. Cropping pattern in saline affected area

Under production program four BRRI released T. Aman rice variety for saline ecosystem were tested. About one bigha land was taken under cultivation of each production program. Ten disperse farmers field were taken for production program to observe the field performance of the test varieties. The varieties were BRRI dhan71, BRRI 73, BRRI dhan75 and BRRI dhan87. BRRI dhan71 and BRRI dhan87 gave higher yield than other varieties. BRRI dhan71 yielded 6.01 t/ha followed by BRRI dhan87.

BRRI dhan87 yielded 5.98 t/ha, while yield of BRRI dhan75 was 5.48 t/ha. BRRI dhan73 givelowest yield (5.03 t/ha). The result showed that BRRI dhan71 and BRRI dhan87 could be a good variety for saline ecosystem. Farmers' preference was on BRRI dhan75 as its grain size and fragrance followed by BRRI dhan87. BRRI dhan87 out performed than other varieties in grain yield.

Under production program, three BRRI released Boro varieties in coastal ecosystem were tested. The test varieties were BRRI dhan 67, BRRI dhan 81 and BRRI dhan 86. About one bigha land was brought under production program. It was observed that BRRI dhan 67, BRRI dhan 81 and BRRI dhan 86 produced 6.08 t/ha, 6.03 t/ha and 5.83 t/h grain respectively. Performance of BRRI dhan67 was better under saline condition where no crops could begrown during dry season. Farmers' opined that BRRI dhan67 was high yielder and saline tolerant variety in south coastal ecosystem.


Fig. Production program of BRRI released T. Aman rice varieties


Fig. Production program of BRRI released Boro rice varieties

Increased productivity of gher boundary introducing of modern technology:

In the coastal belt of Satkhira, most of arable lands are in the gher system. In order to increase the productivity of the gher system integrated rice-fish-vegetables cultivation was introduced. fish culturing in ghers and vegetables like indian spinach, spinach, okra, white gourd, bitter gourd, pumpkin and beans were grown on gher dykes. T. Aman rice BRRI dhan30, BRRI dhan73 was produced along with fish and only fishes are cultivated during Boro season in non-saline gher. Fish was produced in under carp polyculture system. Average gross return for five ghers was 636724 Tk/ha. Average gross margin from five ghers was 312470 Tk/ha. The highest average BCR (2.02) was found when vegetables cultivated at gher dykes. Integrated rice-fish-vegetables cultivation in gher system increased the total productivity and farmer's income.

Fig. Increased productivity of gher by integrated rice-fish-vegetables cultivation

c. Livestock Component

Under 'Livestock Component' five development activities viz., with 'Sonali' chicken, duck rearing with 'Khaki Campbell', Turkey were reared under semi scavenging system, and goat rearing and improvement of health condition of livestock through de-worming and vaccination were also carried out.

Chicken and Duck Rearing:

Under this activity, improved chicken breed 'Sonali' Chicken (Layer) was distributed among participating-farmers for rearing under household condition. Among the distributed chicken 75% chicken survived. The egg production of chicks started after 50 days after distribution. Average number of eggs laid for each farmer was 799. Average cash income was 4460 Tk. per farmer. On an average they consumed, (195) sold (554) and distributed (54) and eggs per farmer, respectively.

Each of the four selected farmers was given six weeks old 17 'Khaki Campbell' duck. All of the ducks were female. Egg production started after five month of distribution. Average egg production was (1236) and incressed of 6968 Tk was obtained by farmer during July, 2019 to June, 2020. Farmer consumed (260), sold (861) and distribed (117) eggs laid by ducks.The egg consumption rate was increased among family members as well as nutritional intake was also increased. Farmers were highly satisfied with these new breed as more egg production and additional monthly income. Improved duck rearing system with proper management created a positive impact among the farmers.

Fig. Sonali chicken (Layer) at farmers household

Fig. Duck (Khaki Campbell) at farmers household

Fifty 'Turkey' chicks were distributed among five farmers. Average initial weights of the chicks were 300-350g. After 5-6 months female birds started laying eggs. At about 7-8 month's duration 'Turkey' birds gained 3.5 kg per bird. During July 2019-June 2020, farmers sold 553 eggs while consumed 58 eggs. Five co operating farmers hatched 166 eggs during last twelve months. Maximum income was obtained from matured turkey and hatched turkey chicks from eggs, followed by selling eggs in last twelve months. Average gross return from selling eggs was 2562 Tk and gross return from selling live mature 'Turkey' and 'Turkey'

chicks for each farmer was 7348 Tk. The average total gross return during twelve months after was 9910 Tk. per farmer. Farmers were highly satisfied with these new birds as more egg and meat production and additional monthly income became due. Turkey rearing is gradually gaining popularity in the selected areas.

Fig. Turkey rearing at FSRD site, Satkhira

Goat rearing in homestead area:

Five farmers under small and marginal group were selected and each of them was given two 'Black Bengal ' doe collected from local market. Extensive and semi-intensive systems of goat rearing were being followed as per necessity. Eight kids were paised from five families in thirteen months. All of the goats produced kids between May 2018 to June 2020. Some goats were producing milk regularly which fulfil nutrition among the family members. When the kids mature, they can be sold in the market and used to expand family income. The initiative of giving one of the many female kids born in a farm family under this project facilitated higher economic returns of the cooperating farmers.

Fig. Goat rearing at FSRD site Satkhira

d. Fisheries component

Polyculture of fish in 'Gher' was practiced with six farmers. Eleven species of fish namely Rohu, Catla, Silver carp, Grass Carp, Mirror Carp, Thai puti, Vangal, Coral, Faissa, Khorkhullu and Bagda and shrimp were cultured in the Gher. Average Gher size was found 136 decimals. Farmers completely harvested their Ghers in January, 2019. Before intervention farmers generally cultured Bagda and Coral in the Ghers, after intervention different type of high value fishes like Khorkhullu, Vangal and Faissa introduced in the saline Gher system. As there was some sort of salinity fresh water species along brackish water species were stocked in the Ghers. Stocking density was 40-50 individuals per decimal, while Bagda was stocked at 3-4/m2. In case of carp fishes, overwintered fingerlings were stocked for rapid growth. Bagda was stocked in February-August, 2019 while other fishes were released in April-August, 2019. The average production for six farmers was 670 kg, while average consumption for six farmers was 74 kg. Average gross return was 184850 Tk and BCR was 1.98. Usually in the Gher systemsfarmers uskally grow 'Bagda' in Satkhira. But due to new intervention of fish polyculture in Gher systems farmers were very much impressed for higher income. The farmers were happy with the production of fish and shrimp in the Ghers.

Fish polyculture in mini pond system were introduced among six farm families having perennial pond. Ten species of fish namely Rohu, Catla, Mrigel, Bata, Silver carp, Grass Carp, Mirror Carp, Black Carp, Tilapia, Thai puti were distributed. Average pond size was 23 decimals. Stocking density was 30-40 individuals per decimal. The fingerling were released on April-August, 2019. Overwintered fingerlings were stocked in the pond for better growth rate. Average consumption from the mini ponds was 53 kg and average income from mini ponds was 9189 Tk. Before intervention, farmers were not aware about the possibility of fish polyculture in the mini ponds. Intervention of modern technology fish production increased significantly.

Farmers were very happy with the size of fish and higher production. They also showed interest to continue inthe practice next season.


Fig. Fish polyculture in saline gher at FSRD site, Satkhira


Fig. Fish polyculture in mini pond near homestead at Satkhira

e. Establishment of mini orchards and plantation of fruit tree in the homestead

A fruit based mini agroforestry with mango and litchi was established at homestead near field with potato and mustard. The average yield of potato (7.0 t/ha) and mustard (700 kg/ha) were obtained from mango based agro-forestry system. Three different types of mango and wood apple saplings were distributed per farm families for homestead plantation. Maximum four mango saplings were distributed per household. Farmers were satisfied with the production of potato and mustard in the mango orchard. Farmers' responses were very encouraging to have fruit mini orchard. They were interested in vegetables production in mini orchards is well.

In the fruit tree plantation program in homestead area 85 fruit saplings were distributed among 12 farmers to improve and maximize the usage of homestead area. The distributed saplings were mango, litchi, wood apple, guava, areca nut and plum saplings. The mango varieties were BARI Aam-3, Gobindobhog and Himshagor. Total eighty five fruit trees were given to twelve farmers. Sixty seven saplings survived after plantation out of 85 saplings and the survival rate was 87%. The fruit trees are in growing stage. Other farmers in the area are encouraged by the activity.


Fig. Fruit sapling distribution among the cooperator farmers


Fig. Establishment of mini orchards at homestead

f. Training and Field day

One training program was organized during 29th and 30th January. Upazilla Livestock Officer, Senior Upazilla Fisheries Officer were invited as resource speckers and share knowledge. A total number of sixty male and female farmers participated the training. Farmers were interested learn to novel technologies.

Two farmers' field days were organized to gather their opinion on different rice varieties and to expose the production technique of modern rice cultivation. on BRRI dhan67 and BRRI dhan87 during the production period of T. Aman season. Local NGO leaders, local representatives and around 150-200 both of male and female farmers attended each of the field day. Farmers gave their opinions on different rice varieties.

Fig. Training program of co-operator farmers

Fig. Field day

III. BINA Component

The PBRG Sub Project on "Climate Resilient Farming Systems Research and Development for the Coastal Ecosystem" is being implemented by Agronomy division in two villages (Sonkorkati and Jadobpur) under Shyamnagor Upazila of Sathkhira since February, 2018. The project was undertaken to develop climate resilient farming system technologies and to maximize the farm productivity with efficient use of farm resources and improve family income and livelihood. Twelve farmers were selected from two villages for conducting farming system research and development activities. The farmers group were marginal, small and medium and who have crops, livestock, fisheries and homestead component. The research areas covered homestead production system, crops and cropping system, livestock production system and fisheries production system. Under the program area, ten research and development activities were executed during July 2019 to June 2020.

a. Homestead Production System Year round vegetables and fruits production at homestead and high value vegetables production at nearby homestead areas.

For year round vegetables production BARI developed 'Lau Dove' model was followed where eight niches were utilized and implemented with 12 farmer during 2019-2020. After intervention of the proven and improved technologies in the homestead, vegetable production has increased significantly. (400%) compared to before intervention of the program. The total vegetables production in the homestead was 455kg homestaed/year. The average vegetables intake, distribution and selling per farm family were 330 kg, 39 kg and 30, kg respectively. The gross return from vegetables per farm was recorded as Tk. 8248 with the gross margin of Tk 5330 per family per anum and income increased by 64.61%. This program inspired farmers to consume more vegetables together with farm income.

The available and un-utilized niches of the homestead has brought under fruit production. Improved management practices such as fertilization, irrigation, pest control and pruning were done with some of quick growing fruits like papaya, lemon, bear, banana etc along with some existing fruit trees mango, coconut, olive, indian dellenia, wood apple etc for higher yield and quality fruit production. It was observed that after intervention of improved technology, the fruit production was increased significantly. Along with intake per farm family per year. After intervention of the program, the distribution and selling tendency of fruits was also increased. The better utilization of homestead area with optimum management by effective utilization by family labor. After intervention of 'Laudove Model' participation of women and children has increased in homestead production system.

Nearby homestead have been brought underhigh value vegetables by three farmers during 2019-20. The vegetables were tomato, broccoli, bitter gourd and kakor. Average size of area was 25 decimal. Average production was 2166 kg/25 decimel. The average vegetables intake, distribution and sold per farm family were 130 kg, 103 kg and 1933 kg, respectively. The total return from vegetables per farm per year was recorded as Tk. 66453 from 25 decimal of land. Income was increased by 46.33% from high value vegetables production.

Fig. Homestead vegetables production in different niches at FSRD site, Satkhira

Fig. High value vegetables production (Broccoli and Muskmelon) at FSRD site, Satkhira

b. Crop cropping system component

To increase total productivity of the land, high yielding variety of mustard and T. Aman rice was introducedin the existing cropping pattern. The trial was conducted at FSRD, Shyamnagor, Sathkhira during 2019-20. One improved cropping patterns: Mustard (Binasarisha-9)- Boro (Binadhan-10)-T. Aman (Binadhan-17), was tested against existing: Fallow-Boro (Binadhan-10)-T. Aman rice (Jamaibabu) pattern.

Higher net return 123135 (Tk /ha) was attaured from improved cropping pattern Mustard (Binasarisha-9)-Boro (Binadhan-10)-T. Aman (Binadhan-17) which was 164 % higher than existing cropping pattern. Cost benefit ratio of improved cropping pattern was 1.56.

Fig. Mustard (Binasarisha-9)

Fig. Boro (Binadhan-10)

Fig. T.Aman (Binadhan-17)

Fig. Improved Cropping pattern

c. Livestock component

Under Livestock component three development activities viz. improvement of health condition of livestock through deworming and vaccination, duck rearing with 'Khaki Campbell' and 'Turkey' rearing under semi scavenging system were carried out during 2019-20.

Vaccination program on cattle and poultry and Duck and Turkey rearing:

To reduce disease occurrence in cattle and poultry vaccination programs were carried out regularly. A total of 20 cattle vaccinated with FMD and Anthrax during reporting period. Before the intervention, percent of mortality in the area was 10% but after intervention mortality reduced to 2%. Distributed poultry birds were vaccinated within a few days after distribution. BCRDV and RDV vaccination was done for a total of 60 'Turkeys' on 1st July and 12th June 2019. In total 204 duck were vaccinated against DPV. After vaccination, mortality rate reduced significantly. Before intervention, mortality rate in the area due to duck plague was 15%. However after intervention mortality rate was only 3% due to duck plague.

Each of the 12 selected farmers was given six weeks old 12 'Khaki Campbell' duck (two male and ten female). The routine vaccination are being followed. Technical supports (feeding, de-worming, vaccination etc) and all assistance were given from the FSRD project. Egg production started after five month of distribution. Average egg production was 117 wilk income 834 Tk from each farmer per month. Farmers consumed, sold and distributed duck eggs. Average egg consumption rate increased by 172% among family members as well as nutritional intake was also increased. Farmers were highly satisfied with these new breed due to more egg production and additional monthly income. Improved duck rearing system with proper management created a positive impact among the farmers. The duck eggs partially fulfilled nutritional requirements through increased consumption.

Sixty 'Turkey' chicks were distributed among 12 farmers. After survival 40 'Turkey' were found among 12 farmers. Average initial weights of the chicks were 300-350g. After 6 months female birds has started laying eggs. Each farm family got 23 eggs and earn 380Tk. per month after six month. Average body weight gain was 4.0 kg after six month of Turkey birds. All the test farmers was very interested about Turkey rearing. An extra income becomes possible by selling eggs after consumption.

Fig. Vaccination program at FSRD site, Satkhira

Fig. Duck rearing (Khaki Campbell)

Fig. Turkey rearing

d. Fisheries Component

Maximization of farmer's income through carp polyculture:

Mixed carp polyculture is a very popular technology in the seasonal pond in this area. Among seven target farmers, fingerlings were distributed and the growth of fingerlings was recorded. The survival rate of fingerlings was more than 80% in most of the cases. After intervention with new technology the total production increased by 108% and income increased to 23.97%. Total production, net income and cost benefit ratio were 2035 kg/ha, 261112 Tk/ha and 1.32, respectively. The utilization pattern of produced fishes were consumption (375kg), distribution (134kg) and sold (1540kg) during reporting period. Ensuring quality fingerlings and modern management practices make it profitable to the farmers. As a result farmers are more interested to fish culture with modern carp polyculture methods.

Fig. Carp poly culture at FSRD site, Satkhira

e. Fruit tree plantation and management

A good number of quality fruit saplings were distributed among selected and surrounding farmers of the project areas at the FSRD, Shyamnagor, Sathkhira. During 2019-2020, under this program fruit saplings of mango, litchi, dwarf coconut, lemon, guava, papaya, black pepper, pumelo, custard apple, sapota, dragon were distributed among the selected farmers. All the distributed saplings were improved varieties so that farmers get quick and more benefit. In total 321 saplings of different fruit varieties were distributed. Besides, sapling, two scheduled spraying of each at flowering and fruit formation stage was applied. Average survival rate of different fruit saplings was 90 percent but mortality was higher in litchi followed by pumelo and wood apple.

Fig. Distribution of fruit sapling at FSRD site, Satkhira

Women participation in agricultural activities at four locations increased to a greater extent that showed a some positive effect on gender equity within the family. The daily nutritional requirements of the family members were supplemented considerably due to increased consumption of vegetables and fruits from the homestead gardening and also from fish, chicken and livestock production. Active participation of the farmers' and integration of their available resources in planned way has created a positive impact on improving livelihood of resource poor farm household.

All the components of farming system are very much essential for the improvement of farmer's livelihood. Income was increased from all the components significantly after intervention. The highest percentage of income was increased (64.61%) from homestead production system. Considering all the components income was increased 31.93%. Finally, it can be concluded that interventions made in different components, exerted a visible positive impact in improving farmers' socio-economic condition and livelihood as well.

D. Livelihood Improvement through Integrated Farming System Research and Development of Drought and Rainfed Ecosystem (Project ID: 097)

Integrated farming is a combination of different agricultural activities and a whole farm management system which aims to deliver more sustainable agriculture. The subsistence farms of Bangladesh are highly diversified with complex relationships among the various sub-system and the enterprises within a subsystem.While there are different production alternatives, farmers have a limited set of resources.These resources may be utilized in such a manner that maximize farm productivity, farmers benefit and resource use efficiency in an environmentally sound and sustainable way. A holistic approach to technology generation and packaging is essential to achieve this result through maximizing the complementary interactions among varius farming enterprises/production system and the biophysical and socio-economic environment. A coordinated project on "Livelihood Improvement of Farmers through Integrated Farming System Research and Development of Drought and Rain-Fed Ecosystem" has been coordinated by Planning & Evaluation Division in partnership with OFRD of the BARI, BLRI from October 2019. The project activities implemented by OFRD (5 sites) and BLRI (1 site). Project Implementation Unit (PIU)-BARC, NATP: Phase- 2 has been financing the project activities. The main objective of the project is to develop better understanding of changing nature of drought in view of climate change, risk and vulnerability associated with drought and its impact on agriculture, food security, economy and livelihood and its potential impact in the future. Planning and Evaluation Division of BARC recruited one Scientific Officer (crop) for BLRI, two Scientific Officers (livestock and fishery) and three Scientific Assistants for OFRD, BARI and one Accountant for BARC to smoothly run the project. Planning & Evaluation Division also hired a highly experienced Farming Systems Expert to look after the project for assistance of Coordination unit. Coordinating unit accomplished the following activities in order to achieve the output and outcome of the project during July 2019- June 2020:

1. Coordinating FSRD programs of all the component institutes.
2. Organised one National Task Force meeting
3. One Coordination meeting was conducted with the PIs and CoPIs of component institutes.
4. Organized inception workshop,
5. Four field visits was paid during reporting period at four FSRD sites, Godagari, Rajshahi, Amnura, Chapainawabganj, Tanore, Rajshahi and Kushtia under OFRD, BARI component.

The farming system research and development activities under this project has been implemented in 72 households of six locations with three components institute BARI (5 sites) and BLRI (one sites). In total 72 farming system research and development activities have been implemented during October 2019 – June 2020.

I. BARI Component

Combination of high temperature, low and erratic annual rainfall and soil moisture deficiencies, causes drought in rainfed ecosystem. Such areas mostly cover north western region (high Barind tract of Rajshahi, Chapainawabganj and Kushtia) and rainfed Sylhet area. The activities of FSRD under PBRG sub-project was undertaken to maximize the farm productivity and efficient utilization of drought and rainfed ecosystem through integration of modern agricultural component technologies among the participating farmers to improve family income and livelihood. Integrated farming research and development activities was started from October 2019 at five locations of FSRD and MLT sites in Rajshahi, Chapainawabganj, Kushtia and Sylhet by OFRD, BARI under drought and rainfed ecosystem. According to the aim of the project, resource poor farmer viz. marginal, small and medium having major components of farming and sizable homestead under single ownership were targeted. In each site twelve farm households from two villages were selected covering four farmers from each category (marginal,small and medium). Verification of new technologies, integration of different farming components for livelihood improvement and dissemination of proven technologies developed by NARS institutes on crops, cropping patterns, climate resilient technologies, resource conservation technologies, plantation of fruit saplings, homestead production systems, fish, livestock and poultry production as well as other income generating activities have been implemented. About seventy farming system research and development activities were conducted at five locations during

15 October 2019 – July 2020. All components were brought with improved technological intervention and accordingly incomes have been increasing from. Different component wise findings are mentioned as below.

1. The necessary information have been collected through preliminary survey (resource inventory) of all the households through structured schedule, exploratory survey (informal and without any schedule), detailed survey with semi structured schedule, case studies, empirical observation by the FSRD personnel and from some secondary sources.
2. The problems of the sites have been, more or less identified through detailed survey, case studies, focal group discussion, exploratory survey, personal observations etc.
3. A total of sixty (60) farm households were selected considering twelve (12) from each site.
4. For year round vegetables and fruit production seven to nine production niches are being utilized with seven to ten winter vegetables in 12 homesteads in each site following high barind, Goyespur and Golapganj model developed by OFRD, BARI. Harvesting of vegetables is going on.
5. Total ten improved cropping patterns have been selected two from in each site (eg. Mustard-Boro-T. Aman and Wheat-Sesame-T. Aman; Lentil-Fallow-T. Aman and Wheat-Sesame-T. Aman);

Lentil-Maize-T. Aman and Mustard (long duration)-T. Aus-T. Aman; Lentil-Sesame-T. Aman and Onion/sweet gourd-T. Aman; Potato-T. Aus-T. Aman and Mustard-T. Aus-T. Aman rice for FSRD and MLT sites of OFRD, Barind, Rajshahi; and Chapainawabganj; Shympur, Rajshahi; Kushtia Sadar, Kushtia and Sylhet). Short duration and high yielding varieties of different crops were intervened to improve the cropping patterns. In the Rabi season some crops already have been planted and some field crops are at maturity stage.

6. In livestock component vaccination for cattle and poultry has been started and continuing as per schedule. Cattle fattening is in progress. Improved poultry breed (Sonali) was distributed among the selected households.
7. Depending on pond suitability and farmers choice, 'Tilapia' as monoculture and Carp as mixed polyculture have been intriduced and fingerlings has already been released in some ponds.

II. BLRI component

The activities of FSRD under PBRG sub-project was undertaken to maximize the farm productivity with efficient use of farm resources in the rainfed ecosystem through creating awareness on modern Agricultural Technology among the participating farmers and improve family income and livelihood. The project activities have been implemented in two villages (Khamar Chak Para and Chakdala) of Naikhongchari upazilla under Bandarban. Initially four short PRA (two in each site) was conducted for selection of project sites. Based on the PRA results, 12 households (marginal, small and medium) were selected from two villages (six households from each village). A baseline survey was conducted to get detail information on selected households. Based on the collected information implementation strategy have undertaken. The primary focus of technological intervention was the development and strengthening of diversified agri-enterprise other than rice i.e. vegetables, fruit, pulses, spices, tuber and root crops, livestock and poultry, fisheries, and off-farm activities. The different technological interventions have provided on the basis of resources of selected household. During 15 October 2019 – June 2020, 14 programs have been executed in the project area. An awareness meeting was organized with the farmer, field staff, extension personnel and scientists where scientific integration of farming system research management and future research program was finalized.

a. Livestock Component

Sheep and Goat were distributed among six households. Each farmer got three sheep (two female and one male) and three goats (two female and one male). The sheep and goats are now in growing stage. Technical supports (vaccination against major disease, necessary treatment and feed) have been provided regularly. The rest six farmers would get goat and sheep at the second phase. Fodder cultivation is increasing day by day at the FSRD site. BLRI-developed HYV Napier fodder cuttings were distributed among the selected farmers.Each farmer got 500 fodder cuttings. The fodder is now in growing stage.


Fig. Group meeting


Fig. Sheep distribution


Fig. Goat distribution


Fig. Fodder cutting distribution

b. Vegetables, fruits and spices production in homestead

BARI developed 'Khagrachari Model' was followed for year round vegetables, fruits and spices production in the homestead. Different vegetables (red amaranth, spinach, indian spinach, cabbage, cauliflower, tomato, radish and panikachu (lati) and fruits (papaya and lemon); spices (bay leaf and black pepper) were grown during reporting period. Some vegetables have been harvested. Vegetable production and consumption increased significantly among the farmers. For mixed fruit orchard development three farmers were selected on the availability of suitable land. Now land preparation is in progress. Sapling of malta, lemon, papaya, dragon, mango and guava were distributed among the farmers for mixed fruit orchard development in July 2020.

c. Fisheries Component

For year-round fish production two ponds from each site were selected. These ponds are perennial in nature having sufficient water throughout the year. Pond preparation is in progress.

d. Off farm activities

This project also encouraged the farmers in performing off farm activities viz. sewing 'Nakshi Kantha', prepare wooden and bamboo handicraft. Interested farmers were encouraged to doing off farm activities. Some inputs and technical support have been provided among the interested household.

Women participation in agricultural activities at six locations increased to a great extent that showed some positive effect on gender equity within the family. The daily nutritional requirements of the family members were supplemented considerably due to increased consumption of vegetables and fruits from the homestead gardening and also from fish, chicken and livestock. Active participation of the farmers' and integration of their available resources in a planned way has created a positive impact in improving livelihood of resource poor farm household.

From one year result it can be concluded that interventions made in different components exerted a visible positive impact. Farmers were very much impressed about farming system research and development activities at different sites. Activities of farming system research and development have been implemented as per work plan.

e. Capacity Building for Conducting Adaptive Trials on Seaweed Cultivation in Coastal Areas

The project is coordinated BARC funded by Krishi Gobeshona Foundation (KGF) from 1 January 2016 to 30 September 2021. Adaptive trials for cultivating seaweed were conducted under direct supervision of OFRD, BARI. The technical endeavors were collection of selected seaweeds from the SMI and Inani beach, cultivation and determination of nutritional quality of harvested seaweeds ensuring food quality and extraction of phycocolloids as sources of several industrial products including Jam, Jelly, Chocolates, Ice creams, etc. Seaweeds were cultivated in 'Land-based' (Nursery) and 'Open-seawaters' using 'One-step' and 'Multi-step' methods wherein a portion of seaweed is attached to synlhetic floting ropes of. Cultivation at Noapara, Naf river estuary, Teknaf was carried out from 1 Jan 2016 to 30 June 2016 where Hypniya mosciformis and C. racemosa were successfully grown using "One-step seeds" at cm gap on floating ropes and 40 cm gap between rope lines. In the "Open-seawater" at Nuniachara sand-flat Gracilaria tenuistipitata was grown successfully using "One-step seeds" for seven months from October 2016 till June 2020 on "Single-line semi-floating rope" method. One-step seed production by H. mosciformis through tissue

culture was attempted but abandoned as the process is highly time consuming requiring years to get expected results and root-like outgrowths at the tip of explants for using as "One-step seeds"was noticed. Nine coordination meetings were arranged by BARC followed by a number of constructive decisions. Four coordination meeting were organized by BARC and monitoring are continuing to run the project smoothly. A monitoring team form BARC regularly visited the project site during planting, growing stage and collection of seaweeds from deep sea area. Logistic and financial support from BARC part was provided for smooth running of the research activities.

Fig. Seaweed cultivation

Policy Level Contribution:

Three meetings were conducted as in Annual Performance Agreement (APA) one on 21 July 2019, one on 20 January 2020 and 20 May 2020 at Conference Room-1, BARC.

Research Management/Financial Management and Coordination:

Four Programme Based Research Grants (PBRG) sub-projects of PIU-BARC, NATP-2 have been coordinating by Planning and Evaluation (P&E) Division. These are as follows:

i. Integrated Farming Research and Development for Livelihood Improvement in the Plainland Eco-system (Project ID: 061);
ii. Improvement of Farm Productivity through Intervention with Improved Agricultural Technologies in

Char land Eco-System (Project ID: 096);

iii. Climate Resilient Farming Systems Research and Development for the Coastal Ecosystem (Project ID: 098);

iv. Livelihood Improvement of farmers through Integrated Farming System Research and Development of Drought and Rainfed Ecosystem (Project ID: 097).

Monitoring, Reviewing and Evaluation Report of Programs/Activities:

PIU-BARC, NATP-2 funded Four Programme Based Research Grants (PBRG) sub-projects of has been monitored timely and properly by Planning and Evaluation (P&E) Division. The overall progresses of PBRG sub-projects were satisfactory and successfully continuing as activities scheduled as mentioned in the project proposal.

Training, Workshop, Seminar, etc.

1) A day-long Annual Review Workshop on progress of activities of 2018-2019 and Workplan 2019-2020 was conducted by Planning & Evaluation Division on 25 August 2019. Progress made during 2018-19 and work-plan for 2019-20 were presented by Head or representatives of all divisions/units/centres of BARC. Project Completion Workshop on Capacity Building for Conducting Adaptive Trials on Seaweed Cultivation in Coastrl areas was organized on 28 September 2019. Sixty Participants (MoA, BARC & NARS institute) were attended the workshop.

2. Workshop on Draft Eight Five Year Plan was organized by the Planning and Evaluation Division, on 13 January 2020 at Conference Room-1, BARC. Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC was present as Chief Guest in the inaugural session. Senior Officers including member-directors, directors, CSOs and PSOs from different division of BARC were present in the inaugural ceremony. Dr. Kabir Uddin Ahmed, Chief Scientific Officer (Planning & Evaluation), delivered welcome address. Sixty Participants from different NARS institutes including BARC attended the workshop.

3. Inception Workshop on Livelihood Improvement of farmers through Integrated Farming System Research and Development of Drought and Rainfed Eco-system (ID: 097) was arranged on 15 January 2020. Sixty Six participants from BARC and NARS institutes attended the workshop.

