ANNUAL REPORT

2021-2022

Towards building advanced intelligent systems for agriculture

BANGLADESH AGRICULTURAL RESEARCH COUNCIL
Farmgate, Dhaka-1215, Bangladesh
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 Forest 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	Textiles and Jute	Research and training on sericulture

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Foreword

I am delighted to know that BARC Annual Report 2021-2022 is peeping through the window. This report reflects as usual the annual activities of Bangladesh Agricultural Research Council (BARC) accomplished during the reporting period. BARC executes and implements the annual activities of its seven divisions, seven units and one centre.

The Annual Report reveals that each of the divisions, units and the centre has done quite a lot of scheduled works within the time frame. Hon'ble Prime Minister of the Government of the People's Republic of Bangladesh, Sheikh Hasina unveiled '100 Years of Agricultural Development in Bangladesh' published by BARC marking the birth centenary of Father of the Nation Bangabandhu Sheikh Mujibur Rahman in 2020. To facilitate need based research BARC has submitted several development, project proposals on contemporaneous topics to the Ministry of Agriculture. Getting directed by the Ministry of Agriculture, BARC has performed different studies of public interest on recent topics in short notice. A ten member External Expert Reviewer Panel comprising a pool of senior scientists are conducting independent annual/periodical review of research programs and giving feedback for modernizing the research programs matching with national and global needs and challenges.

With the utmost effort of BARC, Global Institute for Food Security (GIFS), Saskatchewan University, Canada has opened its regional office in Dhaka at BARC campus keeping in view to gain advanced knowledge and skills and also support collaborative research for agricultural development in Bangladesh. This centre will help agricultural researchers to gain advanced knowledge and skills in tackling the challenges posed in agriculture including climate change.

Since June 2017, BARC has been implementing 'Development of Upazila Land Suitability Assessment and Crop Zoning System of Bangladesh' with an extended period from January 2022 to January 2025 by coordination of Crops Division of BARC with Soil Resource Development Institute (SRDI) and Institute of Water Modeling (IWM). BARC is working as the coordination agency of the project titled

"Development of National Soil Map and National Soil Information Systems of Bangladesh". BARC is also collaborating an international project titled "Nutrient Management for Diversified Cropping in Bangladesh (NUMAN)," with NARS institutes and public universities of Bangladesh and Murdoch University of Australia, which is jointly funded by Krishi Gobeshona Foundation (KGF) and Australian Council for International Agricultural Research (ACIAR).

Improvement of crops through conventional methods and to fit the improved varieties under different environmental conditions have been a challenge and will remain so in future. Therefore, various programmes on adaptive trials of different technologies and varieties of several crops are under implementation and experimentation. Maximization and intensification of land utilization is another focused area with cropping patterns improvements and soil health management has got importance. BARC is collaborating and extending support to NARS institutes to undertake research initiative focusing on these areas. Another vital challenge to us is malnutrition; we keep focusing on nutritional improvement of consumers through plant and animal sources as well. Cost effective livestock production for increasing supply of animal origin food and productivity improvement of animals are our targets to achieve.

The scientists, officers, and staff of BARC have worked in an 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 upcoming years. Finally, I thank those, associated with compiling, editing, and printing the Annual Report 2021-2022.

(Dr. Shaikh Mohammad Bokhtiar)
Executive Chairman

Executive Summary

The Annual Report 2021-2022 is presenting the activities of Bangladesh Agricultural Research Council (BARC) associated with governance, management and development of research programmes in the National Agricultural Research System (NARS). The highlights of the progress of different activities during 2021-2022 have been focused in this report.

The Executive Chairman of BARC Dr. S M Bokhtiar has been awarded with the "Jatiya Suddhachar Purasker" (National Integrity Strategy Award) for the financial year 2021-2022 under the category of the head of organization of the Ministry of Agriculture. This has reflected the performance of BARC in the context of service and integrity.

BARC has published a book titled "100 Years of Agricultural Development in Bangladesh" dedicating the Father of the Nation Bangabandhu Sheikh Mujibur Rahman marking his birth centenary 2020. Hon'ble Prime Minister of Bangladesh Sheikh Hasina unveiled the Book through a video conference from the official residence Ganabhaban on the inaugural programme of world Food Day.

Global Institute for Food Security (GIFS), Saskatchewan University, Canada has opened its regional office in Dhaka to help agricultural researchers in the country to gain advanced knowledge and skills. The office was inaugurated at Bangladesh Agricultural Research Council (BARC) premises in Farmgate, Dhaka, Bangladesh on 12 December 2021 with utmost effort of BARC. Usually, GIFS works with partners to discover, develop and deliver innovative solutions for the production of globally sustainable food. Following the collaboration between BARC and GIFS, University of Saskatchewan, Canada a workshop was jointly

organized titled "Agricultural Technology and Food Security Workshop."

BARC actively participated in organizing the 7th D-8 Ministerial meeting on Agriculture and Food Security Promoting Climate Smart Agriculture with Ministry of Agriculture in collaboration with the D-8 Secretariat. In collaboration with Centre for Agriculture and Biosciences International (CABI), BARC organized workshop on GAEN (Global Agriculture Evidence Initiative): Developing Science-policy for Agriculture, Food and Climate Change. Besides BARC organized or participated in organizing different international and collaborative seminars like a seminar titled "Turkish Agricultural Research Advancement." Where a group of Turkish delegation consisting of four biotechnologists, participated in the seminar and presented papers on the progress of Agricultural Biotechnology in Turkey. In addition as a part of international collaboration BARC arranged a consultation meeting on Exploring potential areas of cooperation in agriculture between Bangladesh and South Sudan. With a four-member delegation headed by Deputy Minister of Foreign Affairs and International Cooperation of South Sudan H.E. Mr. Deng Dau Deng Malek, MP.

The 5th Meeting of Bangladesh Agricultural Research Council (BARC) Governing Body was held at BARC on 17 April, 2022. The meeting discussed agenda-wise different issues like increasing research focus on the production of goat and sheep, strengthening research activities on forestry and agro-forestry especially through the use of biotechnology and tissue culture approaches and providing incentives for scientists and decisions were taken accordingly. The Executive Council meeting was held on 18 Dec. 2022. In this meeting, research achievements of NARS institutes for the financial year 2019-20, research progress for the financial year 2020-21 and research proposal and budget for the financial year 2021-22 were approved. Besides the recommendation of BARC Recruitment/ Promotion Committee and research proposal & budget of CRG, PBRG under NATP, PIU-BARC, Phase-2 were approved.

Crop Division of BARC in collaboration with Bangladesh Rice Research Institute and Bangladesh Institute of Nuclear Agriculture has been implementing AFACI funded project titled "Selection and Dissemination of Elite Salinity Tolerant Rice Varieties of AFACI Member Countries" in the saline area of Satkhira. Last year this project ranked as outstanding among the participating countries. Crop division participated in preparing several importent policy documents like National Seed Policy 1993, National Seed Vision 2030, Terms of Reference (TOR) on utilization of Genome Research Centre of BJRI for NARS scientist as well as give comments on some important documents like Bangladesh Good Agriculture Practices 2020, Seed Rule 2020, National Industrial Policy 2020, Pesticide Rule. This division also organized seven workshops on important topics including Crop Improvement Programme of NARS Institutes, Crop Production Programme of NARS Institutes, Insect Management Programme, Disease Management Programmes, Biotechnological Programme etc.

TTMU is coordinating PBRG sub project on 'Transfer of Agricultural Technologies to Farmers Level for Increasing Farm Productivity' ID: 005 of NATP-2 to strengthen the linkages among research, extension and farmers through different workshops, training, meeting, seminar, etc. This year TTMU organized three ToT training programmes, one workshop and five monitoring tours.

As per approved annual allocation of Budget BARC made proposal for the release fund from the

Government on quarterly basis. During the financial year of 2021-2022, BARC received Tk. 3266.61 lakh for salary and allowances, supply and services, technology transfer, manpower development and capital fund. To accomplish the activities like technology transfer & manpower development etc. necessary funds were released to the Agricultural Research Institutes (ARI's) and associated organizations according to the budget plan. During the year 2021-22, 3 audit objections were settled out of 14 audit objections.

Planning and Evaluation (P & E) Division monitored special fund projects of NARS institutes and CRG and PBRG sub-projects under PIU NATP -2, BARC project timely and effectively. Coordinated seven Programme Based Research Grant (PBRG) sub-projects, under PIU, BARC, NATP-2 and Other projects. Reorganized DPP of the project titled 'Research and Development of Seaweed in Coastal Areas of Bangladesh'. This division is coordinating 'Capacity Building for Conducting Adaptive Trials on Seaweed Cultivation in Coastal Areas' (3rd Phase) project funded by Krishi Gobeshona Foundation (KGF). Under this project, two varieties of Seaweed (BARI Seaweed-01 and BARI Seaweed-02) have been released. Heavy metal analysis was performed for two seaweed varieties at Soil Science Division Lab of BARC and BLRI. A day long Workshop on the 'Preparation of Agricultural Workplan in Accordance with 4IR' jointly organized with the Ministry of Agriculture. The workshop was organized to develop a workplan for agriculture sector of Bangladesh for harnessing the potentials of 4IR technologies in this sector. This division organized several workshops including Annual Review Workshop and training on 'Methodology on Farming System Research and Development'. As a part of regional and international collaboration the division organized MoU signing ceremony between BARC and University Putra Malaysia (UPM) and participated 18th Regular Session of Commission on Genetic Resources for Food and Agriculture (CGRFA). Besides it contributed in preparing number of policy documents, provided input and comments on different important documents and reports. It prepared Project Completion Report (PCR) of 3 projects as well as contributing in DPP preparation for 'Programme on Agricultural and Rural Transformation for Nutrition, Employment, and Resilience in Bangladesh (PARTNER)' project.

A total of 7,283 scientists/officers/ representatives from the National Agricultural Research System (NARS) institutes including Bangladesh Agricultural Research Council (BARC) and other associate organizations participated in the revenue/ other sources' funded training/ workshop/ seminar/ higher studies programmes at home and abroad through physical and virtual modality. Apart from in-country activities, the Manpower and Training Unit conducted the nomination process for participation in virtual international seminar/ workshop/ meeting. A total number of 41 research managers/ scientists/ personnel under different fields of agriculture and cross cutting issues attended 21 programmes (training/ seminar/ workshop/ meeting) to enrich their professionalism in order to achieve the country's ultimate goal to ensure food and nutrition security. The Manpower and Training Unit, BARC, conducted, in 04 (four) batches, a day-long training on Citizen Charter as per Annual Performance Agreement (APA) Work Plan 2021-2022. For capacity enhancement of BARC officials this unit organized several training and workshop like Training on Annual Confidential Report (ACR), Training on Annual Performance Agreement (APA) as well as conducted meeting with stakeholders on citizen charter.

Executive Summary

A total of 10 PBRG sub-projects (ID-029, ID-030, ID-031, ID-035, ID-036, ID-037, ID-154, ID-155, ID-156 and ID-157) were developed and implementing under the direct supervision and monitoring of the Fisheries Division, BARC. The component parts of the PBRG sub-projects are BFRI, BAU, PSTU, BSMRU, RU, SAU, SUST, JUST and NSTU. Fisheries Division was involved in the review, monitoring and participatory programme development of the fisheries and aquaculture research and development activities of the DOF, BFRI and also regularly monitored and evaluated the project activities at field level.

The Nutrition Unit of Bangladesh Agricultural Research Council (BARC) has been working for better human nutrition for a long time. Key activities done by the Unit are project development, supervision, execution, technology development, monitoring and evaluation of the research projects, coordinating research programs with the NARS institutes, universities, BCSIR, BFSA, BIRTAN, and the agencies which are engaged in nutritional research and development like FAO, WHO, World Vision, World-Fish, IFRI, Hellen Killer, etc. Nutrition Unit performed 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 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.

The Livestock Division is working to achieve the goal of 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 biological manure, and helping the rural poor in generation of employment, income and fuel supply through profitable livestock rearing. The division is also engaged to support national avian influenza/bird flu prevention and control programmes, to recruit scientists/officers in NARS institutes, to support different research activities of NARS institutes, and to support different activities of National Agricultural Technology Project (NATP), BARC and DLS Units.

Agricultural Engineering Unit (AEU) implemented two NATP-II funded PBRG sub-projects and one KGF-funded project. PBRG Sub-project (ID: 001) entitled "Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh" and "Groundwater resources management for sustainable crop production in northwest hydrological region of Bangladesh".

As acknowledge management and Bangladesh Agricultural Research Centre BARC, is engaged in organizing and disseminating generated information, researches to the policymakers.

During this period AIC prepared a good number of report for Agriculture steering committee and parliamentary session and also published half yearly journal named Bangladesh Journal of Agriculture (BJA), BARC Annual report, Newsletter and NARS Directory.

Agricultural Information Centre (AIC) organized a training on "Technical Report Writing and Editing" and a workshop on "Communication Skill Development for Agricultural Scientists." The fifty scientists of BARC attended the workshop.

Publication of 100 Years of Agricultural Development in Bangladesh

Her Excellency Hon'ble Prime Minister Sheikh Hasina inaugurated the "100 Years of Agricultural Development in Bangladesh." She addressed The World Food Day 2021 held at Intercontinental Hotel, Dhaka on 16 October, 2021 through a videoconference from her official residence Ganabhaban. Bangladesh Agricultural Research Council (BARC) has published "100 Years of Agricultural Development in Bangladesh," marking the birth centenary of Father of the Nation Bangabandhu Sheikh Mujibur Rahman 1920-2020 and the Golden Jubilee of Bangladesh's independence 1971-2021. The Authors of the Book are Dr. S M Bokhtiar, Executive Chairman BARC, Dr. Syed Samsuzzaman and Dr. Jiban Krishna Biswas.

Hon'ble Prime Minister Sheikh Hasina Unveiled 100 Years of Agricultural Development in Bangladesh on World Food Day on 16 October 2021

Sheikh Hasina said, "I think our agricultural scientists are the best scientists in the world and I expressed my gratitude to them." She also added her government will build a hunger and poverty free Bangladesh as dreamt by Father of the Nation Bangabandhu Sheikh Mujibur Rahman where all the fundamental rights of people such as safe food, nutrition, education, residence etc. will be ensured.

Marking the day, the Ministry of Agriculture initiated different events including international

seminars, public awareness-raising activities etc. An international seminar was organized at Intercontinental Hotel, Dhaka. Hon'ble Prime Minister Sheikh Hasina virtually graced the seminar as Chief Guest and inaugurated the programme. Agriculture Minister Dr. Muhammad Abdur Razzaque, MP presided over the function. Food Minister Mr. Sadhan Chandra Majumder, and Fisheries and Livestock Minister Mr. SM Rezaul Karim were present in the event as Special Guests. In the inauguration ceremony Md. Mesbahul Islam, Senior Secretary, Ministry of Agriculture delivered the welcome address. Dr. S M Bokhtiar, Executive Chairman BARC, was present in the programme.

The Book has been enriched with the messages from Her Excellency the Hon'ble Prime Minister, Hon'ble Minister, Ministry of Agriculture, Chairman of Parliamentary Standing Committee on Ministry of Agriculture and Senior Secretary, Ministry of Agriculture.

This event paved the way for BARC as well as the Ministry of Agriculture to highlight the successes in agricultural research and development towards attaining food and nutritional security in the country.

GIFS Regional Office Opened at BARC in Dhaka

Hon'ble Agriculture Minister Inaugurated the Regional Office of GIFS at BARC

Global Institute for Food Security (GIFS), Saskatchewan University, Canada has opened its regional office in Dhaka to help agricultural researchers in the country to gain advanced knowledge and skills and also for collaborative research for agricultural development in Bangladesh.

The office was inaugurated at the Bangladesh Agricultural Research Council (BARC) premises in Farmgate, Dhaka on 12 December 2021. Usually, GIFS works with partners to discover, develop and deliver innovative solutions for the production of globally sustainable food.

In Bangladesh, this centre will help agricultural researchers to gain advanced knowledge and skills in tackling the challenges posed in agriculture, including climate change.

While inaugurating the centre as Chief Guest, Agriculture Minister Dr. Muhammad Abdur Razzaque, MP said the Saskatchewan region has a worldwide reputation for producing versatile and quality agro-food. As a result of opening this office in Dhaka, technology and experience can be utilized. Cooperation between Bangladesh and Canada in the field of agriculture will be further strengthened, he said. Hon'ble Minister also reiterated that during the tenure of the present government, tremendous success has been achieved in agricultural production in the country. "But there are many challenges in the future to sustain and increase the growth of agricultural production. The GIFS regional office will play an important role in addressing these challenges and making food security sustainable," he added.

Joining the Inauguration Ceremony virtually, David Marit, Agriculture Minister of the Saskatchewan Government, said the establishment of this office would further enhance cooperation between the two countries in the field of agriculture. "We need to work together to meet the food needs of growing population and make food security sustainable. To this end, the two countries will work together," he added.

An Agreement was also signed between GIFS-Canada and BARC for the establishment of the office. Dr. S M Bokhtiar, Executive Chairman of BARC and GIFS Chief Operating Officer Stephen Visscher signed the Agreement on behalf of their respective organizations.

Meanwhile, Mr. Md Mesbahul Islam, Senior Secretary, Ministry of Agriculture; Benoit Prefontaine, Canadian Ambassador to Dhaka; Khalilur Rahman, Bangladesh Ambassador to Canada; Bangabandhu Research Chair at GIFS Andrew Sharpe; Dr. Baljit Singh, Vice-President (Research) at the University of Saskatchewan; and Md Ruhul Amin Talukder, Additional Secretary, Ministry of Agriculture, Government of Bangladesh also spoke at the programme.

BARC Executive Chairman Awarded with National Integrity Strategy Award

Executive Chairman BARC received National Integrity Strategy Award 2021-22 from Hon'ble Agriculture Minister

Dr. S M Bokhtiar, Executive Chairman of Bangladesh Agricultural Research Council (BARC), has been awarded with the "Jatiya Suddhachar Purasker (National Integrity Strategy Award)" for the year 2021-2022, for the category of head of the organization under the Ministry of Agriculture. Dr. Muhammad Abdur Razzaque, MP, Hon'ble Minister, Ministry of Agriculture handed over this award to the Executive Chairman of BARC at an Award Giving Ceremony organized by the Ministry of Agriculture on 21 June 2022 at the Ministry's Conference Room.

HIGHLIGHTS OF RESEARCH AND DEVELOPMENT

OFFICE OF THE EXECUTIVE CHAIRMAN

Office of the Executive Chairman

Name of the Professionals

Name	Designation
Dr. Shaikh Mohammad Bokhtiar	Executive Chairman
Md. Mustafizur Rahman	Principal Technical Officer
S.M. Mustafizur Rahman	Personal Secretary
Md. Mustafa Kamal	Data Entry Officer (CC)

5th GB Meeting of BARC

The 5th Meeting of Bangladesh Agricultural Research Council (BARC) Governing Body was held at BARC on 17 April 2022. The meeting was chaired by the Chairman of the Governing Body Dr. Muhammad Abdur Razzaque, MP, Hon'ble Minister, Ministry of Agriculture. The Co-chairmen of the Governing Body Hon'ble Minister, Ministery of Fisheries and Livestock Mr. S M Rezaul Karim, MP and Hon'ble Minister, Ministery of Environment, Forest and Climate Change Md. Shahab Uddin, MP were present. The meeting was also attended by the designated members like Hon'ble Parliament Members Begum Matia Chowdhury and Begum Umme Kulsum Smrity, Secretaries of the relevant Ministries, Heads of the research and extension organizations, scientists and farmer/NGO/ Agri-business organization representatives.

The 5th Governing Body Meeting of BARC

The meeting discussed agenda-wise different issues like increasing research focus on the production of goat and sheep, strengthening research activities on forestry and agro-forestry especially through the use of biotechnology and tissue culture approaches and providing incentives for scientists and decisions were taken accordingly.

2. Annual Performance Agreement (APA) Activities Accomplished Under Right to Information (RTI)

In line with the activities as defined for the APA (2021-2022) under RTI the following training/seminar and other activities were duly carried out:

Training/Workshop/Seminar Related Information (2021-2022)

Sl. No.	Workshop/Seminar	Venue	Date	No. of Participants		
				Male	Female	Total
01	Training on Right to Information Act 2009	BARC	03/11/2021	53	8	61
02	Training on Right to Information Act 2009	BARC	04/04/2022	53	8	61
03	Training on Right to Information Act 2009	BARC	29/05/2022	39	06	45

Sl. No	Workshop/Seminar	Venue	Date	No. of Participants		
				Male	Female	Total
01	Seminar on Right to Information Act 2009	BARC	07/10/2021	36	6	42
02	Seminar on the Role of Right to Information Act 2009 in ensuring transparency and accountability in Government services	BARC	30/03/2022	53	8	61

Training on RTI (3rd November 2021)

Seminar on RTI (30th March 2022)

3. International Collaboration

Following international events (Seminar/Workshop/Meeting) were organized by the Principal Technical Officer (PTO) in collaboration with other Divisions of BARC during the fiscal year 2021-2022.

3.1 Hon'ble Prime Minister Urged Scientists to Innovate Climate Tolerant Crop Varieties

Hon'ble Prime Minister Sheikh Hasina on 8 May 2022 urged agricultural scientists to innovate climate tolerant crop varieties for ensuring food security across the globe. She also attached utmost priority on food preservation, reduction of post-harvest loss and nutrition security. The Hon'ble Prime Minister said these when a four-member Canadian delegation called on her official residence Ganobhaban. The Canadian delegation came in Dhaka upon the invitation by BARC. The four-member delegation was led by Stephen Visscher, CBE, Director for Strategic Partnership and Chief Operating Officer, Global Institute for Food Security (GIFS), University of Saskatchewan, Canada. The other members of the delegation were Dr. Balajit Singh, Vice-President (Research) Canada University of Saskatchewan, Dr Andrew Sharpe, Bangabandhu Research Chair in Food Security, GIFS, University of Saskatchewan, Canada and Canadian High Commissioner in Dhaka Lilly Nicholls.

High level Canadian delegation made a visit to Hon'ble Prime Minister Sheikh Hasina

The Global Institute for Food Security (GIFS), University of Saskatchewan, Canada opened its regional office in Dhaka last year to enhance cooperation in research among agriculture research institutes of Canada and Bangladesh. The delegation came here to visit it. The delegation also showed their interest to work on the multiple uses of Bangladesh's Jackfruit and plant genetics.

Agriculture Minister Dr. Muhammad Abdur Razzaque, Principal Secretary to the Prime Minister Dr. Ahmad Kaikaus, Agriculture Secretary Md Sayedul Islam and Bangladesh Agricultural Research Council (BARC) Executive Chairman Dr. Shaikh Mohammad Bokhtiar were present among others.

3.2 Seminar on Turkish Agricultural Research Advancement Held at BARC

Seminar on Turkish Agricultural Research Advancement

A Seminar titled "Turkish Agricultural Research Advancement" was organized by Bangladesh Agricultural Research Council (BARC) on 25 January 2022 at BARC. A visiting Turkish delegation consisting of four Biotechnologists, participated in the Seminar and presented papers on the progress of Agricultural Biotechnology in Turkey.

The Seminar was Chaired by Dr. S M Bokhtiar, Executive Chairman of Bangladesh Agricultural Research Council. Executive Director of Cotton Development Board, Director General of Wheat and Maize Research Institute and many other scientists form BARC and other agricultural research organizations under NARS were present in the Seminar and exchanged views with the Turkish scientists and also discussed future research collaboration between the two countries.

Open Discussions were held after the papers presentation. Dr. S M Bokhtiar, Executive Chairman of Bangladesh Agricultural Research Council thanked the presenters and mentioned that Turkey is one of the leading countries regarding production and export of wheat, sugar beet, cotton, milk, poultry, tomato and many other vegetables and fruits. He appreciated the advancement of Turkey in agricultural biotechnology and also mentioned the importance of learning those technologies through visiting Turkey and sharing knowledge and experiences by the team of scientists of Bangladesh. Participants were enthusiastic to know different technologies and application of Biotechnology in wheat, rice, pulses and oil crops production and speed breeding techniques.

Around 65 scientists and officers from Bangladesh Agricultural Research Council, Bangladesh Jute Research Institute, Bangladesh Sugarcrop Research Institute, Bangladesh Institute of Nuclear Agriculture and Cotton Development Board were present in the Seminar.

3.3 Workshop on GAEN: Developing Science-policy for Agriculture, Food and Climate Change

A Workshop on Global Agricultural Evidence Network (GAEN): Developing Science-policy for Agriculture, Food and Climate Change was organized by BARC on 5 June 2022 at BARC in collaboration with CABI. A four-member delegation from CABI attended the Workshop. The delegation members were: 1. Ms. Mary O Connors, Product & Sustainability Manager, CAB International, United Kingdom 2. Dr. Malvika Chaudhary, Regional Coordinator (Asia) Plantwise, CAB International, India. 3. Mr. Gopi Ramasamy, Regional Director, CAB International, New Delhi, India and 4. Ms. Kritika Khanna, Project Development Officer, Plantwise Regional Coordinator Knowledge Bank, CAB International, New Delhi.

The Workshop was Chaired by Dr. S M Bokhtiar, Executive Chairman of BARC while the CABI delegates presented papers on the progress of CABI projects/programmes in Bangladesh and their future programmes for Bangladesh especially the use of evidence in agricultural policy making.

The Workshop was attended by 50 officers and representatives from the concerned Ministries, research and extension organizations, universities, international organizations and private agri-business organizations. Some senior CABI officers also joined the Workshop virtually.

Dr. S M Bokhtiar, Executive Chairman of BARC delivered speech at the GAEN Workshop

3.4 Agricultural Technology and Food Security Workshop

Workshop on Agricultural Technology and Food Security

"Agricultural Technology and Food Security Workshop" was jointly organized by Bangladesh Agricultural Research Council (BARC), Dhaka and the Global Institute for Food Security (GIFS), University of Saskatchewan, Canada on 8 May 2022 at the BARC Conference Room, Farmgate, Dhaka.

Hon'ble Agriculture Minister Dr. Muhammad Abdur Razzaque, MP was Cheif Guest in the inaugural session and Mr. Md. Sayedul Islam, Secretary, Ministry of Agriculture, was present as Special Guest. The session was presided over by Md. Ruhul Amin Talukder, Additional Secretary (PPC), Ministry of Agriculture. Dr. S M Bokhtiar, Executive Chairman of BARC delivered welcome speech highlighting the objectives of the Workshop. Ms Lily Nicholls, Her Excellency High Commissioner of Canada to Bangladesh also made remarks on the BARC-GIFS agricultural collaborative activities.

Hon'ble Agriculture Minister Dr. Muhammad Abdur Razzaque, MP during his speech highlighted the excellent Bangladesh-Canada bilateral relations and the constraints and challenges of Bangladesh agriculture. He hoped that through the sharing of advanced science and knowledge and exchange of germplasm between GIFS and BARC, the agriculture of Bangladesh will be highly benefitted.

The Technical Session of the Workshop was chaired by Dr. S M Bokhtiar. Dr. Md. Tofazzal Islam, Professor, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Dr. Andrew Sharpe, Bangabandhu Research Chair, GIFS at University of Saskatchewan, Canada, Mr. Hasan Pervej Ahmed, International Program Development Manager, GIFS, Canada and Dr. Baljit Singh, Vice President - Research at University of Saskatchewan, Canada presented papers on different areas of agricultural cooperation.

Around 50 heads of organizations / senior officers and representatives from the donor agencies, diplomatic missions and research extension organizations were present.

3.5 Exploring Potential Areas of Cooperation in Agriculture Between Bangladesh and South Sudan

H.E. Mr. Deng Dau Deng Malek, MP, Deputy Minister of Foreign Affairs and International Cooperation, made a speech in the consultation meeting

A consultation meeting on "Exploring potential areas of cooperation in agriculture between Bangladesh and South Sudan" was held at Bangladesh Agricultural Research Council (BARC), Farmgate, Dhaka on 8 February 2022. A four members delegation of South Sudan headed by H.E. Mr. Deng Dau Deng Malek, MP, Deputy Minister of Foreign Affairs and International Cooperation, attended the meeting.

Chaired by Executive Chairman of BARC Dr. S M Bokhtiar, the meeting was attended among others by the senior officers from the Ministry of Agriculture (MoA), heads of the national agricultural research and extension agencies and the high officials from BARC. They include Additional Secretary (Research) from Ministry of Agriculture, Joint Secretary (Int'l Cooperation), MoA, Chairman, BADC, Director General of Department of Agricultural Extension, Director General of the Department of Agricultural Marketing, Director General of Bangladesh Agricultural Research Institute, Director General of Bangladesh Rice Research Institute, Director General of Bangladesh Sugarcrop Research Institute, Director General of Bangladesh Institute of Nuclear Agriculture, Director General of Bangladesh Fisheries Research Institute, Executive Director of Cotton Development Board.

A Key Note paper on 'Agricultural Research and Development in Bangladesh- an overview' was presented at the meeting by Dr. Md. Harunur Rashid, Chief Scientific Officer and Director, PIU-BARC, National Agricultural Technology Programme-Phase II Project (NATP-2).

Executive Chairman of BARC Dr. S M Bokhtiar highlighted the present status of agricultural research and development activities in Bangladesh and technological innovations that has led the country towards self-sufficiency in food and nutrition. Dr. Bokhtiar said, Bangladesh has a well-coordinated National Agricultural Research System (NARS) and more than 2000 skilled

researchers of which 40% are PhD degree holders. He also mentioned different agriculture related policy documents and the government's utmost priority on agriculture sector. Dr. Bokhtiar also highlighted the emerging challenges in agriculture including the adverse impacts of climate change and also he focused on the on-going research programmes to cope with the challenges of climate change and other natural disasters.

H.E. Mr. Deng Dau Deng Malek, MP, Deputy Minister of Foreign Affairs and International Cooperation who is also the head of delegation paid his tributes to the Founding Father of the Nation of Bangladesh Bangabandhu Sheikh Mujibur Rahman and referred to the freedom struggle of South Sudan for 21 years saying that finally they got independence in 2011.

Being impressed with the progress and achievements of agricultural research and development in Bangladesh, he thanked the paper presenters of BARC. Bangladesh is well-advanced in agricultural research and development, the Deputy Foreign Minister of South Sudan hoping that Bangladesh would extend its hands of cooperation and expertise to South Sudan for agricultural development. He also indicated that a mechanism would be developed soon how the agriculture of South Sudan could be benefited from Bangladesh.

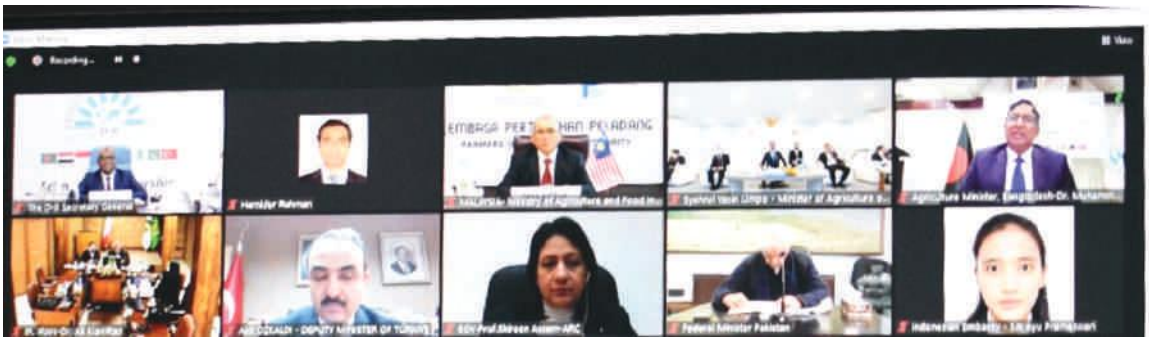
3.6 Seventh D-8 Ministerial Meeting

Dr. Muhammad Abdur Razzaque, Hon'ble Minister, Ministry of Agriculture, Government of Bangladesh made a speech in the Meeting Virtually

Hon'ble Agriculture Minister Dr. Muhammad Abdur Razzaque, MP, Chaired the concluding day of the two-day 7th D-8 Ministerial Meeting on Agriculture and Food Security held on 13 January 2022 at BARC in Dhaka. The member countries of D-8, an alliance of eight developing Muslim countries have agreed to Dhaka's proposal to take up a 'multinational integrated project' for the development of climate-smart agricultural technology. As a part of the project, joint research, innovation, development and expansion of advanced agricultural technologies will be carried out in the D-8 countries to address the adverse impact of climate change. The D-8 Countries Agriculture Ministers were enthusiastically agreed on this proposal and approved the "Dhaka

Initiative" on the concluding day of the seventh D-8 Ministerial Meeting on Agriculture and Food Security was held on 13 January 2022.

The Ministry of Agriculture organized the two-day meeting virtually in collaboration with Bangladesh Agricultural Research Council (BARC), Ministry of Foreign Affairs and D-8 Secretariat, Istambul. In the meeting it was agreed that the project will be implemented and managed with financial and technical assistance from various international donor agencies such as Islamic Development Bank (IDB), Food and Agriculture Organization (FAO) of the United Nations, International Fund for Agricultural Development (IFAD), International Rice Research Institute (IRRI) and other partners.



Hon'ble Agriculture Minister Dr. Muhammad Abdur Razzaque, MP joined the Meeting using virtual platform as Chairperson

Agriculture Minister Dr. Muhammad Abdur Razzaque, MP Chaired the meeting, said the agricultural production system would be affected by climate change in the world. "To sustain agricultural production and food security in the future, innovation and expansion of climate change tolerant crop varieties and technologies must be increased." Dr. Razzaque reiterated the development of climate-smart agricultural technology is very important in D-8 countries. "In the face of global warming and climate change, it will play a pivotal role in ensuring food and nutrition security and improving people's quality of life."

In D-8 countries, agriculture employs 26% of the population and contributes about 13.50% to gross domestic product (GDP). In addition, 60% of the people in the alliance live in rural areas and are largely dependent on agriculture, he said. "So, the Dhaka Initiative will play an important role in the innovation, exchange and food production, and food security of climate-smart agricultural technology," he hoped.

D-8 Secretary General Isiaka Abdulqadir Imam and representatives from member countries Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Turkey – spoke on the challenges, possibilities, actions and increasing cooperation on climate change in agriculture. As part of the 7th D-8 Ministerial Meeting Senior Officers Meeting was held on 12 January 2022 with Mr. Md. Sayedul Islam, Secretary, Ministry of Agriculture, People's Republic of Bangladesh.

Crops Division

CROPS DIVISION

Name of the Professionals

Name	Designation
Dr. Md. Aziz Zilani Chowdhury	Member Director
Dr. Shah Md. Monir Hossain	Chief Scientific Officer (CC)
Dr. Md. Mahfuz Alam	Principal Scientific Officer

1. Regional and International Collaboration & Cooperation

Linkage with International Organizations and Development Partners in Bangladesh Joined in Virtual platform

- Eight Meeting of the 'BIMSTEC Expert Group on Agricultural Cooperation, Virtually held in New Delhi on 31 August 2021.
- CABI's 402nd Executive Council Meeting on 3rd March 2022.
- CGAIR webinar held at 26th April 2022 on "Rural livelihood, agricultural intensification, and climate change adaptation in Char lands of Bangladesh."
- CABI and Cornell University organized "Global Agricultural Evidence Network" (GAEN) meeting held on 4th June at BARC.
- Consultation Meeting on "Biodiversity for Food and Agriculture" held on 04 August, 2021, CGRFA.

AFACI Project

Salt Tolerant Rice Programme

Bangladesh Agricultural Research Council (BARC) is implementing an Asian Food & Agrculture Cooperation Initiative (AFACI) funded project titled "Selection and Dissemination of Elite Salinity Tolerant Rice Varieties of AFACI Member Countries" from June 2019. Dr. Md. Harun-ur-Rashid, CSO (Crops) is the PI of the AFACI project. The project activity is intended to select elite advance lines of salt tolerant rice that can tolerate more than 8 dS/m at critical stages. Bangladesh Agricultural Research Council in collaboration with Bangladesh Rice Research Institute and Bangladesh Institute of Nuclear Agriculture has been implementing the project in the saline area of Satkhira. Last year this project ranked as outstanding among the participating countries.

2. Research Project Development & Evaluation

a) Collection, Conservation and Characterization of Important Plant Genetic Resources under PIU-BARC, NATP-II (ID# 128)

PIU-BARC, NATP-2 funded PBRG sub-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 February 2018 to January 2022.

Major Achievements:

Organization	GP Collection		GP Conservation		Morphological Characterization		Molecular Characterization	
	Target	Achievement	Target	Achievement	Target	Achievement	Target	Achievement
BARI	600	600	600	600	250	844	76	121
BARI	300	247	300	247	300	264	300	216
BARI	90	35	90	35	90	97	60	66
BSRI	50	68	50	68	50	51	40	-
BINA	198	199	198	199	98	141	53	83
CDB	-	-	-	-	360	343	-	-
BSRTI	-	-	-	-	60	60	-	-
BAU	30	35	120	136	120	136	90	136
Total	**1268**	**1184**	**1358**	**1285**	**1328**	**1936**	**619**	**622**

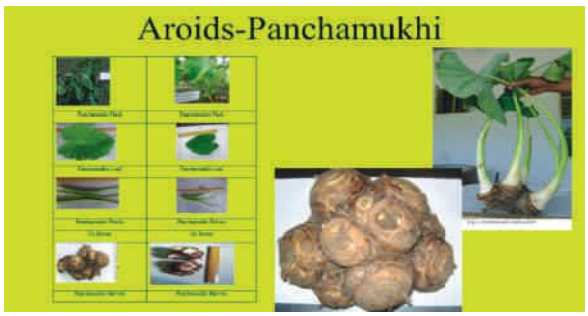
Varieties developed:

The striking achievement of the sub-project embarked with release of 14 varieties by BAU (Banana: 5, Aroids: 4 and Yam: 5) and one chewing type sugarcane variety by BSRI from germplasm collected and evaluated during NATP Phase I and II.

BAU olkachu1

Chewing type sugarcane variety, BSRI akh 47

BAU kachu 1 (Panchamukhi)



BAU kachu 1 (Panchamukhi)

b) Development of Upazila Land Suitability Assessment and Crop Zoning System of Bangladesh Project

Crops Division has been coordinating the project titled "Development of Upazila Land Suitability Assessment and Crop Zoning System of Bangladesh" (in short crop zoning) with financial support of Krishi Gobeshona Foundation (KGF) since June 2017. The first phase of the project ended in January 2022 and the second phase has started in February 2022. The main purpose of this project is to develop an online application system using Geographic Information System (GIS) based technology with a view to delivering location-based information on suitable crop/cropping patterns ensuring sustainable use of scarce land and water resources. During the period from July 2021 to June 2022, many activities were performed for achieving the goals and objectives of the project. At the present crop suitability, assessment for 300 Upazilas has been completed and information is now available through CZIS and 'Khamari' mobile app. The information can be accessible from www.cropzoning.gov.bd and 'Khamari' mobile app can be downloaded from Google Play Store.

Detail Activities are as Follows:

- Compilation, editing and coding of land and soil properties data (physical & chemical) have been completed for 36 Upazilas. The land and soil properties data are Landform, Soil Association, Land Type, Land Relief, Soil Texture, Soil Consistency, Soil Drainage, Soil Moisture, Water Recession, Soil Salinity, Soil pH Including AEZ and Physiography. The data is used for agro-edaphic suitability assessment of crop(s). Reviewing site specific and Union-based fertilizer recommendation outputs of different Upazilas for detection and subsequently correction of anomalies.
- The information related to crop varieties, crop management and production technology, etc. required for the crop zoning study have been gathered, compiled, edited and documented both in Bangla and English. The information has been uploaded into the agri-advisory portal.
- The geocode and name of Division, District, Upazila, Union and Mouza both in Bangla Unicode and English have been updated indeed required for the crop zoning study. Preparation of 2130 soil fertility status maps for 15 soil chemical properties (soil salinity, soil pH, om, n, po, pb, k, s, zn, b, ca, mg, fe, cu, mn) of 142 Upazilas have been completed.
- Land and soil properties map layers i.e., Land Type, Land Relief, Soil Texture, Soil Consistency, Soil Drainage, Soil Moisture, Water Recession, Soil Salinity and Soil pH required for suitability assessment of crop(s) have been prepared for 36 Upazilas. At present, the land and soil properties map layers for 300 Upazilas have been prepared.

  Agro-climatic map layers required for suitability assessment of crop(s) have been prepared for 36 Upazilas. The thermal regime map layers are duration (number of days) of cool temperature ≥ 15°C and duration of extreme temperature ≥ 40°C and moisture regime map layers i.e. length (number of days) of pre-kharif transition period, kharif growing period and rabi growing period. A study has been conducted to delineate the land use classification using high resolution satellite images of 2020 and 2021 considering the maximum cropped area for three different crop calendars (Rabi, Kharif-I and Kharif-II). The specific land use layers are; a) cropland; b) forest; c) mangrove forest; d) river; e) lake; f) beel and haor; g) aquaculture; h) tea estate; i) saltpan; j) rural settlement; k) urban and industrial area; and finally, l) accreted land. It is revealed from the study that the cropland available in Rabi season is 7.26 mha, 7.20 mha in kharif-1 and 6.11 mha in kharif-2 season (mha= million hectare).

3. Preparation of Policy Documents and Providing Inputs

Policy Documents:

- Preparation of a Document on "Prediction of demand and production of cereals and other important crops" on the basis of 16th standing committee meeting of Ministry of Agriculture (10 page) and has been sent to the Ministry of Agriculture (MoA).
- Preparation of an integrated draft on "Single, double and triple cropped land area detection" and has been sent to the MoA.
- Preparation of a keynote paper on "7th D-8 meeting on Agriculture and Food security."
- Preparation of a draft on "National Seed Policy 2022."
- Preparation of a draft on "National Seed Vision 2030."
- Preparation of a Terms of Reference (TOR) on utilization of Genome Research Centre of BJRI for NARS Scientists.
- Comments on "Bangladesh Good Agriculture Policy 2020" and have been sent to the MoA.
- Correction of "Seed Rules 2020" of the Ministry of Agriculture.
- Comments of a draft on "National Industrial Policy 2020" and have been sent to Ministry of Industries.
- Comments on "Pesticide Rule" including export.
- Comments on "Strengthening of Pulse and Oil Seed Research at BARI."

4. Workshop/ Meeting/ Seminar

- **Annual Research Review Workshop on Crop Improvement Programme of NARS Institutes: Research Progress, 2020-2021 and Research Programme, 2021-2022**

  A review workshop on "Crop Improvement Programme" of NARS Institutes was held at BARC on 15-16 September, 2021. The objectives of the workshop were to review the research progress, 2020-21 and research programmes, 2021-22 of NARS institutes viz., BARI, BRRI, BINA, BJRI, BSRI, BSTRI, BWMRI and CDB to avoid duplication of research through appraisal of proposed programmes aligning with different national vision documents and research priority. Scientists and academia of the relevant fields of research institutes and universities attended the workshop as expert members and offered a good number of recommendations/ suggestions for incorporation while planning future research programmes. In the inaugural session Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC, graced the session as Chief Guest, while the session was Chaired by Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC. Dr. Shah Md. Monir Hossain, PSO (Crops), BARC, welcomed and briefed the last year's recommendations provided for the NARS institutes.

  Dr. Bokhtiar acknowledged the activities of agricultural scientists for their outstanding works toward agricultural growth. He stated that achieving safe food, profitable agriculture and sustainable food and nutrition security is our national agricultural vision. Such growth is possible due to favorable policy support and technologies developed by the scientists of NARS. He stated that appropriate research programmes are to be undertaken adhering climate changes under resource shrinking condition. However, he further added that the sector would receive a momentum if previous years' recommendations were integrated in research programmes.

Annual Review Workshop on Crop Improvement Programme of NARS Institutes

Six expert members namely Dr. Mohammod Jalal Uddin, former Executive Chairman, BARC; Dr. Bhagya Rani Banik, former Executive Chairman, BARC, Dr. Md. Abdul Jalil Bhuyan, former Director General, BRRI, Dr. Md. Shahabuddin Ahmed, former Director (HRC), BARI, Dr. Md. Abdur Rashid, former CSO, HRC, BARI and Prof Dr. Gazi Md. Mohosin, Noakhali Science and Technology University were present in the two-day long review workshop. There were four technical sessions Chaired by Prof. Dr. Shahidur Rashid Bhuiyan, Vice Chancellor, Sher-e-Bangla Agricultural University, Dr. Mohammod Jalal Uddin, former Executive Chairman, BARC, Dr. Bhagya Rani Banik, former Executive Chairman, BARC and Dr. Md. Abdul Jalil Bhuyan, former Director General, BRRI, respectively. Following presentations, valued experts and participants provided a good number of recommendations for integration in improving the future research programmes. The respected six expert members of the workshop critically reviewed the presentations and passed comments/suggestions which are being forwarded to the concerned institutes in formulating future research programmes toward achieving SDGs as well as food and nutritional security of the country.

- **Annual Review Workshop on Crop Production Programme of NARS Institutes: Research Progress 2020-2021 and Research Programme 2021-22**

A review workshop on "Crop Production Programme" of NARS Institutes was held at BARC on 20-21 September, 2021. The objectives of the workshop were to review the research progress, 2020-21 and research programmes, 2021-22 of seven NARS institutes viz. BARI, BRRI, BINA, BJRI, BSRI, BWMRI and CDB in order to avoid duplication of research after appraising proposed programmes aligning various national vision documents and research priority. Scientists and academia of the relevant fields of research institutes and agri-varsities attended the workshop as expert members and provided various remarks/suggestions for incorporation while planning future research programmes. In the inaugural session Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC graced the session as Chief Guest,

while the session was Chaired by Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC. Dr. Shah Md. Monir Hossain, PSO (Crops), BARC, welcomed and briefed the last year's recommendations provided for the NARS institutes.

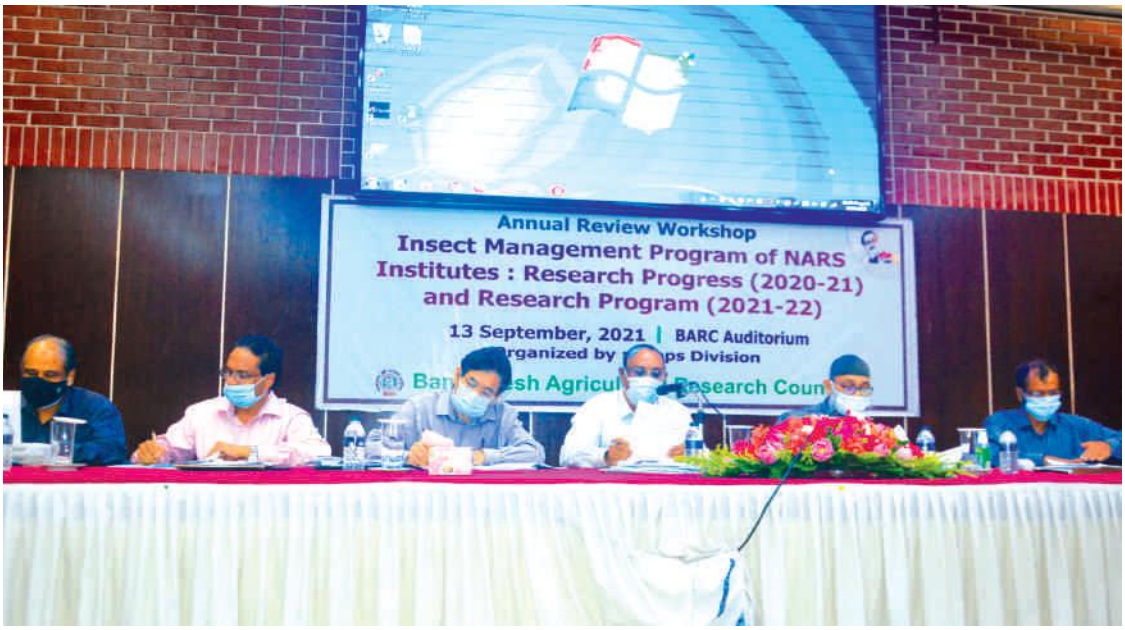
Annual Review Workshop on Crop Production Programme of NARS Institutes

In the inaugural session, Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC, was present as Chief Guest. He applauded scientists for their outstanding works toward the present agricultural achievements, especially in rice self-sufficiency. He stressed the need for concentrating on promoting commercial agriculture and aspects of 4IR (4^{th} Industrial Revolution) in context of climate vulnerability and increased demand for nutrition rich high value crops. He encouraged scientists to publish their research articles in reputed journals for career building as well as international exposure. All concerned are, therefore, requested to take challenges of increased food demand due to increasing population from a declining natural resource base as he added.

Six expert members viz. Dr. Rafiqul Islam Modal, former DG, BARI, Dr. Paresh Chandra Golder, former Member Director, Prof. Md. Moynul Hoque, Department of Agronomy, BSMRAU; Prof. Moin Us Salam, FAO consultant; Dr. Md. Abdul Quayum, former CSO, BARI, Dr. Md. Mahbubur Rahman Khan, former CSO, BARI attended the technical sessions for overviewing and providing appropriate suggestions for further improvement of the programmes. There were four technical sessions Chaired by Dr. Rafiqul Islam Modal, former DG, BARI, Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC and Dr. Paresh Chandra Golder, former Member Director, BARC, respectively. However, valued experts and participants provided a good number of opinions and recommendations which were forwarded to the concerned institutes.