4. Two batches of three-day-long Training on Farming System Research and Development wereorganized by Planning and Evaluation Division, during 11-13 November 2019 and 29-31 December 2019. Dr. Kabir Ikramul Haque. Executive Chairman, BARC was present as Chief Guest. Dr. Shaikh Mohammad Bokhtiar, Member-Director (Planning & Evaluation) presided over the inaugural ceremony. Senior Officers including member-directors, directors, CSOs and PSOs from different division of BARC were present in the inaugural ceremony. Dr. Kabir Uddin Ahmed, CSO, P&E and the course coordinator of the training workshop delivered the welcome address. Thirty Participants from different NARS institutes including BARC attended the training workshop.

5. A three-day-long Training on Methodology of Farming System Research Development was organized by the Planning and Evaluation Division, during 10-12 March 2020. Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC was present as Chief Guest in the inaugural session. Dr. Kabir Uddin Ahmed, CSO presided over the inaugural ceremony. Senior Officers including member-directors, directors, CSOs and PSOs from different divisions of BARC were present in the inaugural ceremony. Twenty five Participants from different NARS institutes including BARC attended the training workshop.

6. A three-day-long Training on Capacity Building on Sustainable Development Goal (SDG) of NARS Scientists was organized by the Planning and Evaluation Division, during 26-28 January 2020. Thirty Participants from different NARS institutes including BARC attended the training workshop.

Scientists Attended Training, Workshop, Seminar, etc. (Foreign and Local)
Dr. Kabir Uddin ahmed, CSO and Dr. Suraya Parvin, PSO of Planning & Evaluation Division attended a 13 day long Training Programme on "Action Research for SDG's Localization for Sustainable Agriculture in Bangladesh" in Curtin University, Perth, Australia. Dr. Kabir Uddin ahmed, CSO, Planning & Evaluation Division attended a training workshop titled "Seed Regulatory Frameworks and Seeds Without Borders" in the Regional Consultative Meeting at Lalitpur, Nepal on 4 September 2019. He attended a Training Programme on "Pesticide Residue Analysis" at BARI, Gazipur on 23 November 2019 and Dr. Suraya Parvin, PSO (A.C) (P &E) attended a 3 day long Training Programme on Farming Systems Research & Development, at BARC during 11-13 November 2019.

MANPOWER and TRAINING UNIT

Professionals:
Dr. M. Baktear Hossain
Director (Manpower and Training)

Mr. Md. Al Mobasher Hussen
Senior Training Officer

During the reporting period (July 2019 to June 2020), a total of 4,495 scientists/officers from the National Agricultural Research System (NARS) institutes including BARC and other associate organizations participated in the revenue/ other sources' funded training/workshop/seminar/higher study programs organized in home and abroad.

The major activities that Manpower and Training Unit has accomplished/assisted during the reporting period are delineated below:

1.1: Visit Program of Yunnan Academy of Agricultural Sciences (YAAS), China Delegation

A five-member delegation led by Dr. Xuelin Li, President, Team Leader, Yunnan Academy of Agricultural Science (YAAS), China visited Bangladesh during 31 August to 4 September 2019. The meeting on agricultural cooperation between YAAS, China delegation and BARC/NARS scientists was held at BARC on 2 September 2019. The progress of BARC-YAAS Memorandum of Understanding (MoU), renewal of the said MoU and more areas for collaboration were discussed in the meeting. The meeting was chaired by Dr. A.S.M. Anwarul Huq, Executive Chairman (Routine Charge), BARC. The meeting was attended by forty participants from the Bangladesh Agricultural Research Council BARC and NARS institutes.

Pic 1: Meeting on Agricultural Cooperation between YAAS, China & BARC/NARS at BARC

The visit program also included:
- ❖ Meeting with the Secretary of Ministry of Agriculture;
- ❖ Meeting with Director General, Bangladesh Agricultural Research Institute and Bangladesh Rice Research Institute at Gazipur;
- ❖ Field visit to BRRI, Gazipur on joint venture on upland rice rescarch;
- ❖ Meeting with Executive Chairman, BARC & Director, SAARC Agriculture Centre (SAC), Dhaka;

1.2: Indian Delegation for Attending 1st Joint Agricultural

The 1st Joint Agricultural Group Meeting (JAWG) between India and Bangladesh was held at BARC, Dhaka, Bangladesh during 7-8 December. The meeting was organized by BARC in coordination with Ministry of Agriculture (MOA). A-four member delegation from India attended the meeting. In the meeting, Indian and Bangladeshi agenda were discussed and identified the areas for collaboration in agricultural research and development. Finally, a future action plan was signed between countries. The meeting was attended by forty participants from BARC and Heads of NARS institutes. Indian delegates also visited BARI, Gazipur to observe on going research activities

Pic 2: 1st Joint Agricultural Group Meeting between India & Bangladesh

1.3: BARC-GIFS, Canada Memorandum of Understanding (MoU) Signing Program

A team comprising sixteen deligates team from the Global Instute for food Security (GIFS), canada. visited Dhaka, Bangladesh during 6-11 February 2020. The MoU signing programs was arranged by BARC in coordination with Ministry of Agriculture, Ministry of Foreign Affairs and High Commission of Canada, Dhaka. The Memorandum of Understanding (MoU) signing programs includes the following events:

a) GIFS-BARC technology workshop:

The workshop was held on 6 Feb. 2020 at BARC. Dr. Md. Abdur Rouf, Addl. Secretary (PPC), MoA was present as Chief Guest and Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC chaired the session. The workshop was attended by one hundred sixty participants from NARS institutes, Universities, concerned organization and GIFS. Participants were divided into four thematic groups namely, 1) Genomics and Phenomics for plant breeding 2) Soil health and Quality 3) Soil water régime and adaptation and 4) Post harvest grain handling. Trends, gaps and opportunities, specific objectives, related activities and possible outcomes were identified for the four thematic areas through the workshop.

Pic 3: Group Photo of the GIFS-BARC Technology Workshop at BARC

b) GIFS-BARC Joint Meeting on Agricultural Cooperation:

The joint meeting on agricultural cooperation between BARC and GIFS, Canada was held on 8 February 2020 at BARC. Dr. Md. Abdur Rouf, Addl. Secretary (PPC), MoA was present as Chief Guest and Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC chaired the session. fourty participants from Head of NARS institutes, Universities Thematic Group leaders and GIFS delegates participated the joint meeting. The meeting reviewed thematic areas of cooperation.

Pic 4: BARC-GIFS Joint Meeting on Agricultural Cooperation held in Dhaka

C) The GIFS delegation visited different fields and labs at BARI, BRRI & BSMRAU on 9 February 2020

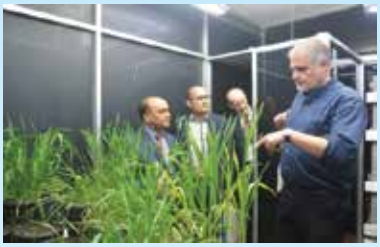


Fig. BSMRAU Research altivity

Fig. BARI visid

Fig. BRRI Deligates in discussion

D) GIFS, Canada and BARC MoU Signing Ceremony

Pic 6: A view of MoU Signing Ceremony between GIFS, Canada & BARC held in Dhaka

MoU between GIFS, Canada and BARC, signing ceremony was held at 6.30 pm on February 10, 2020 at Hotel Intercontinental, Dhaka, Bangladesh. Dr. Md. Abdur Razzaque MP, Hon'ble minister for Agriculture was present as chief guest. Mr. David Marit, Hon'ble minister for Agriculture, Saskatchewan, Canada was also present as guest of honour. Mr. Md. Nasiruzzaman, Secretary, Ministry of Agriculture chaired the session. Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC & Mr. Steve Visscher, Chief Operating Officer, GIFS, Canada signed MoU between BARC, Ministry of Agriculture, Bangladesh and GIFS, University of Saskatchewan, Canada. As many as one hundred senior officials from different Ministries including the head of agricultural research, extension agencies and international organizations were present in the program.

1.4 Foundation Training of 27th Batches held at NATA:

Pic 7: Inaugural Program of 27th Foundation Training held in NATA

As part of the Council's mandate for skill development of the NARS scientists, BARC continues to organize the four-month long foundation training with 40 participants in a batch. During 2019-2020 one batch of Foundation Training was arranged (23 Feb 2020 to 21 June 2020) at National Agricultural Training Academy (NATA), Gazipur under the overall supervision and management of BARC. Mr. Md Nasiruzzaman, Secretary, Ministry of Agriculture attended as Chief Guest in the inaugural program. Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC was present as Special Guest and Dr. Md. Abu Sayeed Miah. Director General, NATA chaired the inaugural program. The heads of related government institutes and NARS institutes were present in the inaugural session. Though the program the training program started on 23 February 2020 but had topostponed on 24 March 2020 due to COVID-19 outbreak.

1.5 Training on Government Performance Management System (GPMS)

Pic 8: A view of the GPMS training program

With revenue funding, a two-days training program on GPMS was organized by the Manpower and Training, Unit during 13-14 June 2020 at BARC auditorium in accordance with the instructions of the MoA. The training program was conducted with the ministry 44 officers BARC. Resource persons were from the Ministry of Public Administration on, MoA They discussed on topics like Guidelines for Annual Performance Agreement (APA), APA Monitoring and Evaluation, Grievance Redress System, Concept of Government Management Performance

System (GPMS), Innovations for Improvement of Service Delivery, E-filing and Right to Information Act 2009 etc.

2.1 In Country PhD (Revenue buget)

One of the major tasks of Manpower and Training Unit is to facilitate higher studies for NARS scientists in various disciplines. A total of 19 NARS scientists were awarded PhD in-country fellowship during the financial year 2013-2014 under revenue funding. The financial management and performance monitoring activities are being carried out as usual. Twelve researchers have already completed their studies while eight are about to complete. One BJRI scientist could not continue PhD research on account of health reasons.

2.2 In Country PhD (CSISA-BARC Scholarship Program)

There was a provision of five slots for in-country PhD under CSISA-BARC Scholarship Program. Five PhD researchers are: one from BARC and two from BARI, one from BINA and another from BFRI (fisheries). The program is being jointly funded by IRRI, CIMMYT and World Fish Centre under CSISA-BD project. The financial management and performance monitoring activities of the program arebeing carried out as usual. Three scientists have completed their PhD research while the remaining two are about to submit their dissertatior.

3. Foreign Training/seminar/workshop/study tour

During the reporting period apart from in-country activities, Manpower and Training Unit initiated and implemented foreign training/seminar/workshop/meeting abroad. In total of 46 research managers/scientists/personnel under different fields of agriculture and cross cutting issues with fund from home (piv-BARC: NATP2-) and abroad attended 20 programs (training/seminar/workshop/study visit/meeting) to enrich their professionalism in order to achieve the country's ultimate goal to ensure food and nutrition security. Details are as follows:

Foreign Training/Workshop/Seminar/Meeting (2019-2020)

Sl. No.	Name, designation & organization	Program Title	Date & duration	Country	Funding agency
1.	Dr. Shah Md. Monir Hossain PSO (Crops), BARC	Participate the Field Visit on Improved post-harvest handling and processing tech niques for value addition of cashew nuts and coffee under "AFACI Program Workshop on Horticulture, Extension and Food Crops"	29 Sept.-12 Oct. 2019	Vietnam	FAO
			2-6 Sept. 2019	Cambodia	AFACI
2.	Mr. Md. Mustafizur Rahman, PTO (M&T), BARC	Participated the 1st BIMSTEC Ministerial Meeting. (BIMSTEC Seminar on Climate Smart Farming System)	11-12 July 2019	Myanmar	BARC & Myanmar Govt.
			11-13 Dec.2019	New Dilhi, India	Govt. of India & BARC
3.	Mr. Md. Mabboob Hussain, CSO, BJRI	Participated the training on 'Action Research for SDGs Localization on Sustainable Agriculture in Bangladesh	6-17 July 2019	Australia	PIU-BARC, NATP-2
4.	Mr. Gobinda Chandra Biswas, CSO, RARS, BARI	-do-	6-17 July 2019	Australia	PIU-BARC, NATP-2

Sl. No.	Name, designation & organization	Program Title	Date & duration	Country	Funding agency
5.	Mr. Babul Chandra Sarker, CSO, BARI	-do-	6-17 July 2019	Australia	PIU-BARC, NATP-2
6.	Md. Monirul Islam, PPO, BRRI	-do-	6-17 July 2019	Australia	PIU-BARC, NATP-2
7.	Mr. Monfique Ahmed Chowdhury, PSO, SRDI	-do-	6-17 July 2019	Australia	PIU-BARC, NATP-2
8.	Mr.Md. Akhteruzzaman, AD, CDB, Dhaka	Participated the training on 'Action Research for SDGs Localization on Sustainable Agriculture in Bangladesh	6-17 July 2019	Australia	PIU-BARC, NATP-2
9.	Dr. Kabir Uddin Ahmed, CSO (P&E), BARC	-do-	6-17 July 2019	Australia	PIU-BARC, NATP-2
10.	Mr.Md. Kamruzzaman SSO, BINA	-do-	6-17 July 2019	Australia	PIU-BARC, NATP-2
11.	Mr. Md. Nur Alam Miah, Divisional Head, BSRI	-do	6-17 July 2019	Australia	PIU-BARC, NATP-2
12.	Suraya Parvin, PSO (P&E), BARC	-do	6-17 July 2019	Australia	PIU-BARC, NATP-2
13.	Md. Al Mobasher Hussen, STO, BARC	-do	6-17 July 2019	Australia	PIU-BARC, NATP-2
14.	Mr. Md. Mahfuz Bin Wahab,ICT Cell, BRRI	-do	6-17 July 2019	Australia	PIU-BARC, NATP-2
15.	Mr. Bikash Chandra Barmon, Assistant Chief, MOA	-do	6-17 July 2019	Australia	PIU-BARC, NATP-2
16.	Mr. Md. Shah Abdullah Al Mamun, SO, BINA	-do	6-17 July 2019	Australia	PIU-BARC, NATP-2
17.	Mr. Hassan Md. Hamidur Rahman, Director (Computer & GIS), BARC	"AFACI Program Workshop on Horticulture, Extension and Food Crops"	2-6 Sept. 2019	Cambodia	AFACI
18.	Dr. Md. Abdus Salam, CSO (Crops), BARC	AFACI Program Workshop on Horticulture, Extension and Food Crops"	2-6 Sept. 2019	Cambodia	AFACI
		"8th Session of the Governing Body of the International Treaty on PGR for Food & Agriculture"	11-16 Nov.2019	Rome, Italy	FAO
19.	Dr. Md. Harunur Rashid, PSO(Crops), BARC	"AFACI Program Workshop on Horticulture, Extension and Food Crops"	2-6 Sept. 2019	Cambodia	AFACI
20.	Dr. Md. Ashraful Alam, SO, Plant Breeding, BWMRI, Dinajpur	-do	2-6 Sept. 2019	Cambodia	AFACI

Sl. No.	Name, designation & organization	Program Title	Date & duration	Country	Funding agency
21.	Dr. Nathu Ram Sarker, DG, BLRI	'Multi-stakeholder Partnership (MSP) Meeting of Global Agenda for Sustainable Livestock (GASL)'	9-12 Sept. 2019	USA	GASL & NATP, Phase-II
22.	Mr. Abdul Mannan MP, Bogra-1	'Participated in the study tour on 'Food Safety and Quality Assurance'.	28 Aug. to 6 Sept. 2019	USA	PIU-BARC, NATP-2
23.	Mr. Muslem Uddin MP, Mymensingh-6	-do-	28 Aug. to 6 Sept. 2019	USA	PIU-BARC, NATP-2
24.	Mr. Md. Mamunur Rashid Kiron, MP, Noakhali-3	-do-	28 Aug. to 6 Sept. 2019	USA	PIU-BARC, NATP-2
25.	Mr. Asharaf Uddin Ahmed, Additional Secretary, MoA	Participated study tour on 'Food Safety and Quality Assurance'.	28 Aug. to 6 Sept. 2019	USA	PIU-BARC, NATP-2
26.	Md. Kabir Ikramul Haque, EC, BARC	-do-	28 Aug. to 6 Sept. 2019	USA	PIU-BARC, NATP-2
		'Meeting on Global Institute for Food Securi'ty	02-10 October 2019	Canada	PIU-BARC, NATP-2
27.	Dr. Shaikh Mohammad Bokhtiar, MD (P&E), BARC & Director, SAC	Participated in the study tour on Food Safety and Quality Assurance.	28 Aug. to 6 Sept. 2019	USA	PIU-BARC, NATP-2
		Regional Expert Consultation Meeting, with officials of SDF funded project, Visit ongoing activities of Sri Lankan Farmers Forum	23-28 Oct. 2019	Sri Lanka	SAARC Agriculture Center (SAC)
		57th Session of the Programming Committee Meeting of SAARC, Visit the Nutrition Smart Villages in Rautohat Districts, Regional Consultation Meeting on Strengthening High Value Vegetable Seed System in SAARC countries	19-24 Dec.2019	Nepal	SAARC Agriculture Center (SAC)
28.	Dr. Mian Sayeed Hassan, Director, PIU-BARC	Participated in the study tour on 'Food Safety and Quality Assurance.	28 Aug. to 6 Sept. 2019	USA	PIU-BARC, NATP-2
29.	Dr. Kabir Uddin Ahmed, CSO (P& E), BARC	SAARC Regional Consultative meeting on Seed without Boarders in SAARC member states	3-5 Sept. 2019	Kathmandu, Nepal	SAC & IRRI South Asia Regional Centre
30	Dr. Muhummad Nazim Uddin, SSO, BARI, Gazipur	AFACI Program Workshop on Basic Agriculture, Food Crops and Animal Science	7-11 Oct. 2019	Bangkok, Thailand	AFACI
31.	Dr. Mohammad Mainuddin Molla, SSO, BARI, Gazipur	-do	7-11 Oct. 2019	Bangkok, Thailand	AFACI
32.	Dr. Md. Abdur Rouf, Additional Secretary, MoA	Meeting on Global Institute for Food Security	2-10 Oct. 2019	Canada	PIU-BARC, NATP-2
33.	Dr. Md. Shahjahan Kabir, DG, BRRI	-do	2-10 Oct. 2019	Canada	PIU-BARC, NATP-2

Sl. No.	Name, designation & organization	Program Title	Date & duration	Country	Funding agency
34.	Dr. Zakiah Rahman Moni, SSO (TTMU), BARC	International Training on Agroforestry: Policy, Practice & Impact	10-24 Oct. 2019	New Delhi India	MANAGE, India
35.	Dr. Md. Mosharraf Uddin Mollah, CSO (AERS), BARC	SAARC Regional Consultation on 'Fostering Investment for Sustainable Agriculture Development for SAARC Member Countries:	23-25 Oct. 2019	Colombo Sri Lanka	SAC & Action Aid Bangladesh
36.	Dr. Sultan Ahmed MD (NRM) BARC	Fifteenth session of the Governing Council of the Center for Sustainable Agricultural Mechanization (CSAM)	29 Nov.2019	Korea	CSAM-UNESCAP
37.	Mr. Md. Ruhul Amin Talukder, Joint Secretary, MoA	Study Tour Agri-products, Processing & Value Addition, Marketing and Mechanization in Agriculture	4-14 Nov. 2019	Thailand & Vietnam	PIU-BARC, NATP-2 & DAE
38.	Mr. Md. Nurul Islam Deputy Director & DPD, DAE, Dhaka	-do	4-14 Nov. 2019	Thailand & Vietnam	PIU-BARC, NATP-2 & DAE
39.	Dr. Md. Anwar Hossen SSO, BRRI, Gazipur	-do	4-14 Nov. 2019	Thailand & Vietnam	PIU-BARC, NATP-2 & DAE
40.	Dr. Md. Miaruddin CSO, BARI, Gazipur	-do	4-14 Nov. 2019	Thailand & Vietnam	PIU-BARC, NATP-2 & DAE
41.	Dr. Md. Azhar Ali Director, DAE, Dhaka	-do	4-14 Nov. 2019	Thailand & Vietnam	PIU-BARC, NATP-2 & DAE
42.	Shorifa Ahmend Deputy Secretary, MoA	BIMSTEC Seminar on Climate Smart Farming System	11-13 Dec. 2019	New Dilhi, India	Govt. of India & MoA
43.	Mr. Md. Hasanuzzaman Kallol, Additional Secretary, FFM, MoA	Study tour on Agricultural Research Management	27 Jan-03 Feb. 2020	USA	PIU-BARC, NATP-2
44.	Dr. AKM Munirul Haque, Joint Secretary, Ministry of Fisheries & Livestock	-do	27 Jan-03 Feb. 2020	USA	PIU-BARC, NATP-2
45.	Muhammad Monowar Karim Khan, MD, BARC	-do	27 Jan-03 Feb. 2020	USA	PIU-BARC, NATP-2
46.	Dr. Md. Aziz Zilani Chowdhury, MD (Crops), BARC	-do	27 Jan-03 Feb. 2020	USA	PIU-BARC, NATP-2

4. In-country Training/ Workshop/ Seminar

During the reporting period 27 training programs and 43 workshops/seminar were arranged by the divisions/units. Under revenue funding 15 training programs and 26 workshops were organized. The participants for the training and workshop/seminar were 933 and 3,338 respectively.

Detailed lists are given below:

Programs Implemented During 2019-2020

4.1 Training (Revenue)

A. In-house-Training

Division/ Unit	Training Title	Training Venue	Date	No. of Participants
Computer & GIS Unit	Development of Innovation Capability for officer	BARC	11-12 Jan 2020	40
	E-Filing for officer	BARC	22 March 2020	37
	E-Filing for staff	BARC	23 March 2020	30
Man. & Trn. Unit	Government Performance Management System (all BARC officer)	BARC	13-14 June 2020	44
Admin & Finance Unit	Good governance training on national integrity strategy (all BARC officer)	BARC	30 Sept. 2019 & 23 Dec.2019	50
	Office Management training on national integrity strategy (all BARC officer)	BARC	30 Dec.2019	43
	Office Management training on national integrity strategy for 3rd class employees	BARC	30 Dec.2019	22
	Good governance training on national integrity strategy for 3rd class employees	BARC	21 March 2020	25
	Training on performance enhancement for 3rd class employees	BARC	6-10, 14-18 & 21-25 June 2020	54
	Training on performance enhancement for 4th class employees	BARC	14-18 & 21-25 June 2020	56
	Total (Program 10)			**401**

B. Training organized for NARS scientists and others (Revenue)

Division/ Unit	Training Title	Training Venue	Date	No. of Participants
M&T Unit	*Foundation Training (27th Batch)	NATA, Gazipur	23 Feb. 2020 to 21 June 2020	40
TTMU	TOT on Transferable Matured Technology of Fisheries in the *Haor* Ecosystem	BFRI, Mymensingh	18-19 Dec.2019	20
	TOT on Transferable Matured Technology of Crops in *Haor* Ecosystem	BARI, Gazipur	28-29 Jan 2020	20
Nutrition	Training on Awareness building on the Importance of nutrition information	Saidpur, Nilphamari	18-22 Feb.2020	35
	Training on Quality Processing and preservation of Agro-products and Nutritional Benefits	Ishardi, Pabna	4-8 March 2020	35
Total (Program 5)				**150**

C. Training organized for NARS Scientists & others (NATP & other funding source)

Division/ Unit	Training Title	Training Venue	Date	No. of Participants
Crops	Global plan of action Reporting and collection, documentation of Plant Genetic Resources under NATP	BARC	18-19 Dec. 2019	40
	Variety Profile of Potential Major Crop Varieties under NATP	BARC	28-31 Dec. 2019	40
NRM (Soils)	Training on Experimentation Data Collection, Analysis and Reporting under NUMAN project	BARC	21-22 Dec. 2019	32
NRM (Forestry)	Climate Smart Agriculture in relation to Charland ecosystem under NATP project	BARC	11-12 Dec.2019	40
	Medicinal and Aeromatic Plants in Bangladesh under NATP	BARC	26-27 Jan 2020	40
TTMU	Transferable Matured Technology of Livestock in *Haor* Ecosystem under NATP	BLRI, Savar	28-29 Nov. 2019	20
AIC	Technical Report Writing and Editing	BARC	8-12 March 2020	25
P & E	Training on Methodology of Farming Systems Development	BARC	10-12 Mar. 2020	25
	Farming Systems Research and Development (FSRD)	BARC	29-31 Dec. 2019	30
	Capacity building on sustainable development goal of NARS institutes	BARC	26-28 Jan 2020	30
Livestock	Training on Antimicrobial Resistance in Bangladesh	Sylhet Agricultural University	25-27 Feb.2020	30
	Training on Antimicrobial Resistance in Bangladesh	Rajshahi University	14-16 Mar.2020	30
Total (Program 12)				382

Total Training (Program Number 27) :(A+B+C): Participant Number: 933

4.2. A. Workshop (Revenue)

Division/ Unit	Workshop Title	Venue	Duration	No. of Participant
Crops	Review Workshop on Crop Improvement Program of NARS Institutes: Research Progress 2018-19 & Research Program 2019-20	BARC	22-23 Sept.2019	80
	Review Workshop on Crop Production Program of NARS Institutes: Research Progress 2018-19 & Research Program 2019-20	BARC	24-25 Sept. 2019	80
	Review Workshop on Disease Management Program of NARS Institutes: Research Progress 2018-19 & Research Program 2019-20	BARC	29 Sept. 2019	70
	Review Workshop on Insect Pest Management Program of NARS Institutes: Research Progress 2018-19 & Research Program 2019-20	BARC	30 Sept. 2019	70
	Review workshop on Biotechnology Program of NARS institutes: Research Progress 2018-19 & Research Program 2019-20	BARC	26 Sept. 2019	70
NRM (Soils)	Annual Research Review and Program Planning Workshop of Soils Programs of NARS Institute, 2019	BARC	23-25 Sept. 2019	80
NRM (Engg.)	Annual Workshop on Research Review 29018-2019 & Research Program 2019-20 on Agril Engineering of NARS Institutes	BARC	18-19 Sept 2019	80
NRM (Forestry)	Research Review 2018-19 & Research Program 2019-20 Workshop on 'Forestry & Agro forestry Research Activities of different NARS Institutes'	BARC	25-26 Sept. 2019	50
P&E	Annual Review Workshop on Implementation of Approved Program (2018-19) and Annual Action Plan for 2019-20	BARC	17 July 2019	50
M & T	GIFS, Canada-BARC Technology Workshop	BARC	6 Feb. 2020	160
Livestock	Workshop on Goat Genome sequence in Bangladesh & it's future perspective	BARC	16.01.2020	60
	Workshop on Lumpy skin disease (Cattle) in Bangladesh: Status, Challenges and way forward	BARC	19.12.2019	60
Fisheries	Future Fisheries and Nutrition	Khulna	13 June 2020	95
	Future Fisheries and Nutrition	Naikhonchari	27 June 2020	95

Division/ Unit	Workshop Title	Venue	Duration	No. of Participant
Nutrition	Food Adulteration and Contamination: Inside Fact and Consumer Responsibility	BLRI, Savar	14 Mar. 2020	90
	Food Adulteration and Contamination: Inside Fact and Consumer Responsibility	Gauripur, Comilla (DAE)	21 Mar. 2020	90
	Sub-total (16)			**1,280**

4.3 B. Workshop/Seminar (NATP, AFACI, KGF funding)

Division/Unit	Activity	Venue	Duration	No. of Participant
DifferentDiv/ Unit	**Total 14 workshop/seminar (organized under NATP funding)**	**BARC**	**-**	**1,128**
M & T	AFACI Projects Progress Review Workshop	BARC	10 March 2020	25
	Consultation Meeting on ACIAR's Bangladesh Research Collaboration Strategy 2019-2020	BRAC Centre, Mohakhali	19 Nov. 2019	65
P&E	Project Completion Workshop on Capacity building for conducting adaptive trials on Seaweed cultivation	BARC	28 Sept. 2019	60
	Sub-total (16)			1,278

4.4 C. Seminar (Revenue)

Division / Unit	Activity	Venue	Duration	No. of Participant
M&T Unit	Meeting on agricultural cooperation between, YAAS, China delegates and BARC/NARS officer	MoA, BARC	2 Mar. 2019	45
	1st India-Bangladesh Joint Agricultural Working Group(JAWG) Meeting	BARC	7 Dec. 2019	40
	Seminar on the applications of genomics and proteomics in the development of agricultural biotechnology	BARC	01 Dec. 2019	60
	Seminar on Sustainable Fisheries Development in the Haor Region: What to be done?	Sylhet Agriculture University	23.12.2109	120
	GIFS, Canada- BARC Joint Meeting on Agricultural Cooperation	BARC	8 Feb. 2020	40
M & T	MoU signed between BARC, MoA and GIFS, Saskatchewan University, Canada	BARC	10 Feb. 2020	100
	Seminar on Digitalising Agriculture	BARC	20 Feb.2020	40
	National Agricultural Day 2020: Awareness Generation on food safety and nutritious food consumption	BARC	27 Feb 2020	180

Division / Unit	Activity	Venue	Duration	No. of Participant
P&E	Seminar on " Industrial Hemp and its importance in farming systems"	BARC	29 Dec.2019	35
AERS	Inter-Minister Meeting/Seminar on paddy/rice purchase & export	BARC	30 July 2019	120
	Total (10)			**780**

Total Workshop/Seminar (Program Number 42): (A+B+C): Participant Number: 3,338

5. Higher Education: (Summary of Higher Study at BARC (PhD) (2018-2019)

Sl No.		PhD		Total	Remark
		Foreign	Local		
1.	2013-2014 (Revenue)	-	18	18	12 : Completed
2	2011-2012 (CSISA-BARC)	-	5	5	03: Completed Others: about to complete
3.	PIU-BARC: NATP-2	60	60	120	120 Ongoing
	Total	**60**	**83**	**143**	

6. HRD Status of BARC (2018-2019)

Events	No. Programs	No. of participants	Remarks
Training	27	933	Rev: 15; Others: 12
Workshop/ Seminar	43	3,338	Workshop/ Seminar (Rev):26;W orkshop (others): 17
Foreign Visit	-	46	seminar/workshop/study visit/training (20 events)
Higher Study (PhD)-in-Country	-	143	Revenue funding
Others	-	35	BARC attended the local training/workshop/seminar conducted by other organizations
Total		**4,495**	**-**

Fisheries Division

Fisheries Division has been working for sustainable fisheries and aquaculture research and development including blue economy. The key activities are project development, supervision, execution, technology development, monitoring and evaluation of the research projects, coordinate research programmes with the NARS Institutes, universities, BFRI, DoF, and the agencies which are engaged in nutritional research and development like FAO, WorldFish etc. Also, it's a part of regular activities to organize and attend national and international seminar, workshop, symposium, conference, meeting and training in fisheries and aquaculture, value addition etc.; reporting national issues, reviewing scientific papers, rendering expert opinion and advisory services etc.

Also, maintaining liaison with national and international agencies for collaboration and strengthening national research and developmental program along with agriculture and livestocks. Moreover, the technical advisory services also provided to the MoA on different issues related to agricultural research and special emphasis with fisheries and aquaculture development. A brief description of the activities during the reporting periods, 2019-2020 are given below:

PROFESSIONAL(s)
Dr. Md. Monirul Islam, Member Director

Program/Project Developed
A total of 10 PBRG sub-projects were developed and have been implementing under direct supervision and monitoring of the Fisheries Division. The component parts of the PBRG sub-projects are BFRI, BAU, PSTU, BSMRU, RU, SAU, SUST, JUSTand NSTU.

Half Yearly Progress Review Workshop of PBRG Sub-Project
Half yearly Progress Review Workshop of the PBRG Sub-Projects, Fishereis Division, were arranged on 22.01.2020. Principal Investigator, co-investigators, expert members including senior officials from BARC and universities were present and provided valuable suggestions and advices. Later, all of these suggestions and advice are incorporated in the project activities. It is noteworthy to mention that, Dr Shaikh Mohammad Bokhtiar, Executive Chairman, BARC.was present as chief guest in this review workshops.

Fig. Pictorial views of inception workshop

Organizing Workshop/Seminars
The following workshops were organized by the Fisheries Division at Naikhongchari, BLRI and Paikgacha, Khulna, BFRI (Table 1). In these workshops, key note paper was presented by Dr. Md. Monirul Islam, Member Director with the view to create awareness among mass people regarding fish nutrition and its benefits as well as fish adulteration and consumer's responsibility. The participants were., Upazilla Fisher-

officers including other officials at Upazilla level, scientists, extension workers, teachers, fish traders, fish feed dealers and reporters from the print and electronic media were invited both of the workshop from the said region/districts. However, in these workshop Dr. Nathu Ram Sarker, Director General, BLRI and Dr. Md. Abdul Jalil, Chief Scientific Officer, BLRI was present as a chief guest respectively.

Table 1: Workshop Programme Implemented by the Nutrition Unit

Title	Places/Venue	Total Programme	Total Participants
Future Fisheries and Nutrition	Naikhongchari, BLRI	01	95
Future Fisheries and Nutrition	Paikgacha, Khulna , BFRI	01	95

Fig. Pictorial Views of Workshop

Policy Level Contribution

The Fisheries Division contributed a good deal in several programs on aquaculture advocacy, motivation of rural fish farmers and project design by the NARS Institutes, Bangladesh Directorate of Fisheries (DoF), BFRI, worldFish and few NGOs working at the grassroots level. However, Member Director (Fisheries) working as an expert member in different organisation, some of which are noted as follows:

Expert Committee

a. Acting as a expert member of the Directorate Fisheries (DoF)
b. Tender Evaluation Committee, NATP Project, PIU, DLS component
c. Acting as a member of the 'Fish and Fisheries Products (AFDC -23)' Committee of BSTI;

d. Acting as a one of the examiner of the Department of Fishries and Technology, Patuakhali Science and Technology University (PSTU), Dumki, Patuakhali.
e. Acting as a member, recruitment committee, BFRI

National Level Collaboration and Linkages

Fisheries Division continued to be closely involved in the process of programme development, review mechanism of various food and aquaculture related activities of NARS, relevant institutes and universities. Besides, the unit is also involved in planning and organizingactivities undertaken by the institutions, like, DoF, WorldFish, BFRI, DAE, BIRTAN, FAO etc., working in the field.

Research Management and Coordination

As a part of the regular annual activities, Fisheries Division was involved in the review, monitoring and participatory program development of the fisheries and aquaculture research and development activities of the DoF, BFRI and Member Director (Fisheries) took part in BARC's centrally monitoring of the supplementary research funding program implemented by the different NARS institutes and universities during the reporting year.

Field Monitoring and Evaluation

Fisheries Division, also regularly monitorede and evaluated the project activities at field level. Dr. Md. Monirul Islam with his team member visited to monitor the BARC funded different ongoing project activities like BARI, BRRI and other NARS institutes during the reporting period. Thereafter, the activities carried out under the core research programm were reported to Planning and Evaluation Division in prescribed format and finally presented the field observation in workshop organised by the BARC in the presence of principal investigators and other relevant scientists.

However, also monitor the ongoing PBRG sub-project activities implementing by BFRI, SUST, SAU, KU, JUSTand BAU under the supervision of Fisheries Division, BARC.

Fig. Pictorial Views of Field Monitoring

Nutrition Unit

The Nutrition unit is involved and are being involving for sustainable human nutrition, mitigation measures of food adulteration and contamination. The major activities done by the unit like project development, supervision, execution, technology development, awareness build up, monitoring and evaluation of the research projects, coordinate research programmes with the NARS institutes, universities, BCSIR, BFSA, BIRTAN and the agencies which are engaged in nutritional research and development like FAO, WHO, World Vision, WorldFish, IFRI, BRAC, Hellen Killer etc. Also, it's a part of regular activities to organize and attend national and international seminar, workshop, symposium, conference, meeting and training in researchand technologies, food adulteration, contamination and mitigation measures; reporting national issues, reviewing scientific papers, randering expert opinion and advisory services etc.

Moreover, maintaining liaison with national and international agencies for collaboration and strengthening national research and developmental programme in nutrition along with agriculture, fisheries and livestocks.

Moreover, the technical advisory services also wereprovided to the MoA on different issues related to agricultural research (including crop, livestock, fisheries & nutrition as a whole) and development.

A brief description of activities done by the Nutrition Unit during 2019-2020 period is given below:

PROFESSIONAL(s)

a. Dr. Md. Monirul Islam, Director (Nutrition)

Program/Project Developed

Presently following projects are implementing by the nutrition Unit, BARC which are as follows. These coordinated PBRG sub-projects are in progress under direct supervision and monitoring by the nutrition Unit.

- Contamination and adulteration of food and food products, process, chain and mollification
- Value addition and standardization of nutritional level in selected food items to mitigate malnutrition
- Food-based initiative for improving household food security, income generation and minimize malnutrition
- Value addition and standardization of nutritional level in selected food items from poultry origin
- Fortification and standardization of nutritional level in selected food items and efficacy test of polyphenolic compounds as quality livestock feed production

Workshop, Seminar, Training-Workshop etc.

Training Programme

As a part of the human resource development, Nutrition unit of BARC was organized different training programmes (Table 1) in Syedpur, Nilphamari and Iswardi, Pabna during 1 July 2019 and 30 June 2020 to create awareness building on nutrition knowledge, promote nutrition rich agricultural crops production and means to increase the knowledge of nutrition through capacity building.

Table 2: Training Programme Implemented by the Nutrition Unit

Title	Places/Venue	Total Programmes Implemented	Total participants
Awareness building on the importance of nutrition information	Saidpur, Nilphamari	02	70 nos; @ 35 each batch
Awareness building on the importance of nutrition information			
Quality processing and Preservation of Agro - Products	Ishwardi, Pabna	02	70 nos; @ 35 each batch

A total of 35 participants in each training programmec from the multi-sectors Like sub-assistant agriculture officer, health workers formal and non-formal teachers, local journalists, producers, family farmers, small entrepreneurs,traders and consumers and other government agency extension workers were attended.

It is worthwhile to mention here that the programme was organized to disseminate the messages focusing on food based nutrition with a view that acquired knowledge would be further transferred to neighbors' and others stakeholders. The courses were designed with multidisciplinary sectors covering and emphasizing the following areas viz., agriculture products, gardening, small-scale fish culture, livestock; food hygiene, sanitation, quality safe food, food securit, micronutrient benefits, food utilisation, cooking process, food adulteration and mitigation measures, improvement of nutrition level, processing to restore food value, nutrition care of lactating and pregnant women as well as adolescent girls and preservation techniques of fruits and vegetables, quality control, etc.

In these programme resource speaker was selected from the multidisciplinary sector like agriculture, fisheries and livestock as well as scientists from BARI, BSRI and BLRI. However, Dr Md. Monirul Islam, Director (Nutrition), attended as a key speaker in all of these training programmes to facilitate and make the training programme successful.

Fig. Pictorial views of training activities

Organizing Workshop/Seminars

A couple of training workshops were organized during 1 July 2019 and 30 June 2020 at BLRI Savar and Gouripur, Comilla (Table 2). In these workshops, key note paper was presented by Dr. Md. Monirul Islam, Director (Nutrition) with the view to create awareness among mass people, the participants viz., Upazilla Agriculture Officer including other officials at Upazilla level, scientists, extension workers, teachers, fruit traders, growers, pesticide dealers and reporters from the print and electronic media were invited in both of the workshops from the said region/districts.

However, in these workshop programme DrNathu Ram Sarker, Director General, BLRI and Dr. Md. Abdul Jalil, Chief Scientific Officer, BLRI was present as a chief guest, respectively.

Table 3: Workshop Programme Implemented by the Nutrition Unit

Title	Places/Venue	Total Programme	Total Participants
Food Adulteration and Contamination: Inside Fact and Consumer Responsibilities	BLRI, Savar	01	85
Food Adulteration and Contamination: Inside Fact and Consumer Responsibilities	Gouripur, Cumilla	01	85

Fig. Pictorial views of the workshop activities

Special Edition (T-Shirt) of Mujib Borsho by Nutrition Unit

As part of the 100 Birth year Celebration "Mujib Borsho' of Father of the Nation Bangabandhu Sheikh Mujibur Rahman- Nutrition Unit, BARC printed Special Edition of T-Shirt as follows.

Director (Nutrition) also attended in telecast programm, talk show to share and disseminate nutrition knowledge, food safety, food adulteration, mitigation measures in different electronic media viz., Channel 24, Atn News, Jamuna Tv., ntv, Rtv, Channel 71, DBC, Samoy tv, Boishakhi Tv etc. including Radio Furti. In addition, a number of research results compiled by the Nutrition Unit, were published in different print media.

Key Research Activities done by Nutrition Unit

Antibiotics, Sulpher Drug and Heavy Metals Residue Analysis in Pasteurized and unpasteurized milk:

The panic was created by some experts and institutes without any authentic scientific data or test result that milks are contaminated with antibiotics, heavy metals and other chemicals. While publishing this report heavily affected the milk industry and raised the public fear in all level.

In this regard, to unreval the actual scenario, Nutrition unit attempted to analyse the pasteurized and unpasteurised milk quality available in market. Pasteurized milk produced by different companies viz, Milk Vita, Arong, Pran, Farm Fresh, Igloo, RD, Savar Dairy were collected from Mohammedpur, Mirpur, Farmgate areas and unpasteurised milk were collected from the producers of Rajason and Savar bazar. Collected samples were then sent to the internationally accredited Laboratory SGS, Chennai following internationally accepted guidelines. It is wortly to note that the samples of pasteurised and unpasteurised milks were analysed directly and after boiling for nine minutes to examine the residue of antibiotics, sulphar drug and heavy metals.

During the study, residue of antibiotics namely Tetracycline, Chlortetracycline, Oxytetracycline, 4 Epitetracycline, 4 Epichlortetracycline, 4 Epioxytetracycline, Enrofloxacin, Ciprofloxin, Chloramphenicol, Streptomycin; sulpher drugs viz, Sulfamethazine, Sulfamerazine, Sulfadiazine Sulfapyridine, Sulfapyridine Sulfathiazole Sulfamethoxazole, Sulphachloropyridazine, Sulfamethiazole, Sulphamethoxypyridazine, Sulphanilamide, Sulphadoxine, Trimethoprim and heavy metals viz., Pb and Cr in particular were detected.

The study made observation that out of 15 milk samples, only in two residues of Chloramphenical and Streptomycin at 0.06 µg/litre and 10 µg/litre in Milk Vita and Pran respectively was found. It is noted that maxiumum residue level of Chloramphenical and Streptomycin are 0.1 µg/litre and 200 µg/litrerespectively, which is far below compared with the maximum residue level (MRL) recommended by CODEX for humanconsumption. No antibiotic, sulfur drug and heavy metals residue were found in the rest of the pasteurised samples whether pasteurised and unpasteurised/rawmilk.

Sugar is very important for our daily life. When simple sugars are naturally found in whole foods, they come with vitamins, minerals, protein, phytochemicals and fiber. The presence of fiber makes a significant difference because it slows down the absorption of sugar, which slows its impact on blood sugar. Natural sugar in whole food is so-called "good sugar."

Eating too much added sugar can have many negative health effects. An excess of sweetened foods and beverages can lead to weight gain, blood sugar problems and an increased risk of heart disease, among other dangerous conditions.

In recent years, it is concerned that sugar are adulterated with other sweetened substances. Therefore, to understand the situation Nutrition unit, analyzed the brand and non brand sugar available in local market. In this regard, sugar samples like No. 1; sugarcane, Teer, Fresh, Refine sugar, ACI, Igloo, SIS, Saccho, Deshi, Health Care and Sawpno and 4 samples of non brand were collected from different parts of the Dhaka City.

Table. 4. Analytical results of different sugar samples

Sl.	Sample name/ code	Collection Point	Sodium cyclamate (ppm)
1.	No. 1; (N-SC-NO-1)	Motijheel (Rakib Store)	<1.0
2.	Sugarcane sugar; (N-SC-SGCN-11	Puran Dhaka (Raya Bazar, Bollam store)	<1.0
3.	Teer; N-SC-TR-2	Cantontment (Jahangir Store)	<1.0
4.	Fresh Sugar; N-SC-FR-3	Gulshan-1	<1.0
5.	ACI sugar pure; N-SC-ACP-4	Badda (Mijan Store)	<1.0
6.	Igloo; N-SC-IG-5	Banani (Tamanna Store)	<1.0
7.	SIS white sugar cube; N-SC-SCSIS-1	SIS (Chaldal.com)	<1.0
8.	Sochcho; N-SC-SCH-7	Tongi (Nazma Store)	<1.0
9.	Deshichini; N-SC-DSH-8	Mohakhali (KachaBazar)	<1.0
10.	Health care; N-SC-HC-9	BaipailKacha Bazar	<1.0
11.	Refined sugar; N-SC-RFS-10	Savar (Prince Bazar)	<1.0
12.	N-SC-MP-O-1	MirpurKacha Bazar	<1.0
13.	N-SC-KK-O-2	Kochukhet (Rojonigondha Market)	<10
14.	N-SC-SDGH-O-3	Sadarghat (Ikra Store)	<1.0
15.	N-SC-KB-O-4	Karwan Bazar (Jonaki Store)	<1.0
16.	Swapno sugar; N-SC-SP-6	Uttara (Swapno super shop)	<1.0

Policy Level Contribution

The Nutrition Unit contributed much in several programs on nutritional advocacy, motivation of rural households and project design by the NARS Institutes, Bangladesh National Nutrition Council (BNNC), Bangladesh Food Safety Authority (BFSA), Institute of Food Science and Technology (IFST) of BCSIR, ICDDR'B and few NGOs working at the grassroots level. However, Director (Nutrition) working as an expert member in different organisation, some of which are as follows:

Expert Committee

f. Acting as a expert Member of the Tender Evaluation Committee, NATP Project, PIU, DLS component
g. Acting as aMember of the 'Fish and Fisheries Products (AFDC -23)' Committee of BSTI;
h. Acting as aMember of the "Oils, fats and allied products" Sectional Committee of BSTI, Dhaka.
i. Acting Member, Agriculture and Food Division Committee (AFDC), BSTI, Dhaka
j. Acting as a one of the examiner of the Department of Fishries and Technology, Patuakhali Science and Technology University (PSTU), Dumki, Patuakhali.
k. Acting as expert member of the "Food Safety Authority (FSA)" (Fruits and vegetables Committee/crop sector)
l. Member of the National Plan of Action on Nutrition (NPAN)
m. Member, Nutrition Working Group (NWG)

National Level Collaboration and Linkages

The unit continued to be closely involved in programme development, review mechanism of various food and nutrition related activities of NARS, relevant institutes and universities. Besides, the unit is also involved in planning and organization of activities undertaken by the institutions, like, DAE, BIRTAN, BNNC, IFST, BFSA, ICDDR'B WFP, INFS, FAO etc., working in the field of food and nutrition, food safety, food adulteration and mitigation, primary health care, food habit, food utilization and cooking practices.

Director (Nutrition) actively contributed to the BSTI to provide quality products and developing standards of these different products and to play the key role by providing suggestion/expert opinion to the BSFA to minimize food adulteration and its mitigation measures.

Dr. Md. Monirul Islam, Director (Nutrition) was also actively engaged with BFSA and contributed to produce the Recommended Level/MRL of pesticides residue and food additives and preservatives for Bangladesh standards.

Research Management and Coordination

As a part of the regular yearly activities, Nutrition Unit was involved in the review, monitoring and participatory program development of the nutritional activities of the BFSA, DAE, DAM, BIRTAN, BNNC, IFST, HK and ICDDR'B. As Director (Nutrition) took part in BARC's centrally monitoring of the supplementary research funding program implemented by different NARS institutes and Universities during the reporting year.

Field Monitoring and Evaluation

The unit also regularly monitor and evaluate the project activities at field level. Dr. Md. Monirul Islam with his team member visited to monitor the BARC funded different ongoing project activities like BLRI, BRRI, BAU, BFRI during the reporting period. Thereafter, the activities done under the core research programm reporting to the Planning and Evaluation Division in prescribed format and finally presented the field observation in the workshop organised by the BARC in presence of principal investigators of the project and other relevant scientists.

However, also monitor the ongoing PBRG sub-project activities implementing by BARI, BFRI, BLRI, PSTU, HDSTU and BAU under the supervision of Nutrition Unit.

Fig. Field Monitoring activities

Publication(s)

Depending on the research finding and other activities, Nutrition unit has been published wcientific paper, reports, proceedings of the seminar symposium etc. on a regular basis. During the reporting period following documents were published.

Leaflets

- পাস্তুরিত ও কাঁচাতরল দুধ ঃ ক্ষতিকরউপাদানেরউপস্থিতি ও স্বাস্থ্য ঝুঁকি নিরুপন, ড. মোঃ মনিরুল ইসলাম।
- হোটেল-রেস্তোরায় পরিবেশনকৃত শাক-সব্জিতেকীটনাশকের উপস্হিতি ও খাদ্য নিরাপদতা, ড. মোঃ মনিরুল ইসলাম।
- রাইস ব্রান অয়েল ঃ কতটা স্বাস্থ্যকর, ড. মোঃ মনিরুল ইসলাম।
- পান্তা ভাতের পুষ্টিমান ও স্বাস্থ্য উপকারিতা, ড. মোঃ মনিরুল ইসলাম।
- সাদা চিনিতে সোডিয়াম সাইক্লামেট এর উপস্থিতি ও জনস্বাস্থ্য সর্তকতা, মোঃ মনিরুল ইসলাম।

However, a number of popular articles were published in the different national daily newspaper with the emphasis of recent issues COVID-19 in particular which are as follows:

- পুষ্টি নিরাপত্তার বাঁধাঃ পুষ্টিকর খাদ্যাভাব না পুষ্টিজ্ঞানের অভাব ও অসচেতনতা
- কোভিড-১৯ পরবর্তী খাদ্য নিরাপত্তা ও পুষ্টিভাবনা এবং করণীয়
- বানিজ্যিকভাবে উৎপাদিত পোল্ট্রি ফিডের রাসায়নিক বিশ্লেষণের তুলনামুলক ফলাফল
- চিংড়িচাষ ঃ একটি সম্ভাবনার প্রতিবন্ধকতা ও করণীয়

Training, workshop, seminar, etc. (Foreign and Local) Attended

Not Applicable


Training Programme
on
Quality processing and preservation of agro-products

NATURAL RESOURCES MANAGEMENT DIVISION

AGRICULTURAL ENGINEERING UNIT (AEU)

Agricultural Engineering Unit. Natural Resources Management Division, BARC has been implementing the mandated activities and beyond. AEU, since its inception, has been prioritizing, planning, approving, reviewing, monitoring and coordinating irrigation and water management, farm mechanization and post harvesttechnology related research programme of the NARS institutes and other institutions including universities, DAE and NGOs. The unit conducted training program and seminar/workshop and maintain strong linkage with the national (IEB, BWDB, WARPO, BSTI, NGOs (IDE, BWP /GWP), BAS and Universities etc.) and international (CIMMYT, IRRI, CSAM, and FAO etc.) organizations. The activities of the unt for 2019-20 is briefly discussed below:

1. Research Program Development

a. Two days NARS Research Planning Workshop on Agricultural Engineering was held on 18-19 September 2019 with the participation of the institutes from the National Agricultural Research System (BARI, BRRI, BINA and BSRI), DAE, Rural Development Academy (RDA), IRRI, Bangladesh Rural Advancement Committee (BRAC), Agricultural Universities etc. The objectives of the workshop were to review the status and needs of agricultural engineering research in Farm Machinery, Irrigation and Water Management and Postharvest Technology. Ninety Agricultural Engineers from NARS institutes, universities and other organization participated in the workshops. Participants and expert members provided valuable suggestions on Agricultural Engineering Research Reports (2018-19) and Planning Future Research Program (2019-20) of NARS institutes and recommendations in various issues.

b. Attended internal and central research review workshops of BARI.

2. Monitoring and Evaluation

i. Conducted field monitoring of PBRG project Groundwater Resources Management for Sustainable Crop Production in Northwest Hydrological Region of Bangladesh" (Groundwater Management Project-002) on 24-27 September, 2019. Consultant and Scientific Officer from Coordination Component: BARC visited BARI, BRRI and BINA component project activities at Chapai Nawabganj, Naogaon, Rajshahi and Pabna district (Fig. 1). They first visited the BINA Component field experiments at Chapai Nawabganj and Naogaon districts. The experiment was on cropping pattern study for identifying water saving pattern at aman season. Then the team monitored the BARI Component field experiment at Godagarigari and Tanore of Rajshahi district. At the end, the team monitored the BRRI Component field experiment at Santhia Upazila of Pabna. The expert team keenly monitored all the experimental fields and gave suggestions to the component's field officers.

Chapai Nawabganj, rajshahi, Pabna Godagonj, Rajsh Satkhira, Pabna

Fig. Photographs of field visit at Chapai Nawabganj, Rajshahi and Pabna district

ii. Conducted field monitoring of PBRG project Groundwater Resources Management for Sustainable Crop Production in Northwest Hydrological Region of Bangladesh" (Groundwater Manage Project-002) on22-24, October 2019 at Mithapukur, Rangpur. The concerned Officer of Coordination

Component, BARC visited field experiment and also attended a field day organized by BRRI Component on BRRI dhan 75 cultivation for developed water saving technologies on 23 October 2020 (Fig. 2). The main characteristics BRRI dhan 75 is, it requires less irrigation water and manure for cultivation. The Upazila Agricultural Officer was the chief guest in this field day and delivered speech to the farmers for significance of cultivating BRRI dhan 75.

Fig. Photographs of Field Day at Mithapukur, Rangpur

iii. Conducted field monitoring of PBRG project up-scaling and application of solar photovoltaic pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh (ID-001) on 5 November, 2019 at Nijsuhuri, Badura, Galachipa, Patuakhali, Amragassyia, Kukura, Amtoli, Borguna and Chalitabunia, Masuakhali, Kalapara, Patuakhali (BARI component's project location) (Fig. 3). The first project site was in off grid area. Signboards were inclusive of project details. Installation of solar pump and solar panel for household appliances in the project site was completed as per inception report. Canals and ponds situated adjacent to the farmer's house are the available water sources for multiple fruit orchard and vegetable irrigation in Rabi season. The selected farmer of Amtoli, Borguna doesn't use national grid electricity but keeps the grid line by paying Tk 57 per month (minimum charge for grid connection). BARC experts and coordinating personnel attended the training program arranged by BARI which was held on 6 November, 2019 in the training room of Upazila Agriculture office, Amtoli, Borguna (Fig. 4).

Galachipa, PatuakhaliAmtoli, BorgunaKalapara, Patuakhali

Fig. 3. Photographs of field monitoring at Patuakhali and Borguna district

Fig. 4. Training program at Amtoli, Borguna

BARC experts and coordinating personnel visited BRRI project locations at Bakerganj, Barisal and Nalcity, Jhalokati on 6 November, 2019 and Uzirpur, Barisal on 7 November, 2019 (Fig. 5). Project sites were in on-grid area. Signboards were inclusive of project details. A set of portable 8 solar panels with a pump and

thresher have been given to the selected farmers. Installation of solar pump and solar panel for household appliances in the project site was completed as per inception report. The solar home system was found linked with national grid and no storage system was given.

Bakerganj, Barisal, Nalcity, Jhalokati, Uzirpur, Barisal

Fig. 5. Photographs of field monitoring at Barisal and Jhalokati district

iv. Conducted Field Monitoring of PBRG project up-scaling and Application of Solar Photovoltaic Pump for 'Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh' (ID-001) on 4 December, 2019 at BARI project location Lalmohon, Bhola. Also BARC coordinating personnel attended the training program arranged by BARI at project location Lalmohon, Bhola and monitored field experiments on 4 December, 2019 (Fig. 6). Training program was held in the backyard of the project concerned farmer Md. Nurul Islam. Dr. Md. Ayub Hossain, CSO and Head, FMPHT Division, BARI & PI of the project was the chief guest and Gazi Nazmul Hasan, SSO and In-charge, On Farm Research Division, BARI, Bhola was the Chairman of the inaugural session. Dr. Muhammad ArsadulHoque, SSO and Sheikh Samsul Alam Kamar, SO were the resource speakers. Distinguished speakers emphasized on the use of solar energy and the importance of the training. They encouraged the participants for enthusiastic participation in learning about operation and maintenance of solar pump and solar home system. Among 20 participating farmers, local electricians, mechanics and SAAO of Lalmohon and Char Fassion were present.

Fig. 6. Training program at Lalmohon, Bhola

v. Conducted field monitoring of PBRG project Groundwater Resources Management for Sustainable Crop Production in Northwest Hydrological Region of Bangladesh" (Groundwater Management Project-002) on07-09, December 2019 at Mithapukur and Pirganj, Rangpur (Fig. 7). The concerned-Scientific Officer from Coordination Component; BARC visited the BRRI Component field experiments. The farmers of this region normally practice Aman-follaw-Boro. Cropping pattern Aman-fallow-Boro. But BRRI component tried cultivation of potato, lentil and mustard during fallow season. There was also an observation well in this experimental site and which was regularly monitored.

Fig. 7. Photographs of field monitoring at Mithapukur and Pirganj, Rangpur

vi. Conducted field monitoring of PBRG project up-scaling and 'Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh' (ID-001) on 13 December, 2019 at Jhalokati (Fig. 8). Project site was located in on grid area. Installation of solar panel for household appliances in the project site was completed. A set of portable 8 solar panels with a pump and thresher have been provided to the selected farmer as per inception report. The solar home system was found linked with national grid and no storage system was given. BARC experts and coordinating personnel also attended the training program arranged by BRRI Component which was held in the backyard of the project concerned farmer Md. Firoj Hawlader (Fig. 9). Training was on 'Solar Pump', 'Paddy Thresher' and 'Solar Home System' Establishment, Utilization and Maintenance based on BRRI portable Solar panel. Dr. Sultan Ahmmed, MD, Natural Resource Management Division, and Coordinator of this project was the chief guest and Dr. Md. Alamgir Hossain, CSO and In-charge, BRRI, Barishal was the chairman of the inaugural session. Dr Nazmun Nahar Karim, CSO, BARC and Associate Coordinator, Dr Shirajul Islam, Consultant of this project were present as the special guest. Agricultural officer of Nalcity and Jhalokati Sadar Nusrat Zahan and Rifat Shikder respectively were also present as the special guest. Distinguished speakers emphasized on use of solar energy and the importance of the training. They encouraged the participants for enthusiastic participation in learning about operation and maintenance of portable solar pump and solar home system. There were 20 particiteting farmers, local electricians, mechanics and SAAO of Nalcity and Jhalokati Sadar were present.

Fig. 8. Photographs of field monitoring at Ramzankathi, JhalokathiSadar, Jhalokati

Fig. 9. Photographs of Training at Nalcity, Jhalokati

BARC experts and coordinating personnel visited BRRI project locations at Samontogati, Nazirpur, Pirojpur and monitored field experiments on 14 December, 2019 (Fig. 10). Project site was located in off grid area.. A set of portable 8 solar panels with a pump and very similer sentince framing thresher have been

given to the selected farmer. Installation of solar panel along with 4 hybrid storage battery for household appliances in the project site was completed. Two more houses, a shop and a mondir along with the selected farmer's house were connected with the given portable eight solar panels and getting the benefit of solar electricity. Also BARC experts and coordinating personnel attended the training program arranged by BRRI at project location Kadamtola, Pirojpur Sadar, Pirojpur (Fig. 11). A training program was held in the backyard of the project benefited farmer Ripon Shek of Pirojpur Sadar. Dr Nazmun Nahar Karim, CSO and Associate Coordinator of this project was the chief guest and Dr. Md. Alamgir Hossain, CSO and Incharge, BRRI, Barishal was the chairman of the inaugural session. Abu Hena Mohammad Jafar, Deputy Direct, DAE, Pirojpur, Dr. Shirajul Islam, Consultant of this project, Agricultural officer of Pirojpur Sadar Shipon Ghosh and chairman of Kadamtola union Md Hamid Khan were present as the special guest. Distinguished speakers emphasized on the use of solar energy and the importance of training. They encouraged the participants for enthusiastic participation in learning about operation and maintenance of portable solar pump and solar home system. All the furmer (20), local electricians, mechanics and SAAO of Nazirpur and Pirojpur Sadar attended the training.