- **Annual Review Workshop on Insect Management Programme: Research Progress 2020-2021 and Research Programme 2021-22**

A review workshop on "Insect Pest Management Programme" of NARS institutes viz., BARI, BRRI, BINA, BJRI, BSRI, BSRTI, BWMRI, CDB and BTRI was held at BARC on 13 September, 2021. The objective of the workshop was to review the research progress 2020-21 and the research programme 2021-22 of NARS institutes to avoid duplication of research, need-based research due to climate change issues, and to take initiatives for future research programmes in alliance with various vision documents and research priority. Scientists and academia of the relevant fields of research institutes and agri-universities were present as expert members in the workshop who provided their valuable remarks and suggestions to follow in formulating future research programmes. The inaugural session was chaired by Dr. Md. Aziz Zilani Chowdhury, Member Director, (Crops), BARC. Dr. Shah Md. Monir Hossain, Principal Scientific Officer (Crops), BARC, welcomed the participants and briefed the last year recommendations for NARS institutes.



Annual Review Workshop on Insect Management Programme of NARS Institutes

In the inaugural session, Dr. S M Bokhtiar, Executive Chairman, BARC thanked all participating scientists for their presence. He appreciated the scientists for their contributions for bringing achievement in pest control of different crops. However, he urged to go through the various government agricultural policies for addressing challenges and take up programmes accordingly. He further added that we should develop ways and means to minimize use of pesticides to protect our environment and produce safe and high yield. He also added that technology invention and policy support should advance fast otherwise a sustainable agriculture would not be achivable.

Five expert members namely Prof. Dr. Khandaker Shariful Islam, Department of Entomology, BAU, Prof. Dr. Md. Ruhul Amin, Department of Entomology, BSMRAU; Prof. Dr. Mohammad Ali, Department of Entomology, SAU, Prof. Dr. Md. Ramiz Uddin Miah, Department of Entomology, BSMRAU and Dr. Syed Nurul Alam, Former Director, BARI, were present in the workshop. Two technical sessions were Chaired by Dr. Syed Nurul Alam, Former Director, BARI

and Professor Dr. Khandaker Shariful Islam, Department of Entomology, BAU respectively, while the recommendation session was Chaired by Dr. S. M. Bokhtiar, Executive Chairman, BARC. Expert members and valued participants placed their valuable suggestions/recommendations which were put forwarded to the respective institutes for integratation in developing future research Programmes towards food and nutrition security.

- **Annual Review Workshop on Disease Management Programme of NARS Institutes: Research Progress 2019-20 and Research Programme 2020-21**

A review workshop on Disease Management Programme of NARS Institutes was held at BARC on 12 September 2021. The objective of the workshop was to review the progress of 2020-21 and the research Programme 2021-22 of nine NARS Institutes to avoid duplication of research and to review the proposed research Programmes for further improvement in alliance with different vision documents and priority research. Scientists and academia of the relevant fields of research institutes and agri-universities were present as expert members in the workshop and put their various remarks to follow. The inaugural session was Chaired by Dr. Md. Aziz Zilani Chowdhury, Member Director, Crops Division. Dr. Shah

Annual Review Workshop on Insect Management Programme of NARS Institutes

Md. Monir Hossain, Chief Scientific Officer (CC), BARC, welcomed the participants and briefed the last year's recommendations for all the NARS Institutes under different categories.

Five expert members, namely, Prof. Dr. Ismail Hossain Mian, Dept. of Plant Pathology, BSMRAU, Prof. Dr. Ismail Hossain, Department of Plant Pathology, BAU, Dr. Biresh Kumar Ghoswami, former DG, BINA, Dr. Tapan Kumer Dey, former Director, BARI and Dr. Md. Ansar Ali, former Director, BRRI were present in the daylong workshop. There were two technical sessions Chaired by Prof. Dr. Ismail Hossain Mian, Dept. of Plant Pathology, BSMRAU and Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC. Expert members and valued participants placed their valuable suggestions/recommendations which were put forwarded to the respective institutes for integration in developing future research Programmes toward food and nutrition security.

- **Annual Review Workshop on Biotechnological Programme: Research Progress 2019-20 and Research Programme 2020-21**

A review workshop on"Biotechnology Programme" of NARS Institutes was held at BARC auditorium on 23 September, 2021. The objectives of the workshop were to review the research progress 2020-21 and research Programmes 2021-22 of NARS Institutes viz., BARI, BRRI, BINA, BJRI, BSRI, BWMRI, CDB & Universities viz., BAU, BSMRAU and SAU; National Institute of Biotechnology (NIB) and private sectors viz., BRAC and ACI to avoid duplication of research through appraisal of proposed Programmes aligning various national vision documents and research priority. The inaugural session was graced by Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, Bangladesh Agricultural Research Council as Chief Guest while Dr. Md Aziz Zilani Chowdhury, Member Director (Crops) Chaired the session. Dr. Shah Md. Monir Hossain, Principle Scientific Officer, Crops Division, BARC welcome the participants and briefed the last year's recommendations. Scientists and academia of the relevant fields of research institutes and agri-universities attended the workshop as expert members. Prof. Dr. Rakha Hari Sarker, Chairman, Dept. of Botany, University of Dhaka, Prof. Dr. Shahidul Haque, Dept. of Biotechnology, BAU, Prof. Dr. Md. Tofazzal Islam, IBGE, BSMRAU, Dr. Md. Shamsher Ali, former DG, BINA, Dr. Mirza Mofazzal Islam, DG, BINA, attended the workshop as expert members.

Annual Review Workshop on Biotechnological Programme of NARS Institutes

The Chief Guest Dr. Shaikh Mohammad Bokhtiar acknowledged the outstanding achievements in agriculture due to the hard labor rendered by NARS scientists. In this regard, he requested the expert members to oversee the last years' recommendation and progress. He praised for developing some promising technologies through biotechnological tools after a decade long effort. He urged all concerned to look towards developing bio-fortified crops and making Bangladesh with a sustainable and profitable farming system and ultimately commercial agriculture. Scientists are being inspired for publishing their research findings in

reputed journals by him. Present days' focus is to equip scientists with advanced technologies to cope with challenges posed by climate vulnerability, increased food demand and declining arable land, he added.

There were two technical sessions which were Chaired by Prof. Dr. Shahidur Rashid Bhuiyan, Vice Chancellor, Sher-e-Bangla Agricultural University and Prof. Dr. Rakha Hari Sarker, Chairman, Dept. of Botany, University of Dhaka, respectively. However, a good number of recommendations and opinions put forwarded by four expert members and audience for integration in the future research Programmes of respective institutes.

- **Consultation Workshop on Biotechnological Research Priority for NARS Institutes**

The Progress Review Workshop (10th) on Biotechnology Research based on the Biotechnology Policy 2012 was held at BARC on 5th June 2021. Under the guidance of the Plant Biotechnology Technical Committee, the crop-related NARS Institutes, Agricultural Universities and private sector have prepared a 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 biotic stress resistant to insects and diseases, abiotic stress-tolerant and harmonious to climate change, iv) Identification and characterization of important genes to develop plant variety 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) Identification of plant diseases at molecular level. The progress of mid and the long-term activities was presented in the workshop. The compiled report was sent to the Ministry of Agriculture.

- **Workshop on Development of High Yielding Hybrid(F1) Varieties of Different Crops and its Dissemination to the Farmers' Level**

A daylong workshop on "Development of high yielding hybrid (F1) varieties of different crops and its dissemination to the farmers' level" was held on 30 May, 2022 at Bangladesh Agricultural Research Council. Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC, graced the inaugural session as Chief Guest and the session was Chaired by Dr. Md. Aziz Zilani Chowdhury, Member Director, Crops Division, BARC. Dr. Md. Mahfuz Alam, Principal Scientific Officer (Crops), welcomed the participants and presented a brief on research priorities of major crops in Bangladesh in order to sensitize the audience. The Chief Guest Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC, emphasized the importance of hybrid technology for improving crop production and stress tolerance. He also urged all concerned to undertake target oriented coordinated joint projects to achieve better result through integration of everybody's knowledge and expertise. The relevant personnel from BARI, BRRI,

DAE, BADC, BJRI, BSRI, BINA, CDB, BRAC, ACI, Metal Agro Ltd and Supreme Seed Ltd attended the Programme. Dr. Md. Aziz Zilani Chowdhury Chaired the technical sessions. After a threadbare discussions, comments and suggestions from the experts, a priority was set as per institutional skill and forwarded to the respective institutes for integration in their future Programmes.

Scientific Publications

a) Scientific Article

1. Bokhtiar, S.M., Ali, M.A., **Chowdhury, M.A.Z.**, Ahmed, K.U., Ahmed, M., Bhuiyan, M.S., Mashuk, O.F., Rahman, M.M., and Rafiquzzaman, S.M. 2022. Yield improvement of Gracilariatenuistipitata by optimizing different aspects in coast of cox's bazar, Bangladesh, Scientific reports,12: 4174 (Impact factor: 4.4)
2. Das, S., **Alam, M. M.**, Zhang, R., Hisano, S. and Suzuki, N. (2021). Proof-of-concept for the yadokari nature: a capsidless replicase-encoding but replication-dependent (+)ss RNA virus hosted by an unrelated dsRNA virus. Journal of Virology. (Impact factor: 5.1)
3. Elahi, F., Islam M., **Alam, M.**, Islam, N., Tipu, M. M. H., Khatun, F., Chowdhury, S. R. and Sarker, S. (2021). First report of *Athelia rolfsii* on jackfruit *(Artocarpus heterophyllus)*. Australasian Plant Disease Notes 16:17 (Impact factor: 0.83)

b) PCR (four)

1. **Chowdhury, M.A.Z.**, M.N. Islam, M.A. Rahim *et al*. (15 author). 2021. Collection, Conservation and Characterization of Imp. Plant Genetic Resources: Sub-Project Completion Report: Vol. I: 1- 405 (PCR)
2. **Chowdhury, M.A.Z.**, M.N. Islam, M.A. Rahim *et al*. (15 author). 2021. Collection, Conservation and Characterization of Imp. PGRs Resources: Sub-Project Completion Report: Vol. II: 405-768 (PCR)
3. **Chowdhury, M.A.Z**., M.N. Islam, M.A. Rahim *et al*. (15 author). 2021. Collection, Conservation and Characterization of Imp. PGRs: Sub-Project Completion Report: Vol. III: 769-1177 (PCR)
4. **Chowdhury, M. A. Z.**, M. A. H. Chowdhury and H. M. H. Rahman. 2021. PCR on Development of Upazila Land Suitability Assessment and Crop Zoning System of Bangladesh, BARC, Dhaka. 244p

c) Book and Manual

1. Rashid M.H., M.A. Rahman, S. Begum and **M.A.Z. Chowdhury**. 2021. Manual: Boro Rice Cultivation in Saline zone. Bangladesh Agricultural Research Council, pp 21
2. Chowdhury, M. A. H., **M. A. Z. Chowdhury** and H. M. H. Rahman.2021. Crop Zoning Methodology. Bangladesh Agricultural Research Council, Farmgate, Dhaka. pp 97 (Book)

Technology Transfer and Monitoring Unit (TTMU)

Name of the Professionals

Name	Designation
Dr. FauziaYasmin	Director
Dr. Suraya Parvin	Principal Scientific Officer
Dr. Zakiah Rahman Moni	Principal Scientific Officer

1. Training & Training Workshops

Technology Transfer and Monitoring Unit (TTMU) is working to facilitate promptly transfer of technologies generated by the National Agricultural Research System (NARS) to Extension agencies viz. Department of Agricultural Extension (DAE), Department of Fisheries (DoF), Department of Livestock (DLS), private and public organizations. TTMU is also coordinating it to strengthen the linkages among research, extension and farmers through different workshops, training, meeting, seminar, etc. On this contextual in the reporting period (July 2021-June 2022) TTMU organized three ToT training programmes. In addition, this year, one workshop, five monitoring tours were completed under PBRG sub project on "Transfer of Agricultural Technologies to Farmers Level for Increasing Farm Productivity" ID: 005 of NATP-2.

The brief descriptions of those activities are given below:

2. Project Implementation

Programme Based Research Grant (PBRG) sub-project "Transfer of Agricultural Technologies to Farmers Level for Increasing Farm on Productivity" (ID: 005) was implemented within 30 June/2022. Ten NARS Institutes (BARI, BINA, BFRI, BJRI, BLRI, BSRI, SRDI, BRRI, CDB, BWMRI) were the components for implementing this sub-project. Dr. Fauzia Yasmin, Director (TTMU), BARC, was involved as Coordinator and Dr. Zakiah Rahman Moni, SSO (TTMU) was the Associate Coordinator from 6.8.2019 to 19.1.2022 during project period (July 2018 –June 2022).

a. Research Highlight (Developed Technology)

Developed Technology:

A technology of "Rapid Technology Transfer (RTT) model" developed from TTMU, BARC, for transferring technologies at farmers' level under PBRG sub-project entitled "Transfer of Agricultural Technologies to Farmers' Level for Increasing Farm Productivity" ID-005, PIU-BARC, NATP-2. A total number of 63 technologies from ten institutes (BWMRI-5, BARI-24, BINA-8, BSRI-3, BRRI-12, BJRI-2, CDB-4, SRDI-1, BLRI-2, BFRI-2) was transferred to 446 farmers

of 35 Upazillas under 17 districts. The technologies, which are developed by CRG and PBRG under PIU-BARC, NATP-2 could be transferred economically and rapidly through this model for dissemination and strengthening Research-Extension-Farmer linkage.

b. Technology Transfer and Field Monitoring Activities

Objectives-1

TTMU coordinated with 10 Institutes to transfer NARS Institutes generated economically viable technologies rapidly among the farmers for higher agricultural productivity and profitability with solving problems at the farmers' level.

Monitoring activities was hampered due to COVID-19 pandemic. In spite of that, TTMU monitored technology transfer activities at seven sites of five NARS Institutes as follows:

Field Monitoring of PBRG Sub-project (ID-005) at seven sites of five NARS Institutes during July, 2021 to June, 2022.

i) CDB component

CDB developed CB-14 variety trial plots of Mahil Hossain and Ruif Marma was monitored at Suparibagan Village of Dighinalaupazila and Nunchari Village of Mohalchariupazila under Khagrachari District at boll splitting stage or pre harvesting stage from 26-28 December, 2021.

ii) BARI component

Monitored the newly established mixed fruit orchard of six farmers at Babugonj and Muladi Upazila of Barishal District from 12 -15 December, 2021. BARI developed fruit varieties were demonstrated in those mixed fruit orchard.

iii) BINA component

BINA developed BINA dhan10 (Boro variety) were demonstrated in 18 farmers fields having the average land size of 1 bigha in Mirkandapara Village of Parangonj Union under Sadar Upazila of Mymensingh District. On 07 December, 2021, concerned PI in his office informed the monitoring team that after harvest, satisfactory yield (6 ton/ha) was obtained from those trial plots.

iv) BJRI component

The team monitored BJRI developed HC-95 variety trial plots (land size varied from 10 to 15 decimal) of 3 farmers of Purba Shalbon Village of Sadar Upazila under Rangpur District and also monitored BJRI developed HC-95 variety trial plots (land size varied from 11 to 38 decimal) of four farmers of Guriadoho Village of Sadar Upazila under Lalmonirhat District from 28/11/21 to 01/12/21 at flowering stage for seed production.

v) BSRI component

The team monitored BSRI developed BSRI Akh 45 variety (gur) trial plots of two farmers, where date of transplanting varied from 08/11/2020 to 28/11/20 at Vatpiar and Brahmoboyra Villages of Sadar Upazila under Sirajgonj District on 08 November, 2021.

vi. Project Completion Workshop on Transfer of Agricultural Technologies to Farmers Level for Increasing Farm Productivity (ID:005)

PCR Workshop (PBRG-ID 005), 23 February 2022

Project Completion workshop for the project was held on 23 February/2022 at BARC Auditorium. Dr. Fauzia Yasmin, Director (TTMU) and Coordinator presided over the workshop. All PI & Co-PI of ten components (BARI, BWMRI, BRRI, BINA, BFRI, BSRI, BLRI, BJRI, SRDI & CDB), extension personals (DAE, DoF, DLS), scientists and officials of BARC, and expert members were present in the workshop. Project Completion Report of ten NARS Institutes along with BARC part was presented in this workshop. Comments and suggestions made by the experts for improving PCR.

Objectives-2

i. Data collection:

Data collection from CDB, SRDI, BSRI, BRRI, BFRI, BINA, BLRI, BJRI, BWMRI, BARI (Pomology, pulse research center, oil seed research center etc.), data entry, data analysis completed.

ii. Financial activities:

Submitted by month regularly

Annual Report, SoE submitted regularly. One PCR, one Book (Bangla), one Booklet, one Leaflet under PBRG sub-project has been published in this reporting year.

3. Policy Level Contribution

- **Inputs/Comments:**
- Prepared Chairperson Speech of Seminar on Fruit Fair/2022
- Prepared opinion on Bangladesh Forest Industries Development Corporation (BFIDC) act 2020 on 18.07.2021
- Provided BARC's views on Bangladesh Flag Ships (Protection of Interests) Rules 2021 (Draft)
- Sent opinions, materials and information on Incentives for Technology Transfer to Least Development Countries (Survey on LDC needs and Priorities for Technology Transfer) on 19/01/2022
- Provided BARC's opinion on proposed Railways (Amendment Act) 2021 on 02/01/2022
- Opinion of BARC on Draft 'Urban & Regional Planning Act, 2022' on 08/02/2022
- Opinion of BARC on the draft of Sub-contracting Act 2022 prepared on 06/06/2022

4. Training, Workshop, Seminar, etc. organized

- **Training (TOT): 3**

i. Three days ToT Training on Post-harvest Management of Fruits and Vegetables

A three day-long Training of Trainers (ToT) program on "Post-harvest Management of Fruits and vegetables" was conducted at Bangladesh Agricultural Research Institute (BARI), Gazipur, on 12-14 October 2021. This Programme was jointly organized by Technology Transfer and Monitoring Unit (TTMU), Bangladesh Agricultural Research Council (BARC) and BARI. Thirty Agriculture Officers (Upazilla Agriculture Officer, Agriculture Extension Officer) from 26 Districts were participated. Dr. Md. Nazirul Islam, DG, BARI, Dr. Mohammad Shamsul Alom, Director (Training) and Md. Hafizul Haque Khan, CSO Post Harvest Technology Division, BARI, were present as Chief Guest and Special Guest and Chairperson in inaugural session respectively.Dr. Fauzia Yasmin, Director (TTMU), BARC and Dr. Md. Golam Ferdous Chowdhury, SSO, Post-Harvest Technology Division, were present as Chief Guest and Special Guest in closing and certification giving ceremony. Dr. Fauzia Yasmin, Director, TTMU was the course coordinator of this training programme.

Ten different technologies on "Post-harvest Management of Fruits and Vegetables" were transferred in three days training programme such as modern technologies of Principles for making jellies, jams, morobas, candies, canned products, fried chips from a variety of fruits and vegetables, preserving raw fruits for a long time by using stepping method, strategies for commercial ripening of fruits and extension of storage period, manufacturing of various fruit osmo-dehydrated products/mangobar/leather/substance, Pickles made from various fruits (raw jackfruit/raw mango) and vegetables (eggplant/mixed-vegetables). These were transferred to the extension personnel through this training. A detail discussion was held between participants and researchers through lectures and visits (field and laboratory). The participants expressed that this training is more effective for post harvest losses and also preservation. The participants has also suggested that, this type of training programme could be conducted by TTMU, BARC in another region and duration should be increased for strengthening linkage between research and extension.

ii. Three days ToT Training on Recently developed Modern Rice varieties

The ToT Programme on "Recently developed Modern Rice varieties" was conducted at Bangladesh Rice Research Institute (BRRI), Gazipur, on 16-18 November 2021 jointly organized by Technology Transfer and Monitoring Unit (TTMU) and BRRI. Thirty Agriculture Officers (Upazilla Agriculture Officer, Agriculture Extension Officer) from 28 Districts were participated. Dr. Md. Shahjahan Kabir, Director General BRRI, Dr. Md. Abu Bakr Siddique, Director (Administration & Common Service), Dr. Mohammad Khalequzzaman, Director (Research) and Dr. Md Shahadat Hossain, CSO & Head, Training Division were present as Chief Guest, Special Guest and Chairperson in inaugural session respectively. Dr. Fauzia Yasmin, Director, TTMU was the Course Coordinator of this training programme.

Twelve recently-developed modern rice varieties viz. BRRI dhan80, BRRI dhan81, BRRI

dhan82, BRRI dhan83, BRRI dhan84, BRRI dhan85, BRRI dhan86, BRRI dhan87, BRRI dhan88, BRRI dhan89, BRRI dhan90 and Bangabandhu dhan100 as well as its production and management technologies were transferred. Discussion between participants and researchers occurred through lectures and visits (field and laboratory). The participants expressed their views that this training is more effective for the participants. They also recommended that; the time of this Programme should be increased.

iii. Three Days ToT Training on Sugarcrop Technologies Generated from Bangladesh Sugarcrop Research Institute (BSRI)

To transfer technologies for dissemination, a three-day long Training of Trainers (ToT) program was conducted on sugarcrop technologies generated from Bangladesh Sugarcrop Research Institute (BSRI) on 07-09 March, 2022 organized by Technology Transfer and Monitoring Unit (TTMU), Bangladesh Agricultural Research Council (BARC) and BSRI, Iswardi, Pabna. This training programme was funded by PIU-BARC, NATP-2. Thirty (2 Additional Deputy Directors, 1 Upazila Agriculture Officer and 27 Agricultural Extension Officers) from Rajshahi and Bogura Region participated in this program. Dr. Fauzia Yasmin, Director, TTMU was the Course Coordinator of this training programme. Dr. Md Amzad Hossain, Director General, BSRI, was present as chief guest, Dr. Suraya Parvin PSO (TTMU), BARC was special guest and Dr. Md Abul Kashem, CSO and Head, Training and Technology Transfer Division, BSRI presided over the inaugural session of the training Programme. The resource speakers of this training Programme were the scientists of BSRI. The following sugarcrop technologies on varieties, pest, diseases, agronomical practices, etc. of sugarcane, sugarbeet, stevia, palm, date, golpata, etc. were transferred to 30 Agricultural Officers through this training:

- Methods and techniques of modern cultivation practices of sugarcane;
- BSRI activities for screening of location specific sustainable sugarcane cultivation technologies;
- Fertilizer and integrated nutrient management for sugarcane cultivation and means to increase the fertilizer effectiveness;
- Practical: Visit of laboratory, crossing and museum plot of sugarcrop, demonstrate the process of sugarcane breeding and practical detection of sugarcane varieties;
- Intercrop with sugarcane, intercroping using modern technologies and management of muri sugarcane cultivation;
- BSRI generated agricultural machineries with irrigation and extraction management;
- Biotechnological research on sugarcane of BSRI; importance, cultivation technologies and consumption of Stevia;
- Methods and techniques for modern cultivation practices of sugarbeet;
- Major pests and insects for sugarcane and sugarbeet: symptoms, type of damage and their management;

- Major diseases for sugarcane and sugarbeet: symptoms, type of damage and their management;
- Palm, date and golpata for mitigating the demand of sugar as well as gur and gur production and preservation technologies;
- Motivation techniques for accepting new technologies of sugarcrop.

A fruitful discussion was held between participants and researchers. The participants expressed different problems for sugarcane cultivation and suggested BSRI technologies should be disseminated for different ecosystems. They also suggested undertaking of new research for shortening the life cycle of sugarcane. It is also a two-way communication process to transfer technologies for dissemination through this training Programme. The participants also suggested that, this type of training programme could be conducted by BARC in another region for strengthening linkage between research and extension officers.

5. Meeting

Dr. Fauzia Yasmin, Director (TTMU) attended the following meetings:

i. **Activities of Innovation Team, Computer & GIS, BARC for Agricultural Ministry:** In every monthly meeting, prepared Innovation idea as a member of Innovation team of BARC.

ii. **Attended National Extension Coordination Committee (NECC) Meeting:**
The NECC meeting on 21 June/2022 at Department of Livestock Services (DLS)

iii. **Agriculture Technology Extension Coordination Committee (ATECC) Meeting Rabi Season /2021**

A day-long meeting of Agriculture Technology Extension Coordination Committee (ATECC) was held on 2 December 2021 at BARC for Rabi Season/2021. The meeting was presided by Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC. Dr. Bokhtiar started and welcomed all the members. He acknowledged the relentless work of agriculturists as well as extension workers in ensuring food security for the growing population and achieving the SDGs and agricultural development. Stress tolerant, high yielding, climate resilience variety could be disseminated rapidly through this meeting, he also added.

Mr. A. K. M. Monirul Alam, Director, Field Service Wing, DAE, co-ordinated this meeting, as the member secretary of this committee. All the participants of ATECC from NARS Institutes, DAE, DAM, BADC, AIS, BIRTAN, SCA, Hortex Foundation, BARC and private organizations joined the meeting. Dr. H. M. Moniruzzaman, Deputy Director (Extension), DAE presented all activities of this meeting. Dr. Fauzia Yasmin, Director (TTMU), BARC as member of this committee attended this meeting.

Agriculture Technology Extension Coordination Committee (ATECC), held on 2 December 2021 at BARC for Rabi Season/2021.

iv. ATECC Meeting Kharif-1 Season/2022

A meeting of ATECC (Agriculture Technology Extension Coordination Committee) was held at BARC on 30 March, 2022 for Kharif-1 Season/2022. The meeting was presided over by Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC. Mr. Md. Sirazul Islam, Director, Field Service Wing, DAE and Habibur Rahaman Chowdhury, Additional Director (Extension and Coordination), Field Service Wing attended this meeting. Dr. Fauzia Yasmin, Director (TTMU) from BARC, also 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. Through PowerPoint presentation, Habibur Rahaman Chowdhury explained the work plan of crop demo, technology demo, field day, training, follow-up activities of seed distribution of aus, aman, boro rice, wheat, mustard, ground nut and jute for 2021-22. Executive Chairman, BARC opined that any foreign crop seed/seedlings (vegetables, fruits, etc.) brought by anyone should be handed over to the concerned research institutes. The research institutes should be followed the proper breeding protocol before dissemination. DAE should take proper initiatives to monitor the unauthorized multiplication. Dr. Fauzia Yasmin, Director (TTMU) recommended about demonstration/field day of BJRI Tosha pat-8 and Kenaf variety HC-95 for dissemination which was selected for transfer from the NATP-2 sub project "Transfer of Agricultural Technologies to Farmers' Level for Increasing Farm Productivity" (ID:005).

6. Foreign and Local

Foreign N/A Locally, Officers of TTMU has attended a good number of Workshops, Seminars, Training and Meetings.

7. National and International Linkage (MoU/Agreement)

i. Linkage:

- Maintained a strong linkage with MoA, DAE, DoF, DLS, BADC, BARD, HORTEX Foundation, KGF, FAO, etc.
- Maintained ICT-based Office Management, as a part of establishing Digital Bangladesh of the present Government.
- Coordinated and given cooperation to the activities of Executive Chairman, BARC and successfully carried out the different tasks, as a part of Good Office Management.

ii. Activities with other Organization

- Attended Inaugural Session of SAC GB Meeting
- Participated and given cooperation actively for SAARC Charter Day-2021
- Coordinated with the personnel of DAE, DoF, DLS

iii Other Activities:

Routine works: Work-plan preparation, divisional annual progress report preparation, budget preparation for future training and workshop, ministry report, newsletter, APA, citizen charter, different report preparation, etc.

9. Publication(s) by the Division/Section in different Journals/Media

Sl. No.	Published Item	No. of Publication
i)	Training Manuals	3
ii)	Book	3
iii)	Booklet	1
iv)	Leaflet	1
v)	PCR	1
vi)	Monitoring Report	5
vii)	Annual Report	2
viii)	Progress and Work-plan Report	2

PLANNING AND EVALUATION DIVISION

PLANNING AND EVALUATION DIVISION

Name of the Professionals

Name	Designation
Dr. Md. Abdus Salam	Member Director (CC)
Dr. Kabir Uddin Ahmed	Chief Scientific Officer (AC)
Dr. Md. Ashraful Alam	Principal Scientific Officer
Dr. A B M Khaldun	Principal Scientific Officer

1. Coordination and Monitoring

a. Coordination of Projects

Coordination of Programme Based Research Grant (PBRG) Sub-Projects, under PIU, BARC, NATP-2 and Other Projects

Total PBRG and other Projects: 07

i. Plain land eco-system (Project ID: 061)

ii. Char land eco-system (Project ID: 096)

iii. Coastal eco-system (Project ID: 098)

iv. Drought eco-system (Project ID: 097)

v. Capacity Building for Conducting Adaptive Trials on Seaweed Cultivation in Coastal Areas (3rd Phase)

vi. Omics Food and Nutritional Security – Platform Technologies to Enhance Crop Genetic Resources and Food Value Chains in Bangladesh (OFANS) (Project Code No. GIFS-KGF/2021/01)

vii. Improving Research Qualities 0f ARI's Through Review and Evaluation by an External Panel of Expert (Project Code No. CEP VI-BARC/2021)

b. Monitoring and Evaluation of Research Projects

- Regular desk monitoring and reporting has been done.
- Project Completion Report (PCR) of 3 projects have been published and submitted to PIU-BARC, NATP-2.
- As a team member visited Genome Research facilities at BJRI on 10 August 2021.
- PBRG Drought and Rain-fed sub project monitoring at Banderbon and Nikhanchori on 31 December 2021.
- PBRG Drought and Rain-fed sub project monitoring at Sylhet on 05 January 2022.
- As a team leader Member Director monitored Technology validation of PIU-BARC at

Panchaghar, and Rangpur.

- Monitoring OFANS activities at BWMRI, BARI and BRRI.

Monitoring and Coordination Meeting under OFANS Project

- Monitoring Technology validation of PIU-BARC at Madhupur, Tangail District.

2. Field Monitoring

a) Drought and Rain-fed Ecosystem (Project ID: 097)

No. of field visit: 03

i) Date and venue of visit: 31-12-2021 to 03-01-2022 at Naikhongchari, Bandarban

Team members:

Dr. Md. Abdus Salam
Dr. Kabir Uddin Ahmed

Activities:

- Discussion with scientists about progress of field activities.
- Field visit of winter crop.
- Visited ongoing livestock Programme under the Sub-Project.
- Visited fish culture Programme and provided necessary suggestions.

Suggestions:

- More motivation is needed for homestead vegetables production
- All record should be maintained properly.
- Building up strong network with DAE and BARI personnel for improving crop production system.

- Special attention should be given on fruit trees.
- Special attention should be given on sheep and goat rearing.
- Hilly chicken rearing Programme should be expanded.
- Mass livestock vaccination Programme needs to be executed.
- More initiative should be taken on pigeon rearing.
- Appropriate stocking density should be maintained in pond fish culture.
- High value fish culture may be introduced in the area.
- Strong network should be built up with DAE, DLS and DoF for the sustainability of FSRD activities

ii) Date and venue of visit: 03-02-2022 to 05-02-2022 at FSRD site Sylhet

Team members:

Dr. Shaikh Mohammad Bokhtiar, EC, BARC
Dr. Md. Abdus Salam
Dr. Kabir Uddin Ahmed

Activities:

- Visited homestead vegetables production, chicken rearing, duck rearing, fish culture in the seasonal pond, mixed orchard, production programme on BARI Sarisha-18, BARI Begun-12 and participated Programmes on the field day of BARI Alu and participated a sharing session arranged by FSRD site, Sylhet about their ongoing programme.

Suggestions:

- More care should be taken on homestead vegetables production.
- Initiative should be given on early Khari-1 vegetables production.
- Mass livestock vaccination programme on cattle, poultry, goat and sheep need to be continued.
- Initiative should be taken for the expansion of BARI Begun-12 cultivation.
- Special care should be given on mixed orchard.
- Fingerlings should be released as per recommended number of BFRI in per unit water body.
- In case of fish production suggestions should be sought from DoF or BFRI personnel whenever necessary.
- Strong network should be built up with DAE, DLS and DoF for the sustainability of FSRD activities.

b) OFANS (Project Code No. GIFS-KGF/2021/01)

No. of field visit: 03

Date and venue of visit: 31-03-2022, BARI and BRRI, and different dates at BWMRI.

Team members:

Dr. Shaikh Mohammad Bokhtiar
Dr. Md. Abdus Salam
Dr. A B M Khaldun

Suggestions

- Visited BWMRI Dinajpur and BRRI, BARI at Gazipur and organized monitoring meetings to speed up the project activities by the components and noted the updated research works.
- Keep regular contacts with Canadian collaboration for the shipment and exchange of research materials.

a) Regional and International Collaboration & Cooperation

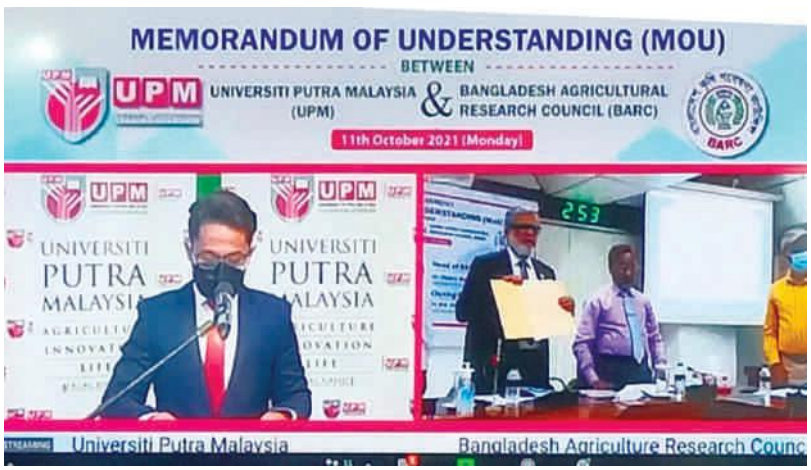
i. 18th Regular Session of Commission on Genetic Resources for Food and Agriculture (CGRFA) at Zoom Platform

Dr. Md. Abdus Salam, Member Director (Planning and Evaluation), Bangladesh Agricultural Research Council and National Focal Point (NFP) of ITPGRFA, Bangladesh attended the 18th Regular Session of Commission on Genetic Resources for Food and Agriculture (CGRFA) held in FAO Head Quarter, Rome, Italy during 27 September -01 October 2021 through Zoom Platform. On behalf of Asia regional group, Bangladesh made Statement on Agenda Item-3: The role of genetic resources for food agriculture in mitigation and adaptation to climate change (CGRFA-18/21/3).

Statement made on 18th Regular Session of Commission on Genetic Resources for Food and Agriculture (CGRFA) at Zoom Platform

ii) Organized MoU signing Ceremony

Organized MoU signing ceremony between BARC and UPM, Malaysia



MoU signing ceremony between BARC and UPM, Malaysia

4. Linkage with International Organizations and Development Partners

- Comments on Agreement between the United States of America and Government of The People's Republic of Bangladesh have been sent to Ministry of Agriculture on 01/08/2021.
- Comments on "Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI), and Intertrop GMBH, Stuttgart, Germany" prepared on 29/08/2021.
- Comments of Bangladesh Agricultural Research Council (BARC) on "Memorandum of Agreement (MoA) between China National Rice Research Institute, People's Republic of China and Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh, Bangladesh" have been sent to Ministry of Agriculture on 20/09/2021.
- Comments on MoU between MoA, Bangladesh and Ministry of Agriculture and Animal Resources, Rwanda have been sent to Ministry of Agriculture on 30/09/2021.
- Comments on FAO TCP on Wet land have been sent to Ministry of Agriculture on 21/10/2021.
- Inputs for Foreign Office Consultation (FOC) between Bangladesh and Maldives in the field of Agriculture have been sent to Ministry of Agriculture on 10/11/2021.
- A draft MoU between Bangladesh and Iran has been prepared after comments of Foreign Ministry and sent to Ministry of Agriculture on 06/12/2021.
- Organized agreement signing and inaugural ceremony of Global Institute for Food Security (GIFS) Regional Office in Bangladesh.
- Preparation of Draft Memorandum of Understanding (MoU) between Ministry of Agriculture, the People's Republic of Bangladesh and the Wageningen University and Research Centre, Netherlands.
- Comments on Memorandum of Understanding (MoU) between Ministry of Agriculture, the People's Republic of Bangladesh and Natural Resources Institute (NRI), University of Greenwich, Medway Campus, Central Avenue Chatham Maritime, Kent ME4 4TB, United Kingdom (UK).
- Preparation of draft MoU between Bangladesh and UAE.
- Comments on Agreement between the Government of Hungary and The Government of the People's Republic of Bangladesh on Economic Cooperation.
- Revise Memorandum of Understanding (MoU) on Cooperation in Agriculture between the Government of Bangladesh and Indonesia.
- Comments on Draft Bilateral Agreement on Cooperation on Commercial Agricultural Development between The Government of The Federal Republic of Nigeria and The Government of The People's Republic of Bangladesh.
- A draft MoU between Bangladesh and Iraq has been prepared after comments of Foreign Ministry and sent to Ministry of Agriculture on 10/04/2022.

Comments on MoU between Bangladesh and Turkey regarding Halal Quality Infrastructure has prepared and sent to Ministry of Agriculture on 24/01/2022.

5. Research Project Development and Evaluation

i) Improving Research Qualities of ARIs through Review and Evaluation by an External Panel of Experts in Workshop

- Organized Inception Workshop at Conference Room-01, BARC on 28/12/2021.
- Organized Sensitization Workshop, BARI, Gazipur on 10/01/2022.
- Organized Sensitization Workshop, BJRI Head Quarter at Dhaka on 31/03/2022.
- Arranged Technical Workshop (Group discussion), BJRI Head Quarter at Dhaka on 12/4/2022.
- Arranged Technical Workshop (Group discussion), BARI, Gazipur on 13/06/2022.
- Organized Technical Workshop (Group discussion), BARI, Gazipur on 14/6/2022.
- Organized Consultation Meeting, BJRI Head Quarter at Dhaka on 25/4/2022.
- Arranged 8th Experts Panel meeting on 21/11/2021.
- Arranged 9th Experts Panel meeting on 04/01/2022.
- 10th Experts Panel meeting on 08/01/2022.
- Arranged 1st Monthly Coordination meeting on 16/01/2022.
- Arranged 11th Experts Panel meeting on 24//01/2022 (Zoom).
- Arranged 12th Experts Panel meeting on 02/02/2022 (Zoom).
- Arranged 13th Experts Panel meeting on 09/02/2022 (Zoom).
- Arranged 14th Experts Panel meeting on 12/02/2022 (Zoom).
- Arranged 15th Experts Panel meeting on 16/02/2022.
- Organized 2nd Monthly Coordination meeting on 29/02/2022.
- Arranged 16th Experts Panel meeting on 06/03/2022.
- Arranged 3rd Monthly Coordination meeting on 29/03/2022.
- Arranged 17th Experts Panel meeting on 04/04/2022.
- Arranged 4th Monthly Coordination meeting on 19/4/2022.
- Arranged 5th Monthly Coordination meeting on 11/5/2022.
- Arranged 18th Experts Panel meeting on 19/05/2022.
- Arranged 19th Experts Panel meeting on 26/05/2022.
- Arranged 20th Experts Panel meeting on 04/06/2022.
- Arranged 6th Monthly Coordination meeting on 28/06/2022.

ii) DPP Evaluation

- Reorganized DPP of the project titled Research and Development of Seaweed in Coastal Areas of Bangladesh sent to the Ministry of Agriculture on 16/05/2022.

- Member Director (Planning and Evaluation) acted as Chairperson of the feasibility study committee of BINA DPP on "Strengthening Research Activities of BINA" on October 2021.

6. Coordination of PBRG Sub-Projects and Other Projects

i) Plain Land (ID 61)

Plain land eco-system (Project ID: 061) Publication of Project Completion Report has been prepared.

ii) Coastal (ID 98)

Coastal eco-system (Project ID: 098) Publication of project completion report has been prepared.

iii) Charland (ID 96)

Char land eco-system (Project ID: 096) Publication of project completion report has been prepared.

iv) Drought (ID 97)

- As coordination unit, Planning and Evaluation Division of BARC has been coordinating FSRD programs of all the component institutes. During July 2021 to June 2022 BARC has organized one coordination meeting with the PIs and Co-PIs of Component Institutes, 2nd Research Progress Review Workshop, two trainings on Farming System Research & Development, one draft PCR preparation workshop, two field visits at FSRD site Sylhet and one filed visit at Naikhongchari, Bandarban.
- Under homestead production system, for year-round vegetables and fruits production in the homestead, Barind model was used in three FSRD sites namely, Basantapur, Amnura and Chanduria while the Goyespur and Golapgonj model used in Jiaroki and Kamalbazar, respectively. Modified Khagrachari Model was used at FSRD site Naikhongchari, Bandarban.

v) Capacity Building for Conducting Adaptive Trials on Seaweed Cultivation in Coastal Areas (3rd Phase)

- Proposal of 15 months extension of Adaptive Trials on Seaweed Project has sent to KGF on 08/03/2022.
- Adaptive Trials on Seaweed Progress and Coordination meeting of project was organized on 05/08/2021.
- Adaptive Trials on Seaweed Progress and Coordination meeting of project was organized on 14/03/2022.
- Two varieties of BARI Seaweed (Seaweed-01 Seaweed-02) have been released.

  Heavy metal analysis was performed for two seaweed varieties at Soil Science Division Lab of BARC and BLRI.

vi) Support to Seaweed Cultivation, Processing and Marketing through Assessment and Capacity Development (TCP/BGD/3704)

Submission of Final Report to FAO on "Support to Seaweed Cultivation, Processing and Marketing Through Assessment and Capacity Development" Project (TCP/BGD/3704)."

7. Preparation of Policy Documents and Providing Inputs

Preparation

- Comments on "Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI), Joydebpur and Syngenta Bangladesh Limited, Dhaka" has prepared and sent to Ministry of Agriculture on 28/11/2021.
- Comments on "Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI), Joydebpur and Thengamara Mohila Sabuj Sangha (TMSS)" have been sent to Ministry of Agriculture on 29/11/2021.
- Comments on "Memorandum of Understanding (MoU) among Department of Agricultural Extension (DAE), ACI Seed and Joint Action for Nutrition Outcome (JANO)" sent to Ministry of Agriculture on 30/11/2021.
- Proceedings of Inter-Ministerial meeting on Bangladesh Delta Plan 2100 has been sent.
- Comments on Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI) and Nirvor Krishi & Consumer Producted Limited have been sent to Ministry of Agricultureon 02/12/2021
- Comments on Draft Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI) and Horticulture Export Development Foundation (Hortex Foundation).
- Comments on the draft MoU between SAVANNA Farm Products and BARI.
- Comments on draft "Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI), Joydebpur and Training and Technology Transfer (TTT) have been sent to Ministry of Agriculture on 07/04/2022.
- Comments on Draft Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI) and Paragon Group on Collaboration in Development and Promotion of BARI Technology.
- Comments on DRAFT Outcome of the Pre-Conference Dialogue for the Delta Plan Breakout Session on the Agriculture Sector Transformation Programme (ATP).
- Comments on Draft Memorandum of Understanding (MoU) between Bangladesh Institute of Research and Training on Applied Nutrition (BIRTAN) and Bangladesh Agricultural Research Institute (BARI) for Collaboration in Research, Development and Training Programme.

Comments on Policy Documents

- Comments of BARC on the Draft APA evaluation 2021-22 prepared by Cabinet Division sent to Ministry of Agriculture on 18/01/2022.

- Comments on Draft Memorandum of Understanding (MoU) between Asia-Pacific Association of Agricultural Research Institutions (APAARI) and Bangladesh Agricultural Research Institute (BARI)
- Comments on Draft Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI) and Maxim Agro for Collaboration in Seed Production, Research, Development and Promotion of Agricultural Technology.
- Comments on Draft Policy Brief on Bangladesh Delta Plan-2100 have been sent to Ministry of Agriculture on 14/09/2021.
- Comments on Independent Evaluation Group "The World Bank Group" in Bangladesh Country Programme Evaluation (CPE): FY11-FY20 have been sent to Ministry of Agriculture on 27/02/2022.

8. Workshop/Seminar/Training/Meeting

a) Annual Review Workshop on progress of activities of 2020-21 and Work Plan for 2021-22

- Held on 26 August 2021
- 50 scientists/officers attended
- Progress of the approved work plan 2020-21 were presented by Technical Divisions/Units
- Work plan for 2021-22 were presented in the workshop & then revised according to the comments/suggestions/recommendations
- Final Workplan 2021-22 sent to the Divisions/Units.

b) Livelihood Improvement of farmers through Integrated Farming System Research and Development of Drought and Rain-fed Ecosystem (Project ID: 097)

Meeting:

Coordination Meeting held on 07.12.2021 at Conference Room-2 with participation of 7 (Male-7; Female-0) members.

Training:

- Methodology on Farming System Research and Development held on 18-20 April 2022 at Room No. -301, Training Building, BARC with participation of 30 scientists (Male -29; Female-1)

- Methodology of Farming System Research and Development organized from 26.05.2022 to 28.05.2022 at Conference Hall, OFRD, BARI, Sylhet with participation of 23 (Male-21; Female-2) Scientific Assistant and same level personnel.

Workshop:

- 2nd Year Annual Review Workshop held on 28.02.2022 at Auditorium of BARC with participation of 56 participants (Male-51; Female-5).

- Draft PCR Preparation Workshop held on June 14, 2022 at Auditorium of BARC with participation of 50 participants (Male- 44; Female-6).

c) Expert Panel workshop:

- Inception Workshop held at Conference Room-01, BARC on 28/12/2021.
- Sensitization Workshop held at BARI, Gazipur on 10/01/2022.
- Sensitization Workshop held at BJRI Head Quarter in Dhaka on 31/3/2022.
- Technical Workshop (Group discussion) held at BJRI Head Quarter in Dhaka on 12/4/2022
- Consultation Meeting held at, BJRI Head Quarter in Dhaka on 25/4/2022.
- Technical Workshop (Group discussion) held at BARI, Gazipur on 13/6/2022.
- 14/6/2022 Technical Workshop (Group discussion) held at, BARI, Gazipur.

d) Workshop on the Preparation of Agricultural Workplan in Accordance with 4IR

- A day-long Workshop on "Preparation of Agricultural Workplan in Accordance with 4IR" was held on 15 June 2022 at Auditorium of BARC was jointly organized by the Ministry of Agriculture and Planning and Evaluation Division, BARC.
- Planning and Evaluation Division, BARC arranged the Zoom platform meeting on "Finalize of combined Agricultural Workplan in Accordance with 4IR" was held on 14 July 2021.
- "Combined Agricultural Workplan in Accordance with 4IR" BARC has sent to the Ministry of Agriculture draft was held on 05/09/2021.
- Use of cloud data for mango production technology released and approved budget sent to Ministry of Agriculture on 20/12/2021.

e) Inception Workshop of OFANS Project

- Organized Inception Workshop on Omics Food and Nutritional Security – Platform Technologies to Enhance Crop Genetic Resources and Food Value Chains in Bangladesh (OFANS) on 30 January 2022.

f) Workshop on Bangladesh Delta Plan 2100

- A day-long workshop on "Bangladesh Delta Plan-2100" was held on 15 February 2022 at Bangladesh Agricultural Research Council (BARC), Dhaka.
- A total of 90, participants from different organizations viz., BARI, BRRI, BINA, BSRI, BJRI, BSTRI, CDB, BFRI, BADC, BARC, DAE, SRDI, DAM, BLRI, BWMRI and BTRI attended the Workshop.

g) Consultation Workshop on Programme on Agricultural and Rural Transformation for Nutrition, Employment, and Resilience in Bangladesh (PARTNER)

- Held on 07 April 2022 at BARC Conference Room-1.
- A total of 38 participants attended the programme including representatives from BARC, BARI, BRRI, CDB, BSRI, BINA, BJRI, BWMRI, SRDI, development partners including World Bank, and IFAD.
- The activity of all NARS Institutes under proposed PARTNER project presented and discussed.

h) Workshop on Identifying the Thematic Areas for Investment in Transforming Agriculture

- Held on 09 June 2022 at BARC Auditorium.

- Around 65 participants attended the programme including representatives from Ministry of Agriculture, BARC, DAE, BARI, BRRI, DAM, CDB, BIRTAN, BSRI, BINA, BJRI, SCA, AIS, NATA, BADC, development partners including World Bank, Islamic Development Bank, IFAD, USAID, DAI, IRRI, GAIN, IFPRI, CIMMYT, Embassy of the Netherlands to Bangladesh and leading private sector organizations.
- Four investment areas were selected, namely "Agro processing, marketing and commercialization", "Climate Smart Agriculture (CSA): Technology development and dissemination", "specialized and multipurpose cold storage, post-harvest management, supply chain management" and "Irrigation and Water Management." The others as cross cutting themes that can easily be achieved through the four major categories.
- The meeting minutes were sent to the Ministry of Agriculture on 22 June 2022.

i) Training attended by the Scientists of Planning and Evaluation Division

i) Dr. Md. Ashraful Alam & Dr. A B M Khaldun, PSO (P&E), BARC attended a training programme entitled "Agricultural Policy & Strategy for Agricultural Training for Senior Executive Scientists" on 04-08 June/2022 conducted by PIU-BARC at National Agricultural Training Academy (NATA), Gazipur.

ii) Dr. A B M Khaldun, PSO (P&E), BARC attended a training programme entitled "Use of Fertilizer Inspection Manual" on 21-23 June 2022, at BARC conducted by Soils Unit, Natural Resources Management Division, BARC, Dhaka.

iii) Dr. A B M Khaldun, PSO (P&E), BARC attended a training programme entitled "Bioinformatics for Sustainable Development in Agriculture" on 22-26 May 2022, at BARC conducted by Livestock Division, BARC, Dhaka.

iv) Dr. A B M Khaldun, PSO (P&E), BARC attended a training programme entitled "Climate Change, Carbon Sequestration and Adaptation Strategies" on 25-27 April 2022, at BARC conducted by Livestock Division, BARC, Dhaka.

v) Dr A B M Khaldun, PSO (P&E), BARC attended a training programme entitled "Methodology of Framing System Research and Development" on 18-20 April 2022, at BARC conducted by Soils Unit, Natural Resources Management Division, BARC, Dhaka.

vi) Dr. A B M Khaldun, PSO (P&E), BARC attended a training programme entitled "Technical Report Writing and Editing" on 06-10 March 2022, at BARC conducted by Agricultural Information Centre, BARC, Dhaka.