Fig. 10. Photographs of field monitoring at Samontogati, Nazirpur, Pirojpur

Fig. 11. Photographs oftraining at PirojpurSadar, Pirojpur

vii. Conducted field monitoring of PBRG project "Ground water Resources Management for Sustainable Crop Production in Northwest Hydrological Region of Bangladesh" (Groundwater Management Project-002) on21-23 December 2019 at Joypurhat Sadar and Kalai Upazila of Joypurhat District (Fig. 12). In this location, BARI Component conducted the research on cropping pattern-based water requirement with adoption of water saving technologies. BARI Sorisha 14 and BARI Alu 25 were tried at Joypurhat sadar as cropping pattern of T Aman-Mustard-Boro and T Aman-Potato-Boro, respectively. With the same cropping pattern BARI Sorisha 14 and BARI Alu 25 were cultivated at Kalai Upazila.

Fig. 12. Photographs of field monitoring atJoypurhat District

viii. Conducted field monitoring of PBRG project "Groun dwater Resources Management for Sustainable Crop Production in Northwest Hydrological Region of Bangladesh" (Groundwater Management Project-002) on25-27 January 2020 at Chapai Nawabganj, Rajshahi and Pabna district. At first BARC experts and coordinating personnel visited Godagari upazilla, BARI component's field experiments (Maize and Mustard field) on 25 January 2020.Then the team visited all the field experimental sites of BINA Component at Chapai Nawabganj on 26 January 2020 and provided necessary suggestions for improving the field research activities. On the same day the monitoring team attended the training program arranged by BARI Component at project location Tanore upazila, Rajshahi and monitored field experiments. Training program was held near the potato field of the project urned farmer Md. Gani Mia of Tanore upazila, Rajshahi. The chief guest, special guest and scientists delivered speech on importance of using water saving technologies for potato production. They also emphasized the farmers of using alternate farrow irrigation method for potato cultivation. The monitoring team visited the BRRI component field experimental sites at Santhia, Pabna on 27 January 2020 and gave suggestions for recording experimental data properly (Fig. 13).

Chapai Nawabganj, Rajshahi, Pabna

Fig. 13. Photographs of field monitoring and field day at ChapaiNawabganj, Rajshahi and Pabna district

ix. Conducted field monitoring of PBRG project titledGroundwater Resources Management for Sustainable Crop Production in Northwest Hydrological Region of Bangladesh" (Groundwater Management Project-002) on08-11, February 2020 at Mithapukur, Rangpur. The team also visited the experimental field at Horipur, Mithapukur. They monitored the experimental field, data collection method from observation well, application of water saving technology practices from research field (potato and mustard) and emphasized on recording field data accurately. The team members of Coordination Component, BARC attended the field day on 10 February 2020 (Fig. 14).

Fig. 14. Photographs of field monitoring and field dayat Mithapukur, Rangpur

x. Conducted field monitoring of PBRG project titled 'Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh (ID-001)' on 15 March, 2020 at BARI project location Aowajpur, Char Fassion, Bhola (Fig. 15). Project site was located in on grid area and signboard was inclusive of project details. Installation of solar pump and solar panel for household appliances in the project site was completed as per inception report. A set of 4 solar panels with a solar pump and battery given to farmer were found functional. A pond situated in front of the farmer's house is the water source for irrigating vegetables. Alternate furrow, drip and farmers irrigation practice for Brinjal, tomato and chili was followed in field. BARC coordinating personnel attended the field day arranged by BARI at project location Lalmohon, Bhola (Fig. 16). A field day was held in the backyard of the project benefited farmer Md. Nurul Islam at Lalmohon, Bhola. Dr. Shirajul Islam, Consultant

of this project was the chief guest and Dr. Muhammad Arsadul Hoque, Co-PI and SSO, BARI was the chairman of the inaugural session. S.M. Shamsuddin, Upazilla Agricultural Officer was present as aspecial guest. Distinguished speakers emphasized on the use of solar energy and the benefit of Solar Pump. They encouraged the participants for enthusiastic participation in learning about operation and maintenance of solar pump and solar home system. Among 40 participant three were farmers, local electricians, mechanics and SAAO of Lalmohon. The participants learnt about alternate furrow and drip irrigation system from Md. Nurul Islam's brinjal and tomato field. Md. Nurul Islam also was irrigating his mixed fruit orchard by solar pump.

Fig. 15. Photographs of field monitoring at Aowajpur, Charfassion, Bhola

Fig. 16. Photographs of field dayat Lalmohon, Bhola

3. Regional and International Collaboration & Cooperation

i. Worked as member in the different committee as mentioned below:

a. Technical committee, Agricultural Mechanization Project of DAE, Dhaka.

b. Technical committee of Bio-gas, Infrastructure Development Company Limited (IDCOL), Dhaka.

c. Board of Management, National Museum of Science and Technology (NMST), Ministry of Science and Technology.

d. Governing Council of CSAM, United Nations Economic and Social Commission for Asia and the Pacific.

e. BANCID Study and Publication Sub-Committee.

f. Science and Technology Development Trustee Board, Ministry of Science and Technology.

g. Technical Advisory Committee (TAC) of KGF.

h. Advisory Committee of Appropriate-scale Mechanization Innovation Hub- Bangladesh.

i. Governing Board of the lnter disciplinary Centre for Food Security (lCF), Bangladesh Agricultural University (BAU).

j. Examiner of MS thesis

ii. Attended meetings/seminar/ workshops organized by FAO, CEGIS, IWM, WARPO, and BARI etc.

iii. Dr. Sultan Ahmmed, MD, NRM Division, BARC attended "Seventh Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific" and the fifteenth session ofthe Governing Council of the Centre for Sustainable Agricultural Mechanization (CSAM) held in Jeonju, Republic of Korea during 27-29 November 2019. In the 7th regional about discussed mainly financing for sustainable agricultural mechanization. This forum mainly included opening ceremony, keynote presentation, panel discussion and case presentation on subsidy schemes and other financing schemes. In the case study presentation on subsidy schemes Bangladesh has presented "Financing for Sustainable Agricultural Mechanization: A program review in Bangladesh context". The fifteenth session of the Council reviewed the CSAM work report for 2019 and the administrative and financial status of the Centrein 2019, provided direction for the programme of work for 2020, considered the report of the independent evaluation of CSAM, and reviewed the five-year

development strategy 2020-2024. Dr. Sultan attended various events and paid field visit from 27 to 29 November arranged by CSAM.


Fig. 17 Seventh Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific

iv. Reviewed draft Policy Brief on 'Solar Powered Irrigation Systems (SPIS)' in Bangladesh: Focus on Sustainable Groundwater Use and Equitable Access to SPIS of Food and Agriculture Organisation (FAO) of the United Nations and International Centre for Integrated Mountain Development (ICIMOD).
v. Reviewed three papers for journal of Agricultural Engineering, The Institute of Engineers, Bangladesh.

4. Research Project Evaluation

Evaluated KGF project untitled" Development and Adaption of a Solar Cabinet Dryer for Vegetable Seeds"; Determination of appropriate tillage depths, seeding mechanisms of crops and their implications on yield performance and soil health under intensive cropping systems; Design and development of low cost power tiller operated sugarcane harvester; and Biogas Technology for Power Generation from Poultry Litter in Bangladesh;.

5. Preparation of Policy Documents and Inputs

Furnished comments on the following aspects/issues and forwareded to the MOA

১. সরকারি/বেসরকারি প্রতিষ্ঠান কর্তৃক ড্রোন (উড্ডয়ন) নিবন্ধন ও উড্ডয়ন নীতিমালা ২০১৯' এর উপর মতামত প্রেরণ;
২. খসড়া 'ড্রেজিং ও ড্রেজডম্যাটেরিয়াল ব্যবস্থাপনা নীতিমালা-২০১৮' এর উপর বিএআরসি'র মতামত প্রেরণ;
৩. নারী ও শিশুর প্রতি সহিংসতা প্রতিরোধে জাতীয় কর্ম পরিকল্পনা (২০১৮-৩০) এর বাস্তবায়ন অগ্রগতির তথ্যাদি প্রেরণ;
৪. JICA কর্তৃক মহেশখালি মাতার বাড়ি এলাকায় Water Front Industry গড়ে তোলার বিষয়ে পরিচালিত জরিপ এর উপর মতামত প্রেরণ;
৫. 'Feasibility study for establishing power tiller and agricultural machinery factory at Bogura' শীর্ষক প্রতিবেদনের উপর মতামত প্রেরণ;

6. Seminar/ Workshop/Meeting

i. Organized workshop on "Research Review 2018-19 and Research Program 2019-20 on Agricultural Engi neering of NARS Institutes" held in the Bangladesh Agricultural Research Council during18-19 September 2019 with participation from the National Agricultural Research System institutes (BARI, BRRI, BINA and BSRI), DAE, Rural Development Academy RDA, IRRI, Bangladesh Rural Advancement Committee there were inaugural technical (three) and concluding sessions in the workshop. After thorough discussions addition, subtraction and corrections were made in the 'rapporteurs' report. According to corrected rapporteur's report, draft recommendation was prepared and sent to head of the divisions for their valuable comments. The recommendations were finalized considering their comments.


Fig. Pictorial view research review and planning workshop

ii. Organized a project completion workshop titled 'Cropping system intensification in the salt-affected coastal zone of Bangladesh' in collaboration with BARI, BRRI, KGF, ACIAR and CSIRO Australia. The daylong workshop was held on 01 March 2020 in Auditorium, Bangladesh Agricultural Research Council. Mr. Kamalaranjan Das, Additional Secretary (Research), MoA was the chief guest in this workshop. Dr. Wais Kabir, Executive Director, KGF, Dr. Robyn Johnston, Program Manager, ACIAR and Mr. Duncan McCullough, Second Secretary, Australian High Commission, Dhaka were presented as the special guests. The workshop was chaired by Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BAR. The workshop was started by the recitation of verses from the Quran. Dr. Sultan Ahmmed, Member Director (NRM), BARC, Farmgate, Dhaka welcomed the participants and discussed the significance of organizing project completion workshop in his welcome address. Dr Mohammed Mainuddin, Principal Research Scientist and Project Leader, CSIRO, Canberra, Australia discussed the overall project overview and highlights. The representatives of the implementing institutes presented a brief description of the project activities carried out.

Fig.18 Pictorial view of workshop

iii. Organized fifth coordination meeting of PBRG sub-project titled "Groundwater resources management for sustainable crop production in Northwest hydrological region of Bangladesh (ID-002)" which was held on 01 August 2019 at BARC Conference Room-1. Under the chairmanship of Dr. Sultan Ahmmed, PIs from the project component BARI, BRRI and BINA presented their progress of the project activities. The chairman of the meeting requested Associate Coordinator, Consultants, PIs, Co-PIs and SOs to make comments/ suggestions for the improvement of the project activities. The proceedings of the fifth meeting were sent to project personnel for implementation of suggestions provided.

Fig.19 Fifth Coordination meeting 01.08.2019

iv. Organized fifth coordination meeting of PBRG sub-project Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh (ID-001) on 5 August 2019 at BARC Conference Room 2. Under the chairmanship of Dr. Sultan Ahmmed, PIs from the project component BARI and BRRI presented their progress of the project activities. The chairman of the meeting requested Associate Coordinator, Consultants, PIs, Co-PIs and SOs to render comments/ suggestions for the improvement of the project activities. The proceedings of the fifth meeting were send to project personnel for integration of the suggestions.

Fig. Twenty Fifth Coordination meeting 05.08.2019

v. Organized sixth coordination meeting of PBRG sub-project titled "Groundwater resources management for sustainable crop production in Northwest hydrological region of Bangladesh (ID-002)" which was held on 26 December 2019 at BARC Conference Room-2 arranged by coordination component BARC. Under the chairmanship of Dr. Sultan Ahmmed, PIs from the project component BARI, BRRI and BINA presented their updated activities. BARI Component has presented up to date cropping pattern-based water requirement experiments and quality assessment of groundwater. BINA Component has mostly done all project activities according to work plan except one tracer technique experiment and installation of second observation well and its pumping test. BRRI Component has also carried out most of the activities. Finally, Associate Coordinator, Dr. Nazmun Nahar Karim presented the overall project activities and emphasizes to carried out project activities as per work plan for second year by the component institutes. The proceedings of the sixth meeting were sent to project personnel for implementation of the suggestions.

Fig. 21: Pictorial view of Sixth Coordination meeting of PBRG subproject's (002)

vi. Organized sixth coordination meeting of PBRG sub-project titled 'Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh (ID-001)' which was held on 26 December 2019 at BARC Conference. Under the chairmanship of Dr. Sultan Ahmmed, PIs from the project component BARI and BRRI presented their recent progress. Dr. Muhammad Arshadul Hoque, SSO and Co-PI, BARI component presented their project activies. Dr. A. B. M. Zahid Hossain, SSO and PI, BRRI component presented their project activities. Among other topics of his presentation he mentioned that the T.Aman cultivation of 2019 was affected by the cyclone, Bulbul. The proceedings of the sixth meeting were sent to project personnel for incorporationof the suggestions.

Fig. 22: Pictorial view of Sixth Coordination meeting of PBRG subproject's (001)

vii. Organized seventh coordination meeting of PBRG sub-project titled 'Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of

Bangladesh (ID-001)' which was held on 16 June 2020. The coordinator, associate coordinator, consultants, PIs, Co-PIs and SOs attend the meeting from their own workplace virtuallydue to Covid-19 pandemic situation. Under the chairmanship of Dr. Sultan Ahmmed, PIs from the project component BARI and BRRI presented their project activities. The PIs stated that they had to suspend their field days and trainings due to on-going pandemic situation. They also briefed about the damage of the crops due the cyclone 'Amphan'. The project personnel askedsuggestion about the project activities underpandemic situation. The proceedings of the seventh meeting were forwarded toproject personnel for inclusion of the suggestions.

Fig. 23 Pictorial view of Seventh Coordination (Virtual) meeting of PBRG subproject's (001)

viii. Organized seventh coordination meeting of PBRG sub-project titled "Groundwater resources management for sustainable crop production in northwest hydrological region of Bangladesh (ID-002)" which was held on 21 June 2020. The coordinator, associate coordinator, consultants, PIs, Co-PIs and SOs of the project attended the meeting from their own workplace through virtually due to Covid-19 pandemic situation. Under the chairmanship of Dr. Sultan Ahmmed, PIs from the project component BARI, BRRI and BINA presented their project activities. The PIs briefed that they had to suspend field days and trainings due to on-going pandemic situation. The project personnel wished to have suggestions for continuing the project activities in time.

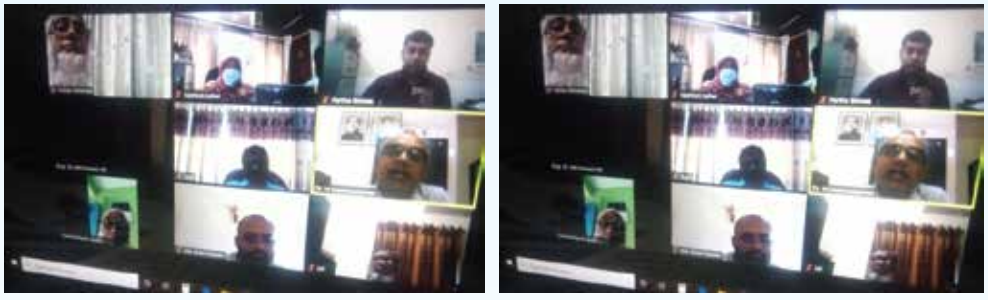


Fig. 24 Pictorial view of Seventh Coordination (Virtual) meeting of PBRG subproject's (002)

7. Regular Activities

i. Worked as a member in different committee of BARC
ii. Attended meetings/seminar/ workshops
iii. Attended training programme
iv. Evaluated first year annual progress report for CGP project of KGF in February and June 2020.
v. Evaluated Annual Report and Half Yearly Report of PBRG sub-project entitled 'Design and Development of fertilizer deep placement mechanism for existing rice transplanter' (Project ID # 064).
vi. Worked as a member of the recruitment committee of PBRG projects and other project.

8. Publications

i. Study on water productivity improvement for enhancing crop production in water scare area of North-west Bangladesh. 2019. J. Institution of Engineers Bangladesh, vol. 42/AE(2), pp. 17–26.

Forestry Unit

Forest Unit under has been implementing the mandated activities and beyond. Since its inception, The unit has been prioritizing, planning, approving, reviewing, monitoring and coordinating OFRD, BARI, and BFRI for agroforestry and forestry technologies related research program of the NARS institutes. The Unit conducted training program and seminar/workshop and maintained strong linkage with the national (BARI, BRRI, BFRI, BTRI, BSRTI, BSRI, CDB, BIRTAN, and DoF,etc.), Universities (BAU, BSMRAU, SAU-Sylhet, IFESCU, etc.) and international (ICRAF, ICIMOD, and FAO,etc.) organizations. The activities accomplished by the unit during 2019-2020 has been briefly discussed below:

2. Name of the professionals

Dr. Md. Saifullah
MD (A&F) and Chief Scientific Officer (AC)
Forest Unit, Bangladesh Agricultural Research Council

3. Policy Level Contribution

a. Policy Research on Forestry, Agroforestry and Environmental and Climate Change aspects: Furnished comments on nine Policy on the following aspects/issues

i) সংশোধিত "বন আইন ২০১৯" এর উপর মতামত
ii) বন্য প্রাণি ও জীববৈচিত্র্য সংরক্ষণে বঙ্গবন্ধু জাতীয় পুরস্কার প্রদান বিধিমালা
iii) গ্যাস বিপণন বিধিমালা, ২০১৯
iv) মন্ত্রি পরিষদ বিভাগের নির্দেশনার আলোকে পরিবেশ, বন ও জলবায়ু পরিবর্তন মন্ত্রণালয় কর্তৃক প্রেরিত পাহাড় ধসের কারণ অনুসন্ধান ও পরিবেশগত সমীক্ষা প্রতিবেদনের বিষয়ে মতামত
v) Agro-food Processing Industry Promotion Policy-2019 এর খসড়া নীতিমালার উপর মতামত
vi) "জাতীয় গুণগতমান নীতি বাস্তবায়ন এবং বাংলাদেশ জাতীয় গুণগতমান ও কারিগরি নিয়ন্ত্রণ কাউন্সিল প্রতিষ্ঠা (BNQTRC)" শীর্ষক-প্রকল্পের খসড়া আইন প্রণয়নে মতামত
vii) বাংলাদেশ বিদুৎ উন্নয়ন বোর্ড আইন ২০১৯-এর উপর মতামত
viii) Bangladesh National Job Strategy-এর উপর মতামত
ix) BARC and Global Institute for Food Security (GIFS), University of Saskatcheewan, Canada -এর মধ্যে প্রস্তাবিত সমঝোতা স্মারকের উপর মতামত
x) Concurrence on the revised Grant Agreement and the revised Grand Design Documents (GDD) on the Project on "Consortium for Scaling-up Climate Smart Agriculture in South Asia' to be supported by International Fund for Agriculture and Rural Development (IFAD)
xi) পরিবেশ আদালত আইন ২০১০ (সংশোধনী), 2019 এর উপর মতামত এবং
xii) বাংলাদেশ পরিবেশ সংরক্ষন আইন ১৯৯৫ (সংশোধিত) এর সংশোধনী, ২০১৯ এর উপর মতামত।

4. Evaluation and Review of forestry research program

Seventy Five forestry research programs of BFRI were reviewed, evaluated and provided suggestion for undertaking future research as per need and to be technically sound.

5. National Seminar/Workshop

i) Organized a national seminar of World Food day-2019 on "আমাদের কর্মই আমাদের ভবিষ্যৎ, পুষ্টিকর খাদ্যই হতে পারে ক্ষুধামুক্ত পৃথিবী (Our actions are our future, Healthy diets for a # Zero Hunger World)" during 16 October, 2019 at KIB Auditorium. Honorable Minister Mr. Sadhon Chandra Mujhumder, Minister, Ministry of Food as chief guest, special guest was Mr. Md. Asraf Ali Khan, State Minister, Ministry of Fisharish and Livestock, Mr. Md.Abdul Mannan, Member, Standing Committe, Ministry of Agriculture, The Seminar was presided by over Mr. Md. Nasiruzzaman, Secretary, Ministry of Agriculture.Dr. Visithchavasit, Director, The Institute of Nutrition, Mahidol University, Thailand was the keynote speaker. Also attended internal and central research review workshops of BARI.

Fig. 1:Administrative building of Bangladesh Forest Research Institute

Fig. 2: Organized World Food Day Seminar at KIB Auditorium

ii) Organized a national seminar titled 'Vegetable Fair' 2020 on "পুষ্টি ও সুস্বাস্থ্যের জন্য নিরাপদ সবজি" on 3 January, 2020 at KIB Auditorium. Honorable Minister Dr. Md. Abdur Razzaque, MP, Minister for Agriculture, as chief guest, whiile special guest was Mr. M. A. Mannan, MP, Honarable Minister, Ministry of Planning, Mr. Md. Abdul Mannan, Member, Standing Committe, Ministry of Agriculture was also present as a special guest and the Seminar was presided by Mr. Md. Nasiruzzaman, Secretary, Ministry of Agriculture. Dr. Sahabuddin Ahmed, Ex. Director, HRC, BARI was the keynote speaker.

Fig. 3: Organized Vegetable Fair Seminar at KIB Auditorium

6. Organized Seminar/ Workshop

C. Review of Workshop of NARS Institutes

Two days NARS Research Review and Program Planning Workshop was held during 26-26 September

2019 with the participation NARS institutes (BFRI, BARI, BRRI, BINA, BJRI, BSRTI, BTRI and BSRI). The objectives of the workshop were to review the status and needs of forestry research in forestry, agroforestry and wildlife technology. Participants and expert members rendered valuable suggestions on research reports (2018-19) and planning future research program (2019-20) and recommendations on various issues.

Fig.4: MD-NRM delivered his speech

Fig.5: CSO (Forest) delivered his speech

Fig. 6. MD-A&F delivered his speech

Fig. 7. workshop Participants

D. Annual Review Workshop of PBRG Sub-projects (three) Coordinated under NATP Phase II

1. Organized annual review workshop on PBRG Sub-project "Exploration, Identification, Characterization, Multiplication and Ex-situ Conservation of Endangered Forest Genetic Resources including Medicinal plants of Bangladesh (ID-074)" during 2 September, 2019.

Fig. 8: Annual review workshop of PBRG Sub-project ID 074 organized by Forest Unit

A day long workshop was been organized on 02 September 2019 at training building of BARC under the auspices of the project “Exploration, Identification, Characterization, Multiplication and Ex-situ Conservation of Endangered Forest Genetic Resources including Medicinal plants of Bangladesh: BARC Component” funded by the NATP Phase-II and implemented by the three components namely BAU BFRI and IFESCU Component under supervision and coordination of Forest unit. The objectives of the workshop were (a) exploring the 1st year activities of the project, and (b) Familiarization on the project work plan.

The workshop began with registration at 9:00 am and the inaugural ceremony of the inception workshop was chaired by Dr. Sultan Ahmmed, Member director (NRM), Dr. A.S.M. AnwarulHuq, Member Director (A&F), was present as the Chief guest in absence of the Executive Chairman and Mr. Mian Sayeed Hassan, Director, PIU, NATP, was present as special guest on the occasion.

Thirty-five scientist/academia from different organizations/universities namely BARC, BAU, IFESCU, BARI, and NATP attended the inception workshop. On the basis of the presentation some queries were discussed elaborately and given some comments/suggestions/recommendations (Annex-1) regarding improvement of the experiments. The participating organizations formulated the specific information in quantitative terms concerning their intervention. This information gave the base lines in assessing the changes those were achieved on completion of the project. The participating organizations also suggested to prepare a questionnaire for collecting information on each of the component.

2. Organized annual review workshop on PBRG Sub-project "PBRG Sub-project "Germplasm Conservation and Farm Productivity Enhancement through Integrating Shade Trees in Tea Based Agroforestry System (ID-072)" NATP-2 under Forest Unit, on 19 February, 2020.

Fig. 9: Second annual review workshop of PBRG Sub-project ID (072) organized by Forest Unit

3. Organized annual review workshop of PBRG Sub-project "Upliftment of Farmers Livelihood and Enrichment of Environment through Improved Agroforestry Practices in Char Land Ecosystem of Bangladesh: BARC Component (ID-077)", NATP-2 under Forest Unit, NRM Division, BARC" during 20 February 2020.

Fig. 10: Second annual review workshop of PBRG Sub-project ID 077 organized by Forest Unit

A day long annual workshop was organized on 20 February 2020 at the training building under the auspices of the project "Upliftment of Farmers' Livelihood and Enrichment of Environmentthrough Improved Agroforestry Practices in Char Land Ecosystem of Bangladesh: BARC Component" funded by NATP Phase-II and implemented by three components namely; BAU-Agroforestry, BARI-Jamalpur and BAU-Socio-economic Component under supervision and coordination of Forest Unit.The workshop begin with registration at 9:00 am with the inaugural ceremony chaired by Dr. Sultan Ahmmed, Member director (NRM), Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC was present as the chief guest and Mr. Mian Sayeed Hassan, Director, PIU, NATP, BARC was present as special guest on the occasion.

Thirty-nine scientists/academicians from different organizations/universities namely BARC, BTRI, BAU, SAU, IFESCU, BARI, and NATP attended the workshop, where in 26 were male and 13 were female participants after presentation some queries were discussed elaborately and given some comments/suggestions/recommendations regarding improvement of the experiments. The participating organizations provided the specific information in quantitative terms concerning their intervention. This information gave the base lines in assessing the changes they were received on completion of the project. The participating organizations also suggested to prepare a questionnaire for collecting the information on each of the component.

4. Coordination meeting

Coordination mechanisms in complex emergencies provide the framework for strategic decision making when there is no single lead agency. A Coordination meeting was held to coordinate the sub-projects of forest unit at the chamber of associate coordinator on 18 November 2019 to share and coordinate projects' plans for upcoming releases. Cross-project collaborations development was discussed having impact as a whole. The coordinator provided forum for all organizations to clarify their roles, responsibilities resources and matching them against the overarching objectives of the programmatic response to the emergency.

Fig. 11. A coordination meeting heldwith PIs at associate coordinator's room

Through the mechanism of coordination, every organization has the opportunity to identify the needs of the emergency and to participate in an organized strategic planning process.

5. Attending Annual Review Workshop organized by PIU-BARC, NATP

First year annual progress report was presented by the coordinating componentand the participating organizations on 17 November 2019 in Annual Review Workshop event organized by PIU-BARC, NATP-2 (Fig. 2). The workshop was successfully completed by having valuable comments and suggestions from the audience and experts.

Fig. 12: Speech deliverationdeliration of Director PIU-BARC, NATP-2 in Annual Review workshop

6. Attended a training programme on 25 December, 2019 titled "Challenges and Prospects of Shade Tree Friendly Tea Production in Bangladesh" organized by SAU Component.

Fig. 13. Dr. Md. Saifullah, Chief Scientific Officer, Forest Unit and Associate Coordinator of the sub-project addressing in the training program

E. Monitoring and evaluation of PBRG sub-projects activities

The participating organizations was constantly monitoring their activities preferably using the participatory monitoring and evaluation tool. BARC also monitored the activities of the subprojects through field visits and desk observation. Dr. Md. Saifullah, Member Director (A&F), and associate coordinator visited BAU-AF (Compomemt-1) research fields and contacted beneficiaries' farmers of BAU-Socio-economic (Compomemt-3) on 13 February 2020 and the research fields of BARI-Jamalpur (Compomemt-2) on 24 February 2020 as well as instructed PI and Co-PI for the smooth running of the project activities, Accordingly. it is also rendered advisory services to the participating organizations, if and when needed.

Fig. 14: Monitoring of PBRG sub-project activity at BARI-Jamalpur

Monitoring visit (SAU Component): A visit was paid by Dr. Mainuddin Ahmed, Consultant, PBRG Sub-project ID 072, and Kazi Noor-E-Alam Jewel, Senior Scientific Officer (Forest Unit), NATP-2, PBRG Sub-project, NRM Division, during 10-13 September 2019 to discuss on activities and work plan with the Pl and Co¬Pl of the components of Sylhet Agricultural University, Sylhet and BTRI thrugh paying a visit to visiting the project area following discussion with the selected tea estate authorities.

Fig. 15. Germplasm center at SAU Campus

A visit was paid along with PI and Co-PI to the experimental field following delivering necessarory advises on 11 September 2019 and also

Fig. 16. Meeting Photograph with the GM Khadim tea estate

Fig. 17. meeting Photograph with DGM and Manager, Burjan tea estate

visited germplasm center of the university and provided necessary advises.

Fig. 18. Discussion meeting with the PI and Co-PIs, SAU and BTRI Component

Monitoring visit (BTRI Component):

a. Monitoring visit at Srimangal

A visit was paid on september 2019 to monitor project activities of BTRI, Srimongal following a courtesy call with Director for a discussion and smooth implementation of the project.

Fig. 19. Meeting with the director of the BTRI

Fig. 20. Meeting with the Director-PDU of Tea Board

Fig. 21. Monitoring team visited the Germplasm center of BTRI

Also visited germplasm center of BTRI physically following a discussion about permanent fencing and technique of fencing. We advised to plant shade trees immediattely and demarcate with appropmiate signboard. We also observed the preparation from selected tips to taste liquor quality. Discussed how to fence permanently and about the technique of fencing. Advised them to plant seedlings immediately and plant selected shade trees also. Pointed out that proper signboard should be there in the field Then prepared tea from the tips of selected tea seedlings to test the taste of liqour.