9. Meeting on Annual Performance Agreement

i) Monthly Meeting for Annual Performance Agreement (APA) Team on 2021-22 Financial Year.

ii) Member Director attended 12 Meetings from July 2021 to June 2022.

ii) NATP-2 PIU, BARC

- Joined the NATP-2 PIU, BARC Project PIC Meeting.

iii) Organized Consultation Meeting

- Arranged Consultation Meeting on GIFS with Canadian High Commissioner.

iv) Coordination Meeting of OFANS project.

- Organized coordination Meeting of OFANS project projection on 31 March 2022 at BARC.

10. Regular/Routine Activities: Reporting

(a) ADP review Meetings

- RADP has sent to Ministry of Agriculture on 13/12/2021.
- Sent report of Monthly Meeting of ADP to the Ministry of Agriculture.

(b) Monthly progress report of different projects of MoA

- Project proposal submitted to Japans Government for Science and Technology Research Partnership for Sustainable Development (SATREPS) on 29/08/2021.
- Report on DCs conference with honourable Prime Minister-2019 has sent to Ministry of Agriculture on 19/09/2021.
- Updated law clause 5 of Access to Information Act-2009 on 29/11/2021.
- Report on Bangladesh sanitary and phytosanitary provided by Asia-Pacific Association of

Agricultural Research Institution (APAARI) has sent to Department of Agricultural Extension (DAE) on 13/01/2022.

- Evaluation report of potato preservations processing and marketing has sent to Department of Agricultural Extension (DAE) on 17/02/2022.
- New project proposal of German funds has been sent to Ministry of Agriculture on 03/03/2022.
- Project proposal submitted on D-8 project support Fund on 20/03/2022.
- Meeting on budget of DLI-8 of Programme on Agricultural and Rural Transformation for Nutrition, Employment and Resilience (PARTNER) on 19/05/2022.

(c) Reports to MoA (Ministry of Agriculture)

- Comments of Bangladesh Agricultural Research Council (BARC) on Payra-Kuakata Comprehensive Master Plan sent to Ministry of Agriculture on 30/05/2022.
- Comments on draft Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI) and University of Barisal have been sent to Ministry of Agriculture on 25/05/2022.
- Comments on draft Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI) and Ispahani Agro Limited have been sent to Ministry of Agriculture on 25/05/2022.
- Comments on draft Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI) and Maxim Agro has sent to Ministry of Agriculture on 23/05/2022.
- Comments on draft Joint working plan and focal point selection of draft Agreement on 03/05/2022.
- Comments on draft Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI) and Paragon Group have been sent to Ministry of Agriculture on 28/04/2022.
- Bangladesh Agricultural Research Council (BARC) on draft "Comprehensive National Integration Policy" sent to Ministry of Agriculture on 21/04/2022.
- Comments on draft Memorandum of Understanding (MoU) between Government of People's Republic of Bangladesh and Government of Hungary have been sent to Ministry of Agriculture on 22/03/2022.
- Comments on draft Joint Research Memorandum of Understanding (MoU) between Bangladesh Jute Research Institute (BJRI) and Yean Bangla Manufacturing Industry Company Limited Charkol have been sent to Ministry of Agriculture on 03/03/2022.
- Comments on draft Joint Memorandum of Understanding (MoU) between Bangladesh and Arab Emirates sent to Ministry of Agriculture on 28/02/2022.
- Concept Note of FAO technical cooperation (2022-23) has sent to Ministry of Agriculture on 16/02/2022.

- Comments on Memorandum of Understanding (MoU) between BARC on WUR, Netherlands and Greenwith University, UK have been sent to Ministry of Agriculture on 10/02/2022.
- Comments on draft Memorandum of Understanding (MoU) between Department of Agricultural Extension (DAE) and Commonwealth Educational Media Centre for Asia (CEMCA) have been sent to Ministry of Agriculture on 03/02/2022.
- Comments on Memorandum of Understanding (MoU) between BARI and PKSF sent to Ministry of Agriculture on 30/01/2022.
- Comments on Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI) and Hortex Foundation have been sent to Ministry of Agriculture on 13/01/2022.
- Inputs of BARC sent to prepare Assessing the Synergies and Trade-Offs among Sustainable Development Goals: The Case of Bangladesh on 13/02/2022.
- Comments on Collaboration Opportunities between the Ministry of Post, Telecommunication and Information Technology and the ITU have been sent to Ministry of Agriculture on 28/11/2021.
- Sent inputs of BARC for the direct encashment to the beneficiary under G2P.
- Provide inputs on the Memorandum of Understanding (MoU) between Bangladesh and Netherlands for revise of extension.
- Comments on Memorandum of Understanding (MoU) between Bangladesh Agricultural Research Institute (BARI) and Thengamara Mohila Sabuj Sangha (TMSS) have been sent to Ministry of Agriculture.
- Comments of BARC Joint Action for Nutrition Outcome (JANO) Project Implementation of Department of Agricultural Extension (DAE) for triparty MoU preparation.
- Provide inputs for Bangladesh Delta Plan-2100 inter-ministerial meeting.

(d) Reports on SDG

- Sent the report of BARC on SDG Targets of Ministry of Agriculture achieving activities on 05/09/2021.
- SDG Monthly report sent to the Ministry of Agriculture for the month of August 2021 on 06/09/2021
- Sent the report of BARC on SDG Targets of Ministry of Agriculture achieving activities on 29/09/2021.
- SDG Monthly report sent to the Ministry of Agriculture for the month of September 2021on 05/10/2021.
- Comments of BARC on SDG tracker data calendar examination on 13/10/2021.
- SDG Monthly report sent to the Ministry of Agriculture for the month of October 2021on 01/11/2021.
- Updated data in SDG tracker on 07/11/2022.
- SDG Monthly report sent to the Ministry of Agriculture for the month of November 2021 on

06/12/2021.

- Provided information of all Institutes under Ministry of Agriculture employees at SDG tracker on 13/12/2021.
- SDG Monthly report sent to the Ministry of Agriculture for the month of December 2021on 11/01/2022.
- Provided the progress of SDG 2nd National Conference on 11/01/2022.
- Comments on "Assessing the Synergies and Trade-Offs among Sustainable Development Goals: The case of Bangladesh" sent to the Ministry of Agriculture on 12/01/2022.
- Updated data in SDG tracker full time Scientist document sent to the Ministry of Agriculture on 13/01/2022.
- Sent nomination for SDG tracker operator of BARC on 26/01/2022.
- SDG Monthly report sent to the Ministry of Agriculture for the month of January 2022 on 06/02/2022.
- Updated data in SDG tracker full time Scientist document sent to the Ministry of Agriculture on 27/01/2022.
- SDG Monthly report sent to the Ministry of Agriculture for the month of February 2022 on 08/03/2022.
- SDG Monthly report sent to the Ministry of Agriculture for the month of March 2022 on 05/04/2022.
- Selection of alternates focal point implementation BARC part for SDG on 27/04/2022.
- SDG Monthly report sent to the Ministry of Agriculture for the month of April 2022 on 10/05/2022.

e) Monthly Report for Social Security on Agriculture Sector

- Establishment three Hill Districts Social Security project & Budget approved for Financial Year 2021-22 sent to 04/09/2021.
- Comments sent on proceeding of 14th of Agriculture document of 14th meeting for Food Security and Disaster Management Committee comment on 25/10/2021.
- Proceeding sent to the Ministry of Agriculture inputs on Food Security and Disaster management cluster committee 15th meeting on 19/12/2021.
- Social Security on Agriculture sector Monthly report sent to the Ministry of Agriculture for the month of December 2021 on 20/01/2022.
- Comments on Draft Outcome of the pre-conference Dialogue for the Delta Plan Breakout Session on the Agriculture Sector Transformation Programme (ATP) has sent to the Ministry of Agriculture on 16/05/2022.

11. Attended Different Workshops/Seminars/Meetings

- Attended BFRI Workshop on Blue Economy at BARC
- Attended BAEN organized PPP workshop
- Attended Crop zoning workshop
- Member Director attended as Panel Discussant at the Webinar on Mobilizing Action for Food System Transformation in Bangladesh
- Attended NATP-PIU Review workshop
- Attended GIFS meeting with GIFS delegates at BARC
- Attended meeting on NIS
- Attended D-8 meeting
- As a Member of the Committee attended BSTI meeting
- Member Director attended as a trainer of GAP policy at DAE
- Member Director attended as a member of BSRI Board meeting
- Attended Planning Commission meeting on Seaweed DPP.
- Attended bilateral meeting with Sudan Agriculture Minister
- Attended GAP workshop
- Attended APRC meeting
- Attended FAO TCP selection meeting at ERD
- Attended workshop on CIMMYT / iDE / Georgia Tech implemented, USAID funded, Cereal Systems Initiative for South Asia - Mechanization and Extension Activity (CSISA-MEA)
- Attended Inter - Ministerial programming meeting on DPP at Planning Commission
- Attended Research Priority meeting at BARC organized by NATP-2, PIU-BARC.
- Member Director attended as an Expert Member at BADC Review Workshop.
- Training Manual Published on Methodology on Farming System Research and Development.
- Published Annual Report.
- Published Leaflet on Farming System.
- Published Seaweed (FAO) PCR.

12. Scientific Publications

Jibiao Fan, Ke Chen, Jilei Xu, **Khaldun ABM**, Yao Chen, Liang Chen and Xuebing Yan. 2022.

Physiological effects induced by aluminium and fluoride stress in tall fescue (Festuca arundinacea Schreb). Ecotoxicology and Environmental Safety 231 (2022) 113192. https://doi.org/10.1016/j.ecoenv.2022.113192.

Sujon Kumar, Barkat Ali, **A. B. M. Khaldun**, Shams Shaila Islam, M. Shalim Uddin, M. A. Latif Akanda, and M. Shohidullah Miah.2021. Genetic Diversity, Correlations and Path Coefficient Analysis among the F5 Populations of Brassica Species. Asian Journal of Advances in Agricultural Research. 16 (2): 20-31, 2021; Article no.AJAAR.71999.

13. Book Chapter in Plants

Masum Billah, Shirin Aktar, Marian Brestic, Marek Zivcak, **Abul Bashar Mohammad Khaldun**, Md. Shalim Uddin, Shamim Ara Bagum, Xinghong Yang, Milan Skalicky, Teame Gereziher Mehari, Sagar Maitra andAkbar Hossain. 2021. Progressive Genomic Approaches to Explore Drought- and Salt-Induced Oxidative Stress Responses in Plants under Changing Climate. Plants 2021, 10(9), 1910; https://doi.org/10.3390 /plants10091910.

Mohi-Ud-Din M, M Rohman, **MA Alam**, M Hasanuzzaman, T Islam. 2022. Wheat variety carrying 2NvS chromosomal segment provides yield advantage through lowering terminal heat–induced oxidative stress. Phytoplasma, 1-14.

14. Award

- Ranked 1st position in E-filing activities

MANPOWER AND TRAINING UNIT

Name of the Professionals

Name	Designation
Dr. Md. Baktear Hossain	Director (Manpower & Training)
Mr. Md. Al Mobasher Hussen	Principal Training Officer (Current Charge)

During the reporting period (July 2021 to June 2022), a total of 7,283 scientists/officers/representatives from the National Agricultural Research System (NARS) institutes including Bangladesh Agricultural Research Council (BARC) and other associate organizations participated in the revenue/other sources' funded training/workshop/seminar/higher studies programmes at home and abroad through physical and virtual modality.

The major activities that Manpower and Training Unit has accomplished/assisted in implementation during the reporting period are given below.

1.1 Training on Citizen Charter

The Manpower and Training Unit, BARC, conducted, in 04 (four) batches, a day-long training on "Citizen Charter as per Annual Performance Agreement (APA) Work Plan 2021-2022". A target of 04 batches training on *Citizen Charter* was set by the Cabinet Division under APA's good governance and reform activities. The objectives of the trainings were to make administration more accountable, responsive, transparent and citizen-friendly.

(i) The 1st Batch for Officer (10th & above grades): The 1st batch of training on citizen charter was held on 18 September 2021 at BARC. As many as 40 officers of the Council attended the training programme. Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC, inaugurated the day-long training as Chief Guest.

Dr. Humayra Sultana, Joint Secretary (Budget and Monitoring) and Focal Point, APA Team, Ministry of Agriculture and Dr. Md. Saifullah, Member Director (Admin & Finance) and Convener, APA Team, BARC, conducted the training session as resource speakers. A total of five topics viz: i) Citizen Charter: vision, mission & importance, ii) Rules & regulations related to the provision of services, iii) Service delivery systems and timeline, iv) Types of services and v) BARC Citizen Charter, etc. were discussed in the training.

(ii) **The 2nd Batch for Staffs (11-15 Grades):** The 2nd batch training on Citizen Charter was held on 30 November 2021 at BARC. A total of 40 staffs of BARC participated in the training programme. Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), inaugurated the training session as the chief guest. The APA team members of BARC conducted training sessions as resource speakers.

(iii) The 3rd Batch for Staffs (16-18 Grades): The 3rd batch training programme on Citizen Charter was held on 16 February 2022 at BARC. A total of 30 staffs of BARC took part in the training programme. Dr. S M Bokhtiar, Executive Chairman, BARC, inaugurated the training programme as Chief Guest while the APA team members of BARC conducted training sessions as resource speakers.

(iv) The 4th batch for staffs (19-20 grades): The 3rd batch training programme on Citizen Charter was held on 16 February 2022 at BARC. A total of 30 staffs of BARC took part in the training programme. Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC inaugurated the training programme as Chief Guest while the APA team members of BARC conducted training sessions as resource speakers.

1.2 Orientation Training on BARC and Service Rules & Regulations

The Manpower & Training Unit organized the orientation training for new employees of BARC on 25 November 2021 at BARC. The objective of the training was to orient new employees about BARC activities and Service Rules & Regulations. A total of 30 new employees participated in the training programme. Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), inaugurated the training session as the Chief Guest.

1.3 Training on Annual Confidential Report (ACR)

The Manpower and Training Unit, BARC, organized a day-long training on "Annual Confidential Report (ACR)" on 29 January 2022 at BARC. A total of 60 officers of the Council including senior officials like Member Directors & Directors took part in the training programme. The objective of the training was to make a clear understanding of the performances, integrity, quality, etc. of an officer during a particular calendar year. Dr. Aziz Zilani Chowdhury, Member Director (Crops), BARC, inaugurated the training programme as Chief Guest while Mr. Subrata Bhowmik, Joint Secretary, Ministry Of Fisheries & Livestock (MoFL) conducted the training sessions as resource person

1.4 Training on Annual Performance Agreement (APA)

The Manpower and Training Unit, BARC, conducted day-long training on Annual Performance Agreement. The training was held on 28 May 2022 at BARC. A total of 56 officers of the Council attended the training programme. Ms. Wahida Akter, Addl. Secretary (Admin), Ministry of Agriculture conducted major three sessions on i) APA concept, background and importance, ii) Guidelines for APA iii) APA structure, process & timeline as resource speaker.

Runu Saha, Sr. Asst. Secretary (Budget & Monitoring) also conducted another two sessions on APA Mandatory Strategic Objectives (MSO) and APA Monitoring and Evaluation in the programme. All level officers of BARC participated in the session.

2. Meeting with Stakeholders on Citizen Charter

As per Annual Performance Agreement (APA) 2021-2022, the Manpower and Training Unit organized 02 (two) stakeholders' meetings on citizen charter at BARC with participation of NARS Institutes and fertilizer entrepreneur

Sl No.	Activities	Progress
●	Stakeholder 1st Meeting on Citizen Charter as per APA 2021-2022	Held on 12 December 2021 at BARC under revenue budget No. of Participants: 44 (NARS representative & Fertilizer Entrepreneur) Chairperson: Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC
	 EC, BARC chaired the meeting	
●	Stakeholder 2nd Meeting on Citizen Charter as per APA 2021-2022	Held on 04 June 2022 at BARC under revenue budget No. of Participants: 25 (NARS representative & Fertilizer Entrepreneur) Chairperson: Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC
	 MD (Crops), BARC chaired the meeting	

3. Project/Research Activities

Project Name: Omics Food and Nutritional Security–Platform Technologies to Enhance Crop Genetic Resources and Food Value Chains in Bangladesh (OFANS)

Theme 1: Application of genomics and phenomics in plant breeding for crop improvement

Specific Objective 1.4: Establishing advanced and gender-balanced training programme at graduate, master's, doctoral and post-doctoral levels between Bangladesh and Canada.

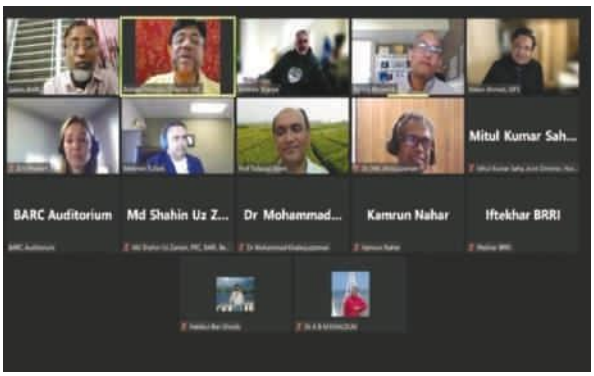
PI: Dr. M. Baktear Hossain, Director and **Co-PI**: Md. Al Mobasher Hussen, PTO

Activities	Progress
• Consultation Meeting on Strategies for Activity Implementation of Specific Objective 1.4 with the participation of Bangladesh and Canada stakeholders 	Held on 24 April 2022 at BARC No. of Participants: 13 Participants from Bangladesh (BARI, BRRI, BWMRI, BSMRAU) and Canada (GIFS) Chairperson: Dr. Md. Abdus Salam Member Director (P&E) and Project Coordinator, OFANS
• 2nd Coordination Meeting on Reviewing the Activity Progress of Specific Objectives 1.4 and next steps 	Held on 27 June 2022 at BARC No. of Participants: 13 Participants from PIs and Co-PIs of BARI, BRRI, BWMRI and BSMRAU Chairperson: Dr. Shaikh Mohammad Bokhtiar Executive Chairman, BARC

Theme 4: Postharvest food handling and processing

Specific Objective 4.4: Design an online training module for post harvest food handling and processing in Bangladesh
PI: Dr. M. Baktear Hossain, Director **and Co-PI:** Md. Al Mobasher Hussen, PTO

• Consultation Meeting on Strategies for Activity Implementation of Specific Objective 4.4 with the participation of Bangladesh and Canada stakeholders 	Held on 14 May 2022 at BARC No. of Participants: 18 Participants from Bangladesh (BARI, BRRI, BWMRI, BSMRAU) & Canada (GIFS) Chairperson: Dr. Md. Abdus Salam Member Director (P&E), BARC and Project Coordinator, OFANS

Activities	Progress
• Meeting of training module preparation on Bioinformatics, Food Hygiene and Food Safety Handling under specific objective 1,4 & 4,4 	Held on 1 June 2022 through online zoom platform The participation of major PIs & Co-PIs from Bangladesh and Canada Canadian Part: Representative from GIFS, NRC and SFIDC Bangladesh Part: PI & Co-PI from BARI, BRRI, BSMRAU, BWMRI **Moderator:** Dr. Pankaj Bhowmik, Senior Research Officer and Scientific Support Lead, Sustainable Protein Production (SPP) Program, National Research Council of Canada

4. Foreign Training/Seminar/Workshop/Consultation Meeting

During the reporting period, apart from in-country activities, the Manpower and Training Unit conducted the nomination process for participation in virtual international seminar/workshop/meeting. A total number of 41 research managers/scientists/personnel under different fields of agriculture and cross cutting issues attended 21 programmes (training/seminar/workshop/meeting) to enrich their professionalism in order to achieve the country's ultimate goal to ensure food and nutrition security.

5. In-country Training/ Workshop/ Seminar

During the reporting period, 61 training programmes and 64 workshops/seminars were arranged by the divisions/units of BARC. Under revenue funding, 46 training programs and 38 workshops were organized. The participants for the training and workshop/seminar were 2,221 and 4,783 respectively.

5.1: Training (Revenue)

- **In-house-Training**

Division/ Unit	Training Title	Training Venue	Duration	No. of Participants		
				M	F	Total
Computer & GIS Unit	Training on Service Process Simplification (SPS) (1st Batch)	BARC	27/09/2021	21	4	25
	Training on Service Process Simplification (SPS) (2nd Batch)	BARC	29/12/2021	22	3	25
	Training on Service Process Simplification (SPS) (3rd Batch)	BARC	16/03/2022	19	6	25
	Training on e-filing for Officer	BARC	02/02/2022	20	2	22
	Training on e-filing for Staff	BARC	03/02/2022	14	6	20
	Training on Increase IT skills for Officer	BARC	29/03/2022	16	4	20
	Training on Increasing IT skills for Staff	BARC	31/03/2022	16	4	20
	Training on Service Process Simplification (SPS) (4th Batch)	BARC	20/06/2022	23	2	25
Manpower & Training Unit	Training on Citizen Charter (1st Batch)	BARC	18/09/2021	36	6	42
	Orientation Training for Newly Recruited Employees	BARC	25/09/2021	21	7	28
	Training on Citizen Charter (2nd Batch)	BARC	30/11/2021	30	10	40
	Training on Annual Confidential Report (ACR)	BARC	29/01/2022	50	8	58
	Training on Citizen Charter (3rd Batch)	BARC	16/02/2022	29	1	30
	Training on Citizen Charter (4th Batch)	BARC	25/04/2022	18	9	27

Division/ Unit	Training Title	Training Venue	Duration	No. of Participants		
				M	F	Total
Principal Technical Officer RTI officer, EC office	Training on Right to Information Act 2009	BARC	03/11/2021	53	8	61
	Training on Right to Information Act 2009	BARC	04/04/2022	53	8	61
	Training on Right to Information Act 2009	BARC	29/05/2022	39	6	45
Admin Unit	Training on National Integrity Strategy (NIS) (1st Batch)	BARC	16/09/2021	41	9	50
	Training on National Integrity Strategy (NIS) (2nd Batch)	BARC	14/03/2022	65	17	82
	Training on Grievance Redress System (GRS) & application of GRS software (1st Batch)	BARC	19/09/2021	25	5	30
	Training on Grievance Redress System (GRS) & application of GRS software (2nd Batch)	BARC	27/12/2021	28	2	30
	Training on Grievance Redress System (GRS) & application of GRS software (3rd Batch)	BARC	14/02/2022	22	8	30
	Training on Grievance Redress System (GRS) & application of GRS software (4th Batch)	BARC	30/05/2022	45	10	55
	Training on HRD and performance enhancement for the 4thclass staff (1st Batch)	BARC	23/01/2022-27/01/2022	22	11	33
	Training on HRD and performance enhancement for 4thclass staff (2nd Batch)	BAR C	23/01/2022-27/01/2022	26	7	33
	Training on HRD and performance enhancement for 3rdclass staff (1st Batch)	BARC	16/01/2022-20/01/2022	26	7	33
	Training on HRD and performance enhancement for 3rd class staff (2nd Batch)	BARC	16/01/2022 20/01/2022	26	4	30
	Total (Programmes 28)					**1,036**

- **Training Organized for NARS Scientists and Others (Revenue)**

Division/ Unit	Training Title	Training Venue	Date	No. of Participants		
				M	F	Total
Nutrition Unit	Food Utilization, Quality Processing and preservation techniques of Agro-products at households level	DAE, Cox'x bazar	26-29 Dec.2021	26	9	35
Nutrition Unit	Food Utilization, Quality Processing and preservation techniques of Agro-products at households level	ADMUS, Malatinagar Bogura	7-10 Jan.2022	27	8	35
	Awareness building on the importance of food-based nutrition information and health impacts	Agriculture Faculty, Rajshahi University	5-8 Nov.2021	20	15	35
	Awareness building on the importance of food-based nutrition information and health impacts	BFRI , Rangamati	27-30 Nov.2021	25	10	35
	Role of Food Based Nutrition to reduce Stunting and Wasting	UAO office, Botiaghata, Khulan	20-23 Nov.2021	26	9	35
	Role of Food Based Nutrition to reduce Stunting and Wasting	Jojkkhula, Pirojpur	10-13 Dec.2021	31	4	35
Livestock Division	Training on Antimicrobial Resistance in Bangladesh	Dept. of Medicine, BAU	29 Nov.-02 Dec.2021	25	5	30
	Training on Antimicrobial Resistance in Bangladesh	CDIL, DLS, Dhaka	6-9 March 2022	24	6	30
	Training on Bioinformatics for Sustain able Development in Agriculture	BARC	22-26 May 2022	16	4	20
NRM (Soil)	Training on Use of Fertilizer Recommendation Guide 2018	BARC	29-31 May 2022	28	12	40
	Training on use of Fertilizer Inspection Manual	BARC	21-23 June 2022	32	8	40
AERS Division	Application of Impact Assessment Methods in Agriculture for NARS Scientists (Agril. Economist)	BARC	29 May to 2 June 2022	16	4	20

Division/ Unit	Training Title	Training Venue	Date	No. of Participants		
				M	F	Total
TTMU unit	Training on Post-harvest Management of Fruits and Vegetables	BARI, Gazipur	12-14 Oct.2021	26	4	30
	Training on Recently Developed Modern Rice Varieties	BRRI, Gazipur	16-2021	23	7	30
AIC	Technical Report Writing and Editing	BARC	6-10 Mar. 2022	24	6	30
Total (Programmes 18)						**591**

- **Training organized for NARS scientists & others (NATP-2 and other funding source)**

Division/ Unit	Training Title	Training Venue	Date	No. of Participants		
				M	F	Total
TTMU	Training of Sugarcrop technologies generated from Bangladesh Sugarcrop Research Institute (BSRI)	BSRI, Ishwardi, Pabna	7-9 March 2022	29	1	30
NRM (Agril Engineering)	Training on Use of 'Modern Farm Machinery for Ensuring Food Security'	BARC	25-27 Jan.2022	28	2	30
NRM (Soil)	Training Programme on Climate Change, carbon sequestration andadaptation strategies	BARC	25-27 April 2022	25	7	32
	Sustainable Soil Management under NUMAN proj ect, FAO	Chuadanga	28-29 Aug. 2021	37	3	40
	Sustainable Soil Management under NUMAN project, FAO	Cumilla	7-8 Nov. 2021	34	6	40

Division/ Unit	Training Title	Training Venue	Date	No. of Participants		
				M	F	Total
PIU_BARC, NATP -2	Total 10 batches traini ng organized under PIU_BARC, NATP_2	BARC	July 2021-June 2022	339	83	422
Total (Programmes 15)						**594**

Total Training (Programme Number 61): (A+B+C): Participants Number: 2,221

5.2. Workshop/Seminar Organized for NARS Scientists and others

A. Workshop (Revenue)

Division/ Unit	Workshop Title	Venue	Duration	No. of Participants
Crops Division	Annual Review Workshop on Disease Management Programme of NARS Institutes: Research Progress 2020-21 and Research Programme 2021-22	BARC	12 Sept. 2021	62
	Annual Review Workshop on Insect Pest Management Programme of NARS Institutes: Research Progress 2020-21 and Research Programme 2021-22	BARC	13 Sept. 2021	63
	Annual Review Workshop on Crop Improvement Programme of NARS Institutes: Research Progress 2020-2021 and Rese arch Programme 2021-22	BARC	15-16 Sept. 2021	77
	Annual Review Workshop on Crop Production Programme of NARS Institutes: Research Progress 2020-2021 and Research Programme 2021-22	BARC	20-21 Sept. 2021	83
	Annual Review workshop on Biotechnology Programme of NARS institutes: Research Progress 2020-21 and Research Programme 2021-22	BARC	23 Sept. 2021	71
	Progress Review Workshop on Biotechnological Research Based on Biotechnology Policy-2012 (1st Batch)	BARC	01 Nov. 2021	59
	Workshop on HYV Hybrid variety development and dissemination at framers' level	BARC	30 May 2022	103

Division/ Unit	Workshop Title	Venue	Duration	No. of Participants
	Progress Review Workshop on Biotechnological Research Based on Biotechnology Policy-2012 (2nd Batch)	BARC	06 June 2022	63
Crops Division	Knowledge Sharing Workshop on Fighting Back Against Fall Armyworm: Integrated Pest Management Solution (Jointly BARC & CIMMYT)	BARC	22 June 2022	222
AERS Division	Review of Socio-Economic Research Programmes of NARS Institute	BARC	14 Sept. 2021	70
	Review of Socio-economic Research Progress (2021-22) & Future Research Programme (2022-23) of NARS institutes	BARC	15 June 2022	80
Computer & GIS unit	Workshop on "4th Industrial Revolution" (1st Batch)	BARC	23 Nov. 2021	50
	Workshop on "4th Industrial Revolution" (2nd Batch)	BARC	19 April 2022	59
	Workshop on "Crop Zoning Software Khamari Mobile app"	BARC	08 June 2022	165
NRM Division	Workshop on Informing and Reviewing Action Plans for Implementation of Good Agricultural Practices in Bangladesh	BARC	9 Jan.2022	100
Soils unit	Research Review and Programme Planning Workshop of Soils Programs of NARS Institutes	BARC	11-13 Oct.2021	80
Agril. Engg. unit	Research Review 2020-21 and Research Programme 2021-22 on Agricultural Engineering of NARS institutes	BARC	24-25 Oct. 2021	72
	Study of the IOT based precision agriculture for sustainable crop production in Bangladesh	BARC	19 Dec. 2021	

Division/ Unit	Workshop Title	Venue	Duration	No. of Participants
Forestry unit	Research Review 2020-21 and Research Planning 2021-22 on Forestry and Agroforestry in Bangladesh	BARC	27-28 Oct. 2021	60
P&E Division	Workshop on Annual Progress 2020-2021 & Work Plan 2021 -2022	BARC	23 August 2021	50
	Workshop on the 4th Industrial Revolution (4IR)	BARC	2 March 2022	90
	Workshop on Delta Plan-2100	BARC	10 Oct.2021	120

Division/ Unit	Workshop Title	Venue	Duration	No. of Participants
Agricultural Information Centre	Communication Skill Development for Agricultural Scientists	BARC	25 May 2022	64
Livestock Division	Annual Workshop on Research Review 2020-21 and Research Progress 2021-22 of Bangladesh Livestock Research Institute	BARC	31 Oct. to 01 Nov. 2021	60
	Workshop on Qualitative and Quantitative study of Hazardous Chemicals in Broiler	BARC	13 Jan.2022	50
Nutrition	Food Adulteration and Contamination: Inside Fact and Consumer Responsibility (1st Batch)	BFRI, Chattogram	22 Sept. 2021	75
	Food Adulteration and Contamination: Inside Fact and Consumer Responsibility (2nd Batch)	RFBO, Rupsha, Khulna	23 Oct.2021	75
EC Office (PTO)	Workshop on Agricultural Technology and Food Security	BARC	08 May 2022	54
	Total (Programmes 28)			**2,229**

B. Workshop (NATP and others funding)

Division/ Unit	Workshop Title	Venue	Duration	No. of Participants
Different Division/ Unit and PIU -BARC, NATP -2	Total 25 Workshops (organized under NATP-2 funding)	BARC	-	1,586
EC Office (PTO)	Workshop on GAEC: Developing Science Policy for Agriculture, Food Security and Climate Change under CABI, UK funding	BARC	05 June 2022	40
	Total (Programmes 26)			**1,626**

C. Seminar (Revenue and Other)

Division/ Unit	Activity	Venue	Duration	No. of Participants
M&T Unit	Seminar on "Transformation of Nutrition Sensitive Agri-Food System"	BARC	30 Dec. 2021	120
	Seminar on ensuring safe food and food security on climate change	BARC	02 Feb. 2022	120
	Seminar on awareness generation on food and nutritious food consumption	BARC	09 April 2022	140
	Seminar on ICT tools and its application for smooth official work	BARC	06 June 2022	140
Admin Unit	Seminar on National Integrity Strategies (NIS) (1 st Batch)	BARC	13 Sept. 2021	50
	Seminar on National Integrity Strategies (NIS) (2 nd Batch)	BARC	16 March 2022	50
	Seminars on hygiene, balanced diet and health	BARC	19 June 2022	149

Division/ Unit	Activity	Venue	Duration	No. of Participants
EC Office, BARC	Seminar on Right to Information Act-2009	BARC	07 Oct. 2021	42
	Seminar on the Role of Right to Information Act-2009 for ensuring transparency and accountability in government services	BARC	30 March 2022	61
	Seminar on Turkish Agricultural Research Advancement	BARC	25 Jan. 2022	56
	Total (Programmes 10)			**928**

Total Workshop/Seminar (Programme Number 64): (A+B+C): Participants Number: 4,783

6. Higher Education: (Summary of Higher Study at BARC (Ph.D) (2021-2022)

Sl No.		Ph.D		Total	Remark
		Foreign	Local		
3.	PIU -BARC: NATP -2	60	80	140	19 completed
	Total	**60**	**80**	**140**	

7. Human Resources Development (HRD) Status of BARC (2021-2022)

Events	No. Programmes	No. of Participants	Remarks
Training	61	2,221	Rev: 46; Others: 15
Workshop/ Seminar	64	4,783	Rev:38; Others: 26
Foreign Meeting/Seminar/Workshop	28	36	Virtual and Physical
Higher Study (PhD)	-	140	NATP -2 funding
Others	51	103	Participation in local training/seminar/workshop organized by other organization
Total		**7,283**	

FISHERIES DIVISION

FISHERIES DIVISION

Fisheries Division of the Bangladesh Agricultural Research Council (BARC) 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, World Fish etc. Also, it's a part of regular activities of the job to organize and attend in national and international seminar, workshop, symposium, conference, meeting and training in the fields of fisheries and aquaculture, value addition etc. reporting national issues, review of scientific papers, expert opinion and advisory services etc.

Also, maintaining liaison with national and international agencies for collaboration and strengthening national research and developmental programme in fisheries along with agriculture and livestocks. Moreover, the technical advisory services also provided to the Ministry of Agriculture (MoA) on different issues related to agricultural research and special emphasis with fisheries & aquaculture development.

A brief description of the activities done by the Fisheries Division of BARC during the reporting periods between 2021-2022 are given below:

Name of the Professionals

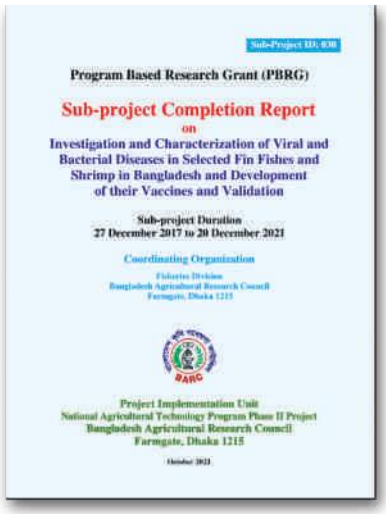
Name	Designation
Dr. Md. Monirul Islam	Member Director

1. Program/Project Developed

A total of 10 PBRG Sub-Projects (ID-029, ID-030, ID-031, ID-035, ID-036, ID-037, ID-154, ID-155, ID-156 and ID-157) were developed and implementing under the direct supervision and monitoring of the Fisheries Division, BARC. The component parts of the PBRG sub-projects are BFRI, BAU, PSTU, BSMRU, RU, SAU, SUST, JUST and NSTU.

Out of these 10 PBRG Sub-Projects, six PBRG Sub-Projects (ID-029, ID-030, ID-031, ID-035, ID-036 and ID-037) have already been completed and four Sub-Projects (ID-154, ID-155, ID-156 and ID-157) are still ongoing. These four PBRG Sub-Projects will be completed in December 2022. The component parts of these four PBRG Sub-Projects are Bangladesh Fisheries Research Institute, Bagerhat, Noakhali Science and Technology University, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Rajshahi University, Jessore University of Science and Tehnology and Sher-e-Bangla Agricultural University.

Project Completion Report (ID-029)



Project Completion Report (ID-030)

Project Completion Report (ID-031)

Project Completion Report (ID-035)

Project Completion Report (ID-036)

Project Completion Report (ID-037)

2. Organizing Workshops/Seminars

The following Workshops were organized by the Fisheries Division at BARC, Farmgate Dhaka. In these Workshops were presented by all Principal Investigator that related with PBRG Sub-Project. With the view to creating awareness to the mass people regarding fish nutrition and its benefits as well as fish adulteration and consumers responsibility. The participants viz., University teachers, Upazila Fisheries officers including other officials at Upazila level, scientists, extension workers, teachers, fish traders, fish feed dealers and reporters from the print and electronic media were invited both of these Workshops. However, in these Workshops programme Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, Bangladesh Agricultural Research Council (BARC) was present as Chief Guest.

Workshop Programme Implemented by the Fisheries Division of BARC

Title	Places/Venue/Date	Total Programme	Total Participiants
Annual Progress Review Workshop on PBRG Sub-Projects	BARC, Farmgate, Dhaka-1215 21 December 2021	01	35
Review Workshop on Research Progress of PBRG Sub-Projects	BARC, Farmgate, Dhaka-1215 02 June 2022	01	70

Annual Workshop PBRG Sub-Projects

3. Policy Level Contribution

The Fisheries Division contributed a good deal in several programmes on aquaculture advocacy, motivation of rural fish farmers and project design by the NARS Institutes, Bangladesh Directorate of Fisheries (DoF), Bangladesh Fisheries Research Institute (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 as follows:

Expert Committee

- Acting as an Expert Member of the Directorate of Fisheries (DoF)
- Tender Evaluation Committee, NATP Project, PIU, DLS component
- Acting as a Member of the 'Fish and Fisheries Products (AFDC -23)' Committee of BSTI;
- Acting as a one of the examiners of the Department of Fisheries and Technology, Patuakhali Science and Technology University (PSTU), Dumki, Patuakhali.
- Acting as a Member, recruitment committee, BFRI

4. 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 organization of activities

undertaken by the institutions, like, DoF, World Fish, BFRI, DAE, BIRTAN, FAO etc., working in the fields of Fisheries and Aquaculture.

5. Research Management and Coordination

As a part of the regular yearly activities, Fisheries Division was involved in the review, monitoring and participatory programme 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 programme implemented by the different NARS Institutes and Universities during the reporting year.

6. Field Monitoring and Evaluation

Fisheries Division, BARC 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 Universities and NARS Institutes during the reporting period. Thereafter, the activities done under the core research programme reporting to the Planning and Evaluation Division in prescribed format and finally presented the field observation in the workshop organized by the BARC in the presence of Principal investigators of the project and other relevant scientists.

However, also monitor the ongoing PBRG Sub-Project activities implementing by BFRI, PSTU, STU, SUST, SAU, KU, JUST and BAU under the supervision of Fisheries Division, BARC.

Field Monitoring

Field Monitoring activities

Nutrition Unit

The Nutrition Unit of Bangladesh Agricultural Research Council (BARC) has been working for better human nutrition for a long period of time. Key activities done by the Unit are project development, supervision, execution, technology development, monitoring and evaluation of the research projects, coordinating 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, World-Fish, IFRI, Hellen Killer, etc. Also, its regular activities include organizing and attending the national and international seminars, workshops, symposiums, conferences, meetings, and training in the field of nutrition in agricultural research and technologies, food adulteration, contamination, and mitigation measures; reporting national issues, review of scientific papers, expert opinion on policy document, and advisory services, etc.

In addition, maintaining liaison with national and international agencies for collaboration and strengthening national research and developmental programme in nutrition along with agriculture, fisheries, and livestock. Moreover, the technical advisory services are also provided to the Ministry of Agriculture (MoA) on different issues related to agricultural research (including crop, livestock, fisheries and nutrition as a whole) and development.

A brief description of activities done by the Nutrition Unit during the reporting 2021-2022 period is given below:

Name of the Professionals

Name	Designation
Dr. Md. Monirul Islam	Director (A.C)
Dr. Mohammad Rafiqul Islam	Director (A.C)
Dr. Zakiah Rahman Moni	Principal Scientific Officer (C.C)

1. Programme/Project Developed and Implementation

Four PBRG Sub-Projects were coordinated and monitored by the Nutrition Unit, which were funded by PIU-BARC, NATP-2.

Details description of the PBRG Sub-Projects are given below:

- PBRG Sub-Project titled "Value addition and standardization of nutritional level in selected food items from animal and plant origin (ID-007)" was coordinated by Nutrition Unit, BARC for a period from 28 March 2018 to 31 January 2022. Two Institutes namely Patuakhali Science and Technology University (PSTU), Barisal and Hazi Mohammad Danesh Science and Technology University (HSTU) Dinajpur, acted as the Component-1 and Component-2, respectivly. Project Completion Report (PCR) was submitted on November 2021 to PIU-BARC-NATP-2. Key information generated from this Sub-Project were as follows:

- Commercial feeds were found to be contaminated either with antibiotics, heavy metals and microorganisms in varying levels and needed to be addressed during feed manufacturing.
- Chick boxes, thin paper, soil, drinking water, wash water and litter at farm level were contaminated with microorganisms and attention should be paid to reduce microbial load.
- Microbial loads were reported in raw broiler meat and thus care should be taken in using water for washing the carcass at wet market.
- Poultry meat and eggs were found to be health-friendly although varying levels of chemicals and heavy metals were detected in poultry feed, raw meat and eggs.

Sub-Project (ID: 007) PCR

- Nutrition Unit, BARC coordinated the Sub-Project entitled "Food-based initiative for improving household food security, income generation and minimize malnutrition (ID-011)" from 5 April 2018 to 13 January 2022. Patuakhali Bangladesh Livestock Research Institute, Savar, Dhaka and Noakhali Science and Technology University were engaged with the research as the Component-1 and Component-2, respectivly. PCR was submitted on November 2021. Key information generated from this Sub-Project is as follows:
  - The BCC tool (plate) developed covered various categories of food items from energy provider to growth and development accelator to disease resistence/immunity developer food items for all categories of age group people.
  - Increase in Ca content was observed higher in fermented BRRI dhan 28, Pari and in Balam Red samples.

- The raw products harvested by the farmers were sold mostly in front of the farmers' households.
- The local Karber (local agent) are now communicating with the farmers which created easy marketing.
- As some fruits are long-term fruits, so it was not possible to value add their production so far.

Pictorial views of Sub-Project (ID: 011) Activities & PCR

- PBRG Sub-Project entitled "Fortification and standardization of nutritional level in selected food items and efficacy test of polyphenolic compounds as quality livestock feed production (ID-099)" was coordinated by the Nutrition Unit, BARC, from 14 August 2018 to 31 December 2021 and PCR was submitted to PIU-BARC, NATP-2 on October 2021. Three Institutes namely Bangladesh Rice Research Institute (BRRI), Gazipur, Bangladesh Agricultural Research Institute (BARI), Gazipur and Bangladesh Agricultural University (BAU), Mymensingh were as research Component-1, research Component-2 and research Component-3, respectivly. Key information generated from this Sub-Project is as follows:
- Considering the quantitative polyphenolic profile, and biomass yield, the following herbs were found to have a greater potential as feed additives for farm livestock: plantain (Plantago lanceolata L.), ivy gourd (Coccinia grandis L.), garlic (Allium sativum), mint (Mentha spp), and lemongrass (Cymbopogon citratus).
- Compared with the CL-diet group, the live weight gain and feed conversion ratio were 18–26% and 13–20% higher in herbal-supplemented groups, respectively.
- Milk yield, milk fatty acids especially polyunsaturated fatty acids and omega-3 fatty acid contents, level of antioxidants were accelerated through medicinal herbs, plantain, and lemongrass supplementation. Between herbs, plantain was found better considering all milk parameters studied.


Sub-Project ID: 099

Program Based Research Grant (PBRG)

Sub-project Completion Report on

Fortification and Standardization of Nutritional Level in Selected Human Foods and Efficacy Test of Polyphenolic Compounds in Livestock Products

Sub-project Duration
14 August 2018 to 31 December 2021

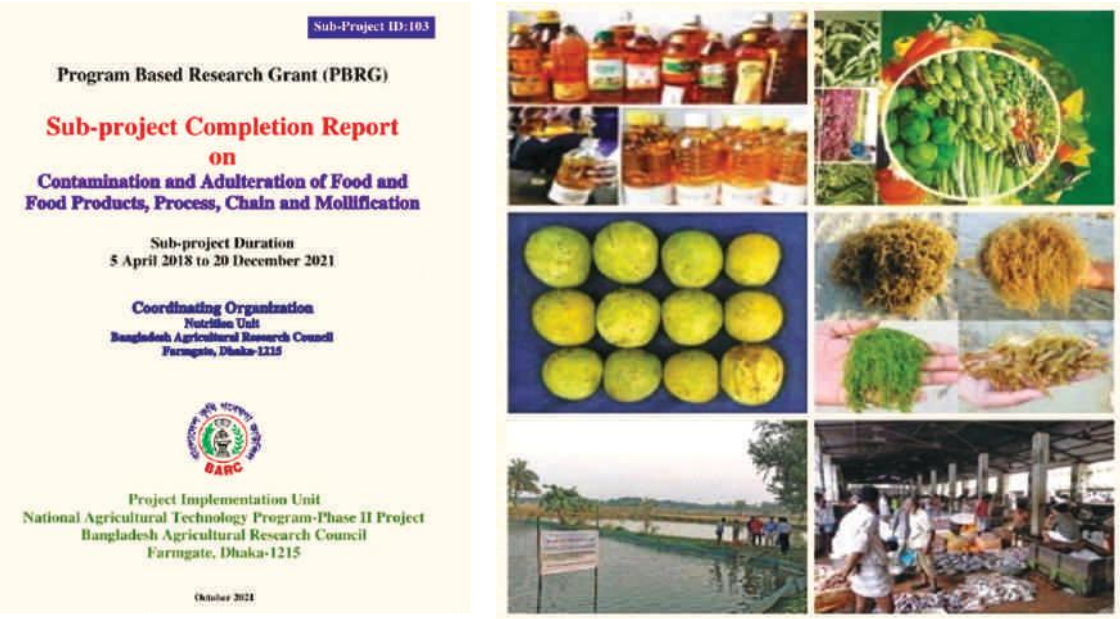
Coordinating Organization
Nutrition Unit
Bangladesh Agricultural Research Council
Farmgate, Dhaka-1215

Project Implementation Unit
National Agricultural Technology Program-Phase II Project
Bangladesh Agricultural Research Council
Farmgate, Dhaka-1215

October 2021

Pictorial views of Sub-Project (ID: 099) Activities & PCR

- The PBRG Sub-Project entitled "Contamination and adulteration of food and food products, process, chain and mollification (ID-103)" was conducted by the Nutrition Unit, BARC, from 05 April 2018 to 20 December 2021 and Project completion report was submitted on October 2021 to PIU_BARC, NATP-2. Two Institutes namely BARI, Gazipur and Bangladesh Fisheries Research Institute (BFRI), Mymensingh were as the Component-1 and Component-2, respectivly of the Sub-Project. Major information generated from this Sub-Project is as follows:
    - Most of the farmers, handlers, traders, retailers and vendors did not have much knowledge regarding physical, chemical, and microbiological, cross contamination and hygiene practices which exists in environment in different ways.
    - Findings of analysis of pesticide type and level of concentration in different forms of cooked vegetables reflects that all types of tested pesticides found to remain within the respective MRL and ADI values.
    - Saponification value and Iodine value of 11 rice bran oil samples studied found within the range of 182.67- 185.64 mg KOH/g for Saponification value and 98.14-103.77 for Iodine Value respectively.
    - All water sources contained different heavy metals such as Pb, Cd, Cr, Ni, Co, Fe and As.



Pictorial views of Sub-Project (ID: 103) Activities & PCR

2. Preparation Policy Document and Inputs

- **Inputs/Comments**

  Last financial year, the Nutrition Unit, BARC, provided the following comments:

  - The Preliminary (Draft) Notification of "Sea Fisheries Policy, 2021" Date: 17-2-22
  - Opinion on amendments to Safe Food Act 2013. Date: 13-4-22
  - Opinions on the Project-submission entitled "Sustainable management of fisheries, marine living resources and their habitats in the Bay of Bengal region for the benefit of coastal states and communities" under the financial (grant) and technical assistance of the Food and Agriculture Organization (FAO) of United Nations . Date: 29-5-22

3. Conducted Training and Workshop

- **Training**

  As part of the human resource development, the Nutrition Unit of BARC organized six different training programmes (Table 1) in the different locations of the country e.g. Khulna, Pirojpur, Coxs Bazar, Chattogram, Bogura, Rangamati, Rajshahi and Jashore during the fiscal year of 2021-2022 to create awareness building on nutrition knowledge, food utilization, balanced diet and health benefits, promote nutrition-rich crops production and means to increase the knowledge of nutrition through capacity building.