Fig. 22. Organoleptic tea tasting procedure showing the tea tasting laboratory, BTRI

Fig. 23. New plantation on hillocks top at Bilashcherra expt. Farm, BTRI

The team member visited the experimental plot in the Bilashcherrha farm in the afternoon. The concerned were advised to put selt explanotory signboard mentioning information on tea variety, shade tree species, date of planting, and spacing.

Fig. 24: Baseline survey activities were monitored at Rajghat Tea estates, Srimangal and Khademnagar Tea estates, Sylhet

Again on 13 September 2019, we discussed various aspects of the projects with Pl and Co-Pl. following a visit to Rajghat Tea Estate to observe base line survey and discussed on the technique of data collection. Assistant manager Mr. Sadekur Rahman was present during the field visit.

b. Monitoring visit at Panchghar

A visit was made at Tetuli, Panchagarh during 13 and 14 December 2020 at BTRI Sub project locations. Huq Tea Estate at Tetulia was visited by the consultant and programme Officer with PI and Co-PI.

Fig. 25: Plantation of shade tree at Rahman Tea Garden in Darjipara, Tatulia, Panchaghar

The visiting team discussed with the management authority about the dead shade sps A. odoratissima, D. robusta and Azadirachtaindica and also about the necessity of replanting the same shade species. Discussions were made on the pests like 'Red Spider' 'Mite' and 'Helopeltis' and their control measures. Watering is a must during the dry period of the newly planted shade trees. During pruning period, the shade species in the section should be taken care of.

Dahuk and Kazi and Kazi Tea Estates were also visited for establishment of shade tress but they have established saturated shade species. So, the nearest Rahman Tea estate was selected and found that the estate had established unplanned non suitable shade species. According to BTRI suggestions, Rahman Tea estate should uproot the unwanted shade species and they have given three species of shade i.e. A. odoratissima, D. robusta and A. indica (each of 50 Nos.). Accordingly, they have given 5 kg Furadan, 5 L. Miticides and 5 L. insecticides to control major pests. Watering of the newly planted shade trees is a must during the dry period.

c. Monitoring and evaluation of intervening activities

NRM Division of BARC and consultant of the sub-project monitored the research activities of the participating organizations (BAU, BFRI and IFESCU) physically through paying field visits regularly and telephonic discussion.

Fig. 26. Monitoring the sub-project activities of BFRI by the CSO, BARC

Fig. 27. Monitoring project activities of BFRI by the project personnel of BARC

Fig. 28. Monitoring of BAU activities at Nator

Fig. 29. Monitoring of IFESCU activities at Sylhet Agricultural University Campus

Fig. 30. Monitoring of IFESCU activities at Ukhia

d. Training program

- A training was organized "Climate Smart Agriculture in relation to Char Land Ecosystem" held at training building of BARC during 11-12 December 2019. Forty NARS scientist and NGO personnel attended the training.

Fig. 31. Speech delivered by the chair and participant

- Another training on **"Medicinal and Aromatic plants in Bangladesh"** was organized at training building of BARC during 26-27 January 2020.

Fig. 32. Certificate awarding ceremony

F. Linkage

Maintained strong Linkage with NARS Institutes, BSTI, DoF, BCSIR, DoDM, MoFE, DoE, Universities, NGOs etc.

1. Technical committee meeting of MoEF(December 2019)
2. Department of Environment(DoE) (August 2019)

3. Technical committee meeting with FAO (February 2020)
4. Technical Committee meeting of Syllabus Review of MS (Forestry), Ph.D (Forestry), MS (Environmental Science and Ph.D (Environmental Science), IFESCU, Chottagram during 7 November, 2019

5. Technical Committee meeting of Syllabus Review of MS (Agroforestry and Environment), Ph.D (Agroforestry and Environment), HTSU, Dinajpur on 10 March, 2020

G. New Initiatives

1. MoU between BARC and North Dakota State University, USA (Activity ongoing)
2. MoU between BARC and University of Sydney, Australia (Activity ongoing)

H. Project Reviewed

1. Reviewed project completion report (PCR) of the project 'Studies on gummosis of shade trees in tea plantation and its management' under PIU-BARC, NATP-2
2. Reviewed project completion report (PCR) of the project 'Evaluation of tree-crop interaction from existing agroforestry systems in Sylhet region for food security by the lens of Climate Smart Agriculture' under PIU-BARC, NATP-2
3. Reviewed the research project 'Exploring the homestead agroforestry model for improving food and nutrition security and up-scaling of livelihoods in the charlands of Bangladesh.' Under KGF-BKGET.

I. Special Work/Activities

Examiner of M.S, Ph.D. and undergraduate standerts, of Agroforestry

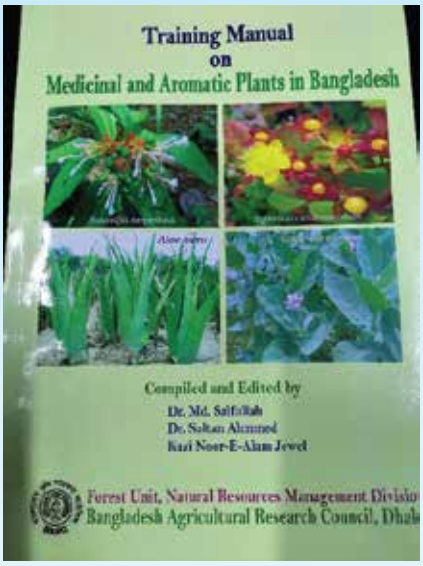
1. Examine MS thesis 'Effect of organic manure and mulching on the growth of Carrot(Daucuscarota L.)', SAU, Dhaka
2. Examine MS thesis 'Influence of nitrogen and phosphorus on growth and yield of brinjal,' SAU, Dhaka

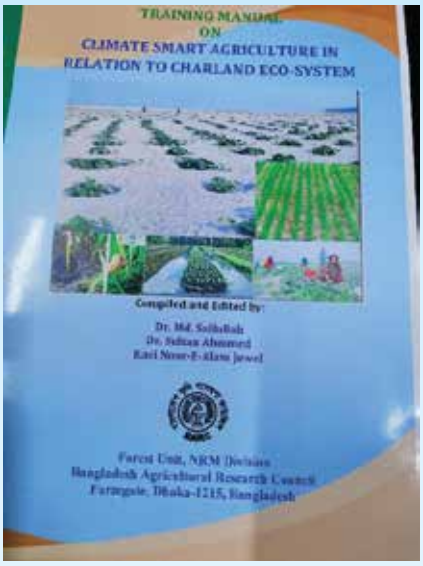
Worked as External examiner of B.Sc. Ag(Hons), Levei-3, Agroforestry, BAU during July-2019

J. Publications

1. Training manual on 'Medicinal and Aromatic plants of Bangladesh'

2. Training manual on 'Climate Smart Agriculture in relation to Charland Ecosystems'





1. Daily Newspaper: Daily Amader Somoy, 19 December, 2019
2. Daily Newspaper: Daily AmaderSomoy, 4 July, 2020

K. Others activities during 2019-2020

1. Participated Training on 'Good governance' during 23 December, 2019
2. Participated Training on 'Enhancing efficiency in research planning through institutional of ARMIS' during 7 October, 2019
3. Participated 'Central Review workshop of BARI' during18 October, 2019
4. Participated 'Annual Review Workshop of BFRI' during 22 September, 2019
5. Annual Review Workshop on Disease Management Program of NARS Institutes during 29 September, 2019
6. Annual Review Workshop on Insect Management Program of NARS Institutes during 30 September, 2019
7. Annual Review Workshop on Crop Production Program of NARS Institutes during 24-25 September, 2019
8. Annual Review Workshop on Biotechnology Research Program of NARS Institutes during 26 September, 2019
9. Annual Review Workshop on Agricultural Engineering Research Program of NARS Institutes on 18 Sept, 2019
10. Annual Review Workshop on Crop Improvement Program of NARS Institutes during 22-23 September, 2019

11. Annual Review Workshop on Soil Management Program of NARS Institutes on 23-25 September, 2019
12. Workshop on "Cost and return analysis of selected crops in Bangladesh" during 30 October, 2019
13. Workshop on "Development of knowledge hub on feed resources for efficient feeding management of livestock" on 13 November, 2019
14. Workshop on "Application of Gamma ray irradiation to develop stress tolerant capability and on-farm condition" on 13 November, 2019
15. Workshop on "Determination of antimicrobial resistance and residues in livestock and poultry food products and feed in Bangladesh" on 31 October, 2019
16. Workshop on "Preparedness for the control of PPR in Bangladesh" on 31 October, 2019
17. Workshop on "In-country Ph. D scholarship of NATP-2 " on 24 October, 2019
18. Workshop on "Transfer of agricultural technologies to farmer's level for increasing farm productivity" on 2 October, 2019
19. Workshop on "PCR of sea weed cultivation in coastal area" on 28 September, 2019
20. Workshop on "Evaluation of AFACI projects in Bangladesh "on 25 July, 2019
21. Workshop on "Microbial characterization of Bangladesh soil and development of climate smart bio-fertilizers for crop production and soil fertility " on 29 Dec, 2019
22. Workshop on "The application of genomics and proteomics in the development of agricultural biotechnology" on 1 December, 2019
23. Worked as member in different committees of BARC

Soils Unit

Name of professionals

2. Dr. Sultan Ahmmed
Member Director (NRM)

1. Dr. Md. Baktear Hossain
Director (Manpower & Training) and
Chief Scientific Officer (Soils)

PROJECT DEVELOPMENT AND COORDINATION

Project development is a major responsibility of BARC. The Soils Unit is working in line with the mandate of the Council. The Unit oversees the soil fertility and fertilizer management related programs. The Unit is involved in development of both national and international coordinated/collaboration projects. The Unit developed four national coordinated projects under Program Based Research Grant (PBRG) projects of NATP-2. The projects are in progress. It is also involved in three international collaboration projects which are in operation.

National Coordinated Projects:

a. Project title: Determination of Critical Limit of Nutrients for Soils and Crops
It is a coordinated project developed by Soils Unit with NATP-2 funding under PBRG. The major objectives of the project are:
b. Delineation of the present status of different nutrients in calcareous, non-calcareous, piedmont and terrace soils
c. Determination of critical limit of different nutrients for cereal, vegetable and oilseed crops
d. Validation of critical limits through field experiments

BARI, BRRI, BINA and BAU are working as implementing organizations and Soils unit coordinated the project. The project was initiated on 11 March 2018 with signing of LoA between Soils Unit, BARC and PIU-BARC, NATP-2. The project will be continued until June 2021.

Critical Limits of different soils nutrients and crops are being determined under the project. BARI, BRRI, BINA and BAU are inrolved as implementing organization with following work distribution.

Organization	AEZ	Nutrient	Crop
BARI	11, 13, 28	K and Zn	Wheat, maize and cabbage
BRRI	18, 19, 20	P, K, S and Zn	Rice
BINA	25, 26, 27	P (Bray & Kurtz) and Mg	Maize and mustard
BAU	1, 3, 9	Mg, S and B	Wheat and mustard

Twelve AEZs have been selected as the study areas under the project. A bench mark survey was conducted in the study areas to know the present nutrient and fertilizer use. For the purpose 720 soil samples (4 components x 3 AEZs/component x 2 Upazilas/AEZ x 3 villages/Upazila x 10 spots/ village) were collected. Soil samples were analyzed for macro- (N, P, K, Ca, Mg & S) and micro- (Fe, Mn, Cu Zn & B) nutrients and basic soil characteristics like pH, organic matter and texture. Soils with different nutrient levels were identified, from where the bulk soil samples were collected for pot experiments. To determine critical limit of a particular nutrient crop pot experiments were conducted by the component organizations using soils with different levels of that particular nutrient and crop. At least 20 soils from 20 locations were used for one nutrient of which 12 soils were from deficient areas, 4 soils from low fertility areas and the remaining 4 soils were from medium fertility locality of that particular nutrient. Sprouted seeds of the test crops were sown in the pot and the crops were harvested after 8-10 weeks of seeding. Dry matter (DM) yield were recorded and plant samples were analyzed for the particular nutrients under study. Critical limit for the particular nutrient and crops were determined by Cate and Nelson method (1965). Critical limit will also be determined by statistical approach developed by Waugh et al. (1973). The results will be validated through field experiment at farm level in the forthcoming seasons.

Fig.1. Dr. Shaikh Mohammad Bokhtiar, EC, BARC visiting pot Experiment of CL Project at BINA, Mymensingh

Table1: Critical Limits of different crops and nutrients estimated responsible institute

Nutrient	Crop	Present CL (FRG-2018)	Estimated CL	Responsible institute
Phosphorus	Rice	8.00 mg kg^{-1}	8.70 mg kg^{-1}	BRRI
	Maize (Rabi)	10 mg kg^{-1}	16.1 mg kg^{-1}	BINA
	Maize (Kharif-I)	10 mg kg^{-1}	14.5 mg kg^{-1}	BINA
	Mustard	10 mg kg^{-1}	14.8 mg kg^{-1}	BINA
Potassium	Rice	0.12 meq 100 g^{-1}	0.09 meq 100 g^{-1}	BRRI
	Wheat	0.12 meq 100g^{-1}	0.17 meq 100g^{-1}	BARI
	Cabbage	0.12 meq 100g^{-1}	0.18 meq 100g^{-1}	BARI
Magnesium	Maize (Rabi)	0.50 meq 100g^{-1}	0.60 meq 100g^{-1}	BINA
	Maize (Kharif-I)	0.50 meq 100g^{-1}	0.52 meq 100g^{-1}	BINA
	Wheat	0.50 meq100g^{-1}	0.50 meq100g^{-1}	BAU
	Mustard	0.50 meq 100g^{-1}	0.55 meq 100g^{-1}	BAU
	Mustard	0.50 meq 100g^{-1}	0.59 meq 100g^{-1}	BINA
Sulphur	Rice	10.0 mg kg^{-1}	16.1 mg kg^{-1}	BRRI
	Wheat	10.0 mg/kg	13.5 mg/kg	BAU
	Mustard	10.0 mg/kg	14.0 mg/kg	BAU
Zinc	Rice	0.60 mg kg^{-1}	0.70 mg kg^{-1}	BRRI
	Wheat	0.60 mg kg^{-1}	0.69 mg kg^{-1}	BARI
	Cabbage	0.60 mg kg^{-1}	0.75 mg kg^{-1}	BARI
Boron	Wheat	0.20 mg/kg	0.30 mg/kg	BAU
	Mustard	0.20 mg/kg	0.25 mg/kg	BAU

2. Project title: Improvement of soil health and crop productivity in climate vulnerable and pollued areas through organic amendments

It is also a coordinated project developed by Soils Unit with NATP-2 funding under PBRG. The major objectives of the project are:

1. Bio-physicochemical characterization of soils in the climate vulnerable and polluted areas
2. Examine potentiality of different organic materials for amending problem soils and improving crop yields in the study areas
3. Quantify the effects of different organic materials on carbon sequestration
4. Development of climate smart technology packages for major crops and cropping patterns in Bangladesh.

BARI, BRRI, BINA, BAU, BSMRAU and SAU are working as the implementing organizations and BARC is working as the coordination unit of the project. The project was initiated on 11 March 2018 with signing of LoA between Soils Unit, BARC and PIU-BARC, NATP-2. The project will be couting until June 2021. The project is under implementalion in different climate vulnerable and polluted areas of the country to achieve the mentioned objectives.

Work distribution among the components:

Organization	Problem Soils Types	Study Location
BARI	Saline, Drought & Acidic	Saline: Dumuria, Khulna Drought: Godagari, Rajshahi Acidic Soils: Belabo, Narshingdi
BRRI	Heavy Metal Polluted Soils	Sreepur, Gazipur Industrial areas
BINA	Drought Prone Soils	Nachole, Chapainawabganj
BAU	Charland& Acidic Soils	Charland: Char Dadna, Islampur, Jamalpur Acidic soils: Modhupur, Tangail
BSMRAU	Haor, Arsenic, other heavy metals & Saline Soils	Haor:Sunamganj Arsenic: Faridpur Sadar Other heavy metal: Bhaluka, Mymensingh Saline: Batiaghata, Khulna
SAU	Saline soils	Kalapara, Patuakhali

Total cost of the project is Tk. 3,71,26,906/-. A number of studies are being conducted under the project in climate vulnerable areas of Dumuria and Batiaghata, Khulna and Kalapara, Patuakhali (saline soils), Godagari, Rajshahi and Nachole, Chapainawabganj (drought prone areas), Belabo, Narshingdi and Modhupur, Tangail (acidic soils), and on pollutedsoils in industrial areas of Sreepur, Gazipur and Bhaluka, Mymensingh (heavy metal polluted soils). Different types of organic fertilizers/materials like vermicompost, trichocompost, poultry manure, standard organic fertilizer, biochar etc. are beingstudied to observe their effectiveness for amendment of climate vulnerable and polluted soils, and improvement of soil health and crop productivity. These organic fertilizers/materials are being studied in combination with different chemical fertilizers in different ratio to identify the best organic fertilizers/materials and best combination with chemical fertilizers for amendment of the above-mentioned climate vulnerable and polluted soils.

Fig.2. Biochar Device of BARI

Fig.3 Biochar of BARI

Fig. 4Field Trial at Dumuria in Saline soil

Fig. 5: Field Trial at Godagari in drought soil

3. Project title: Microbial characterization of Bangladesh soil and development of climate smart biofertilizers for crop production and soil fertility"

This project is a coordinated project funded by PIU-BARC (NATP-2) under sub-sector: Natural Resources. There are five components in the project including, (i) Coordination Component: NRM Division, BARC, (ii) Soil Science Division, BARI (iii) Soil Science Division, BRRI, (iv) Soil Science Division, BINA, and (v) Soils and Nutrition Division, BSRI. The project was initiated in October 2019 and will be continued until June 2021.

Fig.6. Intensive cropping at Saint MartinFig.7. Soil sampling at Saint Martin (BARI Component)

International Collaboration Project:

1. Project title: Nutrient management for diversified cropping in Bangladesh (NUMAN)

It is an international collaboration project between NARS institutes and public universities of Bangladesh and Murdoch University of Australia. The project is being jointly funded by Krishi Gobeshona Foundation (KGF) and Australian Council for International Agricultural Research (ACIAR). The objectives of the project are:

1. Broad objective(s)

The broad objective of the project is to increase the profitability and sustainability of intensive and emerging cropping systems in Bangladesh through improved nutrient management.

2. State specific objective(s)

i. Succinctly, in the order in which they will be achieved. (Objectives should be precise, specific, and result-oriented, and achievable within the time frame).

ii. Identify differences between current and recommended fertilizer use on farms, gather evidence of nutrient imbalance and identify barriers to adoption of more profitable and sustainable nutrient management practices.

iii. Develop and test tools for sustainable nutrient management in intensively cropped areas of north-west Bangladesh and in emerging cropping systems based on CA and on coastal zone soils of southern Bangladesh.

iv. Out-scale the use of tools and development of policies to advance practice change towards improved fertilizer use efficiency through engagement with farmers' groups, extension, the private sector and government policy.

v. Improve the knowledge on soil resources and capability for nutrient management by research partners and key stakeholders.

It is huge project involving the following organizations and project components:

Organizations	Division/Department	Remarks
BARC	Soils Unit	Coordinator (KGF funding part)
Murdoch University, Australia		Coordinator (ACIAR funding part)
BARI	Soil Science Division	Implementing organization
	On-Farm Research Division	Implementing organization
	Agricultural Economics	Implementing organization
BRRI	Soil Science Division	Implementing organization
SRDI		Implementing organization
BAU	Department of Soil Science	Implementing organization
	Rural Sociology	Implementing organization
Khulna University	Agro-technology Discipline	Implementing organization
PSTU	Department of Soil Science	Implementing organization

Besides, there are following two strategic partners in the project:

1. Bangladesh Fertilizer Association (BFA)
2. Conservation Agriculture Service Provider Association (CASPA)

Intensive cropping areas of Durgapur (AEZ-11) and Godagari (AEZ-25) Upazilas of Rajshahi and Sadar Upazilas of Thakurgaon (AEZ-1) and Mymensingh (AEZ-9) and coastal areas of Dakope of Khulna (AEZ-13) and Amtoli of Barguna (AEZ-13) have been selected as the research hubs.

It is an international collaboration project involving four NARS institutes viz BARC, BARI, BRRI and SRDI; three public universities including BAU, Khulna University and PSTU; and the Murdoch University, Australia. The project is being jointly funded by KGF and ACIAR. The KGF funding part is being coordinated by BARC and ACIAR funding part by Murdoch University, Australia through PIO/Liaison Office in Dhaka. There are also two strategic partners in the project including BFA and CASPA. The Letter of Agreement between BARC and KGF was signed in the first week of January 2018; and between BARC and implementing organizations in the second week of January 2018.

The activities of the project can be grouped into two categories; socio-economic and gender aspects of fertilizer management and soil fertility and fertilizer management activities. For the socio-economic and gender studies quantitative and qualitative research approaches were being employed. Research programs for the soil fertility and fertilizer management activities have been developed on the basis of identification of real field problems through field visit, discussion with farmers and rigorous discussion among the project team members. Research programs have been designed for the on-station, on-farm and laboratory-based studies. In addition to Principal Investigators (PIs) and Co-PIs, six 'Research Fellows' (leading to in-country PhD) and 20 Research Assistants (leading to MS) have been engaged for implementation carrying out research. Existing research facilities of the respective implementing organizations are being used for the research. The project activities have been started since Kharif-1 season 2018. Two and half years of the project have been completed successfully so far.

Fig.8. Field monitoring of NUMAN Project

Fig.9. Mid Term Review of NUMAN Project

Fig.10. Training Program under NUMAN Project

2. Project title: Sustainable soil management for nutrition-sensitive agriculture in Sub-Saharan Africa and South East Asia

This is an international collaboration project with the involvement of the Government of Bangladesh, FAO and the Global Soil Partnership (GSP). BARC is responsible for coordination and implementation of the project in Bangladesh and SRDI is working for co-implementation with BARC. It is a 3-year long project initiated in December 2018 and will be continued until November 2021. The project is being funded by the German Government. In addition to Bangladesh, the project is being piloted in Malawi and Burkina Faso.

Fig.11. Signing ceremony of Soil 4 Nutrition Project

Fig.12.Expert consultation workshop of Nutrition 4 Soil Project (FAO)

3. Project title:Development of National Soil Map and National Soil Information Systems of Bangladesh

This project is a coordinated project between BARC and SRDI in which BARC is working as the coordination agency. The project is funded by AFACI. The project was initiated in October 2019 and will be continued until September 2023. The major objective of the project is to develop a National Soil Map for sustainable soil management and food security of Bangladesh which will be the part of the Soil Atlas of Asia.

Fig.13.Expert consultation meeting of Soil Atlas Project

Fig.14. Expert consultation meeting of Soil Atlas Project

POLICY LEVEL CONTRIBUTION
Activities of Fertilizer Technical Sub-Committee

Fertilizer Technical Sub-Committee was formed by the Ministry of Agriculture (MoA) in 1997 to help the National Fertilizer Standardization Committee. Member-Director (NRM), BARC works as the convener and Additional Director (Implementation), DAE as the Member Secretary of the committee. The committee comprises of 19 (nineteen) members with the CSO (Soils), BARC, CSOs of Soil Science Divisions of different NARS institutes, CSO, OFRD, BARI; representatives from different concerned organizations like Departments of Environment, Livestock, Fisheries, BSTI, SRDI, BADC, BCIC etc. During 2019-20, three-meetingsofFertilizer Technical Sub-committee were held with Member-Director (NRM) in the chair. A number of organic and chemical fertilizers and PGRs were evaluated in these meetings of which 24(twenty four) organic fertilizers and6(six) plant growth regulators were recommended for standardization to the National Fertilizer Standardization Committee headed by the Secretary, Ministry of Agriculture.

Fig.15 & 16. Organic Fertilizer Factory at Thakurgaon

The Soils unit of BARC also performed the following activities during 2019-20:
CSO (Soils) have been serving as convener of 3-membered committee of field monitoring for evaluating the capacity of quality organic fertilizer producing factory. The committee visited Solargaon Organic and Vermicompost Fertilizer factory at Dinazpur, ACI Bumper Vermi and Tricho Compost at Thakurgaon and

'Urbora Vermicompopst Factory' (Krishibid Nursery) at Faridpur, Apex biofertilizer and Biopesticides Ltd. (Bradyrhizobium Japonicum) at Gobindaganj, Gaibandha and submitted report to the convener of technical sub-committee on fertilizer (TSC). The committee also visited Apurba Vermicompost at Sayedpur, Rite Organix at Sherpur, Bogura, Krishok Vermicompost factory at Chapainawabganj, Layek Organic Fertilizer Company at Savar, Dhaka, and Sweet Gold Organic Fertilizer at Manikganj during June–December 2019 and submitted evaluation report to the convener.

Fig.17 Apex biofertilizer facility and Biopesticides

Fig.18 Organic fertilizer at Bogra Ltd, Gobindaganj, Gaibandha

The Soils unit provided comments to the Ministry of Agriculture on following aspects:

১. সিনজেনটা বাংলাদেশ লিমিটেড কর্তৃক গবেষণাকার্য পরিচালনার জন্য উদ্ভিদ বৃদ্ধি নিয়ন্ত্রক (পিজিআর) এর নমুনা আমদানির বিষয়ে মতামত প্রদান ।

২. জাতীয় জৈব কৃষিনীতি ২০১৬ বাস্তবায়নের জন্য জৈব কৃষি এক্রিডিটেশন পদ্ধতি নির্ধারণ করা।

৩. ক্রান্তি এসোসিয়েটস্ লিঃ কর্তৃক প্রস্তুতকৃত সয়েল টেস্টিং মিনিল্যাব এর ব্যবহার প্রসংগে মতামত প্রদান।

RESEARCH MANAGEMENT AND COORDINATION

Soils unit of Natural Resources Management Division of BARC organized Annual Research Review and Planning Workshop on Soils Program of NARS institutes. In 2019-20 the workshop was held at BARC during 23-25 September 2019 with scientific professionals involved in soils and fertilizer management research in the NARS institutes. Research programs conducted in the NARS institutes during 2018-2019 were reviewed. The workshop was divided into seven technical sessions and one recommendation session. The technical sessions were divided into different areas of soil fertility and fertilizer management and environmental issues. Besides reviewing on-going research programs, new research program sproposed for 2019-20 were also discussed in the workshop. Scientists from different NARS institutes took part in the discussion and shared their knowledge, thoughts and experiences for improvement of the programs to avoid duplication.

MONITORING AND EVALUATION

Soils Unit, BARC is actively involved in the regular monitoring and evaluation program of BARC. Scientists of Soils Unit worked as the team member of the Monitoring and Evaluation teams formed by the Planning and Evaluation Division. Director (M&T) and CSO (Soils) (Addl. Charge) works as the team leader of a Monitoring Team almost every year and presents report in the workshop. Unfortunately due to COVID-19 outbreak lockdown the program could not be organized in this year.

TRAINING, DRAWN WORKSHOP, SEMINAR AND SYMPOSIA

Training

Soils Unit organized a Training Workshop on "Implementation and Reporting of NUMAN Project" for the

project personnel, NARS scientists and university teachers during 21-22 December 2019. In total 32 participants attended the program.

Workshop

Organized Research Review and Planning Workshop on Soil Management Program of NARS Institutes during 23-25 August 2019. Eighty participants from Soil Science Division of NARS institute (BARI, BRRI, BINA, BJRI, BSRI, BTRI, BFRI, SRDI, CDB and BSRTI), senior soil scientists, soil experts, professors from different universities and DAE officials participated the workshop. Recommendations of the workshop were sent to respective institutes for integration.

PUBLICATION

Soils Unit published the following documents during 2019-20

1. Published Proceedings of Research Review and Program Planning Workshop of Soils Program of NARS Institutes 2018
2. Published two proceedings of Fertilizer technical Sub-Committee Meetings.
3. Published Training Manuals of the following training program: "Implementation and Reporting of NUMAN Project"

OTHER ACTIVITIES

scientists of Soils unit worked as the members of the following committee:

- Online সার সুপারিশমালা-2018 Innovation serviceis now available in www.frg 2018.com and at the Google play store.
- CSO (Soils) has been working as Director (Manpower and Training), BAR Csince June 2019
- CSO (Soil) has been working convener of Organic Fertilizer factory investigation committee.
- Participated as member/resource person of various committees meetings, training programs and development activities organized by ARIs, SRDI, DAE and NGOs.
- CSO (Soils) have been working as convener of Fertilizer Inspection manual amendment committee.
- CSO (Soils) has been working as member of Fertilizer Analysis manual amendment committee.
- Served as an external examiner of BScAg (Hons.) and MS level examinations of BAU, PSTU and SAU.
- Served as an MSc Ag thesis examiner.
- Served as an examiner for PhD of Department of Soil Water and Environment of University of Dhaka and Sher-e-Bangla Agricultural University.
- Worked as a member of Steering Committee for Establishment of Laboratory of SRDI

LIVESTOCK DIVISION

ANNUAL PROGRESS REPORT (2019-2020)

The Livestock Division is involved in organizing and managing various research and other related activities for developing the livestock sector. This division is working in improving nutritional status of the general mass through cost-effective livestock production for increased supply of animal origin food, supporting increased crop production through providing healthy draft animals and organic manure and helping the rural poor in employment generation, income and fuel supply through profitable livestock rearing.

To carry out the mandated responsibilities of BARC and to full-fill the national need the division is entrusted with the duties of planning, reviewing, prioritizing, approving, monitoring, evaluation, supervision and coordination of the livestock research programs implemented by relevant NARS and other institutions including universities, Department of Livestock Services and NGOs. The division is providing training and research support to the NARS institution, DLS, relevant faculties of various educational institutions and NGOs. The division is imparting policy support to the relevant NARS institutes and extension agencies. The division is arranging, conducting and participating in training, meetings, and seminars/workshops. The division is also engaged to support national avian influenza/bird flu prevention and control programs, to recruit scientists/officers in NARS institutes, support different research activities of NARS institutes, and support different activities of National Agricultural Technology Project (NATP), BARC and DLS Units.

Activities

1. Research Programme Development of NARS institutes

- Reviewed progresses of on-going research projects and evaluate and approve the novel research project proposals for 2019-20 of BLRI
- Evaluated final reports of the projects for 2018-19 of BLRI
- Helped to prepare BLRI's future research plans.
- Technical support to the research programs of BLRI throughout the year
- Attended the Annual Research Review Workshop '2019 of BLRI'

2. Monitoring and Evaluation

a. Scientists of Livestock Division conducted the desk monitoring of activities of PBGR Sub-project pound the year

b. Scientists of Livestock Division monitored the activities of PBGR Sub-project at field level.

i. PBRG sub-project: Application of Gamma-ray Irradiation to develop stress tolerant capability in fodder crops and their production performance under on-station and on-farm conditions (ID:110)

BINA component was monitored on 12 February 2020. The team visited the experimental fields and laboratory activities along with the PI. PI explained the activities in progress, specially the pot experiments for napier cultivars as test materials against salinity. The team suggested to initiale a drought leranee to the test of cultivars and suggested a few points for improvement of the experiment (Figure 1).

Figure 1: Pictorial view of field monitoring and evaluation of project ID-110 (BINA component)

ii. PBRG sub-project: Development of knowledge hub on Feed Resources for efficient feeding management of livestock (ID:108)

Monitoring team from BARC visited the BAU component on 12 February 2020 (Figure 2). The team visited the laboratory and discussed with PI regarding project achievement. PI informed the team that activities were going according the plan. The team suggested specific points for achieving the goal.

Figure 2: Pictorial view of field monitoring & evaluation of project ID-108 (BAU component

iii. PBRG sub-project: Determination of Antimicrobial Resistance and Residues in Livestock and Poultry Food Products and Feed in Bangladesh (ID:138)

Monitoring team of BARC visited BAU component on 13 February 2020 (Figure 3). PI informed the team about the on-going activities of the project regarding samples collection, test and analysis. The team suggested some points regarding the activities improvement.

Figure 3: Pictorial view of field monitoring & evaluation of project ID-108 (BAU component)

iv. PBRG sub-project: Preparedness for the control of PPR in Bangladesh (ID:139)

BAU component of the project was monitored by the BARC monitoring team on 13 February 2020 (Figure 4). Co-PI and PhD student under the project briefed the current activities of the laboratory. The team observed the cell culture and PPR virus propagation was going on. The team suggested to start activities on monoclonal antibody development as soon as possible.

Figure 4: Pictorial view of field monitoring and evaluation of project ID-139 (BAU component)

v. PBRG sub-project: Determination of Antimicrobial Resistance and Residues in Livestock and Poultry Food Products and Feed in Bangladesh (ID:138)

BARC monitoring team visited SAU component to over see activities of the project on 03 March 2020 (Figure 5). The team visited the laboratory and discussed with PI regarding project achievement. PI informed that the activities were in progress as per plan and the team was pleased to suggest specific points for achieving the goal.

Figure 5: Pictorial view of field monitoring and evaluation of project ID-138 (SAU component)

vi. PBRG sub-project: Development of knowledge hub on Feed Resources for efficient feeding management of livestock (ID:108)

Monitoring team from BARC visited the SAU component of this project on 03 March 2020 (Figure 5). The team visited the laboratory and discussed with PI regarding project activites. The concerned PI informed the team that activities were being continaing according the plan. A few specific points were suggested for further improvement.

vii. PBRG sub-project: Determination of Antimicrobial Resistance and Residues in Livestock and Poultry Food Products and Feed in Bangladesh (Project ID:138)

The monitoring visited RU component on 16 March 2020 (Figure 6). The team was brifed by PI on an gonig project activities while the visit was paid following some suggetions forwared for improvement of the project activities.

Figure 6: Pictorial view of field monitoring and evaluation of project ID-138 (RU component)

c. Scientist of Livestock division reviewed the half-yearly reports and annual reports of PBRG Sub-Projects.

3. Regional and International Collaboration and Cooperation

a) Meeting and Memorandum of Understanding (MoU)

Dr. Aini Binti Ideris, Honorable Vice-chancellor of University Putra Malaysia (UPM) visited Bangladesh during 21-24 February 2020 to attend the 3rd International Conference on Food Safety as key note speaker, organized by Bangladesh Society for safe Food. During that occasion Livestock Division, BARC organized a meeting between VC, UPM and EC, BARC in presence of BARC officials (Figure 7). It was decided in the meeting to make a MoU between Bangladesh Agricultural Research Council and University Putra Malaysia.

Figure 7: Pictorial view of the meeting between VC, UPM and EC BARC in presence of officials of BARC

b) Cooperation

Livestock Division, provided technical support to SAARC Regional Leading Diagnostic Laboratory of PPR for arranging a training Programme for SAARC Scientists on Molecular Diagnosis of Peste Des Petits Ruminants of Goats (PPR).

c) Participation of Livestock Division Scientists as a Resource Person in Training Courses

i. He acted as a resource person in the training on PBRG Framing system Research project of Planning division.
ii. Dr. Md. Rafiqul Islam acted as a resource person in the training session "Molecular diagnosis of PPR" for SAARC scientists organized by SAARC Agriculture Center.
iii. He acted as a resource person in the training session "Antimicrobial resistance in Bangladesh" organized for scientists/teachers/officers at Sylhet Agricultural University and Rajshahi University

d) Acted as a member of different Committees

i. Acted as a member for the National Avian Influenza control Committee, DLS.
ii. Acted as an Academic Council Member for Sylhet Agricultural University
iii. Acted as a technical member for the committee of Bull progeny testing project, DLS
iv. Acted as a member for the application evaluation committee for recruiting scientist of PBRG project under Planning and evaluation Division
v. Acted as a member for the committee on Feasibility Hybrid Rice Variety Development, Research Modernization and Dissemination of Released Variety
vi. Acted as a member for the Committee on Market value assessment for BARC
vii. Acted as a member of the Recruitment Committee for recruiting first class officers of BAPARD.
viii. Acted as an External examiner for different universities
ix. Acted as a co-supervisor for MS thesis at BAU

4. Research Project Evaluation

a) PBRG sub-project "Development of knowledge hub on Animal Feed Resources for efficient feeding management of ruminants to enhance productivity (ID: 108)" funded by NATP Programme-2, PIU, BARC coordinated by Livestock Division, with three components viz. BLRI, BAU and SAU during July 2018 to June 2021. Scientists of Livestock division monitored the activities of the components throughout the year along with arranging coordination meeting. All components have collected different types of livestock feed

samples during survey (Figure 8). Determination of Chemical composition of collected some feed sample had been completed and remaining analysis would be followed. Extraction ratio and harvest index of some feed had been completed like wheat, rice etc. Livestock division organized the Annual progress review workshop on 13 November 2019. Scientists from different organizations joined the workshop and PIs presented last year activities. A proceeding was prepared with the recommendations received from the audience. which was sent to the PIs for fruitful achievement.

Figure 8: Pictorial view of field activities (ID-108)

b) PBRG sub-project "Determination of Antimicrobial Resistance and Residues in Livestock and Poultry Food Products and Feed in Bangladesh (ID:138)" funded by NATP Programme-2, PIU, BARC coordinated by Livestock Division, BARC with three components viz. BLRI, BAU, PSTU, HSTU, RU, CVASU and SAU are implementing during July 2018 to June 2021. Scientists of Livestock division monitored the activities of the components throughout the year along with arranging coordination meeting. Field based data survey was conducted on farmers, veterinarian and medicine sellers by all components. Samples were collected from all different districts. Isolation and identification of bacteria were done using different culture media, Gram's staining, and biochemical tests (Figure 9). Molecular diagnosis of the bacteria was carried out (Figure 10) and antibiotic sensitivity test was carried out. The division organized the Annual review workshop on 31 October 2019. Scientists from different organizations joined the workshop. A proceeding was drafted were recommendations received from the audience were integrated nand being sent to the courned for further improvement.

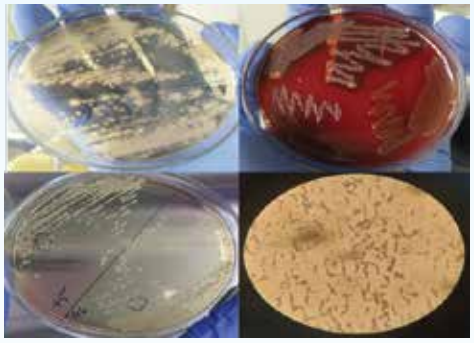


Figure 9: Streptococcus spp and Staphylococcus spp in selective bacterial media and gram's staining

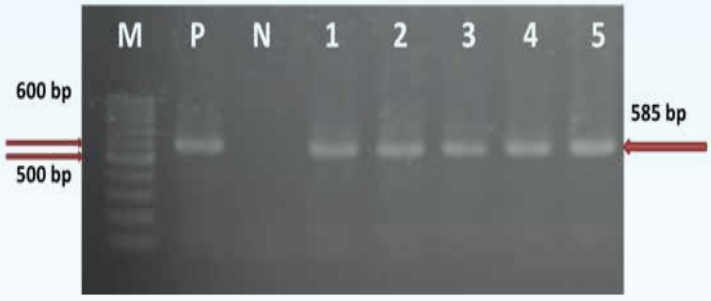


Figure 10: Lane M: 100 bp DNA ladder, P: Positive control, N: Negative control, and Lane 1-5: Isolates amplified by genus specific primers 16S rRNA for E. coli.

c) PBRG sub-project "Preparedness for the control of PPR in Bangladesh (ID:139)" funded by NATP Programme-2, PIU, BARC coordinated by Livestock Division, with three components viz. BLRI and BAU are implementing during july 2018 June 2021. Scientists of Livestock division monitored the activities of the components throughout the year and arranged coordination meeting. BLRI component collected nasal swab samples from Meherpur sadar, Meherpur; Jhenaidah sadar, Jhenaidah ; Dhamrai, Dhaka ; Debhata, Satkhira; Baliadangi, Thakurgaon Brahamanbaria, Manikganj, Rangpur, Sylhet, Gazipur, Bagura, Pabna and Natore. The Samples were being tested by molecular method.

Three upazilla was selected for developing PPR free zone. Selected upazilla are Badarganj, Rangpur; Deabhata, Satkhira and Gangni, Meherpur (Figure 11). BAU component conducted PCR amplification of N protein gene of PPR to confirm the viruses and sequencing were done from co-infection free samples

(Figure 12). Finally samples were selected for virus isolation in cell culture. Adaptation of PPR virus in Vero cell line is going on. Livestock division organized the Annual review workshop on 31 October 2019. Scientists from different organizations joined to the workshop where in PIs talked on last year's activities. A proceeding was drafted with recommendations received from the audience which was being sent to the concerned for neccssary action.

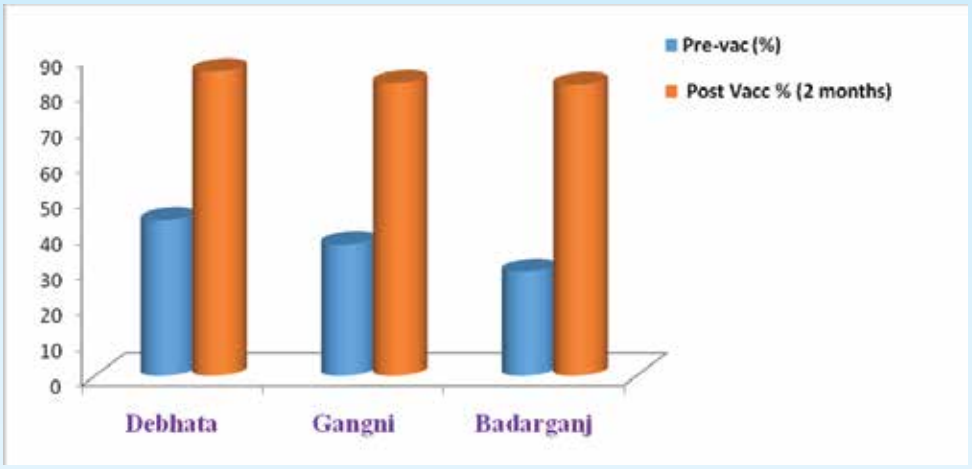


Figure 11: The pre and post (2 months) vaccination status in Debhata, Gangni and Badarganj.

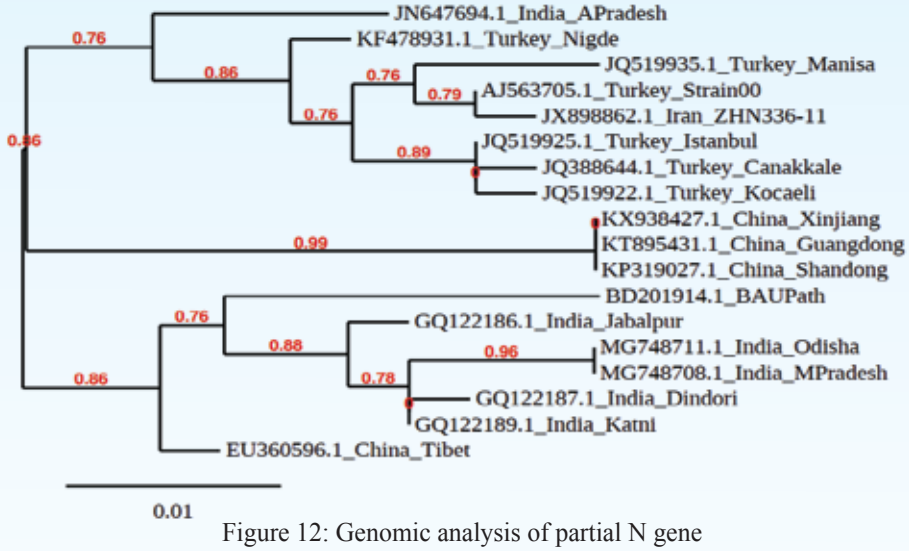


Figure 12: Genomic analysis of partial N gene

(BD201914.1_BAUPath) in phylogeny showed that the isolated virus have 95-98% homology with viruses from Indian and China isolates but formeda separate sub-cluster indicating somewhat evolution.

d) PBRG sub-project **"Application of Gamma-ray Irradiation to develop stress tolerant capability in fodder crops and their production performance under on-station and on-farm conditions (ID:110)"** funded by NATP Programme-2, PIU, BARC coordinated by Livestock Division,with three components viz. BLRI and BAU is implementing during july 2018 June 2021. Scientists of Livestock division monitored the activities of the components round the year and organized coordination meeting. an experiment was conducted consisting of seven BLRI Napier cultivars as, Napier-1, napier-2, Napier-3, Napier-4, Rokona, Pakchong and Markiron one Para and one German grasses by BINA component. Out of 9 fodder cultivars, 20Gy treated plants (clones) produced higher fresh weight in Napier-2, Napier-3, Rokona, Markoron, Para and German grass (Figure 13). In case of 30Gy treatment Napier-1, Napier-4 and Pakchong produced higher fresh weight. The selected (M2 clones) 7 different cultivars of Napier grass were grown in BLRI Fodder Research Plot and the data on biomass production, morphological characteristics and fractions of fodder were recorded and the chemical composition of the fodders were almostto be completed by BLRI component. The selected (M2 clones) two water logging to leratne like German and Para were regrown.

Livestock division organized the Annual review workshop on 13 November 2019. Scientists from different organizations joined the workshop and PIs presented last year activities following a presentation from PIs and drafted a proceeding which has been forworded to the concerned for further improvement.

Figure 13. Field view of experimental plots of Gamma irradiated fodder crops, BINA Mymensingh.

5. Preparation of Policy Documents and Inputs

মুরগীর ডিমকে কৃষিপণ্য হিসেবে নগদ সহায়তা/প্রণোদনা পণ্যের তালিকায় অর্ন্তভূক্তকরণ এবং ১০০% হালাল মাংস হতে প্রক্রিয়াজতি পণ্যসামগ্রীকে প্রক্রিয়াজাত কৃষিপণ্য হিসেবে সহায়তা/প্রণোদনা পণ্যের তালিকায় অর্ন্তভূক্তকরণ সংক্রান্ত মতামত প্রদান।

6. Workshop/Meeting/Seminar

b) Annual Review workshop on PBRG sub-projects (ID: 138 & 139)

Livestock division, BARC organized a day-long Annual Review Workshop on two PBRG sub-projects "Determination of Antimicrobial Resistance and Residues in Livestock and Poultry Food Products and Feed in Bangladesh (ID-138)" and "Preparedness for the control of PPR in Bangladesh (ID-139)" held on 31 October 2019 at BARC Conference room-1. Participants from different organizations like DLS, BLRI, FAO, CVH, CDIL, NIB, ICDDRB, KGF, PIU-BARC, Universities and other organizations participated the workshop (Figure 14). The inaugural session was held under the chairmanship of Dr. Nazmun Nahar Karim, Member Director (Livestock) and Coordinator of PBRG sub-projects, Mr. Kazi Wasi Uddin, Additional Secretary (Livestock-2), Ministry of Fisheries and Livestock was present as chief guest, Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC and Dr. Mian Sayeed Hassan, Director, PIU-BARC were present as special guests. Welcome address was delivered by Dr. Mohammad Rafiqul Islam, CSO, Livestock Division, BARC and associate coordinator. He briefed on the BARC component activities. Technical session-1 was chaired by Dr. Shah Md. Ziqrul Haq Chowdhury, Ex. Member Director, Livestock Division, BARC and Technical session-2 was chaired by Dr. Kazi M. Kamaruddin, Consultant, NATP-2, BARC. The annual progress activities of 2018-2019 were presented by Principal Investigators of the project component.

Figure 14: Pictorial view of Annual Review workshop on PBRG sub-projects (ID: 138 & 139)

b) Annual Review workshop on PBRG sub-projects (ID: 108 & 110)

Livestock division, BARC organized a very interactive and outcome based Annual Review Workshop on two

PBRG sub-projects "Development of knowledge hub on Feed Resources for efficient feeding management of livestock (ID-108)" and "Application of Gamma-ray Irradiation to develop stress tolerant capability in fodder crops and their production performance under on-station and on-farm conditions (ID-110)") held on 13 November 2019 at conference room-1. Participants from DLS, BLRI, BARC, Universities, FAO, USAID, KGF, PIU-BARC, Universities and other organizations attended the workshop (Figure 15). The inaugural session was the chaired by Dr. Nazmun Nahar Karim, Member Director, Livestock and Coordinator of PBRG sub-projects. Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC was present as the chief guest, Dr. Md. Shahjahan Ali Khandaker, Joint Chief, Ministry of Planning, Dr. Mian Sayeed Hassan, Director, PIU-BARC and Dr. Nathu Ram Sarkar, Director General, BLRI were present as special guests. Welcome address was delivered by Dr. Mohammad Rafiqul Islam, Chief Scientific Officer, Livestock Division, associate coordinator of these sub-projects. There were two Technical sessions followed by a concluding sessions. The technical session-1 was chaired by Dr. Nathu Ram Sarkar, Director General, BLRI and Technical session-2 was chaired by Dr. Shah Md. Ziqrul Haq Chowdhury, Ex. Member Director, Livestock. The annual progress activities of the year 2018-2019 were presented by principal investigators of BAU, BLRI, SAU, and BINA components.

Figure 15: Pictorial view of Annual Review workshop on PBRG sub-projects (ID: 108 & 109)

c) Workshop on "Lumpy Skin Disease in Bangladesh: Status, Challenges and Way Forward"

A daylong workshop on "Lumpy Skin Disease in Bangladesh: Status, Challenges and Way Forward" was convened on 19 December 2019 at the training room of BARC. The inaugural session was started with the welcome remarks of Dr. Mohammad Rafiqul Islam, CSO, Livestock Division. The inaugural session was graced by Mr. Kazi Wasi Uddin, Additional Secretary and Project Director, LDDP, MoFL as the chief guest while Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC and Dr. Abdul Jabbar Sikder, Director General, Department of Livestock Services graced the occasion as the special guests. The inaugural session was chaired by Dr. Nazmun Nahar Karim, Member Director (Livestock). The workshop was attended by the participants from various organizations like BARC, DLS, BLRI, University, NIB and other stakeholder organizations (Figure 16).

Figure 16: Pictorial view of workshop on "Lumpy Skin Disease in Bangladesh: Status, Challenges and Way Forward"

d) Consultative workshop on "Whole genome sequences of Black Bengal goat in Bangladesh: Status and way forward"

A very important interactive and outcome oriented day long workshop on "Whole Genome Sequence of Black Bengal Goat in Bangladesh: Status and Way Forward" was organized on 05 February 2020 at the BARC. The inaugural session was inaugurated by chief guest Mr. Rawnak Mahmud, Secretary, Ministry of Fisheries and Livestock (MoFL). Mr. Kazi Wasi Uddin, Additional Secretary and Project Director, LDDP, MoFL; Dr. Md. Salimullah, Director General, NIB and Dr. Khan Shahidul Haque, Former Director General, Bangladesh Livestock Research Institute graced the occasion as the special guests. Dr. S. M. Bokhtiar, Executive Chairman, BARC chaired the inaugural session. The inaugural session was started with the welcome remarks by Dr. Nazmun Nahar Karim, Member Director (Livestock), she pointed out the importance and backdrop of the workshop. Dr. Md. Rafiqul Islam, CSO, on talked "Whole Genome Sequence of Black Bengal Goat in Bangladesh: Status and Way Forward". He highlighted the importance as well as constraint of black Bengal goat production in the economy. The workshop was attended by the professionals and scientist from different stakeholder organizations (BARC, BLRI, DLS, BAU, NIB, DU and Other organizations) (Figure 17).

Figure 17: Pictorial view of consultative workshop on "Whole genome sequences of Black Bengal goat in Bangladesh: Status and way forward"

e) Coordination meeting

i. Livestock division conducted a coordination meeting for the PBRG sub-project **"Application of Gamma-ray irradiation to develop stress tolerant capability in fodder crops and their production performance under on-station and on-farm conditions (ID: 110)"** on 02 December 2019 with the PI and Co-PI of the sub-project under NATP-2, BARC (Figure 18). This meeting was chaired by Member Director, Livestock division and scientists of the division were present. PIs of BINA and BLRI components presented their activities. After discussion regarding the activities, recommendations have been comiled. Minutes of meetings have been sketched out and sent to the PI and Co-PI for necessary actions as per recomandations.

ii. A coordination meeting of PBRG sub-project **"Development of knowledge hub on feed resources for efficient feed management of livestock (ID: 108)"** was conducted by Livestock division on 03 December 2019 with the PI and Co-PI of the sub-project under NATP-2, BARC (Figure 18). Member Director, Livestock division chaired the meeting and scientists of the division were present. PIs of BLRI, BAU and SAU presented their research activities. Following discussion a recommendation was complied and forwarded to the convenced for integration.

iii. A coordination meeting of PBRG sub-project **"Preparedness for the control of PPR in Bangladesh (ID:139)"** was conducted by Livestock division on 08 December 2019 with the PI and Co-PI of the sub-project under NATP-2, BARC (Figure 18). Member Director, Livestock division chaired the meeting and scientists of the division were present. Concerned project activities were presented ha the PI and a recommendetion was drafted following discussion wich was being sent for further improvement.

iv. Livestock division conducted a coordination meeting for the PBRG sub-project **"Determination of antimicrobial resistance and residues in livestock and poultry food products and feed in Bangladesh (ID:138)"** on 10 December 2019 with the PI and Co-PI of the sub-project under NATP-2, BARC (Figure

18). This meeting was chaired by Member Director, Livestock division and scientists of the division were present. PIs of BLRI, BAU, HSTU, RU, CVASU, PSTU and SAU presented their research activities. After discussion regarding for integration, recommendations havebeen composed and sent to the concerned. Minutes for all meetings of the sub-projects have been prepared and sent to the PIs and Co-PIs for necessary actions according the recommendations composed and sent to the concerned for integration..

Project ID: 110 (02-12-2019)

Project ID: 108 (03-12-2019)

Project ID: 139 (08-12-2019)

Project ID: 138 (10-12-2019)

Fig 18. Cordination meetings of various sub-projects

v. Livestock division conducted an online coordination meeting during Corona pandemic with the PI and Co-PI of the PBRG sub-project **"Development of knowledge hub on feed resources for efficient feed management of livestock (ID:108)"** under NATP-2, BARC on 22 June 2020. The meeting was chaired by Member Director, Livestock division and scientists of the division were present (Figure 19). PIs of BLRI, BAU and SAU components presented their activities Following disscussion a recomendation profile was drafted and sent to concerned for integration.

vi. An online coordination meeting through Zoom was conducted by Livestock division, during Corona pandemic with the PIs and Co-PIs of the PBRG sub-project **"Application of Gamma-ray irradiation to develop stress tolerant capability in fodder crops and their production performance under on-station and on-farm conditions (ID:110)"** under NATP-2, BARC on 23 June 2020. Member Director, Livestock division chaired the meeting and scientists of the division were present (Figure 19). Respective PIs talked on their activies and future plan which was followed by recommendations being sent to them for further improvements of programs.

vii. Livestock division conducted an online coordination meeting through Zoom during Corona pandemic with the PIs and Co-PIs of the four PBRG sub-project **"Determination of antimicrobial resistance and residues in livestock and poultry food products and feed in Bangladesh (ID:138)"** under NATP-2, BARC at the dated 24 June 2020. The meeting was chaired by Member Director, Livestock division and scientists of the division were present (Figure 19). PIs of all components talked on their research activities and future plan. After discussion regarding the activities during Covid-19, recommendations have been made. Minutes of the meeting was sent to the PIs and Co-PIs for necessary actions following the recommendations.

viii. An online coordination meeting of the PBRG sub-project **"Preparedness for the control of PPR in Bangladesh (ID:139)"** was conducted by Livestock division on 25 June 2020 with the PI and Co-PI of the

sub-project under NATP-2, BARC (Figure 19). Member Director, Livestock division chaired the meeting and scientists of the division attended the session. PIs of BLRI and BAU presented their research activities. After discussion regarding the activities, recommendations have been drafted as per and being sent to the PI and Co-PI for necessary actions according the recommendations.

Project ID- 108 (22.06.2020)

Project ID- 110 (23.06.2020)

Project ID- 138 (24.06.2020)

Project ID- 139 (25.06.2020)

Figure 19: Pictorial view of the online coordination meetings

7. Training

a) Training Program on "Antimicrobial Resistance in Bangladesh" at Sylhet Agricultural University, Sylhet

Livestock Division, BARC organized a training Program on "Antimicrobial Resistance in Bangladesh" on 03-05 March, 2020 at the Conference Room, Faculty of Veterinary, Animal and Biomedical Sciences, Sylhet Agricultural University, Thirty teachers/officers from Universities, Medical college and Department of Livestock Services (DLS) were participants in this training (Figure 20). The inaugural session was chaired by Dr. Nazmun Nahar Karim, Member Director (Livestock) and Professor Dr. Md. Matiar Rahman Howlader, Vice-Chancellor, Sylhet Agricultural University, Sylhet was present as chief guest. Dr. Moynul Haque, Principal, Sylhet Osmani Medical College, Sylhet, Professor Dr. Abu Hena Mustafa Kamal, Dean, Faculty of Veterinary, Animal and Biomedical Sciences, Sylhet Agricultural University, Dr. Md. Aminul Islam, Deputy Director, Sylhet Division, Department of Livestock Services, Sylhet were present as special guest. Welcome address was delivered by Dr. Mohammad Rafiqul Islam, CSO, Livestock Division, BARC. The training includes Antibiotics: present status, implication and opportunities, Discriminate and indiscriminate use of antimicrobial drugs and environmental hazards, Hands on training of collection, transportation and preservation of samples, Hands on training of Bacterial culture Rational Basis of Antibiotic Therapy , Biosafety and Biosecurity for AMR Laboratory, AMR Control: One Health Approach, Hands on training of culture sensitivity test, AMR/AMU situation in Bangladesh and AMU guidelines. After successfully completion of the course, certificates were awarded to the participants.

Figure 20: Pictorial view of the Training Program on
"Antimicrobial Resistance in Bangladesh" at Sylhet Agricultural University, Sylhet

b) Training Program on "Antimicrobial Resistance in Bangladesh" at University of Rajshahi

Livestock Division, BARC organized a training Program on "Antimicrobial Resistance in Bangladesh" organized on 14-16 March, 2020 at the Dean's Complex, Rajshahi University. In this training course, thirty teachers/officers from University of Rajshahi (RU), Rajshahi Medical College (RMC) and Department of Livestock Services (DLS) were present as participants (Figure 21). The inaugural session was chaired by Dr. Mohammad Rafiqul Islam, Chief Scientific Officer, Livestock Division. Professor Dr. Ananda Kumar Saha, Pro-Vice Chancellor, University of Rajshahi, was present as chief guest. In the inaugural session. Dr. A. S. M Nasiruddin Khan, Deputy Director, Rajshahi Division, Dr Professor Dr. S. M. Kamruzzaman, Chairman, Department of Veterinary and Animal Sciences, University of Rajshahi were present as special guest. The inaugural session was started with the welcome remarks by Professor Dr. K. M. Mozaffor Hossain, Department of Veterinary and Animal Sciences, University of Rajshahi. Resource persons and practical sessions on Antibiotics: present status, implication and opportunities, discriminate and indiscriminate use of antimicrobial drugs and environmental hazards, hands on training of collection, transportation and preservation of samples, hands on training of bacterial culture rational basis of antibiotic therapy, biosafety and biosecurity for AMR Laboratory, AMR Control: One Health Approach, Hands on training of culture sensitivity test, AMR/AMU situation in Bangladesh and AMU guidelines. After successfully completion of the course, certificates were awarded to the participants.