  A total of 35 participants (grand total 210 participants) in each training programme from the different organizations considering their involvement with the multi-sectors like sub-assistant agriculture officer, health workers formal and non-formal teachers, local journalists, producers, family farmers, small entrepreneurs, traders, pesticide dealers, depot owner, consumers and other government agency extension workers, attended.

Table 1: Training Programme Implemented by the Nutrition Unit

Title	Places/Venue	Date	No. of Participants		
			Male	Female	Total
• Role of Food Based Nutrition to Reduce Stunting and Wasting	Upazilla Agriculture Office, Batiaghata, Khulna.	20-23 November, 2021	26	9	**35**
• Food Utilization, Quality Processing and Preservation Techniques of Agro-Products at Households Level	DAE, Cox'bazar.	26-29 December, 2021	20	15	**35**
• Role of Food Based Nutrition to Reduce Stunting and Wasting	Jujkhola, Pirojpur Participants	10-13 December, 2021	25	10	**35**
• Awareness building on the importance of food-based nutrition information and health impacts	Venue: River Sub-station, BFRI, Rangamati.	27-30 November, 2021	26	9	**35**
• Awareness building on the importance of food-based nutrition information and health impacts	Department of Agriculture, Rajshahi University	8-11 November, 2021	31	4	**35**
• Food Utilization, Quality Processing and Preservation Techniques of Agro-Products at Households Level	Alor-Dishari MohilaUnnayan Sangstha, Malatinagar, Bogura.	7-10 January, 2022	27	8	**35**

The programmes were organized to disseminate the messages focusing on food-based nutrition with the view that acquired knowledge would be further transferred to neighbors and other stakeholders. The courses were designed covering multidisciplinary sectors and they emphasized the areas viz., agriculture products, gardening, small-scale fish culture, livestock, food hygiene, sanitation, quality safe food, food security, micronutrient benefits, food utilization, 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 addition, special attention was given to all of the programmes on how and which food can help to improve immunity to protect COVID-19 pandemic.

The resource speakers were selected from the multidisciplinary sectors like agriculture, fisheries and livestock as well as scientists from BARI, BFRI, BLRI and Universities. However, Dr. Md. Monirul Islam, Director (Nutrition), BARC attended as a key speaker in all of these training programmes to facilitate and make the entire training programme effective and successful.

Pictorial views of Training activities

Workshop

Two workshops were organized by the Nutrition Unit, BARC on 1 July 2021 and 30 June 2022 at Bangladesh Forest Research Institute (BFRI), Sholashahar, Chattogram and RFBO Auditorium, Rupsha, Khulna, Bangladesh (Table 2). In these workshops, the keynote paper was presented by Dr. Md. Monirul Islam, Director (Nutrition), BARC with a view to creating awareness among the mass people regarding food adulteration, mitigation measures and consumer's responsibility. A total of 75 participants including Upazilla Agriculture Officer, different officials at the Upazilla level such as scientists and extension workers as well as teachers, fruit traders, growers, pesticide dealers and reporters from the print and electronic media from the said region/districts, attended the workshops.

Table 2: Workshop Programme Implemented by the Nutrition Unit

Title	Places/Venue	Date	No. of Participants		
			Male	Female	Total
• Food Adulteration and Contamination -vs- Nutrition: Inside Facts and Consumer Responsibility	Bangladesh Forest Research Institute, Sholashahar, Chattogram.	22 September 2021	55	20	**75**
• Food Adulteration and Contamination -vs- Nutrition: Inside Facts and Consumer Responsibility	RFBO Auditorium, Rupsha, Khulna	23 October 2021	61	14	**75**

4. Report Writing

Annual Progress and Budget Report

- **Islam. M.R., Moni, Z. R.** Annual Progress and Work-Plan Report: (2021-2022) and future Work-Plan (2022-23), Nutrition Unit, BARC, Farmgate, Dhaka
- **Islam. M.R., Moni, Z. R.** Budget Report according to Work-Plan: (2021-2022): "Budget for future Work-Plan (2022-23). Nutrition Unit, BARC, Farmgate, Dhaka
- **Monitoring Report**

  Hassan. S.M., Bhuiyan. A. A., **Moni, Z. R.** (2022). Report on Field Monitoring of selected technologies PBRG sub project NATP-2 under Group-2 of BARC implemented in Rajsgahi Region.

5. National and International Linkage (MOU/Agreement)

Director (Nutrition), BARC acted as Member of different committees of different National and International organizations.

- Acted as a Member of the "Chemical Division" sectional Committee of BSTI, Dhaka.
- Acted as a Member of Agriculture and Food Division Committee (AFDC), BSTI, Dhaka.
- Acted as expert Member of the Food Safety Authority (FSA) (Fruits and Vegetables Committee/crop sector)
- Member of the National Plan of Action on Nutrition (NPAN)
- Member, Nutrition Working Group (NWG)
- Acts as discussant of the Seminar on "Food and Nutrition Security: Role of BIRTAN"

Pictorial views of Seminar activities

6. Publication: (Scientific Journal)

- Rahman, M. A. and **Moni, Z. R.** 2021. Evaluation of Trichoderma Species as Bio-fertilizer on Growth and Yield of Ashwagandha [Withaniasomnifera (L.) Dunal]. Bangladesh J. Plant Pathol. 37(1&2):33-42
- M. N. Aktar, M. M. Islam, M. S. Raza, B. S. Azhar, **Z. R. Moni**, M. M. Rahman, A. T. M. M. Rahman and M. A. K. Tang2022 "Phytochemical Characteristics and Antioxidant Potential Of Litchi Seeds" Bangladesh J. Agri. 2022, 47(1). Accepted

7. Opinion

- The preliminary (draft) of "Marine Fisheries Policy 2021," Date:17/02/2022
- Providing opinions on amendments to the "Safe Food Act, 2013," Date:13/04/22
- Giving opinion on the project-delivered entitled "Sustainable management of fisheries, marine living resources and their habitats in the Bay of Bengal region for the benefit of coastal states and communities" under the financial (Grant) and technical assistance of the Food and Agriculture Organization (FAO) of the United Nations, Date: 29/05/2022

8. Regular Activities

- Attended a good number of Training, Workshop, Seminar, Meeting organized by BARC and other organizations.
- Rapporteur Report/Speech Writing
- Preparation of Meeting Minutes

NATURAL RESOURCES MANAGEMENT DIVISION

AGRICULTURAL ENGINEERING UNIT (AEU)

The Agricultural Engineering Unit (AEU), Natural Resources Management (NRM) Division, BARC, has been implementing the mandated activities and beyond. The Agricultural Engineering Unit, since its inception, has been prioritizing, planning, approving, reviewing, monitoring, and coordinating irrigation and water management, farm mechanization, and postharvest technology-related research Programme of the NARS Institutes, and other Institutions including Universities, Department of Agricultural Extension (DAE) and NGOs. The Unit conducted training programmes, Seminars, Workshops and maintained a 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. AEU is involved in the monitoring of the research programmes of the NARS Institutes and other Institutions including Universities. Activities of the Agricultural Engineering Unit during 2020-21 have been briefly discussed below:

Name of the Professionals

Name	Designation
Dr. Nazmun Nahar Karim	Chief Scientific Officer (AC)
Dr. AFM Tariqul Islam	Principal Scientific Officer
Dr. Md. Ashraful Alam	Principal Scientific Officer

1. Project Development/Project Financing

The Agricultural Engineering Unit has designed, developed and coordinated a KGF-funded project titled "Feasibility Study of the Internet of Things (IoT) Based Precision Agriculture for Sustainable Crop Production in Bangladesh" during the reporting period. Award letter (Memo No. KGF-BKGET/Award letter/Interim-2/TF86-C/21/498, Date: 04.10.2021) was received on 4 October 2021 and MoU was signed between Executive Director of KGF and Executive Chairman of BARC on 26 October 2021.

2. Project Implementation

AEU has implemented the following two NATP-II funded PBRG Sub-Projects and one KGF-funded Project:

i) PBRG Sub-Project (ID: 001) entitled "Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh." (Completed on January 2022)

ii) PBRG Sub-Project (ID: 002) entitled "Groundwater resources management for sustainable crop production in northwest hydrological region of Bangladesh." (Completed on January 2022)

iii) KGF funded Project (ID: TF86-C/21) entitled "Feasibility study of the IoT-based Precision Agriculture for Sustainable Crop Production in Bangladesh." (Ongoing)

3. Policy Level Contribution

The AEU provided comments on the following policy/aspects/ issues and sent them to the MOA and related organizations.

i) Provided comments on the "Light-Engineering Industry Development Policy 2022."

ii) Prepared a report on the Innovation, Science and Digitalization: Accelerators for transformative change in the Asia Pacific Region, 36th Session of the Regional Conference for Asia and the Pacific (APRC 36), Ministerial Session, 10 March 2022.

iii) Provided election statement of 78th session for Governing Council of Sustainable Agricultural Mechanization (CSAM) under Economic and Center of Social Commission for Asia and Pacific (ESCAP).

iv) Provided comments on the inception report prepared for Master Plan on Meghna River Pollution Control, Navigation increase and Ensuring River Bank Stability.

v) Participated on the survey for Preparation of Action Plan and Activities Related to IWRM Implementation of SDG Indicator 6.5.1 in Bangladesh.

vi) Provided comments on TA 0054 REG: Mainstreaming Water Resilience in Asia and the Pacific.

vii) Provided comments on the Draft National Strategy for Managed Aquifer Recharge (MAR) in Bangladesh.

viii) Provided comments on the concept note titled "Optimization of irrigation water, fertilizer and pesticide usages (precision agriculture) for maximizing the farmers' income in Bangladesh using satellite imagery" proposed by GreenEO UG.

ix) Provided inputs to the finalization of the Thematic Area for Agriculture Sector Transformation (ATP)-Investment in Transforming Agriculture (iTAG).

4. Research Management/Financial Management and Coordination

This unit coordinated two PBRG Sub-Projects and one KGF-funded Project along with research and financial management during the reporting period.

5. Monitoring, Reviewing and Evaluation Report of Programmes/Activities of NARS Institutes

i) Conducted field monitoring of KGF-funded Project entitled "Feasibility study of the IoT-based Precision Agriculture for sustainable crop production in Bangladesh (ID: TF86-C/21)'" at BARI on 24 February 2022.

The BARC team visited the project experimental fields and ICT Lab at BARI and discussed with the concerned scientists and field staff. The team collected updated information on the progress of the activities. BARC team provided on-the-spot suggestions regarding crop management and other project activities for the smooth running of the Project.

ii) Conducted monitoring of the PBRG Sub-Project entitled Productivity enhancement of saline areas through underutilized Barley, Kaon and Prosomillet crops (ID 768) at Noakhali and Bhola on 6 April 2022.

The monitoring team visited the research fields of the Project (ID 768) and discussed with the concerned scientists, fieldstaffs, and cooperator farmers and collected updated information on the progress of activities. They provided some on-the-spot suggestions regarding crop management and other project activities for the smooth running of the Project.

iii) Conducted field monitoring of the technology validation trial entitled IPM with 2-3 IPM techniques for Sustainable Tea Production at Sreemangal, Moulvibazar and Bahubal Upazila, Habiganj on 29 May 2022.

The monitoring team visited the research fields and discussed with the concerned scientists, fieldstaffs, and cooperator farmers and collected updated information on the progress of activities. They provided some on-the-spot suggestions regarding crop management and other project activities for the smooth running of the Project.

Photographs of the monitoring team's visit at Sreemongal, Moulvibazar, and Bahubal, Habiganj

iv) Conducted field monitoring of the technology validation trial entitled Floating bed fodder production in submerged and flooded areas (ID 647) at Jaganathpur and Sunamganj on 30 May 2022.

The monitoring team visited the research fields and discussed with the concerned scientists, fieldstaff, and cooperator farmers and collected updated information on the progress of activities. They provided some on-the-spot suggestions regarding crop management and other project activities for the smooth running of the Project.

The monitoring team at Purbo Vobanipur villege, Jagonathpur, Sunamganj

v) Evaluated Project Completion Report (PCR) of PBRG sub-project entitled Design and Development of fertilizer deep placement mechanism for existing rice transplanter (Project ID # 064).

6. Research management/financial management and coordination

This unit coordinated two PBRG Sub-Projects and one KGF-funded Project along with research and financial management during the reporting period.

7. Monitoring, reviewing and evaluation report of programmes/activities of NARS Institutes

Conducted field monitoring of KGF-funded Project entitled "Feasibility study of the IoT-based Precision Agriculture for sustainable crop production in Bangladesh (ID: TF86-C/21)" at BARI on 24 February 2022.

8. Training workshop, seminar, etc. (foreign and local) organized

The AEU has organized two training programmes, four workshops and one consultation meetings during the reporting year.

Training

i. Training on Inernet of Things (IoT) Based Precision Agriculture for Sustainable Production

The Agricultural Engineering Unit organized a training course on "IoT Based Precision Agriculture for Sustainable Production" at BARC on 22-23 December 2021. A total of 30 trainees participated from Bangladesh Agricultural Research Council (BARC), Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI), Bangladesh Institute of Nuclear Agriculture (BINA), Soil Resources Development Institute (SRDI), Bangladesh Agricultural Development Corporation (BADC), Bangladesh Jute Research Institute (BJRI), Bangladesh Sugarcrop Research Institute (BSRI), Cotton Development Board (CDB), and Department of Agricultural Extension (DAE), in this training course.

Training on IoT Based Precision Agriculture for Sustainable Production

There were ten classes in the training programme. The broad topics of the training were greenhouse and production monitoring and control systems 4IR technology; Precision Resource Management in Agriculture; IoT-based Remote Sensors; Deep Learning and IoT for Precision Agriculture; Overview of Worldwide Adoption and Profitability of Precision Agriculture; Alignment of Precision Agriculture with National Policies and Strategies; Artificial Intelligence (AI) in Agriculture; Internet of Things and Machine Learning Applications for Smart Precision Agriculture; Infrastructure Design for Precision Agriculture, and Opportunities and Challenges of IoT-based Precision Agriculture in Bangladesh. The expert trainers came from BADC, AIUB, Nodes Digital Ltd, BSMARU, BARC, and two trainers took class via Zoom platform from Queen Mary University, London, UK, and University of Tsukuba, Japan.

The training programme was directed and coordinated by Dr. Mian Sayeed Hassan, MD (Natural Resource Management Division), BARC, and Dr. Nazmun Nahar Karim, MD (Livestock) and CSO, Ag. Engg. Unit, BARC, respectively.

ii. Training on Use of Modern Farm Machinery for Ensuring Food Security

The Agricultural Engineering Unit organized a training course titled "Use of Modern Farm Machinery for Ensuring Food Security" at BARC from 25-27 January 2022. A total of 30 trainees participated from Bangladesh Agricultural Research Council (BARC), Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI), Bangladesh Institute of Nuclear Agriculture (BINA), Bangladesh Agricultural Development Corporation (BADC), and Department of Agricultural Extension (DAE) in this training course.

A total of 15 lectures were delivered in the training programme. The training lectures were focused on the present status, prospects, and challenges of mechanization in Bangladesh. The training schedule included a brief description of research and development activities conducted in BARI, BRRI, BSRI, BADC, and DAE. Moreover, it included mechanization plan and policy, public and private sector initiatives, business model of farm machinery, renewable energy uses and farm machinery uses in crops field. Lectures on the operation, repair, and maintenance techniques of rice transplanter and combine harvester were also delivered to the trainees.

The expert trainers were invited from BARI, BRRI, BSRI, BADC, DAE, local agricultural machinery manufacturers, and agricultural machinery importers. The training programme was directed and coordinated by Dr. Mian Sayeed Hassan, Member Director (NRM), BARC, and Dr. Nazmun Nahar Karim, Member Director (Livestock), BARC, and CSO, Agricultural Engineering Unit, BARC, respectively.

The training programme had an inaugural session, three-day-long technical and concluding sessions. The inaugural session (held on 25 January 2022) was Chaired by Dr. Mian Sayeed Hassan, MD (Natural Resource Management Division), BARC on 25 January 2022. Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC, was present as Chief Guest in the inaugural session and advised the concerned trainees to work with due importance on agricultural mechanization to make it profitable and commercialized agriculture. Dr. Md. Ashraful Alam, Principal Scientific Officer, Agricultural Engineering Unit, NRM Division, BARC, discussed the importance of the training course and agricultural mechanization scenario in his welcome address. In the closing session (held on 27 January 2022), Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC was present as Chief Guest and delivered certificates to the trainees.

Training on use of modern farm machinery for ensuring food security

Training on use of modern farm machinery for ensuring food security

Workshop

i) Annual Workshop on Research Review 2020-21 and Research Program 2021-22 on Agricultural Engineering of NARS Institutes

The Agricultural Engineering Unit, BARC organized the "Research Review 2020-21 and Research programme 2021-22 on Agricultural Engineering of NARS Institutes" at Bangladesh Agricultural Research Council (BARC) on 24-25 October 2021 with the participation of the institutes from the National Agricultural Research System (BRRI, BINA, BSRI and BWMRI), Department of Agricultural Extension (DAE), Rural Development Academy (RDA), Agricultural Universities, etc. The workshop was divided into an inaugural, three technical and a concluding session.

The Inaugural session was Chaired by Dr. Mian Sayeed Hassan, MD (Natural Resource Management Division), BARC on 24 October 2021. Dr. Nazmun Nahar Karim, MD (Livestock) and CSO, Ag. Eng. Unit, BARC, briefed about present scenarios of agricultural mechanization in Bangladesh and the last year's comments/recommendations in her welcome address. Dr. N .N. Karim also emphasized undertaking research considering the National Agriculture Policy-2018, National Agricultural Mechanization Policy 2020, Perspective Plan, National Agricultural Extension Policy, etc.

Pictorial view of Research Review 2020-21 and Research programme 2021-22 on Agricultural Engineering of NARS Institutes

The Chief Guest of the Inaugural Session, Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC, urged the concerned scientists to work with due importance on agricultural mechanization in Bangladesh following the government's priorities. He also highlighted the agricultural researches that need immediate attention for food security of the country.

Technical Session-I (Irrigation and Water Management) was Chaired by Dr. Wais Kabir, Ex-Executive Chairman, BARC and Ex-Executive Director, KGF. Technical Session-II (Post Harvest Technology) was Chaired by Professor Dr. Md. Shams-Ud-Din, Vice-Chancellor, German University Bangladesh. Technical Session-III (Farm Machinery) was Chaired by M. Harun Ur Rashid, Ex-Director General, BARI & Ex-Executive Chairman, BARC on 25 October, 2021. At the end of each session, participants participated in the discussions on the presentations presented by Agricultural Engineers of NARS Institutes.

ii) Inception Workshop on Feasibility study of the IoT based precision agriculture for sustainable crop production in Bangladesh (ID: TF 86-C/21)

The Agricultural Engineering Unit organized an Inception Workshop on "Feasibility study of the IoT based precision agriculture for sustainable crop production in Bangladesh (ID: TF

86-C/21)" at Bangladesh Agricultural Research Council (BARC) on 19 December 2021 with the scientists/experts participation of Bangladesh Agricultural Research Council (BARC), Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI), Bangladesh Institute of Nuclear Agriculture (BINA), Soil Resources Development Institute (SRDI), Bangladesh Agricultural Development Corporation (BADC), Bangladesh Agricultural University (BAU), Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Sher-e-Bangla Agricultural University (SAU), Nodes Digital Ltd., and Krishi Gobeshona Foundation (KGF).

The Technical Session was Chaired by Dr. Nazmun Nahar Karim, Member Director (Livestock) and Coordinator (ID: TF 86-C/21), BARC. The honorable Chief Guest was Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC. The Special Guests were Dr. Debasish Sarker, Director General, Bangladesh Agricultural Research Institute (BARI), Gazipur and Dr. Jiban Krishna Biswas, Executive Director, KGF, Dhaka. Dr. Nazmun Nahar Karim, coordinator of this project, talked on the inception report in brief in her welcome address. Dr. AFM Tariqul Islam, Principal Investigator, BARI-component (ID# TF 86-C/21), and SSO, ASICT Division, BARI, presented the inception report of the project on behalf of the project team. An interactive open discussions on the inception report was carried on after the presentation. Md. Abdul Kader, Scientific Officer, Ground Water Project (ID-001) and Tanki Ashraf, Scientific Officer, Solar Pump Project (ID-002), Agricultural Engineering Project, BARC, were rapporteurs of this session.

Finally, Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC delivered his speech as Chief Guest, and Dr. Debasish Sarker, Director General, BARI, Gazipur and Dr. Jiban Krishna Biswas, Executive Director, KGF delivered their speech as Special Guests.

A view of inception workshop (ID: TF 86-C/21)

iii) PBRG Sub-Project Completion Workshop on Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh (ID:001)

The Agricultural Engineering Unit organized a day-long PBRG Sub-Project Completion Workshop on "Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh (ID: 001)" at Bangladesh Agricultural Research Council on 11 January, 2022. Participants were scientists/experts from Bangladesh Agricultural Research Council (BARC), Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI), Bangladesh Institute of Nuclear Agriculture (BINA), Department of Agricultural Extension (DAE), Bangladesh Agricultural Development Corporation (BADC), Infrastructure Development

Company Limited (IDCOL), Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Project Management Unit (PMU) and Project Implementation Unit (PIU-BARC), NATP-II. The Workshop was divided into Inaugural and Technical Sessions.

The Inaugural Session was Chaired by Dr. Mian Sayeed Hassan, Member Director (NRM), BARC. Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC was present as the Chief Guest in this session. The Special Guest was Dr. Md. Harunur Rashid, Director, PIU-BARC, NATP-2. The inaugural session was initiated by the recitation from Holy Quran. Dr. Nazmun Nahar Karim, Member Director (Livestock), CSO (Ag. Engg.), BARC & Coordinator of this sub-project delivered the welcome address. She briefed the sub-project activities in her welcome address and showed a documentary video of the overall project activities. The special guest opined that the participating institutes had implemented the project activities as per the plan and objectives designed. He also remarked that the project was completed with successful output as the generated technologies were taken for validation. The chief guest emphasized on the need of carrying the generated technologies from this sub-project to the doorstep of the farmer in his inaugural speech. He also requested the respective institutes' scientists to continue these activities as a core programme.

The Technical Session was Chaired by Dr. Ahmad Ali Hassan, Ex-Director General, BINA. In this session, Tanki Ashraf, SO, Agricultural Engineering Unit, BARC, acted as a rapporteur. Dr. Md. Ayub Hossain, Chief Scientific Officer and Head, FMPE Division, BARI & Principal Investigator presented the BARI component's project activities. Next, Dr. A. B. M. Zahid Hossain, Senior Scientific Officer, IWM Division, BRRI & Principal Investigator presented the BRRI component's project activities.

iv) PBRG Sub-Project Completion Workshop on Groundwater Resources Management for Sustainable Crop Production in Northwest Hydrological Region of Bangladesh

The Agricultural Engineering Unit organized a day-long PBRG Sub-Project Completion Workshop on "Groundwater resources management for sustainable crop production in northwest hydrological region of Bangladesh (ID-002)" in Bangladesh Agricultural Research Council on 12 January, 2022. Participants were scientists/experts from Bangladesh Agricultural Research Council (BARC), Bangladesh Rice Research Institute (BRRI), Bangladesh Institute of Nuclear Agriculture (BINA), Department of Agricultural Extension (DAE), Bangladesh Agricultural Development Corporation (BADC), Institute of Water Modeling (IWM), Water Resources Planning Organization (WARPO), Project Management Unit (PMU) and Project Implementation Unit (PIU-BARC), NATP-II. The workshop was divided into inaugural and technical sessions.

The Inaugural Session was Chaired by Dr. Nazmun Nahar Karim, Member Director (Livestock) & CSO (Ag. Engg. Unit), BARC. Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC, was present as the Chief Guest in this session. The Special Guest was Dr. Md. Harunur Rashid, Director, PIU-BARC, NATP-2. The inaugural session was initiated by the recitation from Holy Quran. Dr. Nazmun Nahar Karim, Member Director (Livestock), CSO (Ag. Engg.), BARC and Coordinator of this sub-project delivered the welcome address. She briefed the sub-project activities in her welcome address and showed the documentary video of the overall project activities. The chief guest emphasized on the need of reaching the generated technology from this sub-project to the doorstep of the farmer in his inaugural speech. He also requested the respective institutes' scientists to continue these activities as a core programme.

The Technical Session was Chaired by Dr. Shirajul Islam, Ex-Director Research, BARI. In this session, Mr. Md. Abdul Kader, SSO, Agricultural Engineering Unit, BARC, acted as a rapporteur. Dr. Sujit Kumar Biswas, PSO, and Principal Investigator presented the BARI component's project progress. After that, Dr. Md. Towfiqul Islam, CSO & Head and Principal Investigator, presented the BRRI component's project activities. Dr. Md. Hossain Ali, CSO & Head and Principle Investigator of this project then presented BINA component project activities in the workshop.

v) Consultation Meeting on Meghna River Pollution Control, Navigability Increase and Ensuring River Bank Stability

A consultation meeting between the Agricultural Engineering Unit of BARC and the Institute of Water Modeling (IWM) was held on 13 March 2022 at BARC. This meeting was based on the Master Plan on Meghna River Pollution Control, Navigability Increase, and Ensuring River Bank Stability, which was prepared by the Institute of Water Modeling (IWM) in association with the Center for Environment and Geographic Information System (CEGIS). This study aims to prepare a Master Plan with water pollution control and environmental compliance, and a sustainable navigation plan throughout the year including proper dredging, and sustainable riverbank protection from erosion and encroachment along both banks of the Upper Meghna River. This master plan will open windows for the usage of surface water resources along the river for navigation, irrigation, fishing and drinking water supplies, etc. Presently, government policies encourage increasing surface availability for essential needs of the people; therefore, this master plan is highly appreciated.

The agricultural practices around the Meghna River, pesticide use in the study area, soil pollution extent in the study area, and recommendations to control them, etc. were briefly discussed in the meeting. The meeting was Chaired by Dr. Nazmun Nahar Karim, Member Director (Livestock), BARC. Three members from IWM and one member from the Agricultural Engineering Unit participated in the meeting.

Photographs of the consultation meeting between IWM and AE unit, BARC on 13 March 2022.

8. Training, Workshop, Seminar, etc. (Foreign and local) attended

Sl No.	Training	Date	Venue
1	Training on "Annual confidential report"	29-01-2022	BARC
2	Training o n "E -filing system for BARC's scientist and officer"	02-02-2022	BARC
3	Training course on "Technical report writing and editing"	13-17 Feb 2022	BARC
4	Tailor -made-Training (TMT) on "Open -Source Scientific Computing for AgroGeospatial Big Data Analysis," Phase -III	17-02-2022 to 31 March 2022	Online
5	Training course on "Climate change and related topics"	27-31 March 2022	Online
6	Training on "Right to Information Act 2009"	04-04-2022	BARC
7	Training on "Climate change, carbon sequestration and adaptatio n strategies"	25-27 April, 2022	BARC
8	Training on "Right to Information Act 2009"	29-05-2022	BARC
9	Training on "Annual performance agreement"	28-05-2022	BARC
10	Training on "Agricultural policy and strategy for agricultural transformation training for senior executive scientists"	4-8 June 2022	NATA, Gazipur
11	Training on "Service simplification"	20-06-2022	BARC
12	Tailor - made-Training (TMT) on "Open - Source Scientific Computing for AgroGeospatial Big Data Analysis," Phase -III	26-06-2022 to 07 July 2022	iTC, Nether-lands

Sl No.	Workshop	Date	Venue
1	Workshop on Implementation Strategy of PBRG Generated Technologies for Validation	03-01-2022	BARC
2	Project completion workshop on "Upscalling and application of solar photovoltaic pump for smallholder irrigation and ho usehold appliances in the central coastal region of Bangladesh"	11-01-2022	BARC
3	Project completion workshop on "Groundwater resources management for sustainable crop production in north-west hydrological region of Bangladesh"	12-01-2022	BARC
4	Inceptio n workshop on "Managed research program to assess actual demand and supply of 28 essential crops through economic modeling"	17-01-2022	BARC
5	Project completion workshop on "Exploration, identification, characterization, multiplication and ex-situ conservation of endangered forest genetic resources including medicinal plants of Bangladesh"	20-01-2022	BARC

Sl No.	Workshop	Date	Venue
6	Inception workshop on "Validation of NATP-2 generated technologies"	24-01-2022	BARC
7	Inception workshop on "Omics food and nutritional security - platform technologies to enhance crop genetic resources and food value chains in Bangladesh"	30-01-2022	BARC
8	Workshop on "Development of upazila land suitability assessment and crop zoning system of Bangladesh"	04-02-2022	BARC
9	Project completion workshop on "Determination of critical limit of nutrients for soils and crops"	07-02-2022	BARC
10	Project completion workshop on "Improvement of soil health and crop productivity of major problem soils of Bangladesh through organic amendments"	08-02-2022	BARC
11	Workshop on "Delta Plan 2100"	15-02-2022	BARC
12	Project completion workshop on "Transfer of agricultural technologies to farmers level for increasing farm productivity"	23-02-2022	BARC
13	Progress review workshop on "Livelihood improvement of farmers t hrough integrated farming system research and development of drought and rain-fed ecosystem"	28-02-2022	BARC
14	Review workshop on "Action Plans for Implementation of Bangladesh Good Agricultural Practices"	01-03-2022	BARC
15	Workshop on "Finalization of plans to advance the country's agriculture sector in line with the fourth industrial revolution"	02-03-2022	BARC
16	Project completion workshop on "Analysis of agricultural policy on food system and rural development in Bangladesh: Case of Haor area (Wet land) management practice"	14-03-2022	BARC
17	Workshop on "Action plan to meet the challenges of the fourth industrial revolution"	19-04-2022	BARC
18	Workshop on "Communication skill development for agricultural scientists"	25-05-2022	BARC
19	Workshop o n "Development of high yielding hybrid varieties of different crops and extension at farmer level"	30-05-2022	BARC
20	Review workshop on "PBRG sub-project co-ordinated by Fisheries division, BARC"	02-06-2022	BARC
21	Project completion workshop on "Liveli hood improvement of farmers through integrated farming system research and development of drought and rain-fed ecosystem"	14-06-2022	BARC
22	Workshop on "Review of socio-economic research progress and future research program of NARS Institutes"	15-06-2022	BARC

	Seminar		
1	Seminar on "Turkish agricultural research advancement"	25-01-2022	BARC
2	Seminar on "Right to Information Act 2009"	30-03-2022	BARC
3	Seminar on "National Integrity Strategy Action Plan"	19-06-2022	BARC

9. Transferable Technology (Highlights of technology released during the reporting period)

i) **Title of the technology:** Cropping pattern-based water management with water saving irrigation technologies for Rajshahi District (under North-West hydrological region)

a. **Suitabile location:** Godagari and Tanore Upazilas of Rajshahi District

b. **Benefits:** The inclusion of Rabi crops in the cropping pattern instead of Boro rice, a water-intensive crop, certainly has reduced the requirement for irrigation water. As rice plays a pivotal role in meeting food security and as the major share of rice production comes from Boro cultivation, it is not always possible and even not pragmatic to supplement Boro rice with other non-rice crops. Boro rice is supplemented by Aus or Aman rice that receives rain that reduces irrigation need compared to Boro rice. Rather, the use of water-saving technologies for crop production keeping the crops in a pattern unchanged but with a short duration can reduce the irrigation water requirement and thereby reduce the withdrawal of groundwater. In this way, the system crop productivity (i.e., rice equivalent yield) could be increased by 13-28% with the water saving of about 9-18% and an increase in farmers' net income by 15-50%. As a result, it will save groundwater as well as reduce the fuel cost of extraction, and will also conserve the environment and biodiversity of the area.

c. ***Name and contact address of authors:*** Dr. Sujit Kumar Biswas, PSO; Dr. Dilip Kumar Roy, SSO and Khandakar Faisal Ibn Murad, SO, Irrigation and Water Management Division, BARI, Gazipur-1701.

ii) **Title of the technology:** Modeling for quantifying groundwater deficit recharge and safe withdrawal for sustainable crop production in North-West region of Bangladesh.

a. **Suitable location:** North-West hydrological region. Groundwater declining area is also a potential for using/applying developed the model.

b. **Benefits:** Retarding groundwater declining as well as recovering groundwater deficit in the aquifer.

c. **Name and contact address of authors:** Dr. Md. Towfiqul Islam, CSO & Head, Md. Belal Hossain, SSO and Mst. Shetara Yesmin, SSO, Irrigation and Water Management Division, Bangladesh Rice Research Institute, Gazipur-1701.

iii) **Title of the technology:** Low irrigation demand cropping pattern to mitigate groundwater level declination in Rangpur and Pabna districts (under North-West hydrological region)

a. **Suitable location:** Medium highland to highland of Pabna and Rangpur Districts.

b. **Benefits:** Both the cropping patterns save 25-30% irrigation water covering more rainfall and give higher rice equivalent yield than T. Aman-Fallow-Boro cropping pattern. Besides, a higher gross margin of average Tk. 25000 ha-1and Tk. 40000 ha-1 can be achieved in T. Aman-Potato-Boro and T. Aman-Mustard-Boro cropping patterns, respectively over T. Aman-Fallow-Boro pattern.

c. **Name and contact address of authors:** Dr. Md. Towfiqul Islam, CSO & Head (islam.towfiq@yahoo.com); Md. Belal Hossain, SSO and Mst. Shetara Yesmin, SSO, Irrigation and Water Management Division, Bangladesh Rice Research Institute, Gazipur-1701.

iv) **Title of the technology:** Water saving and economic cropping pattern for sustaining groundwater resource in Chapainawabganj and Naogoan Districts (under North-West hydrological region)

a. **Suitable Area/Location for Application**: Chapainawabganj and Naogoan Districts

b. **Benefits**: Cultivation of Rabi crops like mustard, lentil or wheat, and Aus rice instead of Boro, requires less amount of irrigation water, but produces higher annual yield (REY) and net profit. Instead of the traditional two-cropped "Aman-Fallow-Boro" pattern, the three-cropped "Aman-Rabi (lentil /mustard /wheat)-Aus" pattern saves 50–59% irrigation water and increases the equivalent rice yield to about 10-19% at Nachol, Chapainawabganj; and saves 52-62% irrigation water and increases the equivalent rice yield to about 16-14% at Niamatpur, Naogoan District.

c. **Name and contact address of authors**

Dr. Md. Hossain Ali, CSO & Head; Dr. Md. Hasanuzzaman, SSO and Partha Biswas, SO; Agricultural Engineering Division; Bangladesh Institute of Nuclear Agriculture (BINA).

10. National and International Linkages (MoU/Bilateral Agreement, Collaborative Work Plan Signed During the Year). Highlights of Activities Undertaken Under the MoU/Agreement, etc.

i) Professional of this AEU worked as a member of the different committees as mentioned below:

- Project Evaluation Committee of the project entitled "Projection of sea-level rise and assessment of its sectoral (agriculture, water and infrastructure) impacts of Department of Environment.
- BANCID Study and Publication Sub-Committee.
- Advisory Committee of Appropriate-scale Mechanization Innovation Hub- Bangladesh.
- Country Project Management Committee (C-PMC) for the project entitled "Solar Irrigation for Agricultural Resilience (SoLAR)" of IWMI and IDCOL.
- Country Representative of Asian Regional Working Group.

ii) Attended meetings/seminars/workshops organized by FAO, CSAM, KGF, IWM, WARPO, BARI and BRRI, etc.

iii) Attended meetings 1st virtual meeting of Asian Regional Working Group (ASRWG) on 28 February 2022.

iv) Seventeenth Session of the Governing Council of CSAM

Dr. Nazmun Nahar Karim, Member Director (Livestock) & CSO (Ag. Engg.), BARC, participated in the 17th Session of the Governing Council of the Centre for Sustainable Agricultural Mechanization (CSAM) of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) convened virtually on 8 December 2021. The session was attended by representatives of all nine members of the Council, namely Bangladesh, Cambodia, China, India, Malaysia, Pakistan, the Philippines, Thailand and Vietnam.

The 17th session of the Council discussed the role of mechanization in reducing food loss and waste as part of efforts toward enabling food systems transformation, reviewed the

work report of CSAM for 2021 and the administrative and financial status of the Centre in 2021, and provided direction for the Centre's program of work for 2022.

11. Presentation of Research Articles by the Scientist(s) in Different Programme

The scientists of the Agricultural Engineering Unit presented different research articles in different programmes as follows:

- Presented project concept of IoT-based precision agriculture
- Presented two PCR summary reports of PBRG Sub-Project
- Presented annual research progress and programme planning report

12. Publication(s) by the Division/Section in Different Journals/Media

The Agricultural Engineering Unit has published or contributed to the 24 different publications. They are as follows:

Annual Report: (#1)

i) Contributed to publish BARC Annual Report 2021-22

Project Completion Report (PCR): (#2)

i) BARC, 2021a. Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh (ID: 001). Project Completion Report (PCR) of PBRG Sub-Project.

ii) BARC, 2021b. Groundwater resources management for sustainable crop production in northwest hydrological region of Bangladesh (ID: 002). Project Completion Report (PCR) of PBRG Sub-Project.

BARC Newsletters: (#4)

i) Contributed to the four BARC Newsletters.

Leaflet/ Booklets/ Video clip (#5)

i) Contributed to preparing the Action Plan and Activities Related to IWRM Implementation of SDG Indicator 6.5.1 in Bangladesh.

ii) Contributed to making video documentary on PBRG Sub-Project entitled "Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh (ID:001)" and "Groundwater Resources Management for Sustainable Crop Production in Northwest Hydrological Region of Bangladesh (ID:002)".

iii) Published training manual on "Use of Modern Farm Machinery for Ensuring Food Security."

iv) A B M Zahid Hossain, Md. Saidur Rahman Khan, Palash Kumar Kundu, Nazmun Nahar Karim, Tanki Ashraf and Md. Sirajul Islam. (2022). leaflet on "ব্রি ভ্রাম্যমান সোলার প্যানেলের মাধ্যমে উৎপাদিত সৌরবিদ্যুৎ কৃষি এবং গৃহস্থালির কাজে ব্যবহার" Agricultural Engineering Unit, Natural Resources Management, Bangladesh Agricultural Research Council, Farmgate, Dhaka.

v) Contributed to publishing Leaflet on "ব্রি বীজবপনযন্ত্র" Md. Ashraful Alam, AKM Saiful

Islam, Md. Golam Kibria Bhuiyan, Md. Monirul Islam and Md. Esme Adom.

Journal papers: (# 10)

i) Md. Belal Hossain, Md. Towfiqul Islam, Debjit Roy, Mir Nurul Hasan Mahmud, Priya Lal Chandra Paul, Mst. Shetara Yesmin, Palash Kumar Kundu, **Nazmun Nahar Karim**, Md. Abdul Kader, and Md. Humayoun Kabir (2022). Cropping System Intensification: An Approach to Increase Yield, Water Productivity, and Profitability in North-West Bangladesh. Hindawi, International Journal of Agronomy, Volume 2022, Article ID 6288494.

ii) 2. M. H. Ali, M. H. Zaman, M. A. Islam, P. Biswas, **N. N. Karim** and M. A. Kader (2021). Quality Assessment of Groundwater of Barind Area, Bangladesh using Integrated Hydro-chemical Method. Asian Journal of Advances in Agricultural Research 16(4): 18-27.

iii) **AFM Tariqul Islam**, AKM Saiful Islam, GM Tarekul Islam, Sujit Kumar Bala, Mashfiqus Salehin, Apurba Kanti Choudhury, Nepal C. Dey, Akbar Hossain (2022). Adaptation strategies to increase water productivity of wheat under changing climate. Agricultural Water Management 264: 1-14 (107499). https://doi.org/10.1016/j.agwat.2022.107499.

iv) **AFM Tariqul Islam**, M G Mahboob and M Aktaruzzaman (2021). GIS-based Aus-Aman-Groundnut cropping pattern suitability assessment in Delduarupazila. J Agric Inno Dev 1(1): 35-44 (2021).

v) **Md. Ashraful Alam**, AKM Saiful Islam, Md. Monirul Islam, Mohammad Kamruzzaman and Md. Golam Kibria Bhuiyan (2021). Field Performance of Mini Combine Harvester Utilized for Rice Harvesting in Haor Areas of Bangladesh. United International Journal for Research & Technology, 2(11): 104-112.

vi) AKM Saiful Islam, Mohammad Kamruzzaman, **Md. Ashraful Alam** and Md. Esme Adom (2022). Appropriate scale and business viable whole feed combine harvester for sustainable agricultural mechanization in Bangladesh. International Journal of Agriculture, Environment and Bioresearch, 7(2): 98-107.

vii) MR. Manir, KP. Halder, MM. Rana, MM. Rashid, **MA. Alam** (2022). Effect of seedling age on the growth, yield and yield components of rice. International Journal of Biosciences, 20(2): 324-328.

viii) Nilufar Yasmin Shaikh, **Md. Ashraful Alam** and A. K. M. Saiful Islam (2022). Effect of seeding date on the tray raised seedling quality for rice transplanter in Boro season. J. Sci. Technol. Environ. Inform. 11(02): 764-774.

ix) AKM Saiful Islam, **Md. Ashraful Alam**, Md. Monirul Islam and Md. Esme Adom (2022). Design and Development of Rice Straw Rope Maker. International Journal of Engineering Research & Technology, 11(4): 179-189.

x) Nilufar Yasmin Shaikh, **Md. Ashraful Alam**, Mohammad Kamruzzaman, Md. Abdullah Al Mamun, AKM Saiful Islam (2021). Effect of Seeding Density on Mat-Type Seedling Quality for Mechanical Transplanting in Dry Season Rice. Agricultural Sciences, 12: 1231-1243.

13. Brief Highlights of Research and Development of the concerned NARS Institutes

BARI, BRRI, BINA, BSRI, and MWMRI are among the NARS Institutes that have done the following research and development during 2021-2022 on agricultural engineering activities in three different fields such as farm machinery, irrigation and water management, and postharvest technology.

FARM MACHINERY

BARI:

- ❑ Development and Evaluation of Four-Wheel Tractor Operated Seeder
- ❑ Design and Development of a Power Tiller Operated Vegetable Seedling Transplanter
- ❑ Energy Use Analysis of Conservation Tillage Systems for The Rice-Maize Cropping Pattern
- ❑ Design and Development of Onion and Garlic Detopper
- ❑ Investigation of Long-Term Conservation Agriculture at BARI and Adaptive Trials of Conservation Machinery and Water Management Systems in the Southern Delta of Bangladesh
- ❑ Development of a Residue Clearing Device for Conservation Tillage by Precision Seeder to Prevent Blockage of Furrow Openers and Improve Seeding Uniformity
- ❑ Development of Orchard Weeder Cum Mini Tiller
- ❑ Design and Fabrication of Petrol Engine Operated Boom Sprayer for Field Crops
- ❑ Development of an Automatic Irrigation Device
- ❑ Development of a Barley Thresher
- ❑ Development of a Power Operated Sunflower Thresher
- ❑ Improvement of the Sitting Type Coconut Tree Climber
- ❑ Development of Soymilk Making Machinery
- ❑ Adaptive Trial of BARI Cream Separator
- ❑ Development of Drum Type Carrot Washing Machine
- ❑ Up-scaling and Fine Tuning of Coffee Postharvest Processing Machinery
- ❑ Design and Development of a Jute Decorticator
- ❑ Development and Adoption of Suitable Technology for Hygienic Potato Chips Production
- ❑ Up-scaling and Fine Tuning of Cashew Nut Postharvest Processing Machine and Oil Extracting Machine
- ❑ Improvement of Chili Seed Separator
- ❑ Improvement of Tomato Seed Separator Cum Pulper
- ❑ Performance Evaluation of Flat Bed Dryer for Maize Drying

- Development of a Suitable Fruit Bagging Tool
- Up-scaling and Application of Solar Photovoltaic Pump for Smallholder Irrigation and Household Appliances in the Central Coastal Region of Bangladesh
- Development and Adoption of a Solar Cabinet Dryer for Vegetable Seeds
- Development of Cost-Effective, Intensified and Sustainable Recirculating Aquaculture System (RAS) in Bangladesh
- Adaptive Trial of BARI Developed Agricultural Machinery for Crop Production in the Coastal Areas of Bangladesh

BRRI:

- Design and development of whole feed type mini combine harvester
- Modification of the fertilizer deep placement mechanism for existing rice transplanter
- Field evaluation of the BRRI rice transplanter cum mixed fertilizer applicator
- Design and development of walking type power operated rice transplanter
- Design and development of a manual paddy seeding machine for mat type seedling raising
- Design and development of a head feed power thresher
- Design, Development and Fabrication of Power Operated Automatic Seed Sower Machine
- Design and development of battery operated small size reaper
- Determination of tilling efficiency of power tiller at selected areas of Bangladesh
- Development of machine vision approach in determination of paddy varieties
- Test, evaluation and modification of rubber roll de-husker and friction type polisher
- Study on milling recovery of BRRI dhan71 under different moisture content
- Effect of ageing on milling performance of premium quality rice
- Design and development of a small-scale recirculating type dryer
- Opportunity of Local Service Provider on Custom Hiring Business of Combine Harvester for Small Holder Farmers in Haour Areas
- Custom Hire Service Business of Rice Combine Harvester in the Haor Basin of Bangladesh
- Survey on status and constraint of farm machinery used in farmers' field at selected areas
- Potentiality of engineering workshop for enhancing farm mechanization in selected areas of Bangladesh
- Training on operation, repair and maintenance of BRRI farm machinery

BSRI

- Design and Development of a Sugarcane Detrasher
- Developing a Cost-effective Cultivation System for Sugarcane

- Performance Evaluation of Different Tillage methods for Sustainable Sugarcane Cultivation
- Design and Development of Mini Moist Hot Air Treatment (MHAT) Plant for Sugarcane Seed Treatment

BWMRI

- Improvement of a four-wheel tractor operated seeder for cereal crops

IRRIGATION AND WATER MANAGEMENT

BARI

- Optimize fertigation management to minimize nitrate leaching from drip irrigated brinjal field
- Multi-step ahead forecasting of potential evapotranspiration using bidirectional long short-term memory (bi-lstm) networks
- Daily and multi-step ahead forecasting of potential evapotranspiration using machine learning algorithms with limited climatic data
- Effect of drip irrigation and mulching on growth and flowering of chrysanthemum as cut flower
- Effect of irrigation on mango fruit cracking in Chattogram region
- Performance of fertigation system on pumpkin cultivation
- Yield and water productivity indices of different onion varieties under sprinkler irrigation
- Effect of fertilizer and irrigation frequency on the yield and quality of export and processing potato
- Effect of saline water irrigation with different doses of potassium on crop growth and yield of mungbean
- Multi-step ahead prediction of groundwater level fluctuations using coupled wavelet transform and long short-term memory networks
- Coastal groundwater management using an uncertainty-based coupled simulation-optimization approach
- Prediction of saltwater intrusion for different scenarios of aquifer recharge and groundwater extraction under changing climate
- Monitoring of ground water level at different BARI stations
- Effects of floating agriculture practice on the water body of pond
- Groundwater resources management for sustainable crop production in northwest

hydrological region of Bangladesh.

- Dissemination of water saving technologies for non-rice crops in saline prone areas of Bangladesh
- Conjunctive use of fresh- and saline water for maize and sunflower cultivation in coastal areas of Bangladesh
- Low-cost drip irrigation for tomato and chili cultivation in saline coastal areas of Bangladesh
- Growth and yield of spinach as affected by different levels of irrigation in coastal saline area of Bangladesh
- Crop cafeteria with some promising crops in salt-affected coastal areas of Bangladesh
- Characterising dry season's agricultural landuse in northwest Bangladesh: spatial dynamics and water use
- Assessment of cropping patterns for sustainable intensification in drought prone ecosystem using remote sensing and geospatial modeling
- Satellites and ICT based location and crop specific irrigation advisory system for growing more with less water
- Assessment of water recession dynamics in selected haors for dry season cropping intensification using spatial data
- Spatio-temporal assessment of cultivable land in selected char-lands of the northern Bangladesh
- Non-destructived determination of mango maturity using hyperspectral spectroscopy

BRRI

- Determination of physical and hydraulic properties in different soil types
- Study on water-stress tolerance for different advanced rice genotypes of BRRI
- Optimization of irrigation water use for Boro cultivation under different establishment methods
- Performance evaluation of the proposed rice varieties under different water regimes
- Improving soil-water availability for crop production in Charland by amendment practices
- Determining minimum irrigation water requirement of rice at different regions of Bangladesh through water balance from on-farm demand and model simulation
- Impact of delayed transplanting on irrigation requirement and yield of Boro rice at BRRI farm, Gazipur
- Agricultural drought forecasting for mitigating drought in T. Aman rice
- Water resources assessment for dry season crop cultivation in selected polders of coastal region
- Boro area expansion by using less saline water resources for cropping intensification in

Barishal region

- Monitoring of groundwater fluctuation and safe utilization in different geo-hydrological regions
- Conjunctive use of wastewater and freshwater for irrigation in Boro rice cultivation
- Assessment of surface and groundwater quality for irrigation in selected locations of Bangladesh
- Effect of irrigation suspension on mitigating greenhouse gas emission in irrigated rice cultivation
- Evaluation of smallholder surface water solar irrigation system for crop production
- Growing vegetables crops with rice under waterlogged lowland condition
- Improved Water Management Technologies for Increasing Agricultural Production in the Haor areas

BINA

- Determination of aquifer hydraulic properties (by pumping test)
- Estimation of groundwater recharges using tracer technique, water balance and water-table fluctuation method
- Cropping pattern study for identifying water-saving pattern
- Simulation scenario of Withdrawal Rate (WT) under different cropping pattern
- Studies on groundwater table dynamics at Barind area
- Recent trend of precipitation at Rajshahi region of Bangladesh
- Effect of different tillage practices and irrigation management on Mungbean production under conservation agriculture practice
- Response of sesame cultivars to different drainage provisions
- Evaluation of Binadhan-24 under different moisture stress/drought tolerance level
- Response of Rapeseed mutants to irrigation regimes
- Effectiveness of Irrigation regimes on the yield and water productivity of Potato (in cropping pattern) in the Char-land of Rangpur region
- Effectiveness of Irrigation regimes on the yield and water productivity of Groundnut (in cropping pattern) in the Char-land of Rangpur region
- Irrigation management and chemical amendment for soybean cultivars under saline condition

POSTHARVEST TECHNOLOGY

BARI

- Effects of frying temperature and time on physicochemical changes and shelf life of

vacuum fried jackfruit chips

- Optimization of processing parameter for producing quality vacuum fried banana chips
- Effect of sugar concentration on physicochemical properties, bioactive compounds and shelf life of osmotically dehydrated mango slices
- Physicochemical properties and shelf life of osmotically dehydrated jackfruit slices
- Effect of drying on physicochemical properties, bioactive compounds and microstructure of jackfruit seed flour
- Effect of cooking methods and oil on physicochemical, nutritional, minerals and bioactive compounds of leafy vegetables with the focus to dietary lifestyle
- Effect of pineapple pomace on the development of peanut bar and their physicochemical and nutritional properties with consumer acceptance
- Effect of orange peel concentration on the development of sapota marmalade in terms of proximate and nutritional composition and consumer preferences
- Effect of steam blanching and cooking oils on physicochemical, nutritional, minerals and bioactive compounds of mixed vegetables with the focus to dietary lifestyle
- Kinetics of dehydration and appreciation of the physicochemical properties of osmo-dehydrated plum
- Study on physico-chemical characteristics of plum during preservation at different concentrations of sodium chloride
- Effect of various combinations of sodium chloride and sucrose concentrations on the quality of plum pickle during storage
- Effects of various sucrose concentrations on the quality of plum chutney during storage
- Effect of pretreatments and storage temperatures on the physico-chemical parameters and quality of plum
- Changes in the quality characteristics during storage of plum jam and its optimal preparation conditions: This study is under trial. The whole report will be presented after compiling all the data.
- Effect of different fruit juice on the physicochemical properties, bioactive compounds and shelf life of jackfruit leather
- Baseline survey on existing hazardous agents in fresh cut fruits and salad vegetables used in street vendors, hotels and restaurants at selected locations in Bangladesh
- Determination of hazards in fresh-cut fruits and salad vegetables used in street food vendor, hotels and restaurant at selected locations in Bangladesh
- Effect of different sanitizer on physicochemical, microbiological load and shelf life of spinach

BRRI

- Determination of physicochemical and cooking properties of breeding lines
- Determination of physicochemical and cooking properties of Transforming Rice Breeding lines
- Effect of Fe and Zn activities on Zn enriched rice varieties at different location in T. Aman rice season
- Study on anti-cancer properties of pigmented (black, red, purple) rice varieties in Bangladesh
- Determination of physicochemical properties and quality of puffed, popped and flattened rice from newly released BRRI varieties.

Forestry Unit

The Forestry Unit of Natural Resources Management Division, BARC, has been implementing the mandated activities and beyond. Since its inception, the Forestry Unit has been prioritizing, planning, approving, reviewing, monitoring and coordinating OFRD of BARI, and BFRI for agroforestry and forestry technologies related research programmes of the NARS Institutes. The Unit conducted training programmes and seminar/workshop and maintained strong linkages with the government organizations (BARI, BRRI, BFRI, BTRI, BSRTI, BSRI, CDB, BIRTAN, DAE and DoF, etc.), non-government organizations (BRAC, Proshika, Caritas, etc.), Universities (BAU, BSMRAU, SAU, IFESCU, etc.) and international (ICRAF, ICIMOD, and FAO, etc.) organizations. The Forestry Unit's activities of 2021-2022 have been briefly discussed below:

Name of the Professionals

Name	Designation
Dr. Md. Saifullah	Member Director (A&F) (CC) and Chief Scientific Officer (Forestry)
Dr. Md. Golam Mahboob	Principal Scientific Officer

1. Project Development/ Project Financing

The Forestry Unit developed a project proposal entitled "Development of pineapple-based agroforestry models for mitigating climate change impact" and submitted to KGF for financing in response to their 5th Call for Competitive Grants Programme (CGP). It also developed and submitted a proposal for funding titled "Technical Support to Formulate a National Agroforestry Policy for Bangladesh" to UN CTCN (Climate Technology Centre and Network of the United Nations) through proper channel. Both of these proposals are currently under evaluation.

2. Project Implementation

Successfully implemented the final year activities of NATP Phase-II funded PBRC Sub-Project entitled:

a. Germplasm conservation and farm productivity enhancement through the interaction of shade trees and tea-based agroforestry system to mitigate the climate change (ID 072)

b. Exploration, Identification, Characterization, Multiplication and Ex-situ Conservation of Endangered Forest Genetic Resources including Medicinal Plants of Bangladesh: BARC Component (ID 074)

c. Upliftment of Farmers' Livelihood and Enrichment of Environment through Improved Agroforestry Practices in Char Land Ecosystem of Bangladesh (ID 077)

3. Policy Level Contribution

Policy Research on Forestry, Agroforestry and Environmental and Climate Change Aspects: It furnished several policy comments on the following aspects/issues and sent to the MOA:

i) Comments on documents concerning project proposal with technical and financial grant of FAO entitled "Green Cities Initiative (GCI): Building Back Better for Climate and Resilient Sustainable Transitions"

ii) Comments on "Mujib Climate Prosperity Plan Decade 2030"

iii) Comments on "বন্যপ্রাণি ও জীববৈচিত্র সংরক্ষণে বঙ্গবন্ধু জাতীয় পুরস্কার প্রদান বিধিমালা" (Rules for Bangbandhu National Wildlife Conservation Award)"

4. Research Management/Financial Management and Coordination

During the reporting period, this unit coordinated 3 (three) PBRG Sub-Projects along with research and financial management.

5. Monitoring, Reviewing and Evaluation Report of Programmes/Activities of NARS Institutes

a. Validation Trial Monitoring

The Unit conducted monitoring of the validation trial on "Productivity enhancement of saline areas through underutilized crops" at Subarnachar, Noakhali on 23 March 2022

- **Organized Training on Climate Smart Agriculture for Adaptation**

A three-day long training course on "Climate Smart Agriculture for Adaptation" was organized at the Auditorium-2 of BARC on 12-14 June 2022. A total of 40 participants came from different NARS Institutes (BARC, BARI, BRRI, BJRI, BSRI, BTRI, BFRI, SRDI, CDB, etc.), DAE, KGF, PKSF and NGOs (BRAC, PKSF, ADPC, CARITAS and CPE) attended the training course. Participants enjoyed the 16 (sixteen) different lectures delivered by the renowned scientists and experts of the specific topics. The Member Director, Natural Resource Management Division, offered his valuable speech on the importance of the training and inspired the organizers for compiling the attractive and resourceful training manual. Participants in the training shared their feedback and views. Certificates were given to the participants for successful completion of the training.

A view of the field monitoring PBRG Sub-Project (ID 768) at Noakhali

b. Evaluation and Review of Forestry Research Programme

There were 70 forestry research Programmes of Bangladesh Forest Research Institute (BFRI), which were reviewed, evaluated and suggested for future research as needed and technically sound. The Unit also provided with some advisory services for conducting research on priority basis in the annual research Programme of BFRI for the financial year 2022-2023.

6. Organized Training, Workshop, Seminar (Foreign and Local)

a. Organized Training on Forestry and Agroforestry Technologies for Professionals

A two-day long training course on "Forestry and Agroforestry Technologies for Professionals" was organized at the Auditorium-2 of BARC on 2-3 March 2022. A total of 40 participants came from different NARS Institutes (BARC, BARI, BRRI, BJRI, BSRI, BFRI, BTRI, SRDI, CDB, etc.), DAE, BFIDC, and NGOs (BRAC, CARITAS, CEGIS, and Arannyak Foundation) attended the training course. Participants enjoyed the ten different lectures delivered by the different renowned scientists and experts of the specific topics. Executive Chairman of BARC inaugurated the ceremony and distributed course completion certificates among the participants during the closing ceremony.

Photographs of the training programme on Forestry and Agroforestry Technologies for Professionals (inaugural and closing session)

b. Organized Training on Climate Smart Agriculture for Adaptation

A three-day long training course on **"**Climate Smart Agriculture for Adaptation" was organized at the Auditorium-2 of BARC on 12-14 June 2022. A total of 40 participants came from different NARS Institutes (BARC, BARI, BRRI, BJRI, BSRI, BTRI, BFRI, SRDI, CDB, etc.), DAE, KGF, PKSF and NGOs (BRAC, PKSF, ADPC, CARITAS and CPE) attended the training course. Participants enjoyed the 16 (sixteen) different lectures delivered by the renowned scientists and experts of the specific topics. The Member Director, Natural Resource Management Division, offered his valuable speech on the importance of the training and inspired the organizers for compiling the attractive and resourceful training manual. Participants in the training shared their feedback and views. Certificates were given to the participants for successful completion of the training.

Photographs of the training programme on Climate Smart Agriculture for Adaptation (inaugural and closing session)

c. Review of Workshop of NARS Institutes

A two-day Research Review and Programme Planning Workshop was held on 27-28 October 2021 at BARC Auditorium (2nd floor, Main Building), BARC, with the participation of the Institutes from the National Agricultural Research System (BFRI, BARI, BRRI, BINA, BJRI, BSRTI, BTRI and BSRI). A total of 60 participants were present in the workshop. Among them 53 were male and the rest were female. The objectives of the workshop were to review the status and needs of forestry research in forestry, agroforestry and wildlife conservation technologies. Participants and expert members gave valuable suggestions on research reports (2020-21) and planning for the future research Programme (2021-22) of NARS Institutes and recommendations in various issues.

Photograph of the Research Review 2020-21 and Research Planning 2021-22 Workshop

d. PCR Workshop of PBRG Sub-Project (ID - 074)

A day-long workshop was organized on 03 February 2022 at the Auditorium-2, Training Building (3rd floor) of BARC under the Sub-Project of "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 three components namely BAU component, BFRI Component, and IFESCU Component under supervision and coordination of Forestry Unit of NRM Division, BARC. The objectives of the workshop were: (a) exploring the activities of the sub-project, (b) familiarization of the PCR (Project Completion Report) and the technologies generated through the sub-project, and (c) accomplishing the mandate/obligation of PIU-BARC, NATP-2 for further fund disbursement.

Photograph of PCR workshop organized by PIU-BARC, NATP-2

About 40 scientists/academia from different organizations namely BARC, BAU, IFESCU, BARI, and NATP attended the workshop. Principal Investigators (PIs) of the Sub-Project presented their total achievement by the Sub-Project and final report. On the basis of the presentation some queries were discussed elaborately and given some comments, suggestions, and recommendations regarding improvement of the Sub-Project PCR. The participating organizations cordially accommodated the valuable commendations from the experts.

7. Attended Training, Workshop, Seminar (Foreign and Local)

a. Training Courses, Workshops and Seminars Attended

Professionals of the Forestry Unit attended several training courses, workshops, seminars, including the followings:

Sl No.	Title	Date	Venue
	Training		
1	Training on "Annual Confidential Report"	29-01-2022	BARC
2	Training on "E-Filing system for BARC's Scientists and Officers"	02-02-2022	BARC
3	Training course on "Technical Report Writing and Editing"	13-17 Feb 2022	BARC
4	Tailor-Made-Training (TMT) on "Open-Source Scientific Computing for AgroGeospatial Big Data Analysis," Phase III	17 Feb – 31 Mar 2022	Online
5	Integration of climate change a daptation into project development process to support implementation of National Adaptation Plan in Bangladesh	14-19 Mar 2022	DoE (Paribesh Bhaba)
6	Training course on "Climate Change and Related Topics"	27-31 March 2022	Online
7	Training on "Right to Information Act 2009"	04-04-2022	BARC
8	Training on "Climate change, Carbon sequestration and adaptation Strategies"	25-27 April, 2022	BARC
9	Training on "Right to Information Act 2009"	29-05-2022	BARC
10	Training of Trainers (ToT) on "Climate Change Project Proposal Development for Accessing International Climate Finance"	27 May - 2 Jun 2022	BRAC - CDM

Sl No.	Title	Date	Venue
11	Training on "Agricultural policy and strategy for agricultural transformation training for senior executive scientists"	4-8 June 2022	NATA, Gazipur
12	Training on "Gender responsive climate change adaptation"	15 Jun 2022	Spectra Convention Center
13	Training on "Service simplification"	20-06-2022	BARC
14	Tailor -made-Training (TMT) on "Open -Source Scientific Computing for AgroGeospatial Big Data Analysis ," Phase IV	26 Jun -7 Jul 2022	ITC (Enschede, The Netherlands)
	Workshop		
1	Workshop on Implementation Strategy of PBRG Generated Technologies for Validation	03-01-2022	BARC
2	Inception Workshop on "Managed research program to assess actual demand and sup ply of 28 essential crops through economic modeling"	17-01-2022	BARC
3	Project completion workshop on "Exploration, identification, characterization, multiplication and ex-situ conservation of endangered forest genetic resources including medicinal plants of Bangladesh"	20-01-2022	BARC
4	Inception workshop on "Validation of NATP -2 generated technologies"	24-01-2022	BARC
5	Inception workshop on "Omics food and nutritional security - platform technologies to enhance crop genetic resources and food value chains in Bangladesh"	30-01-2022	BARC
6	Workshop on "Development of Upazila land suitability assessment and crop Zoning system of Bangladesh"	04-02-2022	BARC
7	Project completion workshop on "Determination of critical limit of nutrients for soils and crops"	07-02-2022	BARC
8	Project completion workshop on "Improvement of soil health and crop productivity of major problem soils of Bangladesh through organic amendments"	08-02-2022	BARC
9	Workshop on "Delta Plan 2100"	15-02-2022	BARC
10	Project completion wor kshop on "Transfer of agricultural technologies to farmers' level for increasing farm productivity"	23-02-2022	BARC
11	Progress review workshop on "Livelihood improvement of farmers through integrated farming system research and development of drought andrain-fed ecosystem"	28-02-2022	BARC
12	Review workshop on "Action Plans for Implementation of Bangladesh Good Agricultural Practices"	01-03-2022	BARC
13	Workshop on "Finalization of plans to advance the country's agriculture sector in line with the fourth industrial revolution"	02-03-2022	BARC

Sl No.	Title	Date	Venue
14	Project completion workshop on "Analysis of agricultural policy on food system and rural development in Bangladesh: Case of Haor area (Wetland) management practice"	14-03-2022	BARC
15	Workshop on "Action plan to meet the challenges of the fourth industrial revolution"	19-04-2022	BARC
16	Workshop on "Communication skill development for agricultural scientists"	25-05-2022	BARC
17	Workshop on "Development of high yielding hybrid varieties of different crops and extension at farmers' level"	30-05-2022	BARC
18	Review workshop on "PBRG Sub -Project coordinated by Fisheries Division, BARC"	02-06-2022	BARC
19	Project completion workshop on "Livelihood improvement of farmers' through integrated farming system research and development of drought and rain -fed ecosystem"	14-06-2022	BARC
20	Workshop on "Review of socio -economic research progress and future research Programme of NARS Institutes"	15-06-2022	BARC
	Seminar		
1	Seminar on "Turkish Agricultural Research Advancement"	25-01-2022	BARC
2	Seminar on "Right to Information Act 2009"	30-03-2022	BARC
3	Seminar on "National Integrity Strategy Action Plan"	19-06-2022	BARC

b. Participation in the PCR Workshops Organized by PIU-BARC, NATP

The Forestry Unit presented the PCRs (Project Completion Reports) by the coordinating component of BARC and the participating organizations in the PCR Workshop organized by PIU-BARC, NATP-2 during 25 November 2021. Three presentations were continually presented by the coordinator, Dr. Md. Saifullah, MD (A&F) and CSO (Forestry), NRM Division of the three sub-projects ID 072, ID 074 and ID 077. At the end of the presentation two video documentaries named "Agroforestry in Tea Land (চায়ের দেশে কৃষিবনায়ন)" and "Conservation of Endangered Forest Genetic Resources and Medicinal Plants (ঔষধীবৃক্ষ ও বিলুপ্তপ্রায় বনজকৌলী সম্পদ সংরক্ষণ)" were shown and they were appreciated by the participants. The valuable comments and suggestions offered by the audiences and experts during workshop were compiled.

8. Transferable Technology (Highlights of Technology Released During the Reporting period)

- List of technologies released from several PBRG projects coordinated by the Forestry Unit of BARC during the reporting period:
- Enhancing seed germination and seedlings growth of Chebulic myrobalan (Haritaki) *(Terminalia chebula Retz.)* by soaking in cowdung slurry

Introduction: Low germination percentage (%) of Chebulic myrobalan in Bengali Haritaki *(Terminalia chebula Retz.)* as well as requirement of long time is believed to be due to the hard seed coat and thick fleshy pulp of fruits. Nevertheless, delayed and irregular germination of seeds in the nursery is a serious constraint of efficient nursery management and plantation establishment. Thus a new method to enhance seed germination and growth performance of *Terminalia chebula Retz* is developed where seeds are soaked in cowdung slurry for six days before sowing.

Description: Optimum matured, uniform and disinfected fruits of *Terminalia chebula Retz* are collected from trees of BAU-GPC, Bangladesh Agricultural University, Mymensingh. Fruits are depulped at two ends and soaked in normal cow dung slurry for 6 (six) days. The sandy loamy soils are collected, sieved (≤3 mm) and mixed with decomposed cow dung at a ratio of 3:1, after that, they are filled in polybags (12.5 cm ×15.25 cm). One depulped and soaked seed is sown in each polybag by dibbling method in the germination media with depth of 0.5 cm and then covered with a thin layer of soil. Germination percentage is calculated, growth performance and survival percentage are recorded at 120 days after sowing.

Location: Anywhere in Bangladesh.

Benefit: Seedling survival percentage is higher in cow dung slurry (85.21%) than control (47.50%).

- Multi-storied agroforestry system for char land ecosystem

Introduction: Lombu *(Khaya anthotheca)* tree-based multistoried agroforestry practice was developed as a productive system for char land farming system of Bangladesh. Multistoried agroforestry system is an approach for maximum utilization of land, spaces and solar energy as well as to meet the nutritional scarcity of the country.

Description: In this study, a ten-year old lombu tree was used as silvicultural component at the upper layer; ginger, panchamukhikachu and turmeric as root crops were cultivated at the ground layer, papaya plant was in between the lombu trees at the second layer, Chui Jhal (Piper chaba) as vine crop on the lombu tree at the third layer.

Location: Char land of Old Brahmaputra floodplain areas in Mymensingh district.

Benefit: Land Equivalent Ratio (LER) values of ginger-papaya-Chui Jhal-lombu, panchamukhikachu-papaya-Chui Jhal-lombu, turmeric-papaya-Chui Jhal-lombu combinations were 1.75, 1.65 and 1.75 which indicates 65-75% yield advantage i.e., under monocultures, 65-75% more land would be needed to match yields from this intercropping. Moreover, C:N ratio analysis of experimental study of this multistoried agroforestry practices also give positive effect. Based on the LER and C:N ratio analysis all of these crop combinations or intercropping as multistoried agroforestry system of this study would be productive agroforestry systems for char land areas of Bangladesh.

- Agroforestry practices under boundary planted mahogany trees

Introduction: Performance of rice, okra and kangkong in combination with seven years old boundary planted mahogany trees as agroforestry practice was examined. Mahogany trees were planted in south, north and west directions of the experimental field during 2011 maintaining plant to plant 25cm distance.

Description: Along with Mahogany (*Swietenia Macrophylla King*) trees, rice was cultivated during aman season under irrigated condition. Okra and kangkong were cultivated during summer season. Based on the yield of both Mahogany trees and studied crops (rice, okra and kangkong), Land Equivalent Ratio (LER) was estimated.

Location: Char land of Old Brahmaputra Floodplain areas in Mymensingh District.

Benefit: LER of Mahogany-rice, mahogany-okra and mahogany-kangkong were 1.37, 1.62 and 1.63, respectively. This LER analysis indicates 37-63% yield advantage i.e., under monocultures, 37-63% more land would be needed to match yields from this intercropping. C:N ratio was slightly increased which indicates better soil health after the experimental study. Considering the LER analysis and increased C:N ratio, it is clear that Mahogany-rice-okra and Mahogany-rice-kangkong could be profitable agroforestry technology for char-land-based farming system.

- Guava fruit tree-based agroforestry practice for char land ecosystem

Introduction: Crops/vegetables were cultivated during summer and winter season in association with the newly planted to three years old guava fruit trees.

Description: Along with the guava fruit trees stem amaranth, jute as leafy vegetables, kangkong and Indian spinach were cultivated during summer season and winter crops were radish as leafy vegetable, carrot, radish, turnip, spinach, red amaranth, mustard as leafy vegetable etc. After one year of plantation, guava fruit bearing started. Based on the LER and C:N ratio analysis every crop combination (Guava - tested any summer vegetables - tested any winter vegetables) was profitable.

Location: Char land of Old Brahmaputra Floodplain areas in Mymensingh District.
Benefit: Guava fruit tree was unaffected after severe (≥ 15 days) flood condition which indicates guava fruit tree is a flood-tolerant tree species. So, guava fruit tree-based agroforestry practices could be a profitable as well as sustainable agroforestry system for char-land-based farming system in Bangladesh.

- Yellow Myrobalan medicinal tree-based agroforestry practice for char land ecosystem

Introduction: Yellow Myrobalan medicinal tree can be tolerant of severe flood condition. Along with this flood tolerant Yellow Myrobalan, different medicinal tree species of summer (stem amaranth, jute as leafy vegetables, kangkong and Indian spinach) and winter (radish as leafy vegetable, carrot, radish, turnip, spinach, red amaranth, mustard as leafy vegetable) crops/vegetables were cultivated.

Description: Results of the experimental study of every crop combination (Yellow Myrobalan-stem amaranth-spinach, Yellow Myrobalan-jute as leafy vegetable-carrot etc.) showed positive effect by LER and C:N ratio analysis.

Locations: Char land of old Brahmaputro Floodplain areas in Mymensingh district.

Benefits: Based on flood tolerant capacity and positive effect of LER and C:N ratio analysis, "Yellow Myrobalan medicinal tree-based agroforestry system in char land ecosystem" could be a sustainable agroforestry technology for the different char land areas of Bangladesh.

- Mango fruit tree-based agroforestry system for char land ecosystem

Introduction: The newly introduced winter, summer and year round vegetables cultivation under Mango fruit tree based agroforestry system. Production of multiple products (fruits, vegetables and spices) from the same land management was possible. The farmers' income in char areas of Jamalpur and Sherpur region also increased due to using the fallow land under mango tree garden.

Description: In winter season four different vegetables, viz., radish (Long White Mino), sweet gourd (Bengal sweet 2), red amaranth (BARI lalshak 1) and mustard (Tori 7) were cultivated in association with mango fruit trees during the establishment of plantation. Among the vegetables, radish performed better.

In summer season, four different vegetables, viz., Indian spinach (BARI Puishak 1), sweet gourd (Bengal sweet 2), okra (BARI dherosh 2 and yard long bean (BARI borboti 1) were cultivated in association with mango fruit trees during the establishment of plantation. Among the vegetables sweet gourd performed better.

In year round three different crops viz., turmeric (BARI halud 4), ginger (BARI ada 1) and mukhikachu (BARI mukhikachu 2) were cultivated in association with mango fruit trees during the establishment of plantation. Among the crops turmeric performed better.

Location: Char areas of Jamalpur and Sherpur region

Benefit: Mango fruit orchard will be established, and farmers' income will increase by vegetables production under mango fruit orchard. Mango fruit tree based agroforestry practice was more productive and remunerative and it could be suggested for upliftment of farmers' livelihood in Jamalpur and Sherpur region.

- Average gross margin of winter vegetables ranged from 1,01,200-2,43,600 tk/ha. BCR range 2.3-3.7.
- Average gross margin of summer vegetables ranged from 51,500-2,06,200 tk/ha. BCR range 1.8-3.3.
- Average gross margin of year-round crops ranged from 40,000-3,51,500 tk/ha. BCR range 1.2-3.0.
- Akashmoni tree-based agroforestry system for char land ecosystem

Introduction: The newly introduced winter and summer vegetables cultivation under Akashmoni tree-based agroforestry system. Production of multiple products (timber and vegetables) from the same land management was possible.

Farmers' income in char areas of Jamalpur region also increased by using the fallow land under Akashmoni tree garden.

Description: Winter vegetables cultivation under Akashmoni based agroforestry system would be practiced in char land areas. Akashmoni+Radish, Akashmoni +Sweet gourd, Akashmoni+Mustard leaf, Akashmoni+Red amaranth were established under Akashmoni based agroforestry system. Akashmoni+Sweet gourd was performed the height yield Akashmoni+Yard long bean was the lowest.

Location: Naovangar char, Laxmir char and RARS under Jamalpur District.

Benefit: Akashmoni tree-based agroforestry practice was more productive and farmers' income will be increased by vegetables production under Akashmoni tree orchard in summer season for upliftment of farmers' livelihood in Jamalpur and Sherpur Districts.

9. Publication(s) by the Division/Section in Different Journals/Media

a. Journal Articles

- **Research Article:** S. Dey, M. K. Hossain, R. Nandi and M. Saifullah (2021). Effect of Pre-sowing Treatments on Germination and Initial Growth of Terminalia citrina: A Medicinal Tree Species in Bangladesh, Journal of Tropical Forestry and Environment Vol. 11(2): 37-47.
- **Research Article:** Alam, M., Rahman, M., Rahim, M., Hossain, **M., Saifullah, M. and Jewel, K.** (2022). Enhancing seed germination and seedling growth of chebulic myrobalan (Terminalia chebula Retz.) by appropriate soaking and sowing time after collection of fruits. Bangladesh Journal of Agriculture, 46(1-6), 45–54. https://doi.org/10.3329/bjagri.v46i1-6.59973

b. Workshop Proceedings

- A Workshop Proceedings on "Research Review 2020-21 and Program Planning 2021-22 on Forestry and Agroforestry in Bangladesh"

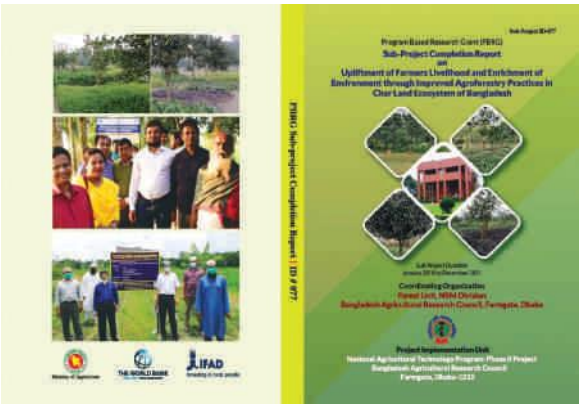
c. Book Chapter

- Hossain, M.K., Miah, M.D., Hossain, M.A., **Saifullah, M.** (2022). Exploration, Identification, Multiplication, and Conservation of Rare Forest Genetic Resources in Chittagong University Campus, Bangladesh. **In**: Ramamoorthy, S., Buot, I.J., Chandrasekaran, R. (eds.) Plant Genetic Resources, Inventory, Collection and Conservation. Springer, Singapore. https://doi.org/10.1007/978-981-16-7699-4_13

Front cover of the Book and the first page of Book chapter

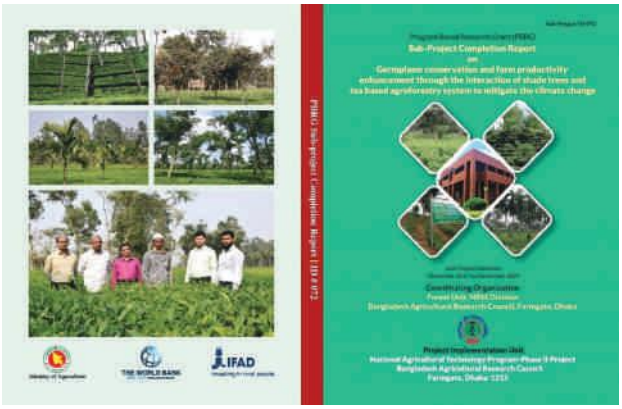
d. PCR (Project Completion Report)

- **Saifullah M,** Shahjahan M, Jewel, K.N.A, Rahman, G.M.M., Wadud, M.A, Rahman, M.S., Rahman, J., Jahan, H, Rahman, M.W. 2021. Upliftment of Farmers Livelihood and Enrichment of Environment through Improved Agroforestry Practices in Char Land Ecosystem of Bangladesh, Sub-Project Completion Report, pp: 204.



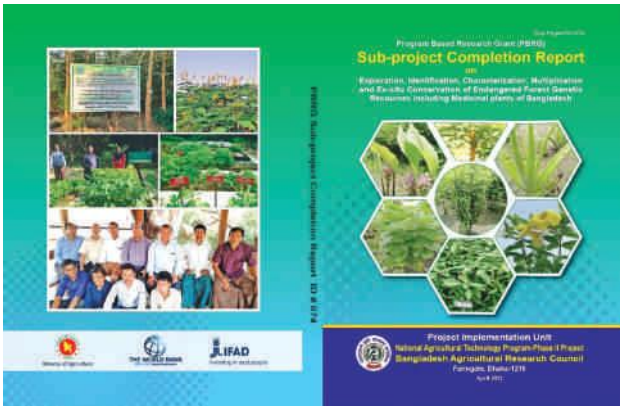
PCR of Sub-Project 077

- **Saifullah, M.,** Jewel, K.N.A., Ahmed, M., Islam, A.F.M.S., Maleque, M.A., Hossain, M.I. and Arefin, M.R. 2021. Germplasm conservation and farm productivity enhancement through the interaction of shade trees and tea based agroforestry system to mitigate the climate change, Sub-Project Completion Report, pp. 1-186.



PCR of Sub-Project 072

- **Saifullah, M.**, Jewel, K.N.A., Yusuf, M., Rahman, M.H., Rahim, M.A., Alam, M.A., Haider, M.R., Alam, M.S., and Rahman M.M., Hossain, M.K. and Miah, M.D. 2022. Exploration, Identification, Characterization, Multiplication and Ex-situ Conservation of Endangered Forest Genetic Resources including Medicinal plants of Bangladesh, Sub-Project Completion Report, Forestry Unit, NRM Division, BARC. pp: 1-207.



PCR of Sub-Project 074

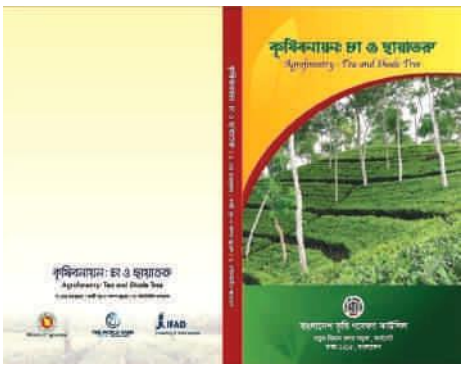
e. Training Manuals

- Training Manual - 2022 on "Climate Smart Agriculture for Adaptation" and "Forestry and Agroforestry Technologies for Professionals"
- Training Manual - 2022 on "Climate Smart Agriculture for Adaptation" and "Climate smart agriculture for adaptation"

Two Training Manuals

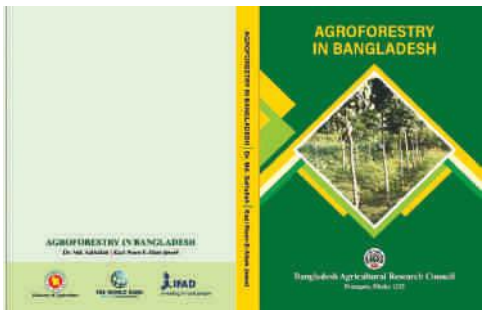
f. Books

- **Saifullah, M.**, Jewel, K.N.A. and Ahmed, M. 2021. Agroforestry: Tea and Shade Tree. Forestry Unit, Natural Resources Management Division, Bangladesh Agricultural Research Council, Dhaka, pp.1-120.



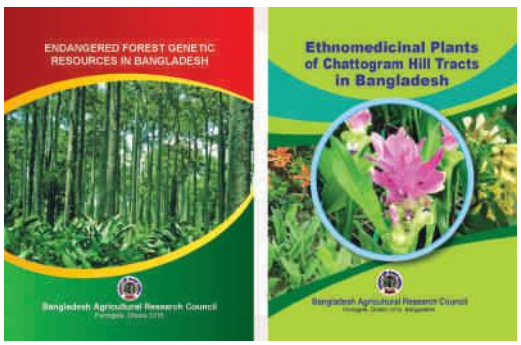
The Book titled Agroforestry: Tea and Shade Tree

- **Saifullah, M.** and Jewel, K.N.A. 2021. Agroforestry in Bangladesh. **Forestry Unit,** Natural Resources Management Division, Bangladesh Agricultural Research Council, Dhaka, pp.1-136.



The Book titled Agroforestry in Bangladesh

- Hossain, M.K., **Saifullah, M.**, Miah, M.D. and Hossain, M.A. 2021. *Endangered Forest Genetic Resources in Bangladesh.* Forestry Unit, Natural Resources ManagementDivision, Bangladesh Agricultural Research Council, Dhaka, pp.1-316.
- **Haider, R., Saifullah, M. and Alam, M.S. 2022.** Ethnomedicinal Plants of Chattogram Hill Tracts in Bangladesh, **pp. 1-350.**



Books titled Endangered Forest Genetic Resources in Bangladesh and Ethnomedicinal Plants of Chattogram Hill Tracts in Bangladesh

Soils Unit

Name of the Professionals

Name	Designation
Dr. Md. Baktear Hossain	Director (Manpower & Training) and Chief Scientific Officer (Soils) (AC)
Dr. Md. Khairul Alam	Principal Scientific Officer
Dr. Faridul Islam	Principal Scientific Officer

1. Project Development and Coordination

Project development is a major responsibility of Bangladesh Agricultural Research Council (BARC). The Soils Unit of BARC is working in line with the mandate of the Council. The Unit oversees the soil fertility and fertilizer management related programmes of the country. The Soils Unit is involved in development of both national and international coordinated/collaboration projects. The Unit developed three national coordinated projects under programmes Based Research Grant (PBRG) projects of NATP-2. Two of those Projects have been completed with published Project Completion Reports. The other Project is now on-going. The Unit is also involved in three international collaboration projects. The Soils Unit has completed one internationally collaborated project on the title "Sustainable soil management for nutrition-sensitive agriculture in Sub-Saharan Africa and South East Asia" with the technical cooperation of UN FAO. Two other projects with the funding from Australian Centre for International Agricultural Research (ACIAR) & KGF on the title of "Nutrient management for diversified cropping in Bangladesh (NUMAN)" and Asian Food and Agriculture Cooperation Initiative (AFACI) on the title of "Development of National Soil Map and National Soil Information Systems of Bangladesh" are now on-going.

2. 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 of BARC with NATP-2 funding under PBRG. The major objectives of the Project are:

- Delineation of the present status of different nutrients in calcareous, non-calcareous, piedmont and terrace soils.
- Determination of critical limit of different nutrients for cereal, vegetable and oilseed crops.
- Validation of critical limits through field experiments.

BARI, BRRI, BINA and BAU worked as the implementing organizations and Soils unit of BARC worked 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 continued until February 2022.

Critical limits of different nutrients for different soils and crops were determined under this project. The total cost of the project was Tk. 3,07,18,675/- only. ThePproject was coordinated by BARC; and BARI, BRRI, BINA and BAU worked as implementing organizations.

Work Distribution Among Different Components is as follows:

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 were 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, a total of 720 soil samples (4 components × 3 AEZs/component × 2 Upazilas/AEZ × 3 villages/Upazila × 10 spots/village) were collected. Soil samples were analyzed for macro- (N, P, K, Ca, Mg & S) and micronutrients (Fe, Mn, Cu, Zn & B) 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 and 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, four soils from low fertility areas and the remaining four soils were from medium fertility areas of the particular nutrient. Sprouted seeds of the test crops were sown in the pot and the crops were harvested at 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 crop were determined by Cate and Nelson method (1965). Critical limits were also determined by statistical approach developed by Waugh et al. (1973). The results was validated through field experiment at the farm level in the last Rabi and Kharif-1 (pre-monsoon) season seasons. Inception workshop was held on 28 June 2018. The Project Completion Report (PCR) was published on 28 February 2022.

Dr. S M Bokhtiar, EC, BARC and Dr. Md. Baktear Hossain, Director (Manpower and Training), CSO (Soils Unit) and Director (SAC) visited the experiments of CL Project at BINA, Mymensingh

Critical Limits of Different Crops and Nutrients Estimated by Different Component Organizations

Nutrient	Crop	Present CL (FRG -2018)	Estimated CL	Estimated by
Phosphorus	Rice	8.0 mg kg^{-1}	8.7 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 m g 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
	Maize	0.12 meq 100 g^{-1}	0.16 meq 100g^{-1}	BARI
Magnesium	M aize (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 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
	Maize	0.60 mg kg^{-1}	0.71 mg kg^{-1}	B ARI
Boron	Wheat	0.20 mg/kg	0.30 mg/kg	BAU
	Mustard	0.20 mg/kg	0.25 mg/kg	BAU

b. Project title: Improvement of Soil Health and Crop Productivity in Climate Vulnerable and Polluted Areas Through Organic Amendments

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

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

BARI, BRRI, BINA, BAU, BSMRAU and SAU worked as the implementing organizations and BARC played role in coordinating 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 was completed on 28 February 2022. The research programs were implemented in different climate vulnerable and polluted areas of the country to achieve the above mentioned objectives. The inception workshop was held on 09 August 2018. The second year annual report was submitted on 01 July 2020 while the second annual Review workshop was organized on 29 September 2020. The Project Completion Report was published on 28 February 2022.

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 Ind ustrial areas
BINA	Drought Prone Soils	Nachole, Chapainawabganj
BAU	Char land & 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

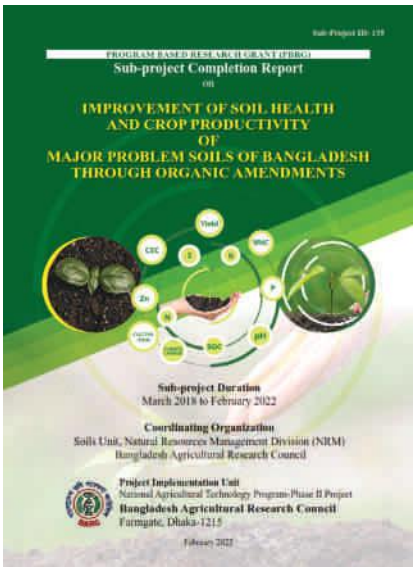
The total cost of the Project was Tk 3,61,82,574/-. A number of studies are being conducted under the Project in climate vulnerable areas of Dumuria and Batiaghata, Khulna and Kalapara, Patuakhali (saline soils), Godagari, Rajshahi and Nachole, Chapainawabganj (drought prone areas), Belabo, Narshingdi and Modhupur, Tangail (acidic soils), and on polluted soils 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. were studied to observe their effectiveness for amendment of climate vulnerable and polluted soils, and improvement of soil health and crop productivity. The best organic fertilizers/materials and best combination with chemical fertilizers were identified through these studies conducted in different above-mentioned climate vulnerable and polluted soils. More than 10 technologies have been proposed from the project for sustainable crop production in the climate vulnerable and polluted soils (Lists given below).

List of Technologies Proposed from the Organic Amendment Project for Sustainable Crop Production in the Climate Vulnerable and Polluted Soils

Sl. No.	Title of the Technology	Component
1.	Application of Biochar in acidic soils of Narsingdi region to alleviate soil acidity and increase prod uctivity of Cauliflower - Ladies finger -Indian Spinach cropping pattern	BARI
2.	Application of biochar in drought prone areas of Barind region to preserve soil moisture and increase productivity of Mustard - Boro - Aus cropping pattern	BARI
3.	Biochar applicat ion in saline soils of Khulna region to reduce soil salinity and increase productivity of sweet gourd - fallow - Transplanted aman cropping pattern	BARI

Sl. No.	Title of the Technology	Component
4.	Soil health and carbon management through organic amendments	BINA
5.	Water saving and profitable cropping pattern in drought prone area of Bangladesh	BINA
6.	Improvement of crop productivity and soil health in Char land through poultry manure biochar application	BAU
7.	Improvement of crop productivity and soil health in Acidic soil through poultry manure biochar application	BAU
8.	Biochar is the best stable and potential organic material for improving soil health and crop productivity	BSMRAU
9.	Biochar is the prospective organic material to adsorb heavy and reduce heavy metal uptake in crop for safe food production.	BSMRAU
10.	Improvement of Soil Health and Crop Productivity of Salinity Problem Soils of Bangladesh through Organic Amendments.	SAU

Dr. S M Bokhtiar, Executive Chairman, BARC made a speech in the Workshop



Project completion Report of the Project titled "Improvement of soil health and crop productivity in climate vulnerable and polluted areas through organic amendments (ID:135)"

c. 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: Soils Unit, NRM Division, BARC, Implementing components: (i) Soil Science Division, BARI (ii) Soil Science Division, BRRI, (iii) Soil Science Division, BINA, and (iv) Soils and Nutrition Division, BSRI, Ishurdi, Pabna. Initiated in October 2019, the project will continue until December 2022. The inception workshop was held on 29 December 2019. The second-year Annual Report was submitted on 12 August 2021 while the second annual Review workshop was organized on 29 September 2020. Coordination meetings were held on 07 July 2021, 13 September 2021 and 26 May 2022. The PCR of the Project is now drafted after collecting from implementing components.

3. International Collaboration Project

a. 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:

- **Broad Objective(s)**

  The Broad Objective or aim of this Project is to increase the profitability and sustainability of intensive and emerging cropping systems in Bangladesh through improved nutrient management.

- **State Specific Objective(s)** succinctly, in the order in which they will be achieved. (Objectives should be precise, specific, and result-oriented, and achievable within the time frame).

  - 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.
  - Develop and test tools for sustainable nutrient management in intensively cropped areas of north-west Bangladesh and in emerging cropping systems based on Conservation Agriculture (CA) and on coastal zone soils of southern Bangladesh.
  - Out-scale the use of tools and development of policies to advance practice change toward improved fertilizer use efficiency through engagement with farmers' groups, extension, the private sector and government policy.
  - Improve the knowledge of soil resources and capability for nutrient management by research partners and key stakeholders.

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	Implem enting 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:

- Bangladesh Fertilizer Association (BFA)
- 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 Amtali of Barguna (AEZ-13) have been selected as the research hubs under the Project.

It is an international collaboration Project involving four NARS Institutes including 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 Krishi Gobeshona Foundation (KGF) and Australian Council for International Agricultural Research (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 Bangladesh Fertilizer Association (BFA) and Conservation Agriculture Service Provider Association (CASPA). The Letter of

Agreement (LoA) between BARC and KGF was signed in the first week of January 2018; and between IARC and implementing organizations in the second week of January 2018.

The activities of the Project can be grouped into two categories;

1. Socio-economic and gender aspects of fertilize management; and

2. 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 Programmes 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 in implementation of the project activities. Existing research facilities of the respective implementing organizations are being used for the research. The project activities started since Kharif-1 season 2018. Three and half years of the project have been completed successfully so far. The Project has been approved for a period of two-year extension.

b. Project Title: Sustainable Soil Management for Nutrition-Sensitive Agriculture in Sub-Saharan Africa and South East Asia

This is an international project in collaboration 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 three-year long project initiated in December 2018 and will continue till 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.

Field visit by NPC of the Project

Progress review Workshop at BARC Auditorium

As per the work plan of the project, necessary activities were completed in the last year (2020-2021) to achieve the overall progress of the project (field examination, training provision, training need assessment, preparation of training manual, research etc.). In the meantime, a PIC committee meeting was held on 03 June 2021. Three-batch training for farmers on Sustainable Soil Management for Nutrient Sensitive Agriculture at Chuadangasadar (Chuadanga), Baliadangi (Thakurgaon) and Chandina (Cumilla) was conducted. The progress of BARC component was presented in a progress review workshop held at BARC Auditorium.

c. 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 continue till 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. The project evaluation meeting was held on 3 November 2020. The project has made the following progress:

- The National Soil type Map prepared applying the principles and guidelines of World Reference Base (WRB).
- A Soil Organic Carbon (SOC) Map (draft)
- A soil salinity map also has been prepared

Expert consultation meeting of Soil Atlas Project

3. Policy Level Contribution

Activities of Fertilizer Technical Sub-Committee

The 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 is comprised of 20 (Twenty) 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. Presently, director, AIS, has been added as another member of the Technical Sub Committee.

The principal activities of Technical Sub-Committee of Fertilizer Standardization are as follows:

- Organized periodic meetings of Fertilize Technical Sub-committee for Standardization of new fertilizers and review the existing fertilizers.
- Organized meetings on Fertilizer need and quality control.
- Giving comments on policy issues related to use/ import/ export/ production of fertilizer and fertilizer materials as and when necessary by the Government.
- Monitoring Fertilizer Quality.

54th Fertilizer Technical Sub-committee for Standardization.

During 2021-2022, one meeting of Fertilizer Technical Sub-committee was held with Director, Research, BARI as meeting chair and Member-Director (NRM) (2nd one) in the chair. Three meetings of the sub-committee (Fertilizer Specification Update Committee, Fertilizer Inspection Manual Preparation Committee and Manual for Fertilizer Analysis Update Committee) under TSC were held during 2021-2022.

A number of organic and chemical fertilizers and PGRs were evaluated in these meetings of which the following number of organic fertilizers, chemical fertilizers and plant growth regulators were recommended for standardization to the National Fertilizer Standardization Committee headed by the Secretary, Ministry of Agriculture.

Recommended for standardization	**Nos.**
Organic fertilizer	8
Plant growth regulator	7
Under process of standardization	
Organic fertilizer	40
Chemical fertilizer	3
Plant growth regulator	15
Bio-fertilizer	4

The Soils Unit of BARC also performed the following activities during 2021-2022:

CSO/PSO (Soils) have been serving as convener of the thee-membered committee of field monitoring for evaluating the capacity of quality organic fertilizer producing factory. The committee visited Organic and Vermicompost Fertilizer factory at Dinajpur, Thakurgaon, Chuadanga and submitted reports to the convener of technical sub-committee on fertilizer (TSC).

Organic fertilizer factory visit at Thakurgaon

Visited Apex biofertilizer and Biopesticides

Visited organic fertilizer factory at Gobindaganj, Gaibandha

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

1. Commenting on "Regarding Clarification of Physical State of Magnesium Sulphate Fertilizers". (09 June 2022).
2. Providing Comments on "Moisture and particle size of fertilizer" (19 May 2022).
3. "Comments on "new fertilizer for sustainable gardening developed under Eden project by Dr. Winston McKenzie" (12 May 2022).
4. Comments on "Permitting soil testing and fertilizer recommendation at farmer level with "SoilSafe MiniLab" developed by Kranti Associates Ltd." (11 November 2021 and 12 June 2022).
5. Regarding providing comments on "Supporting and participating in the Global Methane Pledge Initiative" (13 August 2022).
6. Sending necessary views/inputs for "extension and modification/ revision of the Memorandum of Understanding (MoU) signed between the Governments of Bangladesh and the Netherlands (21 November 2021).
7. Prepared the draft speech for Honorable Minister of Agriculture to participate in the 1st ministerial meeting of Agricultural Innovation Mission for Climate (AIM-C) held in Dubai, United Arab Emirates (17 February 2022).
8. Regarding the nomination of three academicians and three soil scientists for Soil Care Award 2021 on the occasion of World Soil Day (21 November 2021).
9. Giving opinion on the export of "Northern Organic Fertilizer manufactured by Northern Agro Services Ltd., Dhaka Division " to the UK and China (14/11/2021).
10. Giving opinion regarding the signing of Letter of Agreement between FAO, Bangladesh and Department of Agricultural Extension (DAE) under the project titled "Pesticide Risk Reduction in Bangladesh" (02 January 2022).
11. Giving opinion on "BIMSTEC and its relevant different updates" (03 February 2022) "
12. Providing opinion on the draft "The Land Crime Prevention and Remediation Act 2022" (14 February 2022).
13. Comments on "Review and future action plans on the adverse effects of stone lifting in agriculture and the possible challenges of stopping quarrying" (25 April 2022).
14. Giving comments on draft on "Commonwealth Living Land Charter-A Commonwealth Call to Action on Living Land (CALL)".