Figure 21: Pictorial view of the Training Program on
"Antimicrobial Resistance in Bangladesh" at University of Rajshahi

8. Regular Activities

a. Writing speech for the high officials of BARC and MoA for different national and international events (e.g. World Food Day, Vegetables Fair, Fruits Fair etc.)
b. Scientists of Livestock Division acted as a member/member secretary in different committees formed for observing national and international days (World Food Day, National Independence Day, National Victory Day etc.).

c. Scientists acted as rapporteurs in different workshops conducted by BARC and the MoA
d. Preparation of proceedings of different meetings and seminars).
e. Actively participated in different workshops/seminar organized by different Divisions/units of BARC, other national and international organizations.
f. Attended project workshops (inception, review and completion) arranged by different Divisions/Units of BARC and other organizations

9. Publications

i) Scientific publications

1. Chowdhury, S.M.Z.H.; Mahmud, M.S.; Islam, M.R.; Nazir, K.H.M.N.H. (2019). Phylogenetic analysis of Black Bengal and Jamnapari goats in Bangladesh based on partial sequence of cytochrome B gene. SAARC Journal of Agriculture, 17(1): 23-35. DOI: https://doi.org/10.3329/sja.v17i1.42759
2. Shamim Ahamed, K H M Nazmul Hossain Nazir, Md. Abu Yousuf, Md. Muket Mahmud, Md. Rafiqul Islam (2019). Seromonitoring of Pette des petits ruminants in goats and molecular characterization of the virus from field cases. Journal of Advanced Veterinary and Animal Research, 6(3): 416-424.
3. MM Rahman, KJ Roy, MK Aktar, MR Islam, M Abdul Kafi. (2019). Spectrochemical characterization of Vero cell line against PPR virus infection. J. Adv. Biotechnol. Exp. Ther; 2(1):10-16. DOI: https://-doi.org/10.5455/jabet.2018.d1
4. Md. Abu Yousuf, Md. Ershaduzzaman, Md. Alauddin, Tania Akhtar, Nupur Dhar, Md. Zakir Hossain, Md. Rafiqul Islam, Md. Giasuddin (2019). Clinical investigation of PPR outbreak and sero-prevalence of PPR viral antibody in different areas of Bangladesh. Asian-Australation Journal of Bioscience and Biotechnology. 4(2):109-115.
5. Shah Md. Ziqrul Haq Chowdhury, K. H. M. Nazmul Hussain Nazir, Saam Hasan, Ajran Kabir, Md. Muket Mahmud, Mahdi Robbani, Tahmina Tabassum, Tamanna Afroze , Aura Rahman, Md. Rafqul Islam and Maqsud Hossain (2019). Whole genome analysis of Black Bengal goat from Savar Goat Farm, Bangladesh. BMC Research Notes, 12:687. DOI: https://doi.org/10.1186/s13104-019-4700-7
6. Md. Abu Yousuf, Md. Ershaduzzaman, Md. Alauddin, Mamunur Rahman, Tania Akhtar, Nupur Dhar, Md. Zakir Hossain, Md. Rafiqul Islam, Md. Giasuddin (2019). Sero surveillance of PPR virus and its molecular analysis in the selected areas of Bangladesh. Asian-Australation Journal of Bioscience and Biotechnology. 4(2):88-96.
7. N. Jannat, M. S. Rahman, E. Islam, N. A. Rumi, M. Giasuddin, M. Hasan, M. R. Islam, M. Z. Hassan (2019). Seroprevalence and molecular detection of FMDV in cattle at Savar in Bangladesh. SAARC Journal of Agriculture, 17(2): 67-78
8. Tasnima Haque, Khondoker Moaszzem Hossain, Md. Monzur Rahman Bhuiyan, Shafquat Haider Chowdhury, Mohammad Rafiqul Islam, Mohammad Mahmudur Rahman (2020). Knowledge, attitude, and practices (KAP) towards COVID-19 and assessment of risks of infection by SARS-CoV-2 among the Bangladeshi population: An online cross sectional survey. Research Square. DOI:10.21203/rs.3.rs-24562/v1

ii) Contributed in preparing BARC Annual Report (2018-19)
iii) Contributed in drafting BARC Newsletter (2019-20)
iv) Contributed in composing BARC at a glance

v) Popular articles

1. Antimicrobial resistance in poultry: A global threat. Published in the Newspaper The daily Asian age on 20.10.2019
2. Role of veterinarian for animal food safety and animal welfare. Published in the newspaper 'The daily Asian Age' on 13 January 2020
3. প্রাণিসম্পদের ক্ষতি মোকাবেলায় করোনা পরিস্থিতিতে করণীয়। কালের কণ্ঠ ২০ জুন, ২০২০।

Agricultural Economics and Rural Sociology (AERS) Division

1. Name of Professionals

Member Director:	Dr. A. S. M. Anwarul Huq (September, 2019) & Dr. Md. Mosharraf Uddin Molla (February, 2020)
Chief Scientific Officer:	Dr. Md. Mosharraf Uddin Molla
Stenographer-Cum-Computer Operator:	Mrs. Arati Rani Sarker
Office Sohayak:	(i) Md. Abdul Jalil (ii) Md. MujiburRahman (PRL)

2. Research Program development of NARS Institutes

-Performed as an expert member in the technical session of 'Review Workshop on research program development and implemented by Agricultural Economics Division of BARI and BRRI'.

3. Monitoring & Evaluation:

i) Coordinated PBRG Sub-project:

Following two coordinated PBRG Sub-projects (ID: 021 & ID: 158) under AERS Division were monitored:

a) Project ID:021

Implementing Component: 2 (Agril. Econ. Division, BARI & BINA)

Location: BARI , BINA (Tangail survey area) and BARC (Mymensingh & Madaripur survey area)

b) Project ID:158

Implementing Component: 2 (BAU, Mymensingh& SAU, Sylhet)

Location: BAU (Sunamganj survey area)

4. Preparation of Policy Documents and Inputs

Comments and inputs are provided on the following documents:

- Draft MoU between Bangladesh and India
- Concept Note of Sustainable Agriculture and Inclusive Rural Development (SAIRD)
- National Tobacco Control Policy 2019 (draft)
- Common Wealth Trade Ministers Meeting held on 10 October, 2019 in UK
- Draft bilateral cooperation for the development of commercial agriculture between Bangladesh and Nigeria
- 2nd Bangladesh-Russia Intergovernmental Commission on Trade, Scientific, Economic and Technical Cooperation Meeting
- Subsidy for rice export
- The MoU between Bangladesh Jute Research Institute and Institute of Leather Engineering & Tecnology (ILET)
- Report on Self-sufficiency in Onion Production published in a Newspaper
- Report on Necessity of a Certificate by Export Promotion Bureau for cash incentive to potato export published in a Newspaper
- Report on "Rice gets pricier" published in "The daily star"
- Inclusion of egg as an agricultural product in the list of cash incentive goods
- Inputs/information for inclusion in the next edition of Bangladesh Economic Review 2020 (Bangla & English)
- Increase the rate of incentive for expanding potato export
- Inter-ministerial meeting of first Joint Commission between Bangladesh and Cambodia held in Dhaka on 27 February, 2020

- Talking points in the ocassion of the visit of Hon'ble Foreign Minister of Nepal in Bangladesh on 18-19 February, 2020
- Finalization of Roadmap for building Tobacco Free Bangladesh by 2040 declared by Hon'able Prime Minister of Bangladesh

5. Workshop/Meeting/Seminar

a) Inception Workshop of PBRG Sub-project (ID:158)

A day-long Inception Workshop of PBRG Sub-project titled "Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of Haor Area (Wetland) Management Practice (ID: 158) was held on 23 February 2020 at Conference room-1 of BARC organized by AERS division as coordinating part with participation of two implementing components: Department of Agricultural Economics, Bangladesh Agricultural University (BAU) and Department of Agricultural Economics and Policy, Sylhet Agricultural University. Total 73 participants attended the programme including PIs & Co-PIs of component parts, scientists of NARS institutes, renowned university professors, agriculture experts and delegates from different research organizations and private sectors. The technical session was presided over by Dr. Md. Jahangir Alam Khan, VC, University of Global Village, Barisal.

b) Expert Consultation Meeting

-Participated in Expert Consultation Meeting on "Fostering Investment for Sustainable Agriculture Development for SAARC Member Countries: Public-Private-Farmer Cooperation" held in Colombo, Sri Lanka during 23-25 October 2019

c) Coordinating Meeting

- Coordination meeting was held at AERS Division, on 23 February, 2020 with PI of two component parts of PBRG Sub-projects (ID:158) under PIU-BARC, NATP-2.

6. Regular Activities

- Working as a Member of Executive Council, BARC, Member/Expert member of Technical Committee, Recruitment Committee, Tender committee, etc.
- Evaluation of PCR on CRG Sub-projects under AERS Division funded by PIU-BARC, NATP-2
- Performed as a Resource Person in the training programme titled "Project Development and Management" organized by P&E Division BARC
- Acted as a member of Expert Technical Committee for Agriculture Census 2019
- Participation in Inter-ministerial Committee of MoA for estimating cost of production of paddy, rice and wheat
- Participated in Agricultural Price Advisory Committee for estimating minimum price of tobacco
- Acted as a member of Steering Committee for Strategic Plan for Agricultural and Rural Statistics (SPARS) formed by BBS
- Working as a reviewer of PCR and scientific journal
- Working as a supervisor/co-supervisor of MS Thesis
- Working as an Examiner of MS Thesis
- Working as an External Examiner of MS Thesis defense
- Acted as an 'Expert Member' of sub-committee for preparing Compliance Guideline regarding production and curing of tobacco
- Drafted 'Annual Report 2018-19'

7. Publication

1. M. Begum, S.A. Sabur, M.M.U. Molla and S. Barua (2018). Value Chain Analysis of Captured Fish: A Case of Dekharhaor of Sunamganj District in Bangladesh. Bangladesh J. Agri.2016-2018, BARC, Vol. 41-43:49-69.
2. "How would be the Management of Agricultural Marketing in Pandemic Situation" published in "The Daily BanikBarta", page-4, 29 June, 2020.

8. Others

Supervisor of MS Thesis(SAU, Dhaka)

1. Financial Profitability of Ginger Cultivation in Some Selected Areas of Nilphamari District in Bangladesh
2. Profitability Analysis and Input Use Efficiency of Maize Cultivation in Some Selected Areas of Chuadanga District
3. Financial Profitability Analysis of Jute Production in Some Selected Areas of Mymensingh District
4. Profitability and Resource Use Efficiency of Brinjal Cultivation in Some Selected Areas of Satkhira District

Examiner of MS Thesis(SAU, Dhaka)

1. Profitability of Onion Cultivation by the Farmers in Selected Areas of Pabna District in Bangladesh
2. Agricultural Vulnerability and Adaptation to Climate Change: A Case of Rice Farmers in the Southern Part of Bangladesh

External Examiner of MS Thesis Defense

1. Development and Poverty Studies, Sher-e-Bangla Agricultural University (SAU), Dhaka

Fig. Inception Workshop of PBRG Sub-project (ID:158)

Fig. Participation in Expert Consultation Meeting on "Fostering Investment for Sustainable Agriculture Development for SAARC Member Countries: Public-Private-Farmer Cooperation" held in Colombo, Sri Lanka on 23-25 October 2019

Fig. Coordination meeting was held at AERS Division, BARC on 23 February 2020 with PI of two component parts of PBRG Sub-projects (ID:158) under PIU-BARC, NATP-2.

Computer and GIS Unit

Computer and GIS was established in 1985 with an aim to cater the information need support agricultural research and development activities. The major responsibilities of the unit involves overall management of Information and Communication Technology (ICT) related activities in view of hardware, software, networking etc. The ultimate goal was to establish BARC as information hub of NARS so that overall agricultural research system becomes strengthened and robust in terms of information availability, accessibility, dissemination etc. through online system to cater information need of stakeholder in agriculture sector. The unit plays a vital role to establish/strengthen ICT infrastructure to facilitate MIS related activities/services among NARS institutes. The activities also involved in assessing needs of computer hardware, software, network equipment, preparing technical specification for procurement of the goods/accessories, evaluating technical proposal, receiving and distributing ICT goods etc. It also provides support for trouble-shooting of hardware, software, network, internet/email and related services for smooth running of the system. In addition to that, it conducts various ICT based capacity building training, workshop, seminar for the personnel of BARC and NARS institutes. Besides, the unit conducts a lot of other activities such as preparation of progress report, need assessment, review and evaluation of research program, recruiting of computer personnel etc. Personnel of the unit are also working as innovation officer.

Geographic Information System (GIS) is another important functional part of the unit. Maintenance, necessary updating and output preparation of AEZ land resources database and local level Upazila Nirdeshika database (soil, land, nutrition and others) are an on-going activity of this unit. Land suitability assessment and crop zoning of 300 upazilais is an important outcome of GIS activity and it is being carring out by the unit since 2017.

However Computer and GIS Unit administers e-Filing system, updates and uploads files in website, provides various inputs and reports to Ministry of Agriculture and other organizations. Innovation activities are led by the unit routinely.

Personnel

The following computer professionals were rendering their duties under the unit during July 2019 to June 2020:

i. Mr. Hasan Md. Hamidur Rahman, Director
ii. Mr. Md. Shohid Uddin Bhuyan, System Analyst (Up to Dec 2019)
iii. Mr. NazmulHaq Md. Selim (Jan2020 onward)

Major activities of Computer & GIS Unit

The personnel of the Unit accomplished the following activities during July 2019 to June 2020:

1. Data Centre Operation

Following activities regarding server and network administration were performed:

Cloud based antivirus Bit Defender (no. of user license 140) was procured and installed in all computers (desktop, laptop, workstation and server) of BARC centrally for the protection of computers from malware and virus. The Bit Defender antivirus is a light software and it is managed centrally from cloud. Various computer accessories were procured from revenue budget and distributed among staffs.

Internet service availability and email account creation (email under barc.gov.bd domain) for BARC officers were done for newly recruited officers time to time. It is a part of routine activities.

2. National Agricultural Display Centre (NADC) Operation

Supervised, monitored and provided technical support in ensuring smooth functioning of the digital part such as Kiosk, Digital signage, TV screen, storage server for digital content, network devices etc. through troubleshooting and maintenance activities.

3. Development of Upazila land suitability assessment and Crop Zoning System of Bangladesh project

Crop Zoning project is being under implantation cordineted by Crops Division. Following activities were carried out during this period:

- Compilation, editing and coding of land and soil properties data (physical and chemical) have been completed for 119 upazila.
- Soil profile study for 14 dominant soil series under different AEZ have been completed.
- Collection of socio-economic data through focus group discussion (FGD) for 277 upazila have been accomplished.
- Socio-economic data checking, editing and analysis for 180 (one hundred eighty) upazila have been conducted.
- **Edaphic** suitability limitation ratings for 21 stress tolerant crop varieties and **agro-climatic** suitability limitation ratings for 15 stress tolerant crop varieties have been devised. The edaphic and agro-climatic suitability ratings of 74 crops formulated earlier have also been revised.
- Completed compilation, editing of 452 crop variety information such as, cropping season, planting time, harvesting time, duration, yield and other specific characteristics have been documented both in Bangla Unicode and English.
- Completed compilation and editing of crop management and improved production technologies of 53 crops; in Bangla Unicode and English.
- Completed updating of soil and landform map (e.g. conversion and re-projection of existing maps, and scanning of updated hardcopy map, geo-referencing, projection, editing) of 140 upazila.
- Completed digitization of soil sampling locations from soil and landform map of 140 upazila.
- Prepared seamless map layers for admin boundaries, settlements, waterbodies, rivers, forests, roads, building and structures, etc. for the whole country from the geo-data procured from Survey of Bangladesh.
- Carried out field work at different regions for collecting location data (latitude, longitude) of maize crop field through handheld GPS and hard copy questionnaire to generate signature training files for identifying maize area.
- Carried out necessary tasks for redesigning, modifying and coding of the climate information management system as developed earlier for deployment as a web based application system.
- Carried out entry of upazila land and soil properties data and upazila, union, mouza code and name in Bangla Unicode in Crop Zoning Interactive Information System (CZIIS) software.
- Carried out desk validation as well as field validation of land type and crop suitability outputs of different upazilas.
- Carried out field validation of soil fertility status based fertilizer recommendation through demonstration trials that were conducted at farmer's field by BARI, BRRI, BINA and SRDI in four different AEZ.
- Developed of web GIS based Crop Zoning Interactive Information System (CZIIS) software (address: http://geo.iwmbd.com:4000/).
- A mobile apps has been developed and integrated into main system (CZIIS) for dissemination of crop suitability information and fertilizer recommendation based on soil fertility status of Upazila Nirdeshika.
- A bi-lingual agri-advisory portal has been developed which is gateways for demand-driven technology information and advisory services in agriculture and allied discipline. (address: http://-geo.iwmbd.com:4001)
- Soil survey conducted in 18 upazila. The printing of Upazila Nirdeshika completed for 8 upazila and 17 are in press.
- Participated in the annual progress evaluation meeting organized by KGF held on 18th December 2019 where progress and achievement of the project was presented.
- Recruited manpower done time to time against vacant positions.
- Organized training on "Free and Open Source Software for Agro-Geoinformatics (FOSS4AG)" at Computer lab of BARC during 12-13 February. Participants from BARC, BARI, BRRI, SRDI, DAE, BWDB attended the program. Resource speaker was Dr. Aniruddho from University Davis, California, USA.

- Organized an awareness workshop at BINA, Mymensingh on 26 February 2020. BINA scientists, extension officials of Mymensingh region and Keshorganj District of DAE and few teachers from Soil Science Department of BAU attended the program.
- Prepared of three years progress report from June 2017 to May 2020 of the crop zoning project and submitted to KGF.
- Organized two project Advisory Committee meetings, three internal project meetings and during COVID19 pandemic arranged two online meeting.

Fig. Awareness workshop of Crop zoning project at BINA, Mymensingh

Fig. Advisory Committee Meeting, BARC Conference Room #01

Fig. Field validation of Crop zoning map

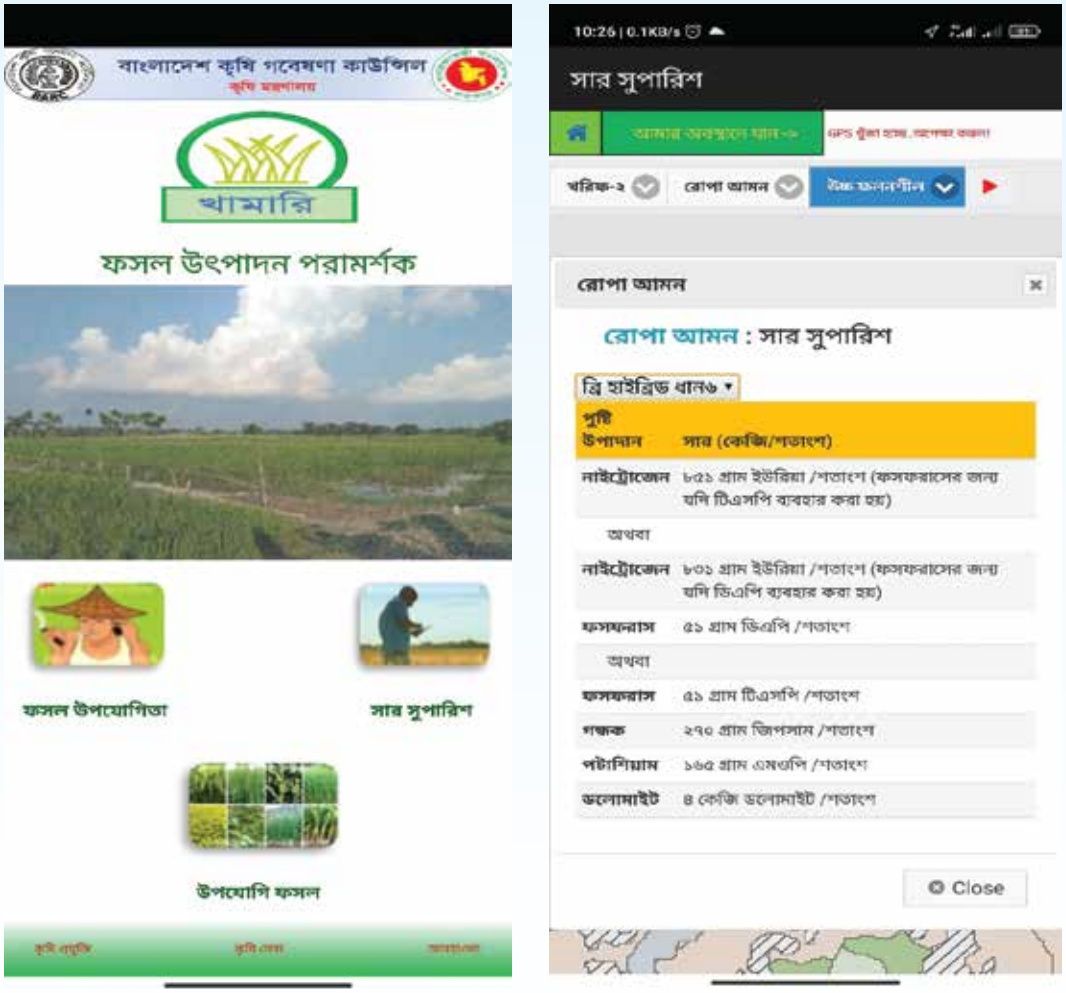
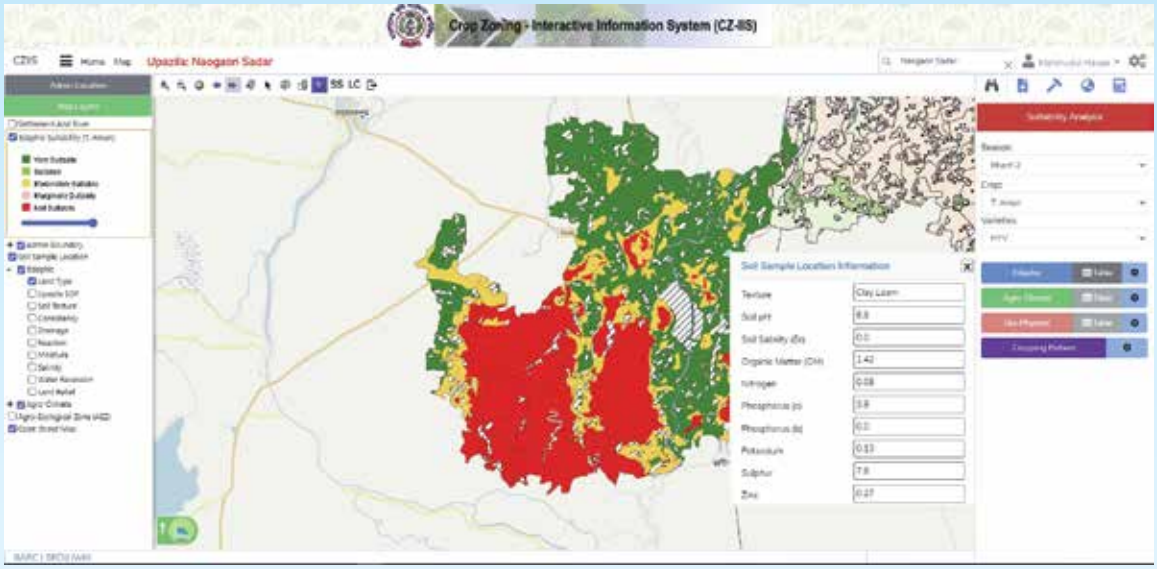


Fig. Khamari Mobile App



GIS based Online Crop Zoning Interactive Information System (CZIIS)

4. Establishment of climate service for agriculture management and crop monitoring system for Bangladesh project

Attended virtual meeting "Consultation meeting on the Regional Drought Monitoring and Outlook System's seasonal outlook" organized by ICIMOD, Nepal on 11 June 2020

5. Database and apps development

- Previously developed applications were updated as needed during this period (climate database portal)

6. Maintenance and Updating of BARC Website

- BARC web portal (www.barc.gov.bd) was updated regularly based on data received from different sections/division. Moreover BRRI cross checks BARC website as per instruction from MoA innova tion team. It is updated as per feedback and reported to MoA
- Website update related report sent to MoA within 7 day of each month. During this period, 517 files wered uploaded and more than 100 files updated

7. e-Filing administration and support

- e-Filing administration activities including user creation, update, delete etc. performed
- Report generation and sent to MoA in first week of every month.
- e-Filing support to different unit/division

8. Functioning of BARC innovation team

Director (Computer & GIS) has been working as Innovation officer andconducted following activities :

- Prepared Innovation work plan-2020, Innovation Report-2019 with the help of innovation team members
- Conducted one training (two day long) and 1 workshop (day long) for BARC officers.
- Conducted six Innovation meeting at BARC
- Attended three meeting arranged by MoA
- Information of innovation team and its activities uploaded to BARC website under the Innovation menu as per guideline of MoA
- Conducted other activities according to the Innovation workplan 2019-20 with the help of innovation team members.

9. Report/Opinion to MoA and Other Organiztion

During this period, following ICT related reports/documents prepared and sent to related organization:

- Innovation activities report (half yearly and yearly) according to Innovation work plan 2019-20 to MoA
- Monthly e-Filing, e-GP reports to MoA
- Monthly website update/upload reports MoA
- E-Service list to MoA
- "Digital Bangladesherpotheogrojatra" report to MoA
- Different e-Services, Innovation, SIP and SPS information (with picture) were sent to MoA
- Opinion of BARC on Prayer for NOC to realize foreign grant on GSMA Agri Tech Innovation Fund awarded to GP sent to MoA
- Remarkable achievements of Computer and GIS unit since 2009 to to-date and future plan (2030 and 2041) sent to Planning and Evaluation division, BARC
- Input provided to admin section for monthly integration meeting of MoA
- Progress Report of BARC activities according to ICT Policy 2018 to MoA
- Progress Report of BARC activities according to Digital Bangladesh Taskforce sent to MoA
- Quarterly APA, integrity report sent to planning division, BARC
- Quarterly service delivery report sent to citizen charter update committee according to BARC citizen charter.

10. Climate database update

- Updated climate database of BARC (http://climate.barcapps.gov.bd) upto 2018. The daily weather data is purchased from BMD, processed and generated monthly data and uploaded in website.

11. Continuation of GIS Activities

- Maintenance and necessary output preparation of AEZ land resources database and local level upazila nirdeshika database (soil, land, nutrition and others) has been continuing as an on-going activity. AEZ land resources data is used for earlier crop zoning study of Bangladesh. Also, the information of 15 (fifteen) upazilas of upazila nirdeshika database were used in SPGR GIS sub-proj ect for earlier crop zoning study.
- The AEZ database is being used extensively by Crop zoning project. The 32 newly created Upazila is demarcated using the data of AEZ database. Upazila maps were generated with updated administrative boundary, land type, soil data, mapping unit etc.

12. Support to BARC and different component of NATP as PEC and TEC member

Necessary supports provided to BARC and NATP-2 in procuring goods, works and services.

13. Support to Divisions/Sections of BARC for Hardware/Software; Data analysis; Information Sharing and Resource Management

- Support provided to different divisions/sections to fix various types of computer hardware and software problems.
- Several types of maps, NARS map, climatic map etc. provided to scientists/researchers/extensionists as per required.

14. Support for planning, budgeting and procurement of computer resources (hardware, software & accessories etc.)

Prepared requirement assessment, specification, budgeting for procurement of computer hardware, software and accessories under BARC and distribution of hardware, software and network equipment. Supports provided to KGF as Focal point of BARC in ARMIS project implemented by KGF.

15. Human Resources Development

Sl. No.	Title	Duration	Participant	Venue	Funding Source
1.	Training on "Development of innovation capability"	11-12January 2020	Forty BARC officers attended the program	BARC	NATP-2
2.	Training on "Free and Open Source Software for Agro-Geoinformatics (FOSS4AG)"	12-13February 2020	Participants from BARC, BARI, BRRI, SRDI, DAE and BWDB attended the program. Resource speaker was Dr. Aniruddho from University Davis, California, USA.	BARC	Crop Zoning Project
3.	Workshop on "Innovation and Service Process Simplification (SPS)"	25-11-2019	50officers of BARC attended the program	BARC	NATP
4.	Awareness workshop of crop zoning project	26-02-2020	BINA scientists, extension officials of Mymensingh region and Keshorganj District of DAE and few teachers from Soil Science Department of BAU attended the program	BINA	Crop Zoning Project

Fig. AFACI Program Workshop on Horticulture, Extension and Food crops

Fig. Training on Free and Open Source Software for Agro-Geoinformatics (FOSS4AG)

Other activities:

a. BARC Citizen Charter update
Director (Computer & GIS) worked as convener of BARC Citizen Charter update committee.

b. Publication

- Published Directory of Annual Agricultural Research Programme of NARS institutes, 2018-19 with the help of AIC.

c. Meeting/seminar/workshop participation
The personnel of Computer and GIS unit attended various meetings/seminars/workshops under different capacity at BARC and other organizations during the reporting period. Some of those are focal point meeting and workshop, PCR workshop, stakeholder workshop, monsoon and climate related workshop, innovation in service delivery workshop etc.

d. International Visit

1. Mr. Hasan Md. Hamidur Rahman, Director (Computer & GIS) attended "AFACI Program Workshop on Horticulture, Extension and Food crops" during 02-06 September 2019 at Cambodia.
2. Mr. Hasan Md. Hamidur Rahman, Director and Mr. Shohid Uddin Bhuiyan, System Analyst, Computer and GIS attended study visit on "ICT in Library Management and Archiving" during 29-06-2019 to 07-07-2019 in Australia.