5. Research Management And Coordination

The Soils Unit of Natural Resources Management Division of BARC organizes Annual Research Review and Planning Workshop on Soils Program of NARS institutes. In 2021-2022, the workshop was held on BARC premise during 11-13 October 2021 with scientific professionals involved in soils and fertilizer management research in the NARS institutes of the country. Research programs conducted in all the NARS institutes during 2020-2021 were reviewed in the workshop. 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 research and environmental issues. Besides reviewing on-going research programs, new research programs proposed for 2021-2022 were also discussed in the workshop. Scientists from different NARS Institutes took part in the discussion, contributed and shared their knowledge, thoughts and experiences for improvement of the programmes and avoiding duplication.

Annual Review and Planning Workshop on Soils Programme of NARS Institutes

6. MONITORING AND EVALUATION

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

7. Training, Workshop, Seminar and Symposia

Training

Soils Unit, NRM, BARC conducted training Programmes on the following titles

- Conducted training programme on "Climate change, carbon sequestration and adaptation strategies" during April 25-27, 2022. There were 40 participants in the training programme and they were NARS Scientists, University Teachers, BADC Officers and DAE Officials.
- Conducted training programme on "Training on Fertilizer Recommendation Guide-2018" during May 29-31, 2022. There were 40 participants and mainly from DAE Officials, NARS Scientists, University Teachers and BADC Officers.
- Conducted training programme on "Training on Use of Fertilizer Inspection Manual" during June 21-23, 2022. There were 40 participants and they were mainly from DAE Officials, NARS Scientists, University Teachers and BADC Officers.
- Conducted farmers training programme on 'Sustainable Soil Management for Nutrient Sensitive Agriculture' at Baliadangi (Thakurgaon), Chandina (Cumilla) and Chuadanga Sadar (Chuadanga). A total of 60 farmers (20 from each location), 60 Sub Assistant Agriculture Officer (SAAO) and 60 Department of Agricultural Extension (DAE) Officers or Officers at equivalent rank were participated in the programme.

Workshop

The Soils Unit organized Research Review and Planning Workshop on Soil Management Programme of NARS Institutes during 11-13 October 2021. Eighty (80) participants from Soil Science Division of NARS Institutes (BARI, BRRI, BINA, BJRI, BSRI, BTRI, BFRI, SRDI, CDB and BSRTI), senior soil scientists, soil experts, professors of soil science from different Universities and DAE officials participated in the workshop. Recommendations of the workshop were sent to respective institutes.

8. Publications

The Soils Unit published the following documents during 2020-2021

- Published Proceedings of Research Review and Programme Planning Workshop of Soils Programme of NARS Institutes 2021
- Published manuscripts (8) in high-profile indexed journal.
- Published two proceedings of Fertilizer Technical Sub-Committee Meetings.
- Published a Book on Fertilizer Analysis Manual (Draft).
- Published a Book on Fertilizer Inspection Manual (Draft).
- Published PCR on "Determination of Critical Limit of Nutrients for Soils and Crops".
- Published PCR on "Improvement of Soil health and crop productivity of major problem soils of Bangladesh through organic amendments".
- Published Training Manuals of the following training Programme:
    i. Climate change, carbon sequestration and adaptation strategies
    ii. Fertilizer Recommendation Guide-2018
    iii. Fertilizer Inspection Manual
    iv. Sustainable Soil Management for Nutrition Sensitive Agriculture
- Published 11 manuscripts in indexed journal and one book chapter in Springer Nature publications.

Some Publications from Soils Unit

9. Other Activities

Scientist of the Soils Unit worked as the members of the following committees:

- Online mvi mycvwikgvjv-2018 Innovation service is now available in www.frg2018.com and at the Google play store.
- CSO (Soils) has been working as Director (Manpower and Training), BARC since June 2019
- CSO/PSO (Soils Unit) has been working as convener of Organic Fertilizer factory investigation committee.
- Participated as member/resource person of various committees meetings, training Programmes 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.
- CSO (Soils Unit) served as an external examiner of B.Sc. Ag. (Hons.) and MS level examinations of BAU, PSTU and SAU.
- CSO/PSO (Soils Unit) served as an M.Sc. Ag. Soil Science thesis examiner of different universities.
- CSO (Soils Unit) served as an examiner for PhD of Department of Soil Water and Environment of University of Dhaka and Sher-e-Bangla Agricultural University.
- PSO (Soils Unit) served as an examiner for MS of Sher-e-Bangla Agricultural University, Dhaka.
- CSO (Soils Unit) worked as a member of Steering Committee for Establishment of Laboratory of SRDI
- CSO (Soils Unit) worked as member of Project Management Committee of Soil Resources Management and Strengthening Farmers Services Project.
- PSO (Soils Unit) works as a Honorary Research Associate at Murdoch University, Australia
- PSO (Soils Unit) serves as research supervisor of MS and PhD students of Sher-e-Bangla Agricultural University and University Putra Malaysia, Malaysia.
- PSO (Soils Unit) serves as Topic Editor /Land/ Journal (IF-3.905)
- PSO (Soils Unit) is assigned as Guest Editor of Special Issue of Land Journal on "Effect of Conservation Agriculture on Soil Health and Crop Production".
- PSO (Soils Unit) is assigned as Guest Editor of Special Issue of Sustainability Journal (IF-3.935) on "Climate Resilient Agronomic, Water and Soil Management Practices for Sustainable Agriculture"
- PSO (Soils Unit) published **11 Research Articles** in highly indexed Journals.

Livestock Division

LIVESTOCK DIVISION

The Livestock Division of BARC is involved in organizing and managing various research and other related activities for developing the livestock sector in Bangladesh. This Division is working to achieve the goal of 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 biological manure, and helping the rural poor in the generation of employment, 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 programmes implemented by the relevant NARS institution and other institutions including universities, Department of Livestock Services (DLS) 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 programmes, to recruit scientists/officers in NARS Institutes, to support different research activities of NARS Institutes, and to support different activities of National Agricultural Technology Project (NATP), BARC and DLS Units.

Name of the professionals

Name	Designation
Dr. Nazmun Nahar Karim	Member-Director (CC)
Dr. Mohammad Rafiqul Islam	Chief Scientific Officer
Dr. Ali Akbar Bhuiyan	Principal Scientific Officer

1. Project Development/ Project Financing

- "Qualitative and quantitative study of antibiotic and heavy metals in broiler" funded by Ministry of Agriculture and implemented by Livestock Division, BARC.

2. Project Implementation

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, BARC with three components viz. BLRI, BAU and SAU are implementing from July 2018 to March 2022. Scientists of Livestock Division monitored the activities of the components throughout the year and conducted coordination meeting. All components collected different types of livestock feed samples during conducting the survey. Determination of Chemical composition of collecting feed samples had been completed. Meta-analysis of data and feeding trial were done by PIs. Extraction ratio and harvest index of some feed was completed like wheat, rice, etc. This project was completed successfully and a project completion report was published and distributed to the stakeholders.

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-2, PIU, BARC, coordinated by Livestock Division, BARC with three components viz. BLRI, BAU, PSTU, HSTU, RU, CVASU and SAU are implementing from July 2018 to March 2022. Scientists of Livestock Division monitored the activities of the components throughout the year and conducted coordination meeting. Field-based data survey was conducted from Farmers, Veterinarians and Medicine sellers by all components. Samples were collected from all different Districts. Isolation and identification of bacteria were done by using different culture media, Gram's staining, and biochemical tests. Antibiotic Sensitivity test was done. Antibiotic resistance bacteria were identified molecularly. This project was completed successfully and a project completion report was published and distributed to the stakeholders.

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, BARC with three components viz. BLRI and BAU are implementing from July 2018 to February 2022. Scientists of Livestock Division monitored the activities of the components throughout the year and conducted coordination meeting. BLRI component collected nasal swab samples from Meherpursadar, Meherpur; Jhenaidahsadar, Jhenaidah; Dhamrai, Dhaka; Debhata, Satkhira; Baliadangi, Thakurgaon, Brahamanbaria, Manikganj, Rangpur, Sylhet, Gazipur, Bagura, Pabna and Natore. Samples were tested by Polymerase chain reaction (PCR) method. Three Upazillas were selected for developing PPR free zone. Selected Upazillas are Badarganj, Rangpur; Deabhata, Satkhira and Gangni, Meherpur, where mass vaccination campaign was performed. BAU component conducted PCR amplification of N protein gene of PPR to confirm the viruses from collected samples, and sequencing were done from co-infection free samples. Finally, samples were selected for virus isolation in cell culture. Cultivation of PPR virus in Vero cell line is going on. This project was completed successfully and a project completion report was published and distributed to the stakeholders.

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, BARC with three components viz. BLRI and BAU are implementing from July 2018 to May 2022. Scientists of Livestock division monitored the activities of the components throughout the year and conducted coordination meeting. The 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 produced higher fresh weight in Napier-2, Napier-3, Rokona, Markoron, Para and German grass; whereas, 30Gy treated plants produced higher fresh weight in Napier-1, Napier-4 and Pakchong. They produced higher fresh weight than those of control plants (parents) except in few cases. On the basis of higher fresh weight and plant type (bushy and compact growth), 28 plants (17 from 20Gy and 11 from 30Gy) were selected and re-grown as M2 clones for agronomic evaluation. The selected (M2 clones) 7 different cultivars of Napier grass were regrowth 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 almost analyzed by BLRI component. The selected (M2 clones) two water logged grass like German and Para were regrown. In salinity stress experiments, selected best mutants from seven Napier cultivars were exposed to salinity stress of 8dSm-1, 10dSm-1 and 12dSm-1 of EC. The expression of NHX1, NHX2, SOS1, HKT family and AKT transporter genes were carried out through semi-quantitative RT-PCR. Salt and drought tolerant napier grass has been developed and field validation completed. This project has been completed successfully and a project completion report has been published and distributed to the stockholders.

Expression patterns of the novel salinity tolerant genes of different Napier cultivars. Semi quantitative RT-PCR was carried out with specific primers using the RNA isolated from leaves subjected to salinity stress for various time points. Actin amplification was used as the internal control.

e. Project entitled "Qualitative and quantitative study of antibiotic and heavy metals in broiler" funded by Ministry of Agriculture and implemented by Livestock Division, BARC. An inception workshop was held on 13 January 2022 at BARC auditorium. A number of recommendations were recorded. A technical committee was formed for implementing the project successfully. A total of 315 broiler and feed samples were collected from Dhaka, Gazipur, Chattogram, Rajshahi and Barisal. Collected muscles, bones and composites (liver, kidney and gizzard) of broiler were sent for determining 10 antibiotics and 3 heavy metals to SGS laboratory, Chennai, India and Quality Control Laboratory, DLS, Savar, Dhaka. Laboratory test results are under analyzing.

Speech delivered by the Chief Guest Wahida Akter, Additional Secretary (Admin), MoA in the inception workshop

3. Policy Level Contribution

- Provided opinion on Bangladesh Animal and Animal Product Prevention Act, 2005" Amendment Act, 2022 (Draft).
- Commented on the Pharmacy Act, 2021
- Provided opinion on The APRC paper on climate resilience.

4. Research Management / Financial Management and Coordination

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 05 March 2022 with the PI and Co-PI of the sub-project under NATP-2, BARC. 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 were taken. Minutes for all meetings of the sub-projects were prepared and sent to the PI and Co-PI for necessary actions according to the recommendations.

ii) The Livestock Division conducted a coordination meeting for formulating a project on "Reduction of methane emission in the livestock sector" on 06 June 2022 with the stockholders and experts (Figure 9). This meeting was Chaired by Member Director, Livestock Division. A presentation was delivered by Dr. Shahjahan Ali Sarker, Consultant, Adorsho Prani Sheba Ltd. Experts and stakeholders from BARC, KGF, CVASU, BLRI, BLRI and DLS provided their opinions regarding formulating the project. After discussion on the activities, recommendations were taken.

iii) The Livestock Division conducted an online meeting of the technical committee for implementing the project on "Qualitative and quantitative study of antibiotics and heave metals in broiler" on 23 January 2022 with the members of the technical committee. This meeting was Chaired by Member Director, Livestock Division. A presentation was delivered by Dr. Mohammad Rafiqul Islam, Chief Scientific Officer and Project Director, Livestock Division, BARC. Members of the committee provided their opinions regarding implementation of the project. After discussion on the activities, recommendations were taken. A proceeding of the meeting was prepared and sent to the members of the committee.

5. Monitoring, Reviewing and Evaluation Report of Programs/Activities of NARS Institutes

i) Desk monitoring: Scientists of Livestock Division conducted the desk monitoring of the activities of PBGR sub-project throughout the year

ii) Field monitoring: Scientists of Livestock Division monitored the activities of PBGR sub-project and validation trial of technology

iii) **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)**

The monitoring team from BARC visited the BLRI component of this project on 22 September 2021 at Nachol, Chapainawabgonj. The team visited the field activities and discussed with Co-PI regarding project achievement. Co-PI informed the team that activities were going on according to the plan. The monitoring team suggested specific points for achieving the goal.


Photographs of field monitoring and evaluation of project ID-110 at Nachol, Chapainawabgonj

iv) **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)**

The monitoring team from BARC visited the BLRI component of this project on 23 October 2021 at Samnagar, Satkhira. The team visited the field activities and discussed with Co-PI regarding project achievement. Co-PI informed the team that activities were going on according to the plan. The monitoring team suggested specific points for achieving the goal.


Photographs of field monitoring and evaluation of project ID-110 at Samnagar, Satkhira

v) **Field Monitoring and Validation of Technology Entitled Integrated Management of Gummosis Disease of Bael (ID: 013) at Shaymnagar, Rajshahi**

The monitoring team visited the field validation activities along with the PI at Shyampur, Rajshahi, on 14 March 2022. The team discussed with the concerned scientists, field staffs and cooperator farmers and collected updated information on the progress of activities compared with planned activities, problems and their suggestion/action needed for smooth running of the project. It provided some on-the-spot suggestions regarding crop management and other project activities for smooth running of the project.

vi) **Field Monitoring and Validation of Technology Entitled Integrated Management of Gummosis Disease of Bael (ID: 013) at Sadar, Chapainawabgonj.**

The monitoring team visited the field validation activities along with the PI atSadar, Chapainawabgonj on 14 March 2022. The team discussed with the concerned

scientists, field staffs and cooperator farmers and collected updated information on the progress of activities compared with planned activities, problems and their suggestion/action needed for smooth running of the project. It provided some on-the-spot suggestions regarding disease management and other project activities for smooth validation of the technology.


Photographs of field monitoring and evaluation of technology (ID-013) at Sadar, Chapainawabgonj

vii) **Field Monitoring and Validation of Technology Entitled Radish-Carrot-Groundnut Cropping Pattern in Padma Char Land (ID-096) at Pakshi, Pabna**

The monitoring team visited the field validation activities along with the PI atPakshi, Pabnaon 13 March 2022. The team discussed with the concerned scientists, field staffs and cooperator farmers and collected updated information on the progress of activities compared with planned activities, problems and their suggestion/action needed for smooth running of the project. It provided some on-the-spot suggestions regarding disease management and other project activities for smooth validation of the technology.


Photographs of field monitoring and evaluation of technology (ID-096) at Pakshi, Pabna

viii) Field Monitoring and Validation of Technology Entitled Self-Propelled Drum Type Carrot Washing Machine (ID-016) at Shyamnagar, Rajshahi on 14 March 2022

The monitoring team visited the research validation fields at Shyamnagar, Rajshahi and discussed with the concerned scientists, field staffs and cooperator farmers and collected updated information on the progress of activities compared with planned

activities, problems and their suggestion/action needed for smooth running of the project. It provided some on the spot suggestions regarding Self-Propelled Drum Type Carrot Washing Machine management and other project activities for smooth running of the project.


Photographs of field monitoring & evaluation of technology (ID-016) at Shyamnagar, Rajshahi

ix) **Field Monitoring and Validation of Technology Entitled BSRI Akh 47: A Potential Chewing Type Sugarcane (ID: 128) at Bandarban and Khagrachori 23-24 March 2022.**

The monitoring team visited the research validation fields at Bandarban and Khagrachori and discussed with the concerned scientists, field staffs and cooperator farmers and collected updated information on the progress of activities compared with planned activities, problems and their suggestion/action needed for smooth running of the project. The team provided some on-the-spot suggestions regarding BSRI Akh 47 management and other project activities for smooth running of the project.smooth running of the project.


Photographs of field monitoring & validation of technology (ID-128) at Bandarban and Khagrochori

x) **Field Monitoring and Validation Trial of Technology Entitled IPM with 2-3 IPM techniques for Sustainable Tea Production at Sreemangal, Moulvibazar and Bahubal Upazila, Hobiganj on 29 May 2022.**

The monitoring team visited the research fields and discussed with the concerned scientists, field staffs and cooperator farmers and collected updated information on

the progress of activities compared with planned activities, problems and their suggestion/action needed for smooth running of the project. The team provided some on-the-spot suggestions regarding crop management and other project activities for smooth running of the project.

xi) **Field Monitoring of Validation of Technology Entitled Floating bed fodder production in submerged and flooded areas (ID-647) at Jaganathpur and Sunamgonjon 30 May 2022.**

The monitoring team visited the research fields and discussed with the concerned scientists, field staffs and cooperator farmers and collected updated information on the progress of activities compared with planned activities, problems and their suggestion/ action needed for smooth running of the project. The team provided some on-the-spot suggestions regarding crop management and other project activities for smooth

Photographs of monitoring team's visit to Purbo Vobanipur Village, Jagonathpur, Sunamgonj

6. Training, Workshop, Seminar, etc. (Foreign and Local) Organized

a) Training

i) **Training Programme on Antimicrobial Resistance in Bangladesh at Bangladesh Agricultural University and Central Disease Investigation Laboratory (CDIL), DLS, Dhaka**

The Livestock Division, Bangladesh Agricultural Research Council, organized a training programme on "Antimicrobial Resistance in Bangladesh" from 29 November to 02 December, 2021 at the Conference room, Faculty of Veterinary Medicine, Bangladesh Agricultural University, Mymensingh. In this training course, 30 teachers/officers from Universities, Mymensingh Medical College, Community-based Medical College and Department of Livestock Services (DLS) were present as participants). The inaugural session was held under the chairmanship of Dr. Mohammad Rafiqul Islam, CSO, Livestock Division, BARC. Dr. Md. Mokbul Hossain, Dean, Faculty of Veterinary Medicine, BAU was present as Chief Guest in the inaugural session. Resource persons successfully conducted lectures 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


Photographs of the Training Programme on Antimicrobial Resistance in Bangladesh at Bangladesh Agricultural University

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 successful completion of the course, certificates were awarded to the participants.

ii) **Training Programme on Antimicrobial Resistance in Bangladesh at Central Disease Investigation Laboratory (CDIL), DLS, Dhaka**

The Livestock Division, Bangladesh Agricultural Research Council, organized a training programme on "Antimicrobial Resistance in Bangladesh" on 06-09 March, 2022 at Conference room of Central Disease Investigation Laboratory. In this training course, 30 teachers/officers from Sher-e-Bangla Agricultural University, Bangladesh Livestock Research Institute, Department of Fisheries and Department of Livestock Services (DLS), were present as participants. The Inaugural Session was held under the Chairmanship of Dr. Nazmun Nahar Karim, Member Director (Livestock), BARC. Dr. Nilufa Akter, Director, Livestock Research Institute, DLS was present as Chief Guest in the Inaugural Session. Resource persons successfully conducted the lectures and practical sessions on Antibiotics: Present Status, Implication and Opportunities, Discriminate and indiscriminate use of Antimicrobial Drugs and Environmental Hazards, hands-on training on collection, transportation and preservation of samples, hands-on training of Bacterial Culture, rational basis of antibiotic therapy, biosafety and biosecurity for AMR

Photographs of the Training Programme on Antimicrobial Resistance in Bangladesh at CDIL

Laboratory, AMR Control: One health approach, hands-on training of culture sensitivity test, AMR/AMU situation in Bangladesh and AMU guidelines. After successful completion of the course, certificates were awarded to the participants.

iii) **Training Program on Bioinformatics for Sustainable Development in Agriculture at Computer Lab., Computer and GIS Unit, BARC**

The Livestock Division, Bangladesh Agricultural Research Council (BARC), organized a training programme on "Bioinformatics for Sustainable Development in Agriculture" on 22-26 May, 2022 at the Computer Lab., Computer and GIS Unit, BARC. In this training course, 20 officers from NARS Institutes (BARI, BRRI, BSRI, BFRI, BJRI, BINA, BLRI, BARC) were present as participants. The Inaugural Session was held under the Chairmanship of Dr. Nazmun Nahar Karim, Member Director, Livestock Division, Bangladesh Agricultural Research Council (BARC), Dhaka. Dr. Md. Aziz Zilani Chowdhury, Member Director, Crop Division, Bangladesh Agricultural Research Council (BARC), Dhaka, was present as Chief Guest. The inaugural session started with the welcome remarks of Dr. Mohammad

Photographs of the Training Programme on Bioinformatics for Sustainable Development in Agriculture

Rafiqul Islam, CSO, Livestock Division, BARC. The resource persons successfully conducted lectures and practical sessions on introduction to bioinformatics and general aspects, bioinformatics for sustainable agriculture, hands-on training on bioinformatics database. introduction to NCBI, Ensembl and TAIR database, hands-on training on gene/promoter prediction, hands-on training on primer design, hands-on training on BLAST and sequence alignment, hands-on training on exploring Plant Metabolic Pathway Databases and Ensembl Plants Database, hands-on training on Protein Identifications, Protein sequence and functional information database (UNIPORT), hands-on training on protein functions, domain and motif analysis, hands-on training on prediction of immunogenic and antigenic peptides and antigenic propensity analysis, hands-on training on exploring Kyoto Encyclopedia of Genes and Genomes (KEGG) and data mining. After successfully completion of the course, certificates were awarded to the participants.

b) Workshop

i) Annual Workshop on Research Review 2020-2021 and Research Programme 2021-2022 of Bangladesh Livestock Research Institute

The Livestock Division, BARC, organized Annual Review Workshop on "Research Review 2020-2021 and Research Programme 2021-2022 of Bangladesh Livestock Research Institute (BLRI)" held on 31 October- 01 November, 2021 at Auditorium-2, Training Building, BARC. Participants from different organizations like DLS, BLRI, FAO, CVH, CDIL, NIB, ICDDRB, KGF, PIU-BARC, Universities and other organizations participated in the Workshop. The Inaugural Session was held under the Chairmanship of Dr. Nazmun Nahar Karim, Member Director (Livestock). Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC was present as the chief guest & Dr. Md. Abdul Jalil, Director General, Bangladesh Livestock Research Institute and Dr. Nilufa Begum, Director (Research, Training & Evaluation), Livestock Research Institute, DLS, were present as special guests. The welcome address was delivered by Dr. Mohammad Rafiqul Islam, Chief Scientific Officer, Livestock Division, BARC. He briefed on a presentation about the recommendations of the last year annual review workshop. Technical session-1 was Chaired by Dr. Kazi M. Kamaruddin, Consultant, Livestock Division, BARC and Technical session-2 was Chaired by Dr. Md. Jahangir Alam Khan, Vice-Chancellor, University of Global Village and Former Director General, BLRI. The Research Review 2020-2021 and Research Programme 2021-2022 were presented by Head of Animal Health Research Division, Animal Production Research Division, Poultry Production Research Division, Goat and Sheep Production Research Division, Biotechnology Division, Socio-Economic Research Division, System Research Division of BLRI. The presentations were followed by lively discussions. The concluding session was graced by Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops). In the concluding session, the rapporteurs presented their reports. Draft recommendations were taken in this session. At the end, Member Director, Livestock, BARC, concluded the annual workshop with giving thanks to the participants for their spontaneous contribution. Proceedings of the workshop were sent to respected institutions.

ii) Workshop on Data Validation of PBRG Sub-Project (ID:108)

The Livestock Division, BARC, organized a very interactive and outcome based Data Validation Workshop on PBRG Sub-Project "Development of knowledge hub on Feed Resources for efficient feeding management of livestock (ID-108)" on 12 December 2021 at the conference room, Training Building, BARC. The Inaugural Session was graced by Dr. Nazmun Nahar Karim, Member Director (Livestock), BARC as the Chief Guest while Dr. Nathu Ram Sarker, Director (Livestock & fisheries), KGF as the Special Guest. The Inaugural Session was Chaired by Dr. Mohammad Rafiqul Islam, CSO, Livestock Division, BARC & Associate Coordinator of this sub-project. The welcome remarks as well as short briefing of the projects were presented by Dr. Mohammad Showkat Mahmud, SSO, Livestock Division, BARC. The workshop was attended by the participants from different organizations (DLS, BLRI, BARC, University, PKSF & KGF). Principal Investigators (PIs) of BAU, BLRI and SAU components presented their data for validation. The presentations were followed by active discussions of expert members, Dr. Khan Md. Shaiful Islam,

Professor, Animal Nutrition, BAU, Mymensingh; Dr. Abu Sadeque Md. Selim, Professor, Animal Science and Nutrition, BSMRAU, Gazipur and Dr. A. B. AM Khaleduzzaman, DD, DLS, and the recommendations were finalized in this workshop.

Photographs of Workshop on Data Validation of PBRG Sub-Project (ID:108)

iii) Consultative Workshop on Safe Livestock Food Production in Bangladesh: Status and Way Forward

The Livestock Division, BARC, organized a very interactive and outcome oriented daylong consultative workshop on "Safe Livestock Food Production in Bangladesh: Status and Way Forward" on 27 February 2022 at BARC. The workshop was hosted by the Bangladesh Agricultural Research Council. The Inaugural Session started at 10:00 hours with the welcome remarks made by Dr. Mohammad Rafiqul Islam, CSO, Livestock Division of BARC. The inaugural session was graced by Chief Guest Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, Bangladesh Agricultural Research Council (BARC). The session was graced by Special Guest Dr. Dr. S. M. Jahangir Hossain, Director General, Bangladesh Livestock Research Institute. The Inaugural Session was Chaired by Dr. Nazmun Nahar Karim, Member Director (Livestock), BARC. The workshop was attended by the academia, scientists and professionals from organizations like BARC, DLS, BLRI, University, different public and private stakeholder organizations.

Photographs of the workshop on Safe Livestock Food Production in Bangladesh: Status and Way Forward

iv) Inception Workshop on Qualitative and Quantitate Study of Antibiotic and Heavy Metals in Broiler Project

The Livestock Division, BARC, organized an inception workshop on "Qualitative and Quantitative Study of Hazardous Chemicals in Broiler Birds" was held on 13 January 2022 at Auditorium-2, Training Building, Bangladesh Agricultural Research Council (BARC). The workshop was inaugurated by the Chief Guest Wahida Akter, Additional Secretary (Administration), Ministry of Agriculture, Government of the People's Republic of Bangladesh. Dr. S M Jahangir Hossain, Director General, Bangladesh Livestock Research Institute (BLRI) and Mr. Manzur Morshed Ahmed, Member (Public Health and Nutrition), Bangladesh Food Safety Authority (BFSA) were present as the Special Guests. Dr. Kazi Md. Kamaruddin, Consultant, Livestock Division, BARC; Dr. Nathu Ram Sarker, Director (Livestock and Fisheries), Krishi Gobeshona Foundation (KGF); Dr. Md. Mostafa Kamal, Project Director, Quality Control Laboratory, Department of Livestock Services were present as discussants. The inception workshop was chaired by Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC. A number of recommendations were made based on the comments and suggestions of the experts, guests, professionals, scientist and participants.

Photographs of inception workshop on Qualitative and Quantitative Study of Hazardous Chemicals in Broiler Birds Project

7. Attended Foreign and Local Training, Workshop, Seminar

- Attended project workshops (inception, review and completion) arranged by different Divisions/Units of BARC and other organizations
- 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.)
- 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.).
- Scientists acted as rapporteurs in different workshops conducted by BARC and the MoA.
- Preparation of proceedings of different meetings and seminars.
- Actively participated in different workshops/seminar organized by different Divisions/Units of BARC, other national and international organizations.

8. National and International Linkages (MoU/ Bilateral Agreement, Collaborative Workplan Signed During the Year. Highlights of Activities Undertaken under the MoU/ Agreement, etc.

- Participation of Livestock Division Scientists as Resource Persons in different Training course
- Scientists of Livestock Division actively worked in the different Committees
  - Acted as a member for the National Avian Influenza control Committee, DLS.
  - Acted as an Academic Council Member for Sylhet Agricultural University
  - Acted as a member for the Committee on Market value assessment for BARC
  - Acted as a member for the Antimicrobial Resistance Sectoral Working Group, DLS.
  - Acted as a member for the National PPR control Committee, DLS.
  - Acted as an external examiner for different Universities
  - Acted as a co-supervisor for MS thesis at BAU
  - Worked as a member in the different committee of BARC
  - Worked as a member in the Editorial Board of Bangladesh Journal of Agriculture (BJA)
  - Attended meetings/seminar/workshops organized by BARC
  - Attended training programme organized by BARC
  - Worked as a member of the recruitment committee of PBRG projects and other project.
  - Worked as a member of the recruitment committee of BLRI Promotion Committee-2
  - Worked as a member of the BLRI Technology Evaluation Committee
  - Worked as a member of the BLRI Technical programme evaluation Committee
  - Worked as a member in the different committee of PIU-BARC
  - Acted as MS thesis evaluator.
  - Acted as member of selection committee for research and Innovation Sub-Project, LDDP, DLS

9. Presentation of Research Articles by the Scientist(s) in Different Programmes

- Writing speech for the high officials of BARC and MoA for different national and international events
- 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.).
- Scientists acted as rapporteurs in different workshops conducted by BARC and the MoA
- Preparation of proceedings of different meetings and seminars.
- Actively participated in different workshops/seminar organized by different Divisions/Units of BARC, other national and international organizations.
- Attended project workshops (inception, review and completion) arranged by different Divisions/Units of BARC and other organizations

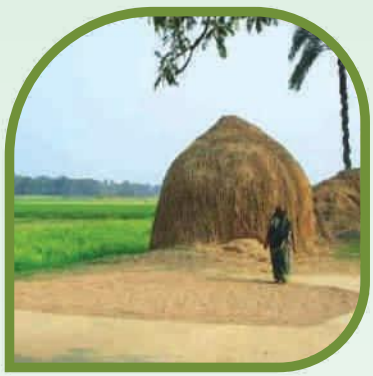
10. Publication(s) by the Division/Section in Different Journals/Media

- Contributed to publish BARC Annual Report (2020-21)
- Contributed to publish BARC Newsletter (2021-22)
- Published a Training Manual on "Antimicrobial resistance in Bangladesh," November, 2021.
- Published a Training Manual on "Antimicrobial resistance in Bangladesh," March, 2022.
- **Published PBRG Sub-project completion report on**
  - "Preparedness for the control of peste des petits ruminants (PPR) in Bangladesh (ID-139)," December 2021.
  - "Development of knowledge hub on animal feed resources for efficient feeding management on livestock (ID-108)," February, 2021
  - "Determination of antimicrobial resistance and residues in livestock and poultry food products and feed in Bangladesh (ID-138)," January, 2022.
  - "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)," June, 2022.
- **Published in booklet**
  - "Preparedness for the control of peste des petits ruminants (PPR) in Bangladesh (ID-139)," December 2021.
  - "Development of knowledge hub on animal feed resources for efficient feeding management on livestock (ID-108)," February, 202
  - "Determination of antimicrobial resistance and residues in livestock and poultry food products and feed in Bangladesh (ID-138)," January, 2022.
  - "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)," June, 2022.
  - ছাগলের পিপিআর রোগ নিয়ন্ত্রণ পদ্ধতি। ডিসেম্বর, ২০২১।
  - বাংলাদেশে প্রাণিজাত প্রোটিন ও প্রাণিখাদ্যে অ্যান্টিমাইক্রোবিয়াল ঔষধের অবশিষ্টাংশ (Residues) এবং প্রতিরোধ (Resistance) নির্ণয় এবং করণীয়। এপ্রিল, ২০২২।
- **Published Video Documentary on**
  - "Preparedness for the control of peste des petits ruminants (PPR) in Bangladesh (ID-139)," December 2021.
  - "Determination of antimicrobial resistance and residues in livestock and poultry food products and feed in Bangladesh (ID-138)2," January, 2022.
- **Scientific Publications**
  - Survey on Knowledge, Attitude, and Practices of Large-Animal Farmers towards Antimicrobial Use, Resistance, and Residues in Mymensingh Division of Bangladesh (2022). Md. Tarek Hossain, Kazi Rafiq, Md. Zahorul Islam, Sharmin Chowdhury, Purba Islam, Ziaul Haque, Mohammed Abdus Samad, Aminatu Abubakar Sani, Most. Rifat Ara Ferdous, **Md. Rafiqul Islam,** Nurnabi Ahmed, Md. Ismail Hossen, A. K. M. Khasruzzman, Mohammod Kamruj Jaman Bhuiyan and Muhammad Tofazzal.

Antibiotics 2022, 11, 442. https:// doi.org/10.3390/antibiotics11040442 **(Impact factor: 4.6).**

- Semi-Scavenging Poultry as Carriers of Avian Influenza Genes (2022). A T M Badruzzaman, Md. Masudur Rahman, Mahmudul Hasan, Mohammed Kawser Hossain, Asmaul Husna, Ferdaus Mohd Altaf Hossain, Mohammed Giasuddin, Md Jamal Uddin, **Mohammad Rafiqul Islam**, Jahangir Alam, Seong-Kug Eo, Folorunso OludayoFasina and Hossam M. Ashour. Life 2022, 12, 320. https://doi.org/10.3390/life12020320. (Impact factor: 3.8).
- Role of Different Growth Enhancers as Alternatives to In-feed Antibiotics in Poultry Industry (2022). Kazi Rafiq, Muhammad Tofazzal Hossain, Rokeya Ahmed, Md. Mehedi Hasan, Rejaul Islam, Md. Ismail Hossen, Sourendra Nath Shaha and **Mohammad Rafiqul Islam**. Front. Vet. Sci. 8:794588. doi: 10.3389/fvets.2021.794588 **(Impact factor: 3.12).**
- Validation and standardization of designed N gene primer-based RT-PCR protocol for detecting Peste des Petits Ruminants virus in goats (2022). Sajeda Sultana, Munmun Pervin, Nazneen Sultana, **Md. Rafiqul Islam,** Mohammad Abu Hadi Noor Ali Khan. J Adv Biotechnol Exp Ther. 2022 Sep; 5(3): 497-509.
- Duck virus enteritis (duck plague) outbreak in an Australian black swan (Cygnus atratus) flock at safari park in Bangladesh: A case report. (2021) Md. Mohirul Islam, Jahidul Islam, Md. Sadequl Islam, Tanvir Ahamed, **Mohammad Rafiqul Islam,** Mst. Minara Khatun, Md. Ariful Islam. Journal of advanced veterinary and animal research, 8(4): 557-562.
- Efficacy of turmeric (Curcuma longa) and garlic (Allium sativum) powder to protect broiler chicken receiving diet containing exogenous afflatoxin. **A. A. Bhuyan,** A. A. Bhuiyan, **M. M. Rana,** M. R. Islam, M. A. Rashid and M. S. K. Sarker. Bangladesh J. Agri. 2019-2021, 44-46: 89-95 DOI: https://doi.org/10.3329/bjagri.v46i1-6.59977

Agricultural Economics and Rural Sociology Division



Agricultural Economics and Rural Sociology Division

Name of the professionals

Name	Designation
Dr. Md. Mosharraf Uddin Molla	Member Director (CC) and Chief Scientific Officer
Dr. Md. Abdus Salam	Principal Scientific Officer

1. Project Development/Financing

- Projections of supply and demand for selected food crops in Bangladesh
- Integrated assessment of agricultural credit management systems in Bangladesh: Quest for policy options submitted to KGF for fund

2. Project Implementation

- Projections of supply and demand for selected food crops in Bangladesh
- Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of Haor Area (Wetland) Management Practice, NATP-2 PBRG sub project ID 158

3. Policy Level Contribution:

- Input on Bangladesh-2022 Staff visit Labour market
- Input on Agriculture, Rural Credit and Policy Action plan
- Opinion on Regional Trade Agreement (RTA) Policy 2022
- Input for 15th Joint Economic Commission between Bangladesh and China
- Inputs for 1st meeting on Joint working Group on Trade between Bangladesh and Australia
- Input for the 3rd Joint Trade Committee (JTC) between Bangladesh and Vietnam
- Input for the Joint Trade and Economic Cooperation between Bangladesh and Belarus
- Input for Meeting with Honorable Minister of Commerce, Trade & Industry of Eswatini
- Information from BARC on 15th meeting on Bangladesh-China joint commission
- Input for High Level Economic Partnership Consultation between Bangladesh and USA
- Input for High Level Economic Partnership Consultation between USA and Bangladesh
- Input on Intergovernmental Commission Meeting on Trade and Economic Cooperation
- Opinion for Free Trade Agreement of Bangladesh
- Opinion for Preferential Trade Agreement (PTA)

- Opinion for Regional Trade Agreement (RTA) Policy 2022
- Opinion for Workshop on Encouraging Private Sector Participation especially in Value-Chain Management for Agricultural Products
- Opinion for 78th session of Economic and Social Commission for Asia and Pacific
- Opinion for Strategy WTO Issue (Other Than Market Access and TRIPS) for LDC Graduation of Bangladesh
- Input for inclusion in Budget speech 2022-23 of Hon'ble Minister, Ministry of Finance
- Input for Bangladesh Economic Review 2022
- Input for USDA Bangladesh Trade Facilitation Project
- Input for World Bank on Country Survey FY2022
- Input on Prime Minister at the LDC5 conference to be held in Doha, Qatar on 23-27 January 2022
- Input on scaling up inclusion digitalization in agriculture value chain
- Opinion on Double Fumigation on Cotton Export from USA
- Opinion on Double Fumigation on Cotton Export from USA
- BARC's opinion for inclusion in the agenda for presentation to the National Committee on Exports
- Suggestions/Comments on WTO Agreement on Agriculture and Sanitary and Phytosanitary (SPS)
- Provided opinion on the draft of "Sheikh Hasina Agricultural University Act 2022"
- Comments on "Framework for Formulation of National Tariff Policy of Bangladesh"

4. Research Management/ Financial Management and Coordination

Coordinating PBRG Sub-Projects (ID: 158) under AERS Division "Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of Haor Area (Wetland) Management."

5. Monitoring, Reviewing, and Evaluation Report of Programme /Activities of NARS Institutes Monitored one Projects

- Project ID: NATP-2 PBRG Sub Project ID 158 "Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of Haor Area (Wetland) Management" Implement Component: BAU, Location: Kishoreganj and Mymensingh
- **Reviewing research progress and future research program:**
  Agricultural Economics of BARI, BRRI, BINA and BSRI, Socio-economic Research Division, BLRI of BLRI & Forest Economics Division of BFRI

6. Research Programme Development of NARS Institutes

Contributed to BARI, BRRI, BINA, BSRI, BLRI & BFRI

7. Organized Training, Workshop and Seminar (Foreign and Local)

a. Review Workshop of Socio-Economic Research Programmes of NARS Institutes

The "Annual Review workshop on Socio-economic Research Program (2021-22) and Future Research Programme (2022-23) of NARS Institutes" was held at the Auditorium-2 of Bangladesh Agricultural Research Council, Farmgate, Dhaka on 15 June 2022 organized by Agricultural Economics and Rural Sociology (AERS) Division, BARC. In the Inaugural Session, Dr. S M Bokhtiar, Executive Chairman, BARC, was the Chief Guest. The workshop was presided over by Dr. Md. Mosharraf Uddin Molla, Member Director (AERS), BARC. At first, Session Chair welcomed all and stated the aims of the workshop highlighting the importance of this review workshop, which is a part of Annual Performance Agreement (APA) of BARC. He also mentioned about the recommendations of the previous year's workshop, which are expected to be incorporated in future research Programme of the respective NARS Institutes. A total of 70 participants including scientists, professors, agriculture experts and delegates attended the workshop from different research organizations, universities and private sectors. The present and future research activities were presented by the head or nominee of the related division of six NARS Institutes (BARI, BRRI, BINA, BSRI, BLRI & BFRI) in the technical session. The first technical session was presided over by Prof. (Ex) Dr. Rezaul Karim Talukdar, BAU and the second technical session by Prof. Dr. Jahangir Alam Khan, Former Director General, BLRI. Five expert reviewers namely Dr. A.S.M. Anwarul Huq, Former Director General, BJRI, Dr. Md. Shahdat Hossain, former Director General, BARI, Dr. Md. Firoze Shah Sikdar, former Director General, BRRI, Prof. (Ex.) Dr. Shaikh Abdus Sabur, BAU, Mymensingh, Prof. (Ex) Dr. S. M. Fakhrul Islam, BSMRAU, Gazipur reviewed the presented research Programme critically. However, the following comments/suggestions were made in the daylong workshop by the expert reviewers and valued participants which are expected to be integrated in formulating future research programs of the respective division of NARS Institutes.

Comments/Suggestions on the Research Programmes of BARI:
Future Research Programme (FY: 2022-23):

- Problem identification should be more specific.
- The word 'Study/project/activity' could be written instead of experiment.
- The production and marketing system of Dragon fruits in some Selected Areas of Jashore Region should be removed or Exp. 7 and 10 study could be merged.
- In the Exp 12, crop variety should be specified instead of farming system since farming system is holistic approach.
- Study on the scope of mustard crop inclusion in hill cropping pattern should be undertaken.
- In the Exp 2, stress tolerant means many types of stress but specific stress tolerant maize variety should be mentioned.
- Why are farmers not interested to adopt mustard between two rices? The study on constraint toward mustard adoption should be undertaken.
- Under the Exp. 9, in-depth value chain analysis should be given emphasis other than supply chain.
- The reason regarding why price of potato increased a year followed by decrease in subsequent year should be studied.

- Market-oriented study should be given emphasis.
- An objective about identifying constraints/ searching solution as well as policy implication should be taken for the study since all the study is important for policy support.
- Justification for study location should be given other than purposiveness.
- The number of studies can be smaller in order to improve the quality of study. Sample size should be increased rationally in case of all proposed studies. At least 100 samples should be considered.

Comments/Suggestions on the Research Programmes of BRRI:
Future Research Programme (FY: 2022-23):

- Problem identification should be more specific.
- Study on BRRI initiative with suitable variety for haor area should be undertaken.
- Under the activity 14, the name of the technology should be mention/listed down and considering the number of technologies, the study should be designed for survey in the successive year.
- Under the activity 15, the haor area should be included. Government provided on several type of combine harvester and transplanter, and machine type should also be specified.
- Since rice price tends to increase during peak harvest, a study on reason behind price hike should be undertaken.
- Estimated rice yield or production should be predicted based on crop cut result.
- Conversion factor from paddy to rice should be realistic and actual conversion factor should be used. Branding and conversion factor should be consistent. More study on conversion factor should be undertaken.
- An objective about identifying constraints/ searching solution as well as policy implication should be adopted for each study since all the study is important for policy support.
- Justification for study location should be given other than purposiveness.
- Number of studies can be smaller in order to improve the quality of study. Sample size should be increased rationally in case of all proposed studies. At least 100 samples should be considered.
- Market-oriented study should be given emphasis.

Comments/Suggestions on the Research Programmes of BINA:
Future Research Programme (FY: 2022-23):

- Problem identification should be more specific.
- The word "Study/Project/Activity" should be written instead of experiment.
- Under BINA FP-1: Yield gap analysis of BINA dhan 19 in some selected areas of Bangladesh, research station yield, potential farmers yield and actual farmers yield should be considered for yield gap analysis.

- In the BINA FP-2, in case of profitability of BINA dhan 22 analysis, scientific assessment should be made considering the review of literature.
- An objective about identifying constraints/ searching solution as well as policy guideline should be taken for the study.
- The sample size should be increased rationally in case of all proposed studies. At least 100 samples should be considered.
- Market-oriented study should be given emphasis.

Comments/Suggestions on the Research Programmes of BSRI:
Future Research Programme (FY: 2022-23):

- Problem identification should be more specific.
- Economic study on palm juice should be undertaken
- In the BSRI-2: Impact of BSRI provided extension services on date palm juice and gur production in some selected areas of Bangladesh, the word impact means boarder sense. In this case, evaluation or effect can be used in lieu of impact.
- In BSRI-3, determination of AEZs recommended nutrient doses has already been published, the step2 should be removed.
- An objective about identifying constraints/ searching solution as well as policy implication should be taken for the study since all the study is important for policy support.
- Justification for study location should be given other than purposiveness.
- Number of studies can be smaller in order to improve the quality of study. The sample size should be increased rationally in case of all proposed studies. At least 100 samples should be considered.
- Market-oriented study should be given emphasis.

Comments/Suggestions on the Research Programmes of BFRI:
Future Research Programme (2022-23):

- Problem identification should be more specific.
- "Valuation of Ecosystem Services in Sitakunda Botanical Garden and Ecopark, Chattogram" seemed to be overestimation. Therefore, suitable ecology evaluation method under the study "Valuation of Ecosystem Services in Hazarikhil Wildlife Sanctuary (HWS) of Chattogram" is needed in order to avoid overestimation.
- An objective about identifying constraints/ searching solution as well as policy implication should be taken for the study since all the study is important for policy support.
- Justification for study location should be given other than purposiveness.
- Number of studies can be smaller in order to improve the quality of study. The sample size should be increased rationally in case of all proposed studies. At least 100 samples should be considered.
- Presentation front and color should be visible and rationale.

Comments/Suggestions on the Research Programmes of BLRI:

Future Research Programme (2022-23):

- Problem identification should be more specific.
- Study on optimum duration for meat production should be undertaken.
- Livestock breed and duration-based profitability should be undertaken.
- An objective about identifying constraints/ searching solution as well as policy implication should be taken for the study since all the study is important for policy support.
- Justification for study location should be given other than purposiveness.
- Number of studies can be smaller in order to improve the quality of study. The sample size should be increased rationally in case of all proposed studies. At least 100 samples should be considered.
- Market-oriented study should be given emphasis.

8. General Recommendation/Suggestion for All Institutes

All presentation of different institute should be legible and clear.

a. Inception workshop on projections of supply and demand for selected food crops in Bangladesh

Inception workshop on projections of supply and demand for selected food crops in Bangladesh by 2030 and 2050 was held on 17 January 2022 at the BARC Auditorium-2 organized by AERS division. The inaugural session was presided over by Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC. In the session, Wahida Akter, Additional Secretary (Admin), Ministry of Agriculture was the Chief Guest and Tonmoy Das, Joint Secretary Ministry of Agriculture, was the Guest of Honor. The inaugural and welcome speech was given by Dr. Md. Mosharraf Uddin Molla, Member Director (AERS), BARC and coordinator of the research team. The keynote paper was presented by Prof. Dr. S.M. Fakhrul Islam, Professor (Retired), BSMRAU, Gazipur and Leader, Research Team. A total of 60 participants including team members and member of advisory committee, renowned university professors, agriculture experts and delegates from different research organizations and private sectors were present.

Wahida Akter, Additional Secretary (Admin), Ministry of Agriculture delivered the speech

b. Project Completion Report (PCR) Review Workshop: Cost and Return Analysis of Selected Crops in Bangladesh funded by PIU-BARC, NATP-II, PBRG (021)

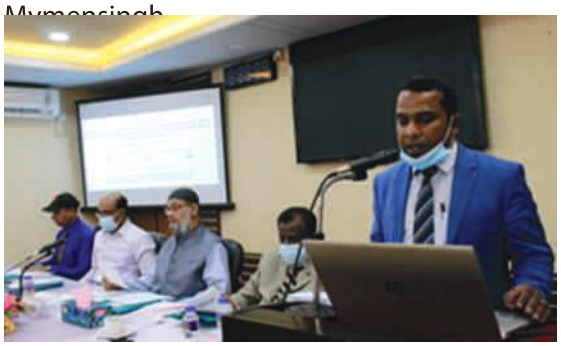
The Project Completion Report (PCR) Review workshop on "Cost and Return Analysis of Selected Crops in Bangladesh" was held at the Auditorium-1 of Bangladesh Agricultural Research Council, Farmgate, Dhaka on 25 October 2021 organized by Agricultural Economics and Rural Sociology (AERS) division, BARC. The Executive Chairman, BARC, Dr. Shaikh Mohammad Bokhtiar was present as Chief Guest of the workshop. At the outset, the Chairperson of the workshop Dr. Md. Mosharraf Uddin Molla, MD (AERS) and Coordinator of NATP-II, PBRG Sub-Project ID#021 welcomed all distinguished audience and made a brief presentation regarding the execution of the project activities with a highlight on challenges of the project implementation during COVID-19 as well as summary findings especially usefulness of this research for agriculture policy. The Sub-Project coordinator also mentioned about the necessity of this type of project on other crops, which could be supportive for policy maker and market policies. A total of 72 participants including scientists, professors, agriculture experts and delegates attended the workshop from different research institutes, universities and private sectors. The technical session was presided over by former Professor Dr. Md. Rejaul Karim Talukdar, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh. On behalf of the coordinating part, Dr. Md. Abdur Rashid, CSO and Head, Agricultural Economics Division, BARI and PI of the Sub-Project presented the detailed findings of cost and return of the selected crops in the technical session. Four expert reviewers namely Dr. A.S.M. Anwarul Huq, Former Director General, BJRI, Prof. (Ex.) Dr. Shaikh Abdus Sabur, BAU, Mymensingh, Prof. Dr. Mohammad Mizanul Haque Kazal, SAU, Dhaka and Dr. M. Shahe Alam, Form.er CSO, Agricultural Economics Division, BRRI, reviewed the presented research program critically. However, the expert members and the distinguished participants appreciated the successful completion of the project and suggested to update the cost and return information by three years interval and undertake this type of project activities on other crops as well by the respective division of NARS Institutes.

PCR Review Workshop on Cost and Return Analysis of Selected Crops in Bangladesh

c. Project Completion Report (PCR) Review Workshop: Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of Haor Area (Wetland) Management Practice (ID: 158)

A PCR Review 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 14 March 2022 at the BARC Auditorium-2 organized by AERS division as coordinating part with participation of two implementing components: Bangladesh Agricultural University, Mymensingh and Sylhet Agricultural University. The inaugural session was presided over by Dr. Md. Mosharraf Uddin Molla, Member Director (AERS), BARC. In the session, Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC

was the Chief Guest and Dr. Harunur Rashid, Director, PIU-BARC, NATP-2 was the Special Guest. A total of 80 of participants 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 were present at the program. The technical session was presided over by Professor (Ex), Dr. Md. Rejaul Karim Talukdar, BAU, Mymensingh.



Review Workshop on Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of Haor Area (Wetland) Management Practice (ID: 158)

Review Workshop: "National Budget 2021-22 Analysis: Agriculture and Agricultural Development Perspective"

Not organized due to budget constraint

- **Training on Application of Impact Assessment Methods in Agriculture**

A training program on "Application of Impact Assessment Methods in Agriculture" was held on 29 May-02 June at Computer Lab., BARC organized by AERS Division. The resource speakers were the Professors from Bangladesh Agricultural University, Mymensingh. Twenty participants (Agricultural Economists) from NARS Institutes (BARI, BRRI, BINA, BSRI, BLRI and BFRI) and Agricultural Universities attended the training programme. Dr. S M Bokhtiar, Executive Chairman, BARC, was the Chief Guest at concluding session and handed over the certificates to the participants of the training programme.

Training on Application of Impact Assessment Methods in Agriculture

9. Attended Training, Workshop and Seminar (Foreign and Local)

Training

- "Annual Confidential Report (ACR)" organized by BARC during 29 January 2022
- "E-filing system for BARC's scientist and officer" organized by BARC during 02 February 2022
- "Technical Report Writing and Editing" organized by BARC during 13-17 February 2022
- "Right to Information Act 2009" organized by BARC during 04 April 2022

- "Climate change, carbon sequestration and adaptation strategies" organized by BARC during 25-27 April 2022
- "Annual performance agreement" organized by BARC during 28 May 2022
- "Right to Information Act 2009" organized by BARC during 29 May 2022
- "Agricultural policy and strategy for agricultural transformation training for senior executive scientists" organized by NATA Gazipur during 4-8 June 2022
- "Service simplification" organized by BARC during 20 June 2022

Workshop

- Implementation Strategy of PBRG Generated Technologies for Validation organized by PIU-BARC, NATP-2 on 3 January 2022
- "Upscalling and application of solar photovoltaic pump for smallholder irrigation and household appliances in the central coastal region of Bangladesh" by BARC during 11 January 2022
- "Groundwater resources management for sustainable crop production in north-west hydrological region of Bangladesh" organized by BARC during 12 January 2022
- "Exploration, identification, characterization, multiplication and ex-situ conservation of endangered forest genetic resources including medicinal plants of Bangladesh" organized by BARC during 20 January 2022
- "Validation of NATP-2 generated technologies" organized by PIU-BARC, NATP-2 during 24 January 2022
- "Omics food and nutritional security-platform technologies to enhance crop genetic resources and food value chains in Bangladesh" organized by BARC during 30 January 2022
- "Development of upazila land suitability assessment and crop zoning system of Bangladesh" organized by BARC during 02 February 2022
- "Determination of critical limit of nutrients for soils and crops" organized by BARC during 07 February 2022
- "Improvement of soil health and crop productivity of major problem soils of Bangladesh through organic amendments" organized by BARC 08 February 2022
- "Delta Plan 2100" organized by BARC 15 February 2022
- "Drought and Rain-fed Ecosystem" organized by BARC during 20 February 2022.
- Workshop on "Bangladesh Good Agricultural Practices" organized by BARC, Date: 22 February 2022.
- "Transfer of agricultural technologies to farmers level for increasing farm productivity" organized by BARC 23 February 2022
- "Livelihood improvement of farmers through integrated farming system research and development of drought and rain-fed ecosystem" organized by BARC 28 February 2022

- "Action Plans for Implementation of Bangladesh Good Agricultural Practices (GAP)" organized by BARC 01 March 2022
- Workshop on "Finalization of Integrated Action Plan to Advance/Build the Country's Agriculture Sector in line with Fourth Industrial Revolution" organized by BARC, Date: 02 March 2022.
- Workshop on "Actions to meet the challenges of Fourth Industrial Revolution" organized by BARC, dated: 19 April 2022.
- "Communication skill development for agricultural scientists" organized by BARC 25 May 2022
- "Development of high yielding hybrid varieties of different crops and extension at farmers' level" organized by BARC 30 May 2022
- "PBRG Sub-Project co-ordinated by Fisheries division, BARC" organized by BARC 02 June 2022
- "Livelihood improvement of farmers' through integrated farming system research and development of drought and rain-fed ecosystem" organized by BARC 14 June 2022

Seminar

- "Turkish Agricultural Research Advancement" organized by BARC during 25 January 2022
- "Right to Information Act 2009" organized by BARC during 30 March 2022
- "National Integrity Strategy Action Plan" organized by BARC during 19 June 2022

10. Publication by the Division/ Section in different Journal /Media

a) Journal Article

i. M.C. Rahman, M.A.R. Sarker, **M.A. Salam**, J. Alam, M.M.U. Molla, M.S. Rahman, S. Islam, M.R.A. Khan and M.M. Rahman (2021). Analysis of Recent Rice Price Dynamics in Bangladesh: Causes and Policy Options. Asian Journal of Agricultural Extension, Economics and Sociology. 39 (12): 54-69, 2021.

b) Published Project Completion Report

i. **M.M.U. Molla**, M.A. Rashid, S. Islam, M.M. Khatun, M.S. Rahman and R. Sultana (2021). Cost and Return Analysis of Selected Crops in Bangladesh. Project Completion Report. PBRG Sub-Project ID: 021, PIU-BARC, NATP-2, Dhaka.

ii. **M.M.U. Molla**, F.A. Huda, J.U. Ahmed, M.R.U. Mia and B. Marium (2022). Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of Haor Area (Wetland) Management Practice. Project Completion Report. PBRG Sub-Project ID: 158, PIU-BARC, NATP-2, Dhaka.

11. Regular Activities

- Working as a Member of Executive Council, BARC, Tender Committee, Technical committee, Recruitment committee, Investigation committee, Receiving committee (goods), Project Implementation Committee, etc.

- Acted as an Expert Member on Socio-economic Research Review Workshop of NARS institutes.
- Performed as a Resource Person in the training programme titled "Methodology of Farming Systems Research & Development" organized by P&E Division, BARC
- Performed as a Resource Person in the training programme titled "Research Methodology" organized by PIU-BARC, NATP-2.
- Performed as a Resource Person in the training programme titled "SWOT and Sensitivity Analysis" and "Collection of Data in Social Science" organized by PIU-BARC, NATP-2
- Acted as a Member of Expert Technical Committee for Agriculture Census 2019 of BBS
- Participation in Inter-ministerial Committee of MoA for estimating cost of production of rice and wheat
- Participation 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 Scientific Journal
- Working as a Supervisor/Co-supervisor of MS Thesis
- Working as an Examiner of MS Thesis
- Annual Report 2021-22 was prepared.

12. Others

- **Examiner of MS Thesis (SAU, Dhaka)**
- "Profitability Analysis of Banana Cultivation in Some Selected Areas of Gazipur District"
- "Profitability Analysis of Brinjal Production and Socio-economic Condition of Brinjal Farmer in Jamalpur District"
- "Financial Profitability and Resource Use Efficiency of Onion Cultivation in Some Selected Areas of Faridpur District of Bangladesh"
- "Profitability and Resource Use Efficiency of Wheat Production in Some Selected Areas of Naogaon District in Bangladesh"
- **Research highlights on Annual Research Report for FY 2021-22**

I. Agricultural Economics Division, BINA

Study 1: Cost and Returns of Selected Pulse Crops in Bangladesh

The study was undertaken to estimate the financial and economic returns and competitiveness of some selected pulse crops in Bangladesh. A total of 300 pulse growers (50 for each location and for each crop) were randomly selected for the study. The cost-and-return analysis was done on both variable and total cost basis. Domestic resource cost (DRC) was also estimated for evaluating the comparative advantage of selected spices crops. The study revealed that the gross margins of producing selected pulse crops were found positive.

However, highest gross margin was estimated for chickpea producers (Tk 56562/ha) followed by blackgram producers (Tk 43705/ha) and grasspea producers (Tk.32852/ha). Comparatively lowest net return was calculated also for grasspea producers (Tk 18067/ha) than other two selected pulse crops in the study areas. The highest benefit cost ratio was for blackgram (1.71) followed by chickpea (1.61) and grasspea (1.56). The estimates of DRC (Domestic Resource Cost) showed that Bangladesh had comparative advantage in chickpea, grasspea and blackgram production as these estimates were less than one implied that the production of chickpea, grasspea and blackgram would be highly efficient for import substitution. Responded farmers mentioned that the low market price at harvesting time and market syndicate were the major constraints for pulses production. Again due to severe infestation of insects and diseases of selected pulses crops yield were drastically reduced and it leads to heavy loss to the growers. Fertilizer not working properly might be due to adulterations, crisis of labour at harvesting time and high wage rate in the study areas were also among the constraints. Government should take initiatives for reasonable price at harvesting time. DAE personnel should frequently make visit to the farmer's field. Mechanization should be introduced to the farmer's field for minimizing the labour crisis.

Study 2: Value Chain Analysis of Selected Gher Based Vegetables in Southern Region of Bangladesh

The study was carried out at Bagerhat, Khulna and Sathkhira Districts to analyse the supply chain of Gher based fresh vegetables and to document the current market situation of Gher based fresh vegetables with regard to production, consumption, and trade during January-May, 2022. Twelve major important vegetables, namely country bean, yard long bean, bitter gourd, bottle gourd, ash gourd, sweet gourd, ridge gourd, snake gourd, brinjal, cucumber, tomato and okra were selected for the study. Both vegetable producers and traders were selected for the study. The producers (200 farmers) of the selected vegetables who come to the market for selling their produces were randomly selected for interview. A number of traders (100 traders/market actores) i.e. Bepari, Arotder and Retailer were selected for selected vegetables through establishing a congenial relationship with them. In the study areas in case of all selected vegetables, producers sold a lion share to different traders and consumers immediate after harvesting. Majority of selected vegetables farmers used auto-van for transporting their products in the market. Cent percent selected vegetables farmers of all areas reported that they sold their product in the primary market i.e local market in the study areas. About 90% product ran through Farmer – Bepari –Aratdar – Retailer - Consumer in this channel. Average postharvest loss of vegetables was 10.43% at farm level and the total post-harvest loss of selected vegetables in the supply chain was estimated at 25.43% meaning a huge loss occurred at different levels of marketing. Estimated producers' shares to the consumers' prices for different vegetables ranged from Tk. 33-39%. Average marketing cost of all areas was found to be the highest for bepari and the net margin of all vegetables was found to be the highest for retailer followed by bepari. The total price spreads of all vegetables was ranged from Tk. 18-25 per kg in the study areas. Among the selected vegetables, sweet gourd, ridge gourd and tomato were more efficient than other studied vegetables. Disease infection and insect infestation were the acute problem of vegetable cultivation in the study areas and lack of capital, high transport cost and unstable price and lack of marketplaces were the major problems for the traders.

Study 3: Supply Chain Analysis of Malta (Sweet Orange) in Bangladesh

The study estimated the profitability of malta (sweet orange) cultivation, identified supply chains, measured marketing efficiency and explored the problems of its cultivation in the study areas of Bangladesh. A total of 225 respondents consisting of 50 producers and 25 traders for each District (Khagrachari, Banderban and Panchagar) were selected for the study. Data were collected through a pre-tested interview schedule during 2021-22. The analysis revealed that malta cultivation was profitable in the study areas. The highest cost was estimated at Tk.7,02,650/ha in 1st year garden and the lowest cost was Tk. 3,94,315/ha in 2nd year garden. Gross return was highest in the 5-10th year garden (Tk. 9,80,000/ha) and the lowest Tk. 5,17,600/ha in 3rd year garden. The benefit-cost ratio at 6.5% rate of interest was 1.89 and IRR 50%. Among the different supply chains, on an average, 50% of products flowed through longer channel-I (Farmer-Bepari-Arathdar-Retailer-Consumer). The highest net marketing margin received by retailer (Tk. 10779/ton) was found in the study areas). Lack of improved production technology, poor quality saplings, insect/pest infestation, adulteration of fertilizer and insecticides, lack of adequate market facilities, inadequate storage facilities, and inadequate transport facilities were found to be major problems in malta cultivation. The information system must be developed so that traders and suppliers will get supply market information regularly based on the various marketing variables. Cold storage warehouse should be set up in the major wholesale market to preserve or store malta during an emergency or for off-period.

Study 4: Farm Typology Delineation and Characterization in Coastal Areas of Bangladesh

The study conducted a questionnaire survey on 150 farms of Bangladesh covering six polders namely P-31, P-30, P-15, P-48, P-43, and P-44. We identified 20 variables for typology delineation and characterization through expert consultation and literature survey. A combination of Principal Component Analysis (PCA) and Cluster Analysis (CA) was used to delineate farm typology. PCA reduced the dimensionality of multiple variables into six Principal Components (PC), which we used in CA to categorize 150 farms into meaningful clusters (farm types). The number of clusters was identified by studying the generated dendrogram. The study found 10 distinct farm types and characterized them by variables concerning farm households' resource endowment and production characteristics.

Study 5: Impact of Climate Change on Crop Farming in Selected Coastal Zone of Bangladesh

This study is conducted with the overall objective of analyzing the economic impacts of climate change on crop farming in coastal region of Bangladesh. The specific objectives of the study were: i) To analyze the impact of climate change on net income from crop farming with climate, soil and socioeconomic variables, ii) To determine the marginal impact of temperature and rainfall on net income from crop farming, iii) To predict a range of potential future impacts on crop production, and iv) To assess farmer's perceptions and to investigate farmers' adaptation measures due to climate change. The study used a cross sectional Ricardian approach to analyze the impact of climate change on net income from crop farming.

The analysis is based on cross-section data of the primary survey conducted (April-June, 2021 and January to February, 2022) on 600 crop farming samples farmers' selected randomly and secondary data on average long-term temperature and rainfall data from 1971 to 2020 (49 years) over 6 districts in coastal region of Bangladesh. Results indicate that climate has a nonlinear effect on net income from crop farming. The marginal impact of the temperature and rainfall on farmers' net crop income are a significant ($p < 0.01$) and negative. The elasticity results showed that the changes in net crop income are very high for crop faming season. However, the predicted values of temperature and rainfall for these studies for the year 2030 to 2100 was based on three climate change prediction models (BCC-CSM1-1, CCSM4, and GFDL-CM3) to understand the likely impact of climate change on crop production. The impacts of these AOGCM scenarios were estimated on net crop income for the year 2030 to 2100 and under all scenarios; the negative effects in the net crop income per hectare is more by the year 2100 than in 2070, 2050 and 2030. Farmers have taken some adaptation strategies to reduce these adverse effects on crop production. The major adaptation strategies include cultivation of short-duration saline tolerant crop varieties, changing planting dates, higher levels of irrigation, to find off-farm jobs, change in crop, and no adaptation. Estimates from a multinomial logit model (MNL) specify that gender, education level of household head, farm size, access to agricultural credit, irrigation facilities and extension services, govt. subsidy on agricultural inputs and access to climate information affect adaptation choices significantly. Therefore, policy makers should target these determinants to boost farmers' adaptation and thereby lessen the adverse effects of climate change. Consequently, the government should design policies aimed at improving the afore-mentioned factors.

Study 6: Adoption Status of BARI Developed Onion Varieties at Farm Level in Bangladesh

The study assessed the adoption of BARI developed onion varieties, determined the factors responsible for BARI onion variety adoption, explored farmers' perceptions on BARI onion variety cultivation, storage and post-harvest loss of onion at farm level in Bangladesh. The study analyzed 320 households' data collected from BARI onion variety adopters and non-adopters spread in the four onion growing districts namely Faridpur, Magura, Pabna, and Rajshahi. Along with descriptive statistics, the study used Probit Model for analyzing the data. Only 17% farmers cultivated BARI onion variety BARI Piaz 1 and BARI Piaz 4). Six varieties of onion occupied about 12% of total onion areas in 2020-2021. In 2019-20 area under BARI onion varieties was only 9.5% and in 2018-19 it was approximately 10%. From these findings, it is stated that area under BARI onion varieties cultivation is increasing. Farm size, training on onion cultivation, innovativeness, and contract with extension personnel had a positive and significant influence on adoption of BARI onion variety. The average total cost of cultivation was highest Tk. 365,018 in Taherpuri cultivation. Total cost of BARI Piaz-1 and BARI Piaz-4 were Tk. 321213 and Tk. 299545 respectively. The benefit-cost ratio of Lalteer king was highest 1.83 followed by Super king (1.80), Taherpuri (1.79), BARI Piaz 1 (1.71), Red king (1.68) and BARI Piaz 4 (1.53). However, the profitability indicators imply that the cultivation of onion at the farm level is highly profitable. About 89% farmers stored their produced onion following traditional storage method and only 11% farmers did not store onion. 21% farmers stored their onion on the ceiling of their bedroom by using plastic paper spreading sandy soil on it. 37% farmers

stored onion on macha. 42% farmers stored onion on the ceiling of other rooms. They did not follow any scientific method even drying before storage. They stored four to eight months for getting better price. Total post-harvest loss at farm level was estimated about 21.41% where, highest 17% loss was occurred during storage. If the farmers followed only scientific method of storage post-harvest loss can be reduced and supply of onion will be increased to meet the domestic demand.

Study 7: Price Volatility of Watermelon in Bangladesh

Watermelon is of high demand as a fresh fruit in Bangladesh. During the last few years with the increasing demand, its prices seem to have fluctuated greatly in Bangladesh. The present study was conducted to identify the inherent causes of price volatility and probable solutions to keep the price in a congenial level. Data and information was collected from purposively selected four intensive watermelon producing areas of Bangladesh. Qualitative tools such as Focus Group Discussion (FGD) and Key Informant Interview (KII) were also used to collect the data and information. Besides, farm level production data was also collected from 100 watermelon farmers from the survey areas. Watermelon production was found profitable in all the surveyed areas. The highest profitability was found in Chattogram District (BCR 5.24) and the lowest was in Thakurgaon District (BCR 1.00). Farias, wholesalers, retailers, and consumers were the main market actors in the survey areas. About 49% of the produced watermelon was sold in farm gate while only 19% of them farmer transported to the big terminal market. Ramadan month, hot summer season, higher demand, traders syndicate and higher market toll were some of the important causes of price hike as opined by farmers in the survey areas. While less production, higher market toll, hot weather and higher transportation cost were regarded as the prime reason for watermelon price spiral as suggested by the traders in different market in the survey areas. Farmers also suggested some measures to control prices viz. reduction of market toll and taxes, strong punishment for the market malpractices, government controlling system, and reducing the prices of production inputs. On the other hand, providing transport subsidy, reduction of market toll and road subscription and strong market monitoring were the crucial measures to keep price to a reasonable level as suggested by the traders in the survey areas.

Study 8: Socioeconomic Study on Local Cultivar Dohazri Alu in Chattogram District

The local cultivar of potato (Dohazari Alu) is very much popular for their distinct features. It has high market demand in the study areas. That's why the present study was carried out in 11 Villages covering 55 farmers under ChandanishUpazila in Chattogram District to examine the input use, productivity, profitability and to know farmers and consumers perceptions to this cultivar. Results revealed that farmers used less inputs particularly fertilizer doses during its production period. The yield was recorded at 13.752 tons/ha. The gross margin was calculated at Tk. 1,71,465.9/ha. The BCR was found to be 1.83 for variable cost basis. The cost of production per kg was calculated at Tk.17.91. Regular training of farmers on fertilizer and pest and disease management will increase its productivity. If the management practices could be improved, the way of income of the farmers will be easier.

Study 9: Baseline Study on Cashew Nut Production Processing and Marketing in Bandarban Hill District

The study was carried out in 17 paras/villages under four Upazilas in Bandarban hill District with a view to documenting current status of cashew nut production processing and marketing covering 105 samples household for data collection. Multi-stage sampling technique was followed for selecting the specific locations. Results revealed that farmers used less inputs particularly fertilizer during whole production period. The yield was obtained at 0.425 tons/ha irrespective of all locations which are lower than that of global average of cashew nut production (0.750 ton/ha). The gross margin was calculated at Tk.1,48,76.36/ha. The BCR was found to be 2.03 irrespective of all locations indicating that the cashew nut production is profitable. Productivity will increase if the improved production technologies can be adopted and common diseases and pests are controlled. Cultivating more productive varieties in new places will increase the production manifold. Resulting export opportunities will be increased. Simultaneously, the number of processing factories needs to be increased locally in line with the increase in production. Currently, farmers need hands-on training on improved production technologies, post-harvest management, storing and marketing facilities for ensuring fair prices of their produces.

Study 10: Level of Pesticide Use on Brinjal Production at Some Selected Areas of Jashore Region

The study was designed to assess the level of pesticide use and profitability of brinjal production at farm level in selected areas of Jashore region during January-May, 2022. Average brinjal cultivated area per farmer was 0.08 ha. Most of the farmers cultivated local variety which called chega, vangor, airet, makra, lafa begun, BARI Bt Brinjal 4 etc. Cent percent farmer spray insecticide in their fields to protect crops from different insects, pests and diseases. Cent percent farmers argue that crop production would not be possible without insecticidesthat protect crops from insects and pest. In general cultivation, a farmer sprays every day on his brinjal fields and it's about 77 times in a season. Some farmer spray at morning and some at evening, every day farmer sprays pesticides in their fields. Bt brinjal effect only against brinjal fruit and shoot borer (BFSB) but against other sucking pests like aphids, jassids, whiteflies, epilachna beetles, thrips, and redmites, farmers applied specific pesticides in their brinjal field. Half of the costing was involved in the pesticide buying by the farmer. Though Bt Brinjal required less pesticide but farmers did not feel encouraged to cultivate it due to less market demand. Pheromone trap was most effective method used in brinjal fields. But farmer did not used it properly, farmers argue that IPM technology was time consuming method. Farmers faced different types of problem such as insect pest infestation Brinjal Shoot and Fruit Borer (BSFB), plant deformation, little leaf of brinjal, disease infestation (wilting), etc. Considering the benefit cost ratio (BCR) brinjal cultivation was profitable.

Study 11: Impact of Returns on Investment from Lentil Research and Development in Bangladesh

There is a need for better evidence for the impact of plant breeding research on pulses to

guide policy-making and investment. Lentil *(Lens culinaris)* is one of the major pulses in Bangladesh that has an important contribution to food security and agricultural sustainability. The objectives of this study are to quantify the impact of/and returns on investment from lentil research and development (R&D) in Bangladesh. This study applies the economic surplus model, which is a widely applied method to quantify the economic impact of agricultural technology adoption at the aggregate level. Both primary and secondary data are used in this study. The study reveals that the most adopted lentil variety is BARI masur 6 (24.4%). About 85% of areas are covered by BARI lentil varieties and 13% by local cultivars. The adoption of improved lentil varieties has created numerous socioeconomic impact in Bangladesh. Improved variety adoptions have increased lentil yield by 33.5%, farmers' net profit by 169.56%, and ensured comparative advantage of production (DRC=0.72). During the period from 1992/93 to 2020-21, these adoptions have added 75401 tons of nitrogenous fertilizers to the soil, produced 260.13 thousand tons of livestock feed, and created 16.97 million man-days of additional employment. The increased production of lentils attributed to research and development, has saved foreign exchange Tk 30.66 billion. The returns on investment reveal an encouraging scenario of the investment in lentil R&D since the estimated IRR (71.20%), NPV (Tk 514.73 billion) and BCR (4.33) were much higher compared to other rates of returns estimated for other crops in Bangladesh.

Study 12: Climatic Stresses, Adaptation Strategies and Capacity Assessment of Pulses Growing Farmers in the Coastal Areas of Bangladesh

Climate change and its variability cause different biotic and abiotic stresses that negatively are affecting the agricultural crops and the livelihoods of coastal farmers. But data and information regarding these issues are scarce in Bangladesh. Therefore, the study was conducted to assess the adaptation knowledge and strategies to cope with climate variability stresses, identify the factors that determine the adaptation capacity of the farmers, and identify potentiality and problem of adaptation to climate variability stresses faced in pulse crop production by the farmers. The study revealed that draught and uneven rain (100%) were the severe stresses followed by water salinity (30%), soil salinity (25%), disease infection (21%) and insect infestation (21%) that negatively affect the yield of crops. Climate variability stresses negatively affect the crops yields which in turn give low return to the farmers. To adapt adverse situation farmers adopt different measures like reserve rain water, digging well, use salt tolerant variety, irrigation, drainage system, use pesticides, use insecticides, and migrate to other occupations on a temporary basis. Age, family members, experience, farm size were identified as the significant determinants of adaptation capacity of the farmers to the climate variability stresses. Lack of capital, lack of adequate seed of salt, water and draught tolerant variety of crops, lack of adequate irrigation equipment, lack of proper knowledge on soil and water conservation technique were found to be the major constraints to adapt climate variable stresses.

Study 13: Profitability and Varietal Adoption of Chickpea in Some Selected Areas of Bangladesh

Chickpea is an important pulse crop widely grown in Bangladesh. BARI has developed many

improved chickpea varieties and disseminated to the farmers fields. The up-to-date information regarding adoption and financial profitability of this crop are unknown to the researchers and policymakers. Therefore, the study was conducted in Rajshahi District to determine the adoption status and profitability of BARI chickpea production and to examine the factors affecting the yield of BARI chickpea during 2020-2021. The study revealed that 58% farmers cultivated BARI chickpea varieties in the study area. The average level of adoption of BARI chickpea 1, BARI chickpea 2, BARI chickpea 3 and BARI chickpea 5 were 25%, 3%, 5% and 25%, respectively at farm level. The cultivation of chickpea was profitable to the farmers since the per hectare total cost, gross return and gross margin of chickpea cultivation were Tk 71830, Tk 87128 and Tk 53688, respectively. Unavailability of latest BARI chickpea seed, lack of technical know-how, lack of training, and diseases (root rot) were the main constraints to BARI chickpea cultivation at farm level.

Study 14: Socioeconomic Study of Floating Agriculture in Haor Area of Kishoreganj

The aim of this study was to examine the cost benefit analysis and economic viability of vegetables production on the floating bed in Kishoreganj district of Bangladesh. The study area was selected purposively and 30 households (HHs) were surveyed through purposive sampling technique from a population of 45 households. From the results of the primary data, it was found that majority of the farmers were relatively younger and middle aged and were in a position to put more physical effort for floating garden in the studied area. Agriculture is the main occupation of 90% of the farmers who are involved in floating farming. On an average, gross return of the demo farmer was calculated at Tk. 30690 per year for three beds (each bed size was 30 feet long and 4.5 feet wide) which was 67% higher than non-demo farmers' of Tk.18390 and total cost was estimated at Tk. 17180 and Tk. 11010 in demo and non-demo farmers, respectively. Gross margin was estimated at Tk. 13510 in demo farmers which was 83% higher than non-demo farmers. Benefit cost ratio was 7% higher in demo farmers than non-demo farmers due to use of modern variety and improved management.

Study 15: Case Study of Farm Machinery in Char Areas of Mymensingh District

The study aimed at exploring farmers' perception towards farm mechanization and finding out its relationships with the selected characteristics of the farmers. Problems faced by the farmers in farm mechanization and their corresponding solutions were also explored. Data were collected by using a pre-tested interview schedule at Sader upazila of Mymensingh district from randomly selected 60 respondents by using simple random sampling method during February to March 2022. Farmers' attitude toward farm mechanization was the focus issue of the study and was measured by Likert scale. The observed score of farmers' attitudes towards farm mechanization ranged from 13 to 59 with the mean score of 33.33. Among the farmers, 40.0 percent belonged to neutral attitude category while 31.66 percent belonged to unfavourable and 28.33 percent to the favorable attitude category. Two out of eight selected characteristics of the farmers viz, educational qualification and extension media contact had significant positive relationships and annual income had negative significant relationship with their attitude toward farm mechanization. Rests of the characteristics had no significant

relationship with the focus issue. Based on Problem Facing Indices (PFIs) the top ranked problem in relation to farm mechanization is machinery use is not profitable (PFI 143) and the top ranked solution suggested by the farmers in relation to farm mechanization is government subsidy in heavy farm machineries. Different agricultural development organizations should recognize the existing problems of farm mechanization and step forward for solving these problems.

II. Agricultural Economics Division, BINA

Study 1: Economic Study of BINA dhan 20 Cultivation in Some Selected Areas of Bangladesh

This study was conducted to analyze the profitability of BINA dhan 20 producing farmers in Mymensingh, Jamalpur and Rangpur Districts of Bangladesh. This study was based on primary data which were collected from 150 BINA dhan 20 producing farmers. In the sampled areas data were collected through pre-designed interview schedule from February-March, 2022 for achieving the purpose. In the study, costs and return analysis was done on both cash cost and full cost basis for estimating profitability. The cultivation of BINA dhan 20 was profitable from the viewpoint of the farmers. The study found that BINA dhan 20 production is profitable. The average net return per hectare was Tk. 29964.48. The net return was highest in Rangpur (Tk. 31735.50/ha) followed by Mymensingh (Tk. 30142.55/ha) and Jamalpur (Tk. 28015.38/ha), respectively. Benefit cost ratio was 1.41 and 2.02 on full cost and cash cost basis implying that the BINA dhan 20 cultivation at the farm level was profitable. Cobb-Douglas production function was chosen to determine the factor affecting gross return of BINA dhan 20 production. All of the factors namely, human labour cost, power tiller cost, seed cost, fertilizer cost, irrigation cost, wedding cost and insecticides cost were statistically significant and positive. The positive sign indicated that using more of these inputs in BINA dhan 20 production could increase the yield to some extent. The regression coefficients for farming experience and agricultural training under all areas had negative but significant relationship at 5% and 10% level, respectively. The regression coefficient of age was positive and significant at 5% level. Under all areas, the regression coefficient of education and farm size was positive but not significant. The farmers in the study areas encountered some constraints to BINA dhan 20 production. The first ranked constraint was unavailability of seeds in all areas (92%). Other constraints were lack of training (65%), lack of technical know-how (40%), natural calamities (36%), lack of capital (26%) and low education level of farmers (14%). The economic return of Binadhan-20 production encouraging to the farmers for more cultivation.

Study 2: Yield Gap Analysis of BINA Soybean 3 in Some Selected Areas of Bangladesh

Soybean is very important oil crop in Bangladesh to ensure high return and the self-sufficiency in oilseed production. The purposes of this study were to estimate yield gap, cost and return, factors and constraints identification. The study was conducted in three major Binasoybean-3 growing areas of Bangladesh, namely Noakhali, Lakshmipur and Barishal. The estimated yield gap I was 0.17 t ha-1 (6.97%) and yield gap II was 0.22 t ha-1 (9.97%). The lowest total yield gap

was 0.33 t ha-1 (13.60%) observed in Lakshmipur and it was the highest 0.50 t ha-1 (21.05%) in Noakhali district. The average yield gap was 0.39 t ha-1 (16.95%). The coefficients for seed, MoP and human labour were found to be positively significant at 1% level. On the other hand, numbers of power tiller, urea and pesticide costs were found to be positively significant at 5% level. TSP and Gypsum were found to be positively significant at 10% level. The total cost of production in field level of Binasoybean-3 was in Tk. 54247.06 ha-1 where 33.36% was fixed costs and 66.64% was variable cost. The highest cost in farm level was in Barisal (Tk. 54668.40 ha-1) followed by Noakhali and Lakshmipur in Tk. 54253.22 and Tk. 53819.57 ha-1, respectively. The major shares of total cost were human labour, power tiller, fertilizer, seed and power tiller. The highest net return (Tk. 39524.69 ha-1) comes from Lakshmipur district and the lowest net return (Tk. 22720.17 ha-1) comes from Barishal District. The undiscounted Benefit Cost Ratio (BCR) was 1.73, 1.66 and 1.42 for BINA Soybean 3 in field level for Lakshmipur, Noakhali and Barishal, respectively. The average Benefit Cost Ratio (BCR) was 1.60. Farmers of BINA Soybean 3 growing areas were faced various constraints to their cultivation like, non-availability of quality seed at proper time (49.70%), lack of knowledge about improved technology (48.77%), lack of soil moisture during sowing time (45.44%), disease and pest infestation (40.05%), lack of credit facilities (33.66%) and insufficient or high price of labour in harvesting time (43.11%). BINA Soybean 3 production in the study areas was profitable and farmers received higher return on their investment.

Study 3: Profitability and Technical Efficiency of BINA dhan 17 Cultivation in Some Selected Areas of Bangladesh

The study was conducted in three major BINA dhan 17 growing areas of Bangladesh, namely Sunamganj, Kishoreganj and Netrokona District. The objectives were to estimate the costs and return, technical efficiency determination and identification. Multistage sampling technique was followed for this study. A total of 180 farmers were randomly selected as sample size in the study area, 60 from each District. Some descriptive statistics were used for analyzing the collected data. The Stochastic frontier production function model was used for estimating the technical efficiency of BINA dhan 17 growers in the study areas. The result revealed that the average total cost of production was Tk. 76863 ha-1 where 35.90% was fixed costs and 64.10% was variable cost. The average net return ha-1 was Tk. 44289. The net return was highest in Sunamganj (Tk. 46621 ha-1) followed by Kishoreganj (Tk. 45342 ha-1) and Netrokona (Tk. 40904 ha-1), respectively. Benefit cost ratio (BCR) was estimated at 1.58. The BCR was highest in Sunamganj (1.62) followed by Kishoreganj (1.57) and Netrokona (1.54), respectively. The co-efficient of human labour, land preparation and insecticide costs were found positive and significant at 1% level, while that of seed, urea and organic manure were found positive but significant at 10% level. On the other hand, TSP was found positive but significant at 5% level. Irrigation cost was statistically insignificant and showed negative relationship with Binadhan-17 production. About 68.33% farmers produced outputs which were very close to the maximum frontier output level (91%–99%). The mean efficiency of the Binadhan-17 producers was 89.40%, which indicates that they were made a production loss of 10.60% due to inefficiency factors. In other words, they were 10.60% apart from the frontier level. About 68% farmers opined timely non-availability of good seed as a top ranked problem of Binadhan-17 cultivation which was followed lack of knowledge about recommended production technology (62%), non-availability of sufficient labour in time (49%), high price and adulteration in fertilizer (42%) and lack of capital (39%). The study could be taken as an advantage in the short run by the policy makers to increase rice production.

Study 4: Performance and Supply Chain Analysis of BINA lebu 1 in Some Selected Areas of Bangladesh

The study was conducted to find out the performance and supply chain of Binalebu-1 in four major BINA lebu 1 growing areas of Bangladesh, namely Cumilla, Mymensingh, Rangpur and Dhaka Districts. Simple random sampling technique was followed for this study. A total of 240 respondents taking 40 farmers and 20 traders/intermediaries were randomly selected from each of the aforesaid districts. Profit model, descriptive statistics was used in analysing the collected data. The average cost of lemon production was estimated at Tk. 206127 per hectare of which about 68% was variable cost and 32% was fixed cost. Human labour cost was the lion share (32%) of total cost and it followed by irrigation cost (6.63%), insecticide (2.64%) sapling (2.60%), and in the study areas. The average yield of BINA lebu 1 was recorded 28.32 t/ha in all study areas while it was highest in 3rd year (30.24 t/ha) followed by 2nd year (28.17 t/ha) and 1st yearr (26.58 t/ha). The average gross return, gross margin and net return of lemon were found to be Tk 744517.62/ha, Tk 454521.67/ha, and Tk 538390.75/ha, respectively. Average benefit cost ratio was found to be 2.71 on the basis of total cost. Based on the point of sale, the supply chain can be classified into four types: Channel 1: Accounts for 40 % which was ranked as I; Channel II: Accounts for 20 % which was Ranked as II; Channel III: Accounts for 18 % which was Ranked as III, Channel IV: Accounts for 12 % which was ranked as IV; Channel V: Accounts for 10 % which was Ranked as V. It was revealed from the study that the value addition of the farias, beparis, paikers, arathdars and retailers were Tk.135, Tk.95, Tk.55, Tk.39 and, Tk155 per quintal respectively. Farmers are facing various problems in lemon cultivation. The highest problem was for lack of capital (58%) and the lowest was for lack of sapling (20%).

III. Socio-economic Research Division, BLRI

Study 1: Production and Marketing of Beef in Different Areas of Bangladesh

Beef has a high nutrient content which is very essential for a healthy life. It's a vital source of protein, iron (Fe), zinc, vitamins, and other micronutrients (omega-3 fatty acid, selenium). According to the US Department of Agriculture (USDA), on average 56 gm of beef is required for a person based on a 2,000-calorie diet. Moreover, beef is the most preferred dietary item by Bangladeshi consumers in history. But the fact is that the price of beef is now going beyond the purchasing power of the general consumers which is a matter of rigorous concern.

Considering this view as a research problem, the present study wants to review the national and international beef prices in the major producing and exporting countries; measure the profitability of beef production under different farming categories, and identify the factors influencing beef price. For this, we have taken seven (7) administrative divisions and from each division, we have selected one district purposively on the basis of cattle population density, beef fattening, and marketing. In this case, we studied published articles in peer-reviewed journals and use cost-benefit analysis to meet the objectives. From the results (data analysis partially), we observed that beef prices increased globally as well as in the domestic market of Bangladesh. But the beef price is higher in Bangladesh compared to neighbouring countries-Pakistan, India, Nepal, and Sri Lanka. From viewpoint of profitability analysis, the net return is higher in Bogura, i.e. BDT 59,733.00 per cattle and the benefit-cost ratio (BCR) (full cost basis) were found 1.56 and 1.28, respectively in Bogura and Jashore that indicating beef cattle production is a profitable enterprise. In contrast, farmers reported that feed cost is very

expensive nowadays. In the light of research findings, our recommendation is that the government should give subsidy on animal feed production and import as well.

IV. Agricultural Economics Division, BSRI

Study 1: A Comparative Profitability Analysis of Sugarcane Cultivation with Different Cropping Patterns in Bangladesh

A comparative profitability analysis of sugarcane with intercrops and different cropping patterns was examined in two mill-zone areas of Bangladesh namely Thakurgoan and Chuadanga Districts. Data was collected from a total of 100 farmers taking 50 from each location by using random sampling technique. Descriptive and financial profitability analysis of sugarcane with intercrops and other cropping patterns were estimated using simple accounting calculation procedures. The study found three dominant cropping patterns in both Thakurgoan and Chuadanga Districts. The Boro-Fallow-T. Aman, Boro-Jute-T. Aman and Mung Bean-Boro-T. Aman were the dominant cropping pattern in Chuadanga District. On the other hand, Potato-Maize-T. Aman, Boro-Fallow-T. Aman, and Wheat-Maize-T. Aman were the dominant cropping patterns in Thakurgaon District. In Chuadanga District, the Boro-Jute-T. Aman cropping pattern (BCR 1.48) was the most profitable cropping pattern followed by Mung bean-Boro-T. Aman (BCR 1.46) and Boro-Fallow-T. Aman (BCR 1.36) cropping pattern. In Thakurgaon District, the Wheat-Maize-T. Aman cropping pattern (BCR 1.55) was the most profitable cropping pattern followed by Boro-Fallow-T. Aman (BCR 1.49) and Potato-Maize-T. Aman (BCR 1.39) cropping pattern. The major intercrops cultivated with sugarcane were potato, onion, lentil in the study areas. In both locations, profitability of solely sugarcane cultivation was lower relative to sugarcane cultivation with intercrops. In Chuadanga District, potato and lentil cultivation as intercrop with sugarcane (BCR 1.59 and 1.53, respectively) were more profitable than the cultivation of other cropping patterns. Similarly, potato and onion cultivation as intercrop with sugarcane (BCR 1.65 and 1.54, respectively) were more profitable than the cultivation of other cropping patterns in Thakurgaon district. Lack of clean seed, knowledge gap on modern cultivation practices, lack of suitable land, shortage of money, did not get purzi at a time for a plot, not to get product price in time were the major constraints of farmers in the mill-zone areas.

Study 2: A Socio-economic Analysis of Date Palm Cultivation in Some Selected Areas of Bangladesh

The study examined the socio-demographic characteristics and profitability of jaggary (called gur) production of date palm farmers in two selected date palm growing areas of Bangladesh. A total of 100 farmers were selected for interviews during 2021-22 cropping season who cultivated date palm taking at least 50 samples from each location. Problem confrontation index (PCI) approach was used for ranking the identified constraints. The result of the study indicated that majority of the date palm farmers were smallholder farmers (landholding 0.6 ha). Average age, education and farming experience of the date palm farmers were 50.2, 4.4 and 25.5 years, respectively in the study areas. Approximately 60% of the total farmers solely depend on agriculture and the rest of them are involved in business (32%) and service (8%) beside agriculture. The highest percentage of date palm tree planted scattered method (72%) followed by both scattered and row plantation (18%) and row plantation (6%) in the study

areas. Average of age of the juice harvesting date palm trees was 24.6 years. Juice harvest from date palm tree started in the month of November and closed at February. About 88%, 52% and 35% farmers used Urea, TSP and MOP fertilizers, respectively in the cropping season, but only 24% farmers used pesticides to control pests and diseases. Only 9% and 19% farmers received training and credit facility, respectively. About 23% farmers had organizational membership status. The highest input cost of gur preparation was found for human labor (Tk. 97260.9/50 trees) which shares 58.6% of the total cost followed by fuel cost (18%) and aratdar commission (6%). Average net return of gur preparation was Tk 227450.4/50 trees which was highest for the farmers of Natore District relative to the farmers of Rajshahi District.

V. Forest Economics Division, BFRI

Study 1: Valuation of Ecosystem Services in Sitakunda Botanical Garden and Eco-park, Chattogram.

Ecosystem services (ES) are the direct and indirect contributions of ecosystems to human well-being. Sitakunda Botanical Garden and Eco-Park is full of natural services that are provided by its healthy ecosystem. This study was carried out to identify the ES of this protected area and to estimate the economic value of the identified services. A total of 32 components under four ecosystem services were estimated. The maximum components were from provisioning services followed by regulating, supporting and cultural services. The accumulated economic value of those services was BDT 1396.73 million (USD 15.18 million) per year. This study also recorded the status of the vegetation and wildlife to measure the biodiversity of this park.

Study 2: Economic Impact of Bee Keeping in Selected Areas of Bangladesh

The report was primarily initiated to evaluate the economic impact of beekeeping in selected areas of Hill tracts. BFRI, BCIC and NGOs Institutions imparted technical support on beekeeping in various places of Hill Districts. It was reportedly found that about 700 stakeholders already involved in beekeeping. Twenty (20) families of beekeeper from each Hill District were selected. Information about quantity of honey and income from floral cropping production were gathered. Besides, the yield of floral cropping production in pre and post beekeeping period was also recorded. It was found that the bee colonies are generally set up within various cropping plant other than paddy plant. Yield of seasonal fruits and other agricrops were increased from 18% to 30% than that of the pre-beekeeping yield. Because of bee farming, average production of other crops was increased for 18.31% than the paddy production. Honey revenue raised average income about 16.32% in selected areas. So, overall situation highlights the positive economic impact of beekeeping in Hill districts of Bangladesh.

COMPUTER and GIS UNIT

The Computer and GIS unit of BARC was established in the year 1985 with an aim to cater the information need in support of agricultural research and development activities of the country. The major responsibilities of the unit involve overall management of Information and Communication Technology (ICT) related activities in view of hardware, software, networking, etc. The ultimate goal is to establish BARC as information hub of NARS so that overall agricultural research system becomes strengthened and robust in terms of information accessibility, confidentiality, integrity, availability, dissemination, etc. through online system to cater information need of stakeholders in agriculture sector. The unit plays a vital role to establish/strengthen ICT infrastructure to facilitate MIS related activities/services among NARS institutes. The unit also involved in assessing needs of computer hardware, software, network equipment, preparing technical specifications for procurement of the goods/accessories, evaluating technical proposals, receiving and distributing ICT goods, etc. It provides support for troubleshooting of hardware, software, network, internet/email, e-file and related services for smooth running of the system. In addition to that, it conducts various ICT based capacity building trainings, workshops, seminars 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 programs, recruiting of computer personnel, etc. Personnel of the unit are also working in innovation team and 4IR implementation of BARC.

Geographic Information System (GIS) is another important functional part of the unit. Providing regular and ad-hoc basis cartographic support is a routine job of this unit. Maintenance, necessary updating and output preparation of Agro-Ecological Zone (AEZ) land resources database and local level UpazilaNirdeshika database (soil, land, nutrition and others) are on-going activities of the unit. Land suitability assessment and crop zoning of Bangladesh is another important activity of the GIS unit which has been carried out since 2017.

Innovation and e-Governance, Service Process Simplification (SPS), Service Digitalization, etc. activities are led by the Computer and GIS unit as a regular job. This unit administers e-Filing system of BARC, updates and uploads files in website, provides various inputs and reports to Ministry of Agriculture (MoA) and other organizations. However, the unit works in formulation/ implementation of different ICT and GIS based national, international and regional projects and programmes since inception. Some examples are: ARMP, NATP-1, NATP-2, AFACI-ATIN, AgMIP, ARMIS, Drought Monitoring, Crop Zoning, etc.

Professionals of Computer and GIS Unit

Name	Designation
Hasan Md. Hamidur Rahman	Director
Hasan Mahmud	Senior System Analyst
Md. Hanif	System Analyst
Mst. Deloara Khushi	Programmer
Nazmul Haq Md. Selim	Data Entry Officer (CC)

1. Project Proposal Development

Developed two Project proposals during the period

- "Building Agri-Cloud Platform for the NARS" - submitted to Planning and Evaluation Division, BARC for consideration in the PARTNER Project.
- "Integration of Khamari Mobile App with Farmers' Smart Card" - submitted to Planning and Evaluation Division, BARC for consideration in the PARTNER Project.

2. Project Implementation

- **Crop Zoning Project**

A lot of activities were conducted under Crop Zoning Project throughout the year. Most important activities are mentioned below:

- Compilation, editing and coding of land and soil properties data (physical & chemical) have been completed for 36 Upazilas. The land and soil properties data are Landform, Soil Association, Land Type, Land Relief, Soil Texture, Soil Consistency, Soil Drainage, Soil Moisture, Water Recession, Soil Salinity, Soil pH including AEZ and Physiography. The data is used for agro-edaphic suitability assessment of crop(s).
- Compilation and editing/updating soil chemical data of 36 Upazilas have been completed. The soil chemical data are Nitrogen (N), Phosphorus (P), Potassium (K), Sulphur (S), Zinc (Zn), Boron (B), Calcium (Ca), Magnesium (Mg), Ferus (Fe), Copper (Cu), Manganese (Mn), soil reaction (pH), organic matter (OM), soil salinity along with soil series, sample number, land type and soil texture. The soil fertility status data is used for preparing fertilizer recommendation of crops/cropping patterns.
- Reviewing site specific and union-based fertilizer recommendation outputs of different upazilas for detection and subsequently correction of anomalies.
- Reviewing and correcting the agro-edaphic and agro-climatic suitability limitation ratings data based on crop suitability outputs.
- The information related to crop varieties, crop management and production technology, etc. required for the crop zoning study have been gathered, compiled, edited and documented both in Bangla and English. The information is uploaded into the agri-advisory portal.