Fig. AFACI Program Workshop on Horticulture, Extension and Food crops

Agricultural Information Centre

Agricultural Information Centre (AIC), a knowledge management hub of BARC, is engaged in collecting, organizing and disseminating research results. It renders knowledge services to the stakeholders ranging from researchers to policy makers with a view to enhancing their capacity. This service is aimed to enhance agricultural productivity. The centre providies quality agricultural information to accelerate research and development. AIC provides knowledge services to the National Agricultural Research System (NARS) including documentation services. The documents generated in the NARS institutes and beyond are huge in number subsequently deposited in the AIC library of BARC. Information in terms of quantity and quality is managed in an institutional repository. AIC maintains two sections: 1. Documentation and Publication, 2. Library and Reprography. The activities are performed by AIC during 2019-2020 described below:

Personnel of AIC

The following professionals worked in AIC during July 2019 to June 2020:
Dr. Kabiruddin Ahmed, Director
Dr. Susmita Das, Principal Documentation Officer

1. Documentation and Publications

AIC published the biannual 'Bangladesh Journal of Agriculture' (BJA), Annual Reports, Quarterly BARC newsletter, technical directories, technical reports, telephone directory, yearly diary, greeting cards. It prepared a good number of reports on Agriculture Standing Committee and question-answers including supplementary, asterisk and non-asterisk questions required by the Parliament Sessions and relevant ministers for Parliament Meeting. AIC also organized annual religious and national events through designing and distributing Eid, Bangla and English New Year Greeting Cards, Banner, taking part in advertisement for disseminating scientific information, and designs of different research publications. It monitored different research projects and participates in different National and International seminars, workshops, symposiums and other relevant programs. It was also involved in preparing notes for the events organized by BARC or ministries including guests of different national seminars, workshops, symposiums. AIC member of acted as master of ceremonies or facilitator for different national and international seminars, workshops and symposiums. Information was maintained by AIC in two ways: in the digital databases for easy access for the users and in printed inventory documents available in the library. The center attempted in bringing out the printed inventory of the information resources in series publication, hoped to help users to identify materials of their interest. Some of such publication are as follows:

a. Publication of BARC Annual Report 2018-2019
b. Publication of BARC Newsletter (Vol.17.3, 17.4. Vol.18..1 , Vol. 18.2 2019 & 2020)
c. BJA Vol: 41-43, December 2018
d. Directory of Annual Agricultural Research Programme of NARS Institutes 2018-2019

2. Library and Reprography

This section consists of development of collection, literature search, update and maintenance of databases, news clipping services, resource exchange and sharing, and photography and photocopy services. This section is dedicated for scientific professionals, graduate students and policy makers. AIC devoted considerable efforts and resources for the development of an outstanding library collection to meet the expanding needs of agricultural research and to serve as an information resource centre for NARS institutes.

2.1 Development of Collection

Every year new books, reports, pamphlets, bound journal etc. were added in professional manners to the existing ones. The AIC library maintained a total collection of about 24,700 information materials in the form of books, reports, pamphlets, bound journal etc. In the previous year, 173 new books and reports were procured and 20 journals/Newsletters were published by AIC during 2019-2020.

2.2 Literature Search

The centre rendered literature search services from digital full-text using CDS-ISIS and D-space database management- to satisfy the quarries of the researchers, agricultural scientists, planners and policy-makers. It also provided search services on specific requests by teachers, students and users from NARS institutes and other organizations during 2019-2020. BARC and NARS scientists, teachers and students, NGO and private organizational personnel were the users..

2.3 Update and Maintenance of Databases

Agricultural Information Centre updated and maintained the databases of different publications. It had its own repository using DSpace with database on Koha 6211 books and reports of different sorts out of which 273 records were added during previous year. Its database is rich in Journals, Newsletters, and Periodicals amounting 1130 records.

2.4 News Clipping Services

News clippings from daily newspapers both in Bangla and English on different research related issues or events, programs and ceremonies related to agriculture were identified and processed in different format and were circulated to the users for their attention. These had been compiled and prepared with a content list and finally preserved in the library. News clipping of 2,582 articles (Bangla and English) were identified and processed in different formats during 2019-2020. Later, these clippings were compiled with a content list and preserved in the library. One hard copy was kept preserved as reference copy.

2.5 Resource Exchange and Sharing

The AIC library performed exchanged resources and shared activities with national and international organizations during 2019-2020. Recently the library has started collecting information materials from FAO, CGIAR Centers, BBS, BANSDOC and NARS institutes on regular basis.

2.6 Online Archive of Important Documents

The AIC library developed a database driven online archive based on Content Management System (CMS) in last year. The database contained digital contents of non-conventional documents of high archival value (policy documents, all kinds of reports, proceedings and other mimeographs).

2.7 Photography and Photocopy Services

AIC regularly provides photography and photocopy services to all divisions and units. Last year, it captured photographs of 85 workshops/trainings/seminars/meetings. It also supplied 1889 photos in digital and printed form to the concerned divisions and officials. During 2019-2020, it supplied 1,06,290 photocopies of official documents, reports, letters, scientific literature etc. after 4,830 requests.

2.8 User Service

During 2019-2020, 7,500 users of different categories used the library. Besides the BARC and NARS scientists, university teachers and students, NGO and private organizational personnel used the library for meeting their queries.

2.9 CRG Sub-Project

Agricultural Information Center implemented PIU-BARC, NATP-2 Supported CRG sub-project on Enhancing Agricultural Research Services through Digitization of Research Outputs, BARC. Under this project, digital repository of important documents with ‘Dspace’ and ‘Koha’ software, to serve the searchers, policy makers and other stakeholders, was developed in the center. A publication titled ‘Resources in AIC Library’ was also published.

2.10 International Linkage

AIC is linked with different international organizations. Dr. Susmita Das, Principal Documentation Officer is acting as Asia Ambassador of Plan S- an International Expert Group of Open Access Research, a board

member of the working group of AgriXiv- a preprint repository for agriculture in India and Core Member of YPARD, Bangladesh.

2.11 Training/Workshop/Seminar

AIC also arranged different workshops, trainings, seminars and meetings for wider and quick delivery of agricultural scientific findings.

2.12.1 National Training Program

Agricultural Information Centre (AIC) organized different training programs, international workshops and one national workshop. The training courses cover various subjects including technical report writing and editing, communication, graphic design. In the reporting period, AIC organized a 5-day training program on 'Technical Report Writing and Editing' during March 8-12 2020

The main objective of the training program was to make the NARS scientists and officers skilled in scientific and modern techniques of technical report writing and journal paper editing. Twenty five scientists from the NARS institutes and DAE attended the training. The inaugural ceremony of the training program was graced by the chief guest Dr. Shaikh Mohammad Bokhtiar, EC, BARC. Dr. Mian Sayeed Hasan, Director, PIU-BARC, NATP-2 was present as a special guest. The program was chaired by Dr. Kabir Uddin Ahmed, Director, AIC and course director. Dr. Susmita Das, Principal Documentation Officer, AIC welcomed participants and highlighted the objectives of the training program as the course coordinator.

Dr. Shaikh Mohammad Bokhtiar, opined that technical report writing is an important professional skill considered as the main vehicle for scholarly communication. He further emphasized on the importance of techniques of technical writing and journal paper editing. Dr. Mian Sayeed Hasan, Director, PIU-BARC, NATP-2 as a special guest uttered the necessities of techniques of technical writing and report writing for each and every agricultural scientist. The training program ended with a closing ceremony. Dr. Shaikh Mohammad Bokhtiar, EC, BARC distributed the certificates among participants. In his speech, he highlighted the importance of technical report writing and editing again. Mr. Aziz Jillani Chowdhury, MD, Crops and Dr. Md. Boktiar Hossain,

Director, training and manpower attended the concluding ceremony as special guests. Dr. Kabir Uddin Ahmed, Director, AIC chaired the concluding and certificate awarding session and thanked the guests.

Fig.1 EC, BARC delivering speech

Fig.2 Participants in a frame

2.12.3 Regional and International Collaboration & cooperation

a. Study Visit Programme on ICT in Library Management:

Dr. Susmita Das took part in the Study Visit Programme on ICT in Library Management organized by PIU, BARC-NATP-2 during 29 June to 7 July, 2019. The study visit consists of a delegation from Bangladesh Agricultural Research Council, NARS institutes and Ministry of Agriculture. The site was different libraries and information centers in Australia. The visit aimed at focusing on ICT in library management. The team members were Dr. Susmita Das, Principal Documentation officer, Hasan Md. Hamidur Rahman, Director, Computer and GIS Unit, Md Shohid Uddin Bhuyan, System Analyst, Computer and GIS Unit, and Saleha Khatoon, Senior Librarian, BARC. Md Saiful Islam, Principal Scientific Officer, ASICT Division, Md Mohoshin Ahmed Chowdhury, librarian, and Pollab Kumar Roy, Assistant programmer, Ministry of

Agriculture. The team paid a visit to some Australian renowned institutions in Library and Information sector including the State Library Victoria, Commonwealth Science and Industrial Research Organization (CSIRO), Information Services, RMIT University Library, Department of Primary Industries, Information Services (DPI), State Library of NSW, Australian Library and Information Association (ALIA) and the National Library of Australia. The team also visited the Common wealth Science and Industrial Research Organization (CSIRO), Information Services and Royal Melbourne Institute of Technology (RMIT), University Library on Tuesday, 2 July 2019. The Department of Primary Industries was inspected by the team on Wednesday 3rd July and Information Services (DPI) and the State Library of NSW on 4th July, and Australian Library and Information Association (ALIA) and the National Library of Australia were visited on 5th July. The program was coordinated by Mohammed Abu Jafar Khan Emon. The team members are benefitted with some technological knowledge after Australia visit. They thought that the library modernization system in terms of infrastructure, logistics/facilities, contents etc. thought would help BARC and NARS Institutes deliver effective and efficient information management system such as automatic book sorter. The visit would facilitate the team to introduce online library management system along with search tool like 'Primo' in their own institutions in order to extend and access information about a wide range of print and electronic resources from a single search point.

Fig.3 Bangladeshi team visiting State Library in Victoria, Australia

b. Plan S Ambassadors Virtual Meeting:

Dr. Susmita Das attended a virtual meeting as one of the Plan S Amssadors in Asia held on 4th May, 2020. The virtual meeting was organized and supported by cOAlition S, an international consortium of research funders.

. Global Open Access Portal Meeting:

Dr. Susmita Das on behalf of Asia region attended Webinar on Redeveloping Global Open Access Portal for COVID-19. The webinar was organized by UNESCO on 06 May 2020. She also attended a virtual meeting as Plans Amssadors in Asia held on 4th May, 2020.

d. BAEN EC Online Zoom Meeting:

Dr. Susmita Das attended BAEN EC meeting on 27, April, 2020 as an Executive Member of BAEN. The meeting was organized by BAEN (Bangladesh Agricultural Extension Network).

d. BSAFE Foundation Live Talk Show:

Dr. Susmita Das attended a live talk show on use of ICT in mitigating the challenges of Agriculture on 28 June, 2020. It was organized by BSAFE Foundation on 28 June, 2020.

2.12.4 Preparation of Policy Documents and Inputs:

Agricultural Information Center prepared 10 reports on Agriculture Standing Committee and Question-Answer including Supplementary, asterisk and Non-asterisk remarkably. It provided information for 9th and 11th meeting of Committee on Government Assurances. AIC also answered questions raised to the Hon'ble Prime Minister for 5th session 11st Parliament. It answered Star asterisk questions & supplementary questions by the Hon'ble Minister for Public Administration and concerned ministers for 11th Parliament. AIC provided 'Theme Song' for the Birth Centennial of Mujib. President's addresses for the first session of the 11th Jatiya Sangsad. It answered questions raised to the Hon'ble Agriculture Minister for the act 71ka (3) of 11st Parliament. It provided inputs as an editor of 'National Souvenir Committee' of special issue of 100 years celebration of Father of the Nation Bangabandhu Sheikh Mujibur Rahman.

Bangabandhu Corner

Marking the Birth Centenary of the Father of the Nation Bangbandhu Sheikh Mujibur Rahman, AIC created **Bangabandhu Corner in BARC Libray to pay tributes to this great leader**

Fig.4 Bangabandhu Corner at BARC Library

3 Publications

3.1 Annual Report (1)

Ahmed. K.U. and Das, S. (2020). Annual Report 2018-2019. Bangladesh Agricultural Research Council (BARC). Dhaka, Bangladesh.

Three scientific papers, four monographs, one annual report, two training manuals and four issues of BARC newsletters were published from AIC, during 2019-2020.

3.2 Scientific Paper (2)

1. Das, S., Nasiruddin, M., & Kabir, W. (2019). Model for ICT based Agricultural Information Management System for the Agricultural Development in Bangladesh. Asian Journal of Extension Education. 37:116-127.
2. Das, R. K., Das, S., Rahman, R., & Mondal, P. (2019). Mapping of Agricultural Research in Bangladesh: A Scientometric Analysis. Journal of Advanced Research in Library and Information Science, 6(2):7-15.

3.3 NAS Directory (1)

Bokhtiar, S. M., Ahmed. K.U., Das, S., Rahman, H.M.H., & Quayyum, M.A.Q. (2019). Directory of Annual Agricultural Research Programe of NARS Institute 2018-2019. Bangladesh Agricultural Research Council (BARC). Dhaka, Bangladesh.

3.4 BARC Newsletter (4)

Das, S., & Hossain, B. (2019). BARC Newsletter. Bangladesh Agricultural Research Council. 17(1&2): Dhaka.

Das, S., & Ahmed, K. U. (2019). BARC Newsletter. Bangladesh Agricultural Research Council. 17(3&4): Dhaka.

3.5 Training Manual of Technical Report Writing and Editing 2020.

4. Additional Activities

AIC also performs its other additional activities for meeting different requirements of BARC.

a. AIC, prepared a good number of reports on agriculture for Standing Committee and Question-Answer including supplementary, asterisk and non-astrisk marked questions by the Parliament Members and other concerned ministers for 11th parliament sessions during 2018-2019.
b. It designed and distributed two Eid cards, two greeting cards for Bangla New Year and English New Year during 2018-2019. It also designed the banners of different programs in the reported period. AIC took part in advertisement for disseminating scientific information, and designs of different research publications.
c. A wide variety of research workshop in national and international seminars, symposiums and other relevant programs were mentored by AIC during 2019-2020.
d. AIC member monitored different research projects undertaken by Bangladesh Agricultural Research Council.
e. As a member of different monitoring teams, AIC member participated in different field visits to various localities where projects have been undertaken by BARC and NATP-2 during 2019-2020.
f. Dr. Susmita Das, PDO, AIC as a member of the BARC innovation team, contributed to generating innovative ideas and piloting and showcasing different innovations.
g. During 2019-2020, AIC memberprepared speeches for chief guest, special guest of different national seminar and international conferences, workshops and symposiums.
h. AIC was involved in preparing notes for the events organized by BARC in the reporting time.
i. Dr. Susmita Das, PDO, AIC acted as master of ceremonies or facilitator for different national and international conferences, seminars, workshops and symposiums organized by BARC. She worked as focal person of 'Krishi Media' in last year. She also worked as an editor of special publication published by MoA for 100 years celebration of Bangabandhu birth .

ADMINISTRATION AND FINANCE

The following table listed perssonal worked for administration and finace during reporting period.

Name of professionals

SL.No	Name	Designation
1	MD. Abdul Mottakin	Director (Support Service)
2	Muhammad Mahbubul Hassan	Deputy Director (Establishment)
3	K. M. Ali Haider	Senior Assistant Director (C.C.)
4	MD. Shohag Fokir	Assistant Director

ADMINISTRATION

BARC Recruitment/promotion Comittee-1 (DPC-1):

In the financial year 2019-2020, a total of 4 meetings were held on 17 July 2019, 27 August 2019, 18 November 2019 and 19 December 2019.

BARC Recruitment/promotion Comittee-2 (DPC-2):

In 2019-2020, three meetings were held on 03 December 2019, 13 January 2020 and 19 February 2020. Promotion of Principal Technical Officer, Principal Documentation Officer, Deputy Director (Establishment) and Assistant Director (Store) was dealt in these meetings.

BARC Recruitment/promotion Comittee-3 (DPC-3):

Three meetings were held on 03 December 2019, 13 January 2020 and 12 February 2020, respectively, in the financial year 2019-2020. Direct recruitment for the post Stenographer cum computer operator, Auditor, Account assistant , Driver, Office assistant cum computer operator, Pump operator, Mechanic, Duplicating

machine operator, Electrician, Office assistant had been sattled down in these meetings.

Increment order, promotion order, Retirement order and Retirement benefit:

All Increment orders, Promotion orders, PRL orders were issued by Establishment unit. Fourteen employees went on PRL in this fiscal year. Retirement benefits of all employees have been provided or are in the process.

Executive Council Meeting:

The 32nd, 33rd and 34th meetings of Executive Council were held on 01 October 2019, 19 December 2019 and 19 March 2020 in BARC conference room-1. These meetings considered various issues incluiding the folling:

(1) The Approval of Recommendations Approved by Bangladesh Agricultural Research Council Recruitment/ Promotion Committee-1, 2 and 3.

(2) Provision of Retirement Allowance and Retirement Benefit (Gratuity) of BARC Officers / Employees as per Rules applicable to Government Employees.

(3) Acquisition of research by Bangladesh Agricultural Research Institute, Bangladesh Livestock Research Institute, Soil Resources Development Institute, Bangladesh Forest Research Institute, and Cotton Development Board for the 2017-18 financial year, research progress for 2018-19 fiscal year, and presentation of the research proposal and budget for 2019-20 fiscal year. and approval of the project under PBRG of PIU-BARC.

Governing Body Meeting:

The 4th meeting of Governing Body was held on 14 November 2019 in BARC conference room-1. The following issues were discussed at the meeting:

(1) Approval of the minutes of the 3rd meeting and reviewed the progress of implementation of the decisions taken at earlier meeting.

(2) Notify the minutes of 19th to 32nd Executive Council Meeting of BARC.

(3) The significant activities and achievements of BARC and National Agricultural Research System in recent times.

(4) Incentives for Agricultural Scientists in the National Agricultural Research System promised by the Hon'ble Prime Minister.

FINANCE UNIT

Existing Officer's of Finance Unit:

SL #	Name of the Officer's	Designation
1.	Mr. Ajit Kum ar Chakraborty	Director (Finance)
2.	Mr. Md. Jashim Uddin Chowdhury	Deputy Director (Budget)
3.	Mr. Md. Daloar Hossain	Sr. Asstt. Director (Accounts) & Deputy Director(A/cs) Addi.charge
4.	Mr. Sk. Habibur Rahaman	Asstt. Director (Audit)

1. Introduction

BARC is the apex body of the NARScomprising 12 national agricultural research institutes. As per the BARC Act 2012, it has the mandate to develop priorities in agricultural research, allocate resources and function as a coordinating body to improve the overall research activities of the NARS institutes BARC received funds from Development and Revenue Budgets. to conduct its annual mandeted activities like research management, coordination, monitoring, evaluation, technology transfer and manpower development. In this respect BARC's Finance Unit prepares the MTBF budget and financial plan of medium term activities and accordingly disburses fund for achievement of the goal. It keeps all the record of expenditure incurred during the year and reports to the Ministries, CAO, IMED, Development Partner and other Govt. Offices in time. It also reconciles the Accounts with CAO to prepare the final accounts which is submitted before the Public Accounts Committee (PAC) of the National Assembly.

2. Budgeting and Expenditure Control

The Govt. has implemented "Medium Term Budgetary Framework (MTBF)" for all the Ministries including Ministry of Agriculture and its Divisions, Bodies and Corporations since 2005-06. Accordingly, BARC prepared budget in the form of MTBF for Revenue Head and Development Projects and submitted to the MoA for approval.

3. Fund Release/Disbursement

BARC makes proposal for the release of fund from the treasuary. on quarterly basis as per approved annual allocation of Budget. In the Financial year 2019-2020, BARC received Tk. 2860.00 lakh for salary and allowances, supply and services, technology transfer, manpower development and capital fund, to implement the activities like technology transfer and manpower development etc. The overall financial progress made during the FY 2019-20 follows:

Financial progress under Revenue Budget:

Sl. No.	Line items	FY 2019-20		Achievement (%)
		Budget	**Expenditure**	
1.	Salary and Allowances	1318.40	1290.67	97.90
2.	Supply and Services	398.05	379.60	95.36
3.	Research Grant	50.00	23.52	47.04
4.	Training, Workshop, Seminar	221.00	135.45	61.29
5.	Repair and Maintenance	63.00	63.00	100.00
7.	Retirement Benifit	628.00	628.00	100.00
8.	Capital expenditure	191.00	55.76	29.19
	Total :-	2869.45	2576.00	89.77
9.	**(-)** Own Income	9.45	-	
		2860.00	2576.00	90.07

4. AFACI projects & others:

Sl.	Projects name
1.	AFACI Seed Extension
2.	AFACI Salt tolenent Rice
3.	AFACI GAP
4.	CCSISA contribution to HRM in Agriculture
5.	Feed the future Biotechnology potato partnership
6.	Collection, Conservation and Characterization of important plant genetic resources
7.	Development of Upazilla Land suitability assessment and crop zoning system of Bangladesh (KGF)
8.	Capacity building for conducting adaptive trials seaweed cultivation in coastal area (KGF)
9.	Nutrient management for diversified cropping in Bangladesh (KGF)

5. Accounting

ARC's Finance Unit maintained its accounts following standard accounting system. It has kept a well-printed Cash Book, General Ledger, Trial balance, Bank reconciliation, Advance Register, Budget Control Register, iBAS++ software posting (Budget and Expenditure), CPF, Gratuity, Leave salary, Benevolent fund, Group insurance and other related books to record all transaction during the year accurately.

6. GOB Audit

GoB civil audit department not yet conducted audit for the FY 2019-2020

7. Settlement of audit objections

During the year 2019-20 one audit objections have been settled out of 15 audit observation:

Sl. No.	Particular	Settled audit objections	Amount (Tk)
1.	Revenue	02	46,05,000.00
2.	Development	05	6,59,000.00
	Total :	**07**	**52,64,000.00**

8. Reporting

BARC Finance unit has kept all the record of expenditure incurred during the year and reported to the Agriculture Ministry, IMED, CAO, Development Partner and other Government offices monthly, quarterly, half yearly and annually for revenue and development programs..

9. Monitoring and Evaluation

Monitoring and Evaluation are the integral part of an effective planning and performance based budgeting plan became successful and the value for money was realized only when the proposed targets for outcomes/outputs were achieved. To attain the targets, BARC Finance section regularly maintained desk monitoring on the utilization of fund for planned activities including budgetary and expenditure control mechanism.

10. Reconciliation

BARC also reconciled the Accounts with CAO to prepare the Final Accounts which was submittedbefore the Public Accounts Committee (PAC) of the National Assembly.

11. Retirement benifits

During the year 2019-20, retirement benefits and CPF payment made to the Officer's and Staff of BARC are shown below:-

A) CPF Final payment

1.	Officer's (4 persons)	Tk. 78,08,000.00
2.	Staff (3 persons)	Tk. 43,28,000.00
	Total.=	Tk. **1,21,36,000.00**

B) CPF Non Refundable

1.	Officer's (1 persons)	Tk. 13,00,000.00
2.	Staff (2 persons)	Tk. 13,60,000.00
	Total.=	Tk. **26,60,000.00**

C) CPF Loan: CPF loan provided to the Officer's and Staff during the year is as follows:

1.	Officer's (5 persons)	Tk. 21,75,000.00
2.	Staff (26 persons)	Tk. 85,64,500.00
	Total.=	Tk. **1,07,39,500.00**

D) Gratuity payment:

1.	Officer's (5 persons)	Tk. 2,63,00,000.00
2.	Staff (5 persons)	Tk. 1,10,56,000.00
	Total.=	Tk. 3,73,56,000.00

E) Leave Salary payment: Leave Encashment allowed to the Officer's and Staff during the year are as follows: -

1.	Officer's (10 persons)	Tk. 84,02,000.00
2.	Staff (10 persons)	Tk. 30,45,000.00
	Total.=	Tk. 1,14,47,000.00

F) Benevolent Fund:

1.	Officer's & Staff (22 persons)	Tk. 65,000.00
2.	Medical Assistance(4 persons)	Tk. 39,770.00
	Total.=	Tk. **1,04,770.00**

12. Income tax:-
Salary statement of the Officer's and Staff for payment of Income tax during the year.

13. Group Insurance:
BARC undertook 'Group Insurance Scheme' for well being of its Officers and Staff for any unavoidable incident with Jiban Bima Corporation since 40 years.

We mourn of our one colleague Late Md. Nurul Islam, Driver, during the year. We received an amount of Tk. 5,68,000.00 as compensation under the Group Insurance from Jiban Bima Corporation for the aforesaid deceased and payment made to their nominees accordingly.

BARC Personnel **Annexure – I**

Sl	Name	Designation	Office	Phone (Office)	Fax	Email
1	Dr. Shaikh Mohammad Bokhtiar	Executive Chairman (Current Charge)	Chairman's Office	48117935	+880-2-9128061	ec-barc@barc.gov.bd
2	Dr. Md. Aziz Zilani Chowdhury	Member Director	Crops Division	58155006	+880-2-9128061	md-crops@barc.gov.bd
3	Dr. Md. Monirul Islam	Member Director (Fisheries)	Fish division	58155001	+880-2-9128061	dir-nutrition@barc.gov.bd
4	Dr. Mian Sayeed Hassan	Member Director, BARC and Director, SAARC Agriculture Centre (SAC)		48117890		
5	Dr. Nazmun Nahar Karim	Member Director (CC) (Livestock) and Chief Scientific Officer (Agri. Eng.)	Agricultural Engineering Unit	48117898	+880-2-9128061	nazmun.karim@barc.gov.bd
6	Dr. Md. Saifullah	Member Director (CC)	Administration and Finance Division	48117897	+880-2-9118226	md-af@barc.gov.bd
7	Dr. Md. Abdus Salam	Member Director (CC)	Planning and Evaluation Division	48117906	+880-2-9128061	masalamsso@yahoo.com
8	Dr. Md. Mosharraf Uddin Molla	Member Director (cc)	Agricultural Economics and Rural Sociology Division	48117899	+880-2-9128061	md-aers@barc.gov.bd
9	Dr. Md. Monowar Karim Khan	Member Director (CC) (Deputation)	BARC	9122920		monowarkk@yahoo.com
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ANNEXURE-II

THE GOVERNING BODY

BANGLADESH AGRICULTURAL RESEARCH COUNCIL

1	Honorable Minister for Agriculture	Chairman
2	Honorable Minister for Fisheries and Livestock	Co-Chairman
3	Honorable Minister for Environment and Forests	Co-Chairman
4	Begum Matia Chowdhury, Parliament Member, Sherpur-2	Member
5	Mr. Abdul Mannan, Parliament Member, Bogra-1	Member
6	Secretary, Ministry of Agriculture	Member
7	Secretary, Ministry of Fisheries and Livestock	Member
8	Secretary, Ministry of Environment and Forests	Member
9	Member (Agriculture), Planning Commission	Member
10	Vice Chancellor, Bangladesh Agricultural University	Member
11	Chairman, Bangladesh Agricultural Development Corporation	Member
12	Executive Chairman, Bangladesh Agricultural Research Council	Member
13	Director General, Department of Agricultural Extension	Member
14	Director General, Bangladesh Agricultural Research Institute	Member
15	Director General, Bangladesh Rice Research Institute	Member
16	Director General, Bangladesh Jute Research Institute	Member
17	Director General, Bangladesh Institute of Nuclear Agriculture	Member
18	Director General, Bangladesh Sugarcane Research Institute	Member
19	Director General, Department of Livestock Services	Member
20	Director General, Department of Fisheries	Member
21	Joint Secretary, Finance Division, Ministry of Finance	Member
22	Joint Secretary (Discipline and Law), Ministry of Public Administration	Member
23	Chief Conservator of Forests, Forest Department	Member
24	Professor Dr. Mostafa Ali Reza Hossain, Bangladesh Agricultural University	Member
25	Professor Dr. Alok Kumar Paul, Sher-E-Bangla Agricultural University	Member
26	Professor Dr. Haseena Khan, Dhaka University, Dhaka	Member
27	Mr. Motahar Hossain Mollah, President, Bangladesh Krishok League, Kapasia, Gazipur	Member
28	Dr. F.H Ansarey, MD, ACI, Dhaka	Member
29	Dr. Muhammad Musa ED, BRAC, 65, Mohakhali, Dhaka	Member
30	Member Director (Administration & Finance), BARC	Member Secretary

ANNEXURE-III

THE EXECUTIVE COUNCIL

BANGLADESH AGRICULTURAL RESEARCH COUNCIL

1.	Executive Chairman, Bangladesh Agricultural Research Council, Dhaka	Chairman
2.	Director General, Bangladesh Agricultural Research Institute, Gazipur	Member
3.	Director General, Bangladesh Rice Research Institute, Gazipur	Member
4.	Director General, Bangladesh Jute Research Institute, Dhaka	Member
5.	Director General, Bangladesh Institute of Nuclear Agriculture, Mymensingh	Member
6.	Director General, Bangladesh Sugarcrop Research Institute, Ishurdi, Pabna	Member
7.	Director General, Bangladesh Livestock Research Institute, Savar, Dhaka	Member
8.	Director General, Bangladesh Fisheries Research Institute, Mymensingh	Member
9.	Director, Bangladesh Tea Research Institute, Srimongal, Moulvibazar	Member
10.	Director, Bangladesh Forest Research Institute, Chittagong	Member
11.	Director, Soil Resource Development Institute, Dhaka	Member
12	Director, Bangladesh Sericulture Research and Training Institute, Rajshahi	Member
13	Executive Director, Cotton Development Board, Dhaka	Member
14	Executive Director, Krishi Gobeshona Foundation, Dhaka	Member
15.	Member Director (Crops), BARC	Member
16.	Member Director (Planning and Evaluation), BARC	Member
17.	Member Director (Natural Resources Management), BARC	Member
18.	Member Director (Agricultural Economics and Rural Sociology), BARC	Member
19.	Member Director (Livestock), BARC	Member
20.	Member Director (Fisheries), BARC	Member
21.	Member Director (Administration and Finance), BARC	Member Secretary

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