- Socio-economic data from 2 (two) Upazilas have been collected through Focus Group Discussion (FGD) at the Upazila level during the reporting period. Socio-economic data is used for computing socio-economic indicators to measure crop profitability.
- Socio-economic data editing and economic profitability analysis of cropping patterns have been completed for 111 Upazilas. Till now cropping pattern wise profitability analysis for 300 Upazilas has been completed.
- Economic profitability indicators in terms of gross margin and BCR were calculated for 76 crops in 162 Upazilas selected as study locations under Dhaka, Chattogram, Sylhet, Khulna, Barishal and Mymensingh Division. At present the economic profitability indicator of 76 crops for 300 hundred Upazilas has been completed. The economic profitability indicators of crops are used for evaluating the best crop/ cropping pattern so as to give an option to the farmers to choose which crop to grow.
- Reviewing and correcting cropping patterns data and their economic profitability under different Upazilas have been carried out.
- Comparison of cultivated area under different crops (BBS) with corresponding suitable crop area data (Crop Zoning) of 69 Upazilas from Dinajpur, Tangail, Barguna, Barishal, Chattogram, Cumilla, Faridpur, Bagerhat, Jashore and Rangpur Districts have been performed.
- Updating of Upazila soil and landform map has been completed for 36 Upazilas. There are several steps followed for updating the soil and landform map. These are scanning of hardcopy maps, projection, geo-referencing, digitization of soil sample location and other map features and spatial adjustment. The updated soil and landform map is used for preparing individual map layers of nine land and soil factors required for edaphic suitability assessment of crop and creation soil sample location map.
- Upazila wise updated land use map has been prepared using satellite imagery. The information is very crucial for land use planning as it provides the actual extent of cultivable land and miscellaneous land area by Upazila. During the reporting period the updated land use map has been prepared for 57 Upazilas.
- The updating of pourashava (ward), Union and Mouza boundary has been carried out for 72 Upazilas. Small area atlas maps of BBS, BBS Geocodes, National Window Portal and LGED Digital Maps have been reviewed to adjust the administrative boundary.
- The geocode and name of Division, District, Upazila, Union and Mouza both in Bangla Unicode and English have been updated as it requires for the crop zoning study.
- Preparation of 2130 soil fertility status maps for 15 soil chemical properties (soil salinity, soil pH, OM, N, P, Pb, K, S, Zn, B, Ca, Mg, Fe, Cu, Mn) of 142 Upazilas have been completed.
- Land and soil properties map layers i.e. Land Type, Land Relief, Soil Texture, Soil Consistency, Soil Drainage, Soil Moisture, Water Recession, Soil Salinity and Soil pH required for suitability assessment of crop(s) have been prepared for 36 Upazila. At present the land and soil properties map layers for 300 Upazila have been prepared.

- Agro-climatic map layers required for suitability assessment of crop(s) have been prepared for 36 upazilas. The thermal regime map layers are duration (number of days) of cool temperature ≤ 15°C and duration of extreme temperature ≥ 40°C and moisture regime map layers i.e. length (number of days) of pre-kharif transition period, kharif growing period and rabi growing period.
- Carried out desk validation of land type, crop suitability outputs and fertilizer recommendation for taking necessary measures as appropriate.
- During this period, a new feature was added to the Khamari mobile app for accessing site specific information on soil properties and fertility status instantly at field level. The information will be helpful for the extension personnel, scientists and other stakeholders to know the field condition and calculate fertilizer recommendation precisely for different crops.
- The development of CZIS software, 'Khamari' mobile app and agri-advisory portal in terms of adding new features, enhancement of existing features, improvement of user interface, fixing bugs, etc. is ongoing.
- A study has been conducted to delineate the land use classification using high resolution satellite images of 2020 and 2021 considering the maximum cropped area for three different crop calendars (Rabi, Kharif-I and Kharif-II). The specific land use layers are; a) crop land; b) forest; c) mangrove forest; d) river; e) lake; f) beel and haor; g) aquaculture; h) tea estate; i) salt pan; j) rural settlement; k) urban and industrial area; and finally, l) accreted land. It is revealed from the study that the crop land available in Rabi season is 7.26 mha, 7.20 mha in kharif-1 and 6.11 mha in kharif-II season.
- The Fifth Project Advisory Committee meeting of the Crop Zoning Project was held on 06 September, 2021. The Executive Chairman of BARC chaired the meeting where committee members, Principal Investigator of IWM component, Principal Investigator of SRDI component and some project personnel were present. In the meeting some important decisions were
  taken. These are, preparation of Crop Zoning Project proposal for completion of the remaining 195 Upazilas, arrangement of consultation workshop for stakeholders in agriculture within 1st week of October 2021 and conduct demonstration trial on fertilizer recommendation for crops other than rice and field investigation for validation of appropriateness of project outputs.
- A consultation workshop on online crop zoning software and mobile app was held on 04 October, 2021 with the Executive Chairman of BARC, Dr. Shaikh Mohammad Bokhtiar as Chief Guest and Director (Field Service), DAE and Executive Director of KGF as Special Guests. The workshop was chaired by the Member Director (Crops) and Coordinator of Crop Zoning Project. The participants of the workshop were Principal and Co-principal Investigator of BARC, SRDI and IWM, Focal Points of DAE, BARI, BRRI and BINA, division, District and Upazila level DAE officials, scientists and officers of BARC and NARS institutes, KGF officials, farmers representative and former and pre-sent Crop Zoning Project staff.
- The Executive Chairman of BARC in his remarks emphasized that the user friendliness of crop zoning information systems should be given top priority. He also suggested

development of a complete crop zoning system through incorporating the feedback and suggestions of the participants. He hoped crop zoning information will be more informative which will help flourishing the present agriculture system.

- A consultation meeting of the Crop Zoning Project was held on 6 December 2021 where Dr. Md. Aziz Zilani Chowdhury, the Coordinator of Crop Zoning Project presided the meeting. The Principal Investigators, Co-Investigators, Focal Points, Scientists/Experts and Crop Zoning Project professionals attended the meeting. In the discussion session, the participants of the meeting highly appreciated BARC for taking this project and hoped it would be a great help for the farmers and other stakeholders in agriculture for enhancing crop productivity.
- Prepared the Project Completion Report for the period from June 2017 to December 2021

3. Policy Level Contribution

The Computer and GIS Unit plays an important role in giving opinion and feedback upon ICT related policy level issues asked from MoA time to time. During the period, the following opinions were sent to MoA:

During this period, the following ICT related reports/documents were prepared and sent to related organizations:

- Opinion provided to MoA on DAE's proposed project titled, "Crop monitoring and quantification of staple crops through GIS and satellite based remote sensing technology" (জিআইএস এবং স্যাটেলাইট ভিত্তিক রিমোট সেন্সিং প্রযুক্তির মাধ্যমে ক্রপ মনিটরিং ও প্রধান প্রধান ফসলের জমির পরিমান নির্ণয়)
- Opinion provided to MoA regarding the Letter of Interest (LoI) from Imprimerie Nationale (In Group).
- Innovation activities report of BARC (half yearly and yearly) according to Innovation Workplan 2021-2022 to MoA.
- Sent information for portal mapping to connect all the organizations under MoA.
- Monthly e-Filing, e-GP reports to MoA.
- Monthly website update/upload reports to MoA.
- Different e-Services, Innovation, SIP and SPS information (with evidences) sent to MoA.
- Progress Report of BARC activities according to ICT Policy 2018 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.

4. Research Management/ Financial Management and Coordination

The Director (Computer and GIS) has been working as Principal Investigator of Crop Zoning Project since 2017. As a PI of the project, he had to handle the project management as well as budgetary issues aligning with financial rules and regulations.

The Director (Computer and GIS) worked as convenor of ARMIS technical committee and provided suggestions to necessary changes for the improvement of the application. He also provided support to deploy changes in ARMIS portal.

Monitoring, Reviewing and Evaluation Report of Programs/Activities of NARS Institutes: The Director (Computer and GIS) monitored two NATP, Phase-II project titled "IPM with 2-3 IPM management techniques for sustainable tea production (ID 337)" and "Floating bed fodder production in submerged and flooded area (ID 647)" as a team member of the monitoring team. The monitoring was conducted during 28-05-2022 to 30-05-2022 in Moulvibazar (Sreemangal), Habiganj and Sunamganj Districts.

5. Organized Training, Workshop and Seminar

- **Training on "Service Process Simplification (SPS)"**

  The trainings were held on 27 September, 2021, 29 December, 2021, 16 March, 2022 and 20 June, 2022. Participants (4×25=100) were all BARC Officers, Duration-1 day (4 Batches).

- **Training on "e-Filing for Officer"**

  The training was held on 2 February, 2022. Participants (22) were all BARC Officers, Duration-1 day.

- **Training on e-Filing for Staff**

  The training was held on 3 February, 2022. Participants (20) were all BARC Staffs, Duration-1 day.

- **Training on "Increase IT skills for Officer"**

  The training was held on 29 March, 2022. Participants (20) were all BARC Officers, Duration-1 day.

- **Training on "Increase IT skills for Staff"**

  The training was held on 31 March, 2022. Participants (20) were all BARC Staffs, Duration-1 day.

- **Workshop on "Actions to Combat 4IR Challenges"**

  The training was held on 23 November, 2021 and 19 April, 2022. Participants (50 and 59 respectively) were all BARC officers, Duration-1 day (2 Batches).

- **Workshop on "Crop Zoning software and Khamari Mobile app"**

  Daylong workshop was held on 08 June, 2022. A total of 165 participants attended the workshop such as BARC officers, scientists of NARS Institutes, extension officers from DAE, representatives from KGF, IWM, SRDI, etc.

Attended Training, Workshop, Seminar

The personnel of Computer and GIS unit attended various meetings/seminars/workshops under different capacity at BARC and other organizations during this period. Some of those are focal point meetings and workshops, PCR workshops, stakeholder workshops, monsoon and climate related workshops, e-Nothi trainings, seminar on BNDA, workshops on my-Gov and SPS, RIMES workshop, CABI workshop, etc.

Transferable Technology: Mobile app '**Khamari**' is developed under Crop Zoning Project and training for field level stakeholders including farmers, traders, and extension personnel is going on.

National and International Linkages: Mr. Hasan Md. Hamidur Rahman, Director (Computer and GIS) attended a 10-day long tailor-made training (4th phase) on "Open-Source Scientific Computing for AgroGeospatial Big data analysis" at ITC, University of Twente (UT), Netherlands from 27 June 2022 to 6 July 2022. It was the 4th phase of the training while other three phases were completed online. In the training, various future opportunities were explored and discussed with ITC, UT faculties and officials regarding ICT and Geospatial big data processing and analytics among other issues.

Presentation of Research Articles by theScientist in Different Programme: N/A

Publication by the Division/Section in Different Journals/Media:

- An article titled "চতুর্থ শিল্প বিপ্লবঃ বাংলাদেশের কৃষিখাতের প্রস্তুতি কেমন?" was published in the renowned newspaper "The Daily Prothom Alo."
- A book named "Crop Zoning Methodology" was published which describes the ins and outs of the process followed by the Crop Zoning Project.
- A publication named "A Regional Drought Monitoring and Outlook System for South Asia" was published in the renowned publication site "Springer."

6. Other Activities

a. Server and Network Operation

- Installed core switch and core firewall in the server room to replace the faulty core switch and firewall of obsolete signature. Two new ACs (each 5 ton) were installed in the server room with the help of engineering section. Cable dressing, tagging and labeling were done in the server room. Also the power cables are well managed by installing two new Power Distribution Units (PDUs).

- Email service is migrated from Google's free tier to BCC's Zimbra mail platform. Email account creation of all BARC Officers is done along with newly recruited professionals in the new platform. Migration of email from old platform to new one was done as necessary. Smooth access and availability of internet service was ensured throughout the year. In connection to this, worked with BTCL to resolve the issue of optical fibre cut in front of the SRDI office while road construction was ongoing.

- Procured and installed cloud-based antivirus Bit Defender (150 user) in desktop computers,

laptops, workstations and servers of BARC centrally for the protection of computers from virus, spyware, adware, ransomware or malware.

b. Procure Zoom License and Host Virtual Meetings using Zoom Platform

Zoom license procured for BARC for one year. Virtual meetings were conducted using the platform instead of physical meetings/workshops/seminars due to Covid-19 pandemic. Created more than 50 meetings during this period and provided support to host and manage the virtual events.

c. National Agricultural Display Centre (NADC) Operations (Operations and Maintenance of Digital Display part of NADC)

Director (Computer and GIS) worked as member secretary of NADC operations and maintenance committee. Several consecutive meetings were held with members/focal points of NARS institutes and updated respective display racks with new samples. An updated inventory list was also prepared based on the displayed items.

d. Database and Apps Development

- The Crop Zoing Platform (www.cropzoning.gov.bd) is migrated to the elastic cloud of National Data Centre (NDC).
- The updated version of the 'Khamari' app is uploaded in the Google Playstore.
- The Personnel Data Sheet (PDS) application is upgraded to Version 4.0 from the earlier version 3.0.
- New user request approval of different online applications of BARC was done as routine jobs.

e. Uploading, Updating and Maintenance of BARC Website

- A new feature (event calendar) of our national web portal was explored and implemented for BARC.
- Cloud based e-book service 'Flipbook' was procured and hosted two important books in that platform.
- BARC web portal (www.barc.gov.bd) was being updated regularly based on data received from different sections/units/ divisions. Files were uploaded and pages were updated on regular basis. The website structure was changed several times as per instruction from MoA.
- Website upload and update report sent to MoA, BARC administration and APA focal point within 7th day of each month as well as quarterly basis. During this period 1498 files were uploaded and 125 pages updated.

f. e-Filing Administration and Support

- Updated several posts in the e-Filling system of BARC with the help of BCC engineers.
- e-Filing administration activities performed including user creation, update, delete, etc.
- e-Filing report generation in prescribed format and sent to MoA, BARC administration and

APA focal point within the 7th day of each month as well as quarterly basis.

- e-Filing support to scientists, officers and staffs of different divisions, units and sections.

g. Functioning of BARC Innovation Team

Director (Computer and GIS) has been working as Innovation officer of BARC. As an innovation officer, he conducted the following activities during this financial year:

- Prepared Innovation work plan-2022, Innovation Report-2021 with the help of innovation team members.
- Conducted 2 trainings (two days long) and 1 workshop (day long) for BARC officers.
- Conducted 4 Innovation committee's meetings at BARC.
- Information of innovation team and its activities uploaded to BARC website under the Innovation menu as per the guideline of MoA.
- Conducted other activities according to the Innovation work plan 2021-2022 with the help of innovation team members.

h. Climate Database Update:

The daily weather data of 2019 and 2020 was purchased from BMD, processed, generated monthly data and uploaded in the website (http://climate.barcapps.gov.bd). The purchasing process of the weather data for the year 2021 is ongoing.

i. Continuation of GIS Activities (Maintenance and output preparation of AEZ Land Resources Database).

Maintenance and necessary output preparation of AEZ land resources database and local level upazila nirdeshika database (soil, land, nutrition and others) is an on-going activity. AEZ land resources data is used for earlier crop zoning study of Bangladesh. The AEZ database is being used extensively in current crop zoning project. The 5 newly created upazilas are demarcated in map using the AEZ database. The upazila maps are generated with updated administrative boundary, land type, soil data, mapping unit, etc.

j. Support to BARC and Different Component of NATP as PEC and TEC Member

Supports provided to KGF, SARC and NATP-2 time to time in procurement of goods, works and services along with BARC

k. Support to Divisions/Sections of BARC for Hardware/Software; Data analysis; Information Sharing and Resource Management

Support provided to different divisions/units/sections to fix various types of computer hardware, software and networking related problems. Several types of maps, NARS map, climatic map, etc. provided to scientists/researchers/extensionists as per requirement.

l. Support for Planning, Budgeting and Procurement of Computer Resources (hardware, software & accessories, etc.)

The unit prepared requirement assessment, specification, budgeting for procurement of computer hardware, software and accessories under BARC and distribution of hardware, software and networking equipment. Support provided to KGF as focal point of BARC in ARMIS project implemented by KGF.

m. BARC Citizen Charter Update

Director (Computer and GIS) worked as convener of BARC Citizen Charter update committee.

- 36th APRC Technical Sub-Committee

Computer and GIS unit provided support in the technical sub-committee of the FAO's 36th session of APRC held on March-2022 in Dhaka.

n. Vegetable Fair-2022 & Fruit Fair-2022

Computer and GIS Unit provided support in audio-visual/multimedia and venue management of the Vegetable Fair-2022 and Fruit Fair-2022.

o. Letter of Agreement (LoA) Signed with FAO

On 23rd June 2022, an LoA has been signed with FAO for the enhancement of 'Khamari' mobile app developed under Crop zoning project. It will facilitate the end-user training as well as feedback collection from the root level.

p. Focal Point of BARC of Integrated Digital Service Development Platform

The unit worked as focal point for the "Integrated Digital Service Development Platform" software being implemented by MoA. Overall cooperation was provided to conduct a day-long workshop at BARC participated by MoA Officials, a2i representatives and representatives of related organizations under MoA. As per MoA requirement, explored three components of the IDSDP related to BARC and provided comprehensive feedback regarding overall usability status of the software. Several meetings were conducted at BARC under this activity.

e-Filing Training of BARC Staffs (1st batch on 03-02-2022)

Training on Service Process Simplification (SPS) (1st Batch 27 September, 2021)

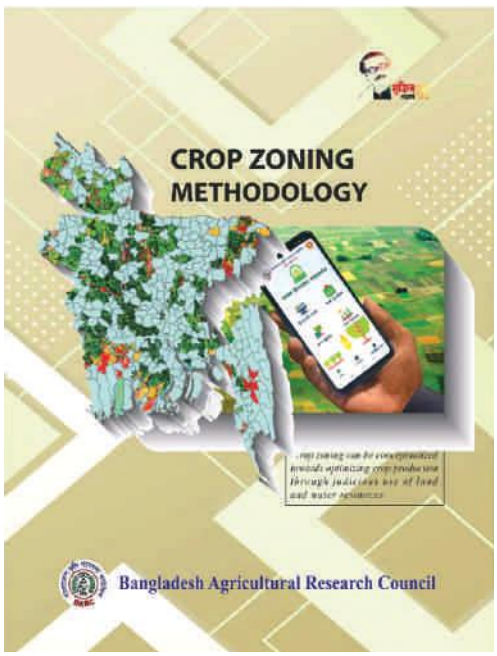
Training on Service Process Simplification (SPS) (1st Batch 27 September, 2021)

Training on Service Process Simplification (SPS) (4th Batch 20 June, 2022)

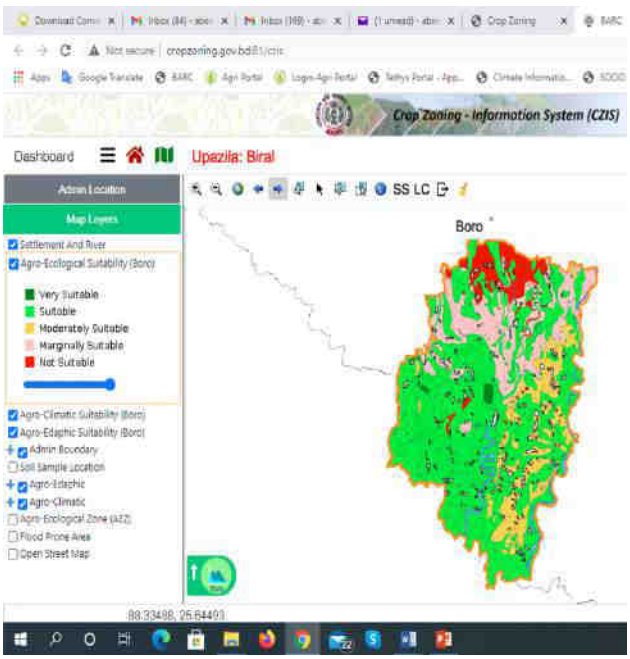
Workshop on Actions to Combat 4IR Challenges (23 November, 2021))

Advisory workshop on Crop Zoning software and Khamari Mobile Apps

Tailor-made training (4th phase) on Open-Source Scientific Computing for AgroGeospatial Big data analysis at ITC, University of Twente (UT), Netherlands, July.

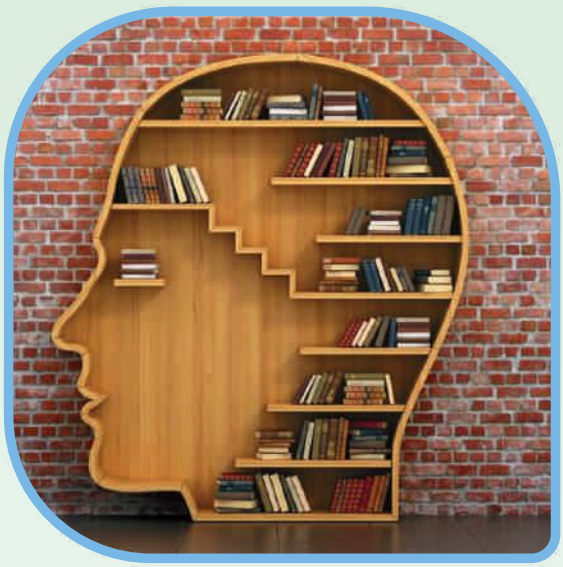


Snapshot of GIS based Software Crop Zoning Information System (CZIS)



Snapshot of Khamari Mobile Apps

AGRICULTURAL INFORMATION CENTRE



AGRICULTURAL INFORMATION CENTRE

Agricultural Information Centre (AIC), a knowledge management hub of BARC, is engaged in collecting, organizing and disseminating research generated information to enhance agricultural productivity. It renders knowledge services to the stakeholders ranging from researchers to policy makers. The Centre works on the principle of providing quality agricultural information in order to accelerate research and development. AIC provides knowledge services to the National Agricultural Research System (NARS) including documentation services. The documents generated in the Institutes of NARS 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 2020-2021 are described below:

Personnel of AIC

The following Professionals worked in Agricultural Information Centre (AIC) during July 2021 to June 2022:

Name of the Professionals

Name	Designation
Dr. Kabir Uddin Ahmed	Director
Dr. Susmita Das	Principal Documentation Officer
Dr. Md. Taibur Rahaman	Principal Librarian (A.C.)
Md. Sazzadur Rahman Sarker	Senior Reprographic Officer
Dr. Mst. Sufara Akhter Banu	Senior Scientific Editor
Md. Saimum Hasan	Information Officer
Mohammad Nazmul Islam	Graphics Designer
Md. Wasiuzzaman	Junior Bibliography Officer

1. Documentation and Publications

Agricultural Information Centre (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 for Agriculture Standing Committee and question-answers including supplementary, star-marked and non-star marked 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, taken part in advertisement for disseminating scientific information, and designs of different research publications. It monitored different research projects and participants 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. Agricultural Information Centre (AIC) 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 Centre attempted in bringing out the printed inventory of the information resources in series publication. This inventory was hoped to help the users to identify the materials of their interest.

During this period, the following publications were accomplished by AIC

a. Publication of BARC Annual Report 2020-2021
b. Publication of NARS Directory 2020-2021
c. Publication of BJA Vol: 44-46, January 2022
d. Publication of BJA Vol: 47 (1) June 2022
e. BARC Newsletter April-September, 2021 (Vol. 19.2 & 19.3)
f. BARC Newsletter October –December, 2021 (Vol.19.4)
g. BARC Newsletter January–March, 2022 (Vol. 20.1)
h. BARC Calendar 2022
i. BARC Diary 2022 with different quotes of Bangabandhu Sheikh Mujibur Rahman

Glimpse of different publications

2. Library and Reprography

This section is responsible for 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.

Glimpse of different Cards

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. AIC Library had a total collection of about 24,700 information materials in the form of 20,000 Books and Reports, Pamphlets and 1100 bound Journals and serial etc.

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, 108 new books and reports were procured and 20 current Journals/ Newsletters were published by AIC during 2021-2022.

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 2021-2022. BARC and NARS scientists, teachers and students of Universities, NGO and private organizational personnel were the users of this library.

2.3 Update and Maintenance of Databases

Agricultural Information Centre updated and maintained the databases of different publications. It had its own repository using D-space with database on Koha 6211 books and reports of different sorts out of which 273 records were added during the previous year. Its database was rich in Journals, Newsletters, and Periodicals of about 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 formats 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. 11750 Articles in Bangla and English were identified, compiled and preserved in the library for users. Later, these clippings were compiled with a content list and preserved in the library. One hard copy was prepared and preserved as a reference copy.

2.5 Resource Exchange and Sharing

The AIC library performed resource exchange and sharing activities with national and international organizations during 2021-2022 like the previous years. Recently the library has started collecting information materials from FAO, CGIAR Centers, BBS, BANSDOC and NARS Institutes on a regular basis.

2.6 Online Archive of Important Documents

The AIC library developed a database driven online archive based on Content Management System (CMS) 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 the divisions and units. Last year, it captured photographs of 160 workshops/trainings/seminars/meetings. It also supplied 20461 photos in digital and 90 printed forms to the concerned divisions and officials.

2.8 User Service

During 2021-2022, 300 users of different categories used the BARC library. Besides the BARC and NARS scientists, university teachers and students, NGO and private organizational personnel used the library for meeting their queries.

3. International Linkage

Agricultural Information Centre, BARC is linked with different international organizations. Dr. Susmita Das, Principal Documentation Officer, AIC, acted 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.

3.1 Conference on Knowledge Management for Agricultural Librarians

Realizing the significant role of agricultural information professionals, National Institute of Agricultural Extension Management (MANAGE), Hyderabad, India organised a two-day virtual International "Conference on Knowledge Management for Agricultural Librarians and Information Professionals" virtually during 16-17 February 2022. Over 100 Agri-Librarians, Information Specialists, Knowledge Managers, and Extension Specialists from ICAR Institutions, SAUs, NGOs, Agrioperneurs, and Agri Startups attended the conference. Among the keynote speakers, Dr. Susmita Das, Principal Documentation Officer from Bangladesh Agricultural Research Council (BARC), Dhaka, Bangladesh presented the status on Open Access in Agricultural Research Information in South Asia. Dr. R. C. Agrawal, Deputy Director General (Education), ICAR, as the Chief Guest in the valedictory session highlighted the importance of ICT applications in knowledge management. Dr. P. Chandra Shekara, Director General of MANAGE stated that agri-librarians and information specialists are key partners in disseminating knowledge resources to farmers to solve their problems. The conference was organised by Dr. Srinivasacharyulu Attaluri, Program Officer and Dr. A. Krishna Murthy, Documentation Assistant, MANAGE and coordinated by Smt. Aparna V. R, MANAGE Fellow.

3.2 Training Programme on Social Media for Agricultural Extension

Dr. Susmita Das, Principal Documentation Officer, was awarded with the certificate of the course on social media for Agricultural Extension jointly organized by University of Agricultural Sciences, Bangalore, Karnataka and National Institute of Agricultural Extension Management (MANAGE), Hyderabad, India during 16- 20 May, 2022.

Dr. Susmita Das, Principal Documentation Officer acted as one panelist of Asia OA meeting 2021 Confederation of Open Access Repositories (COAR) during 25 -27 October. He presented about the Open science Bangladesh update.

4. Training/ Workshop/ Seminar

Agricultural Information Centre (AIC) also arranges different workshops, trainings, seminars and meetings for wider and quick delivery of agricultural scientific findings.

4.1 Training Programme

According to the annual work plan Agricultural Information Centre (AIC), BARC, organized a 5-day training programme on Technical Report Writing and Editing on March 06-10, 2022 at Bangladesh Agricultural Research Council. The main objective of the training programme was to make the NARS scientists and officers skilled in scientific and modern techniques of technical report writing and journal paper editing.

Thirty scientists from NARS Institutes attended the training. The inaugural ceremony of the training programme was graced by the Chief Guest Dr. Md. Aziz Zilani Chowdhury, Member Director, Crops Division, BARC. Dr. M. Baktear Hossain, Director SAARC and Training & Manpower Unit, was present as Special Guest. The programme was Chaired by course Director Dr. Kabir Uddin Ahmed, Director, AIC. Dr. Susmita Das, Principal Documentation Officer, AIC gave the welcome address and highlighted the objectives of the training programme as the course coordinator.

As the Chief Guest, Md. Aziz Zilani Chowdhury emphasized on the importance of technical report writing and journal paper editing for scientists. He also shared some techniques of effective technical writing. Dr. M. Baktear Hossain, as a Special Guest uttered the necessities of technical report writing for every agricultural scientist.

After successful completion, the training program ended with a closing ceremony. Dr. Md. Abdus Salam, Member Director, Planning and Evaluation Division, BARC as a Chief Guest of the closing programme distributed the certificates among the participants. Dr. Kabir Uddin Ahmed, Director, AIC Chaired the concluding and certificate giving session and thanked the Guests and the participants.

Training programme on technical report writing and editing

Participants of the Training programme on technical report writing and editing

4.2 Workshop

Resource person and participants on the workshop

Agricultural Information Centre (AIC), BARC, organized a day long workshop on Communication Skill Development for Agricultural Scientists on 25 May 2022 at Bangladesh Agricultural Research Council. The main objective of the workshop was to make the agricultural scientists and officers good at communication.

Sixty four scientists and officers from BARC attended the workshop. The inaugural ceremony of the program was graced by the Chief Guest Dr. Mian Sayeed Hassan, Member Director, NRM Division. Dr. Md. Aziz Zilani Chowdhury, Member Director, Crops Division, BARC and Dr. M. Baktear Hossain, Director SAARC and Training & Manpower Unit, were present as Special Guests. The programme was Chaired by course director Dr. Kabir Uddin Ahmed, Director, AIC. Dr. Susmita Das, Principal Documentation Officer, AIC gave the welcome address and highlighted the objectives of the training program as the course coordinator.

Dr. Md. Aziz Zilani Chowdhury conducted the workshop. Professor Dr. M Zulfikar Rahman, Department of Agricultural Extension Education, BAU presented the main article on Communication Skill Development for Agricultural Scientists. In his lecture he presented some easy techniques and the application for effective communication.

As the Chief Guest, Dr. Mian Sayeed Hassan, Member Director, NRM emphasized on the importance of communication not only for the scientists but also people of all sectors. He suggested to change the name of the workshop from Communication Skill Development for Agricultural Scientists to Communication Skill Development for Professionals. Dr. M. Baktear Hossain, as a Special Guest uttered the necessities of communication for every agricultural scientist.
Dr. Kabir Uddin Ahmed, Director, AIC Chaired the concluding session and thanked the guests and the participants.

5. Preparation of Policy Documents and Inputs

Agricultural Information Centre (AIC) Provided information for inclusion in the speech of HE the president for the 11th National Parliament 2022.

It prepared 9 reports for Agriculture Standing Committee and Question-Answer including Supplementary, Star Marked and Non-Star Marked remarkably. It provided information for 9th and 11th meeting of Committee on Government Assurances. AIC also answered 18 questions for the Hon'ble Prime Minister and also provided 47 Questions-Answer of Hon'ble Agriculture Minister and others Parliament Members (MPs)

6. Publications

Three scientific papers, four monographs, one annual report, two training manuals and four issues of BARC newsletters were published from Agricultural Information Centre (AIC), BARC during 2021-2022.

6.1 Scientific Paper (04)

- **Das, S.** & p; Mondal, M. (2021) Socio-Economic Factors Affecting Agricultural Production and Income in Bangladesh. Journal of Agricultural Socio-Economic (JASE), 2(2), p. 43-48. DOI: htt://dx.doi.org/10.33474/jase.v2i2.10856
- **Das, S** Strategies of Extension Service Providers To Meet the Information Needs of the Farmers, July 2021 SAARC Journal of Agriculture 19 (1) : 249-258 DOI:10.3329/sja.v19i1.54794
- **Das, Susmita**; Mondal, Paritosh; and Das, Rajesh Kumar, "ICT Based Agricultural Knowledge Transfer of Women Farmers: A Case of Gender Responsiveness from a Developing Country Perspective" (2021). Library Philosophy and Practice (e-journal). 6496. https://digitalcommons.unl.edu/libphilprac/6496
- **Das, Susmita**; Ahmed,K.U.; and Awal M.A. The role of radio and television in the dissemination of agricultural technologies among farmers of Bangladesh , Bangladesh J. Agri. 2019-2021, 44-46: 55-64 ; DOI: https://doi.org/10.3329/bjagri.v46i1-6.5997305
- K.M.K. Huda, **M.S.A. Banu**, M.H. Rashid, S. Parveen and M.A.M. Hussen : Effect of temperature stress on Brassica rapa genotypes during germination and reproductive growth Bangladesh J. Agri. 2019-2021, 44-46: 19-29 DOI: https://doi.org/10.3329/bjagri.v46i1-6.59970
- M.N. Jomadder, K.M.K. Huda, M. Jony, M.S. Islam, **M.S.A. Banu**, M.H. Rashid and S. Parveen: Genetic evaluation of boro rice (Oryza sativa L.) genotypes under irrigated and rainfed conditions Bangladesh J. Agri. 2019-2021, 44-46: 77-87 DOI: https://doi.org/10.3329/bjagri.v46i1-6.59976

6.2 Annual Report (01)

Ahmed. K.U. & Das, S. (2021). Annual Report 2020-2021. Bangladesh Agricultural Research Council (BARC). Dhaka, Bangladesh.

6.3 NARS Directory (01)

Bokhtiar, S. M., Ahmed. K.U., Das, S., Rahman, H.M.H., Quayyum, M.A.Q., Hasan M.S. (2022).

Directory of Annual Agricultural Research Programme of NARS Institute 2020-2021. Bangladesh Agricultural Research Council (BARC). Dhaka, Bangladesh.

6.4 BARC Newsletter (04)

Das, S., & Ahmed, K. U. (2020). BARC Newsletter. Bangladesh Agricultural Research Council. 18(3&4): Dhaka.

Das, S., & Ahmed, K. U. (2021). BARC Newsletter. Bangladesh Agricultural Research Council. 19(1): Dhaka.

6.5 Collection of ISBN Numbers

ISBN Numbers for Six books of BARC were brought by AIC through proper formalities.
i.e., 100 years of Agricultural Development in Bangladesh
The 100 Agro Technologies Atlas
Agroforestry in Bangladesh
Agroforestry Tea and shade Tree
Endangered Forest Genetic Resources in Bangladesh
Project Completion Report

3.6 Editor of National Souvenir Committee

Dr. Susmita Das worke d as an editor of National Souvenir Committee of special issue for 100 years celebration of the Father of the Nation Bangabandhu Sheikh Mujibur Rahman by Ministry of Agriculture. The publication was inaugurated by Hon'ble Prime Minister, Sheikh Hasia.

6.7 Popular Articles (09)

Dr. Susmita Das, Principal Documentation Officer, AIC, BARC wrote popular article on

1. Exploiting the potential of agro-tourism to boost rural economies, Published in The Daily Observer: Thursday, 18 November, 2021
2. গ্রামীণ অর্থনীতির উন্নয়নে কৃষি-পর্যটন, 18 January 22, The Daily Samakal
3. শ্রদ্ধার্ঘঃ বঙ্গবন্ধুর দূরদৃষ্টির ছাপ সমকালীন কৃষিতেও, 14 August 2021, https://www.bahumatrik.com/
4. বঙ্গমাতার জন্মদিনে শ্রদ্ধাঞ্জলি, 'বিজয়-লক্ষ্মী' স্বরূপে এক মহিয়সী, 08 August 2021 https://www.bahumatrik.com/

Articles Published on National Daily

Articles published on national dailies

7. Additional Activities

Agricultural Information Centre (AIC) also performed additional activities for meeting different requirements of Bangladesh Agricultural Research Council.

- Agricultural Information Centre (AIC), BARC prepared a good number of reports on agriculture Standing Committee and Question-Answer including supplementary, star marked and non-star marked questions raised by the Parliament Members and other concerned ministers for 11th parliament sessions during 2021-2022.
- Dr. Susmita Das, Principal Documentation Officer, AIC, BARC Worked in the organizing committee of MoA for the 36th Regional Conference for Asia and the Pacific (APRC) of the United Nations.
- Involved with different research projects and participates in different national and international seminars, workshops, symposiums and other relevant programs were mentored by Agricultural Information Centre during 2021-2022.
- Agricultural Information Centre designed and distributed 3 Eid cards, Nabo Barsha, New Year Greeting Card. It Prepared 28 Banners and 11 cover designs for different programs and publications. Also designed 2 Note pad, 4 Greeting cards 3 Power Point Templates, 1 Nameplate, 2 Glass Board, 1 folder, 1 Tissue Box 2 Logos, 3 Newsletter's Must Head, 1 Calendar, 1 Diary, 1 Glass Door.
- As a member of different monitoring teams, Agricultural Information Centre participated in different field visits to various localities where projects have been undertaken by BARC and NATP-2 during 2021-2022.
- Agricultural Information Centre, as a member of the BARC innovation team, contributed to generating innovative ideas, piloting and showcasing different innovations in BARC.

- During 2021-2022, Agricultural Information Centre prepared speeches for Chief Guest, Special Guest of different national seminars and international conferences, seminars, workshops and symposiums.
- AIC was involved in preparing notes for the events organized by BARC during the reported time.
- Agricultural Information Centre acted as master of ceremonies or facilitator for different national and international conferences, seminars, workshops and symposiums organized by BARC during 2020-2021.
- AIC worked as focal person of Krishi media in last year.
- Distributed publications to different national & international organizations
- Monitored research projects, participated as member in different team/committee, master of ceremonies (different seminars and workshops) etc.

ADMINISTRATION AND FINANCE

ADMINISTRATION AND FINANCE

The following Table listed Personnel worked for Administration and Finance during reporting period.

Name of the Professionals

Name	Designation
Md. Abdul Mottakin	Director (Support Service)
Muhammad Mahbubul Hassan	Deputy Director (Establishment)
K. M. Ali Haider	Senior Assistant Director (Establishment)
Md. Shohag Fokir	Assistant Director (Establishment)
Mohammad Tawfiqur Rahaman	Assistant Director (Common Service)
Aysha Siddika	Assistant Director (Establishment) (C.C.)

1. Recruitment Information

(a) Promotion/Recruitment Committee-1

A total of three (03) meetings of Council Promotion/Recruitment Committee-1 were organized. In the meeting, a total of 24 people were promoted to the post of Chief Scientific Officer (3rd grade). Bangladesh Agricultural Research Institute (BARI), Bangladesh Institute of Nuclear Agriculture (BINA) and Bangladesh Jute Research Institute (BJRI). In addition, direct recruitment of Chief Scientific Officer for the 05 posts of Bangladesh Jute Research Institute (BJRI) approved in the Council Promotion/Recruitment Committee-1 meeting.

(b) Promotion/Recruitment Committee-2

Two (02) Officers of Bangladesh Agricultural Research Council were promoted as Principal Scientific Officer (TTMU) and Assistant Director (Common Service) in the Council Promotion/Recruitment Committee-2 meeting. In the meeting of Council Promotion/Recruitment Committee-2, 19 Officers were directly appointed to the Bangladesh Agricultural Research Council.

(c) Promotion/Recruitment Committee-3

A total of 13 persons were directly appointed in the meeting of Council Promotion/Recruitment Committee-3.

2. EC Meeting Information

- The only meeting of the Executive Council was held on 18/12/2021. The meeting was presided over by the Honorable Executive Chairman of Bangladesh Agricultural Research Council Dr. Shaikh Mohammad Bakhtiar and Member Director (Administration and Finance) Dr. Md. Saifullah conducted the meeting as member secretary.
- In the meeting, research achievements of NAR'S Institutions for the financial year 2019-20, research progress for the financial year 2020-21 and research proposal and budget for the financial year 2021-22 were approved.

- The meeting also approved the recommendation of Bangladesh BARC Council Recruitment/Promotion Committee.

- Research proposal and Budget of CRG, PBRG under NATP, PIU-BARC, Phase-2 was approved.

The 37th EC Meeting conducting by Executive Chairman of BARC

3. National Integrity Strategy Award, 2022

The awarding meeting of the National Integrity Strategy Award 2022 was held on 12/06/2022 with the honorable Executive Chairman Dr. S M Bakhtiar as the President of the meeting. Awards were given to 3 people in 3 categories in the meeting.

Md. Mustafizur Rahman, Principal Technical Officer in grade 02 to 09 categories, PA System Operator Mr. Syed Tauhid Ahmed in grade 10 to 16 categories and Office Assistant Mr. Bedan Mia in grade 17 to 20 categories were awarded.

Finance Unit

Existing Officers of the Finance Unit

Name	Designation
Ajit Kumar Chakraborty	Director
Md. Jashim Uddin Chowdhury	Deputy Director (Budget)
Md. Daloar Hossain	Deputy Director (Accounts)
Kamrul Hasan	Senior Asstt. Director (Budget)
Md. Mominul Islam	Senior Asstt. Director (Audit)
Md. Jobair Reza	Senior Asstt. Director (Accounts) CC

1. Introduction

Bangladesh Agricultural Research Council (BARC) is the apex body of the National Agricultural Research System (NARS) comprising 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. BARC received funds from Development and Revenue Budgets of the Govt. to conduct its annual mandate activities like research management, coordination, monitoring, evaluation, technology transfer and manpower development. In this respect BARC's Finance Unit prepares the Medium Term Budgetary Framework (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 Ministry of Agriculture for approval.

3. Fund Release/Disbursement

BARC makes proposal for the release of fund from the Govt. on quarterly basis as per approved annual allocation of Budget. In the Financial year 2021-2022, BARC received Tk. 3256.61 lakh for salary and allowances, supply and services, research, pension and retirement benefit, repair and maintenance, manpower development and capital fund. To implement the activities like technology transfer & manpower development, etc. As necessary funds were released to the Agricultural Research Institutes (ARI's) and associated organizations according to the budget plan. The overall financial progress made during the FY 2021-22 is as follows:

Financial Progress Under Revenue Budget

(Taka in lakh)

Sl. No.	Line Items	FY 2021-22		Achieve-ment (%)
		Budget	Expenditure	
1.	Basic Salary	855.00	810.36	94.78%
2.	Allowances	776.00	750.66	96.73%
3.	Supply and Services	476.25	464.06	97.44%
4.	Workshop, Seminar	62.00	61.42	99.06%
5.	Training	80.00	79.86	99.83%
6.	Repair and Maintenance	71.50	71.29	99.71%
7.	Retirement Benifit	745.00	745.00	100%
8.	Research	38.86	38.01	97.81%
9.	Municipal tax	13.00	12.44	95.69%
10.	Motor vehicle	65.00	56.69	87.21%
11.	Computer &accecories	25.00	24.95	99.80%
12.	Office equipment	40.00	39.93	99.83%
13.	Furniture	9.00	6.00	66.67%
	Total	3256.61	3160.67	97.05%
	(+) Own income	10.00	-	-
	Total	3266.61	3160.67	96.76%

Qualitative and quantitative study of antibiotic & heavy metal residues in broiler project: -

	Special Research	425.00	363.85	85.61%

4. AFACI Projects and Others

Sl. No.	Projects Name
1.	AFACI Salt tolenent Rice
2	CCSISA contribution to HRM in Agriculture
3.	Feed the future Biotechnology potato partnership
4.	Development of Upazilla Land suitability assessment and crop zoning system of Bangladesh (KGF)
5.	Capacity building for conducting adaptive trials seaweed cultivation in coastal area (KGF)
6.	Nutrient management for diversified cropping in Bangladesh (KGF)
7.	Development of national soil map & national soil information system

5. Accounting

BARC'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 (Govt. of Bangladesh) Audit

GoB Agriculture & Environment Audit Department not yet conducted Audit for the FY 2021-2022.

7. Settlement of Audit Objections

During the FY 2021-22, three Audit objections were settled out of 14 Audit observation:

Sl. No.	Particular	Settled audit objections	Amount (Tk)
1.	Revenue	03	5,16,539.00
2.	Development	0	0
	Total =	03	5,16,539.00

Note- New 10 (ten) Audit objections were raised in June 06, 2022.

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 programmes.

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.

11. Retirement Benifits

During the year 2021-22, retirement benefits and CPF payment made to the Officers and Staff of BARC are shown below:

A) CPF Final Payment

1.	Officers (3 persons)	Tk. 78,22,840.00
2.	Staff (2 persons)	Tk. 11,49,232.00
	Total=	**Tk. 89,72,072.00**

B) CPF Non-Refundable

1.	Officers (0 persons)	Tk. 0
2.	Staff (1 persons)	Tk. 15,00,000.00
	Total =	**Tk. 15,00,000.00**

C) CPF Loan

CPF loan provided to the Officers and Staff during the year is as follows:

1.	Officers (0 persons)	Tk. 0
2.	Staff (7 persons)	Tk. 25,30,000.00
	Total =	**Tk. 25,30,000.00**

D) Gratuity Payment

1.	Officers (3 persons)	Tk. 1,48,53,220.00
2.	Staff (3 persons)	Tk. 64,57,365.00
	Total =	**Tk. 2,13,10,585.00**

E) Leave Salary Payment

Leave encashment allowed to the Officer's and Staff during the year are as follows:

1.	Officers (7 persons)	Tk. 39,94,284.00
2.	Staff (6 persons)	Tk. 19,23,339.00
	Total=	**Tk. 59,17,623.00**

F) Benevolent Fund

1.	Officers and Staff (23 persons)	Tk. 4,67,000.00
2.	Medical Assistance (0 persons)	Tk. 0
	Total=	**Tk. 4,67,000.00**

12. Income Tax

Salary statement provided to the Officers and Staff for payment of income tax during the year.

13. Group Insurance

BARC undertook Group Insurance scheme for wellbeing of its Officers and Staff for any unavoidable incident with Jiban Bima Corporation for 40 years.

During the year there was no case.

BARC Personnel
Annexure – I

Bangladesh Agricultural Research Council (BARC)
Farmgate, Dhaka-215
www.barc.gov.bd

SL	Name	Designation	Office	Phone (Office)	Email
1.	Dr. Shaikh Mohammad Bokhtiar	Executive Chairman	Executive Chairman's Office	02-41025252	ec-barc@barc.gov.bd
2.	Dr. Md. Aziz Zilani Chowdhury	Member Director	Crops Division	02-222242626	md-crops@barc.gov.bd
3.	Dr. Md. Monirul Islam	Member Director	Fisheries Division	-	dir-nutrition@barc.gov.bd
4.	Dr. Mian Sayeed Hassan	Member Director	NRM Division	02-410252546	md-nrm@barc.gov.bd
5.	Dr. Nazmun Nahar Karim	Member Director(CC)	Livestock Division	02-222242629	nazmun.karim@barc.gov.bd
6.	Dr. Md. Abdus Salam	Member Director (CC)	Planning and Evaluation Division	02-222242648	ma.salam@barc.gov.bd
7.	Dr. Md. Saifullah	Member Director (CC)	Administration and Finance Division	222242628	m.saif@ barc.gov.bd
8.	Dr. Md. Mosharraf Uddin Molla	Member Director(CC)	AERS Division	222242630	md- aers@barc.gov.bd
9.	Ajit Kumar Chakraborty	Director	Finance Unit	02-41025251	dir- finance@barc.gov.bd
10.	Dr. Md. Baktear Hossain	Director	Training & Manpower Unit	02-41025276	m.baktear@barc.gov.bd
11.	Dr. Fauzia Yasmin	Director	TTMU	02-41025266	f.yasmin@barc.gov.bd
12.	Dr. Kabir Uddin Ahmed	Director	AIC	02-41025257	kabir@barc.gov.bd
13.	Md. Abdul Mottakin	Director (SS)	Support Service Unit	02-41025253	a.mottakin@barc.gov.bd
14.	Hasan Md. Hamidur Rahman	Director	Computer and GIS Unit	02-41025258	h.rahman@barc.gov.bd
15.	Dr. Md. Harunur Rashid	Director, PIU-BARC, NATP-2	PIU-BARC	02-41025271	directornatpbarc@gmail.com
16.	Dr. Mohammad Rafiqual Islam	Chief Scientific Officer	Livestock Division	02-222242658	mrislam210@hotmail.com

SL	Name	Designation	Office	Phone (Office)	Email
17.	Dr. Shah Md. Monir Hossain	Chief Scientific Officer (CC)	Crops Division	02-41025270	monirsmh@yahoo.com
18.	Md. Mustafizur Rahman	Principal Technical Officer	Office of the Executive Chairman	222242657	m.rahman@barc.gov.bd
19.	Dr. Susmita Das	Principal Documentation Officer	Agricultural Information Centre	02-41025259	susmitabarc@gmail.com
20.	Md. Jashim Uddin Chowdhury	Deputy Director (Budget)	Finance Unit	-	ju.chowdhury@barc.gov.bd
21.	Md. Daloar Hossain	Deputy Director (Accounts)(AC)	Finance Unit	02-222242635	d.hossain@barc.gov.bd
22.	Mohammad Mahbubul Hassan	Deputy Director (Establishment)	Support Service	02-222242663	m.hassan@barc.gov.bd
23.	Dr. Suraya Parvin	Principal Scientific Officer	TTMU	02-41025280	parvin.su1980@gmail.com
24.	Hasan Mahmud	Senior System Analyst	Computer and GIS Unit	02-41025255	hasan.mahmud@barc.gov.bd
25.	Dr. Md. Ashraful Alam	Principal Scientific Office	Planning and Evaluation Division	02-41025277	ashrafulw@yahoo.com
26.	Dr. Md Golam Mahboob	Principal Scientific Officer	Forestry Unit	02-41025281	golam.mahboob@barc.gov.bd
27.	Dr. Md. Mahfuz Alam	Principal Scientific Officer	Crops Division	02-41025286	mahfuz.alam@barc.gov.bd
28.	Dr. A B M Khaldun	Principal Scientific Officer	Planning and Evaluation Division	02-41025275	abm.khaldun@barc.gov.bd
29.	Dr. Ali Akbar Bhuiyan	Principal Scientific Officer	Livestock Division	02-222242640	aab_bau@barc.gov.bd
30.	Dr. Faridul Alam	Principal Scientific Officer	Soils Unit	02-41025274	farid443@barc.gov.bd
31.	Dr. Abul Fatta Mohammad Tariqul Islam	Principal Scientific Officer	Agricultural Engineering Unit	02-222242653	tariqul.islam@barc.gov.bd
32.	Dr. Md. Khairul Alam	Principal Scientific Officer	Soils Unit	02-41025279	khairul.alam@barc.gov.bd
33.	Dr. Md. Ashraful Alam	Principal Scientific Officer	Agricultural Engineering Unit	02-41025269	a.alam@barc.gov.bd

SL	Name	Designation	Office	Phone (Office)	Email
34.	Dr. Md: Abdus Salam	Principal Scientific Officer	AERS Division	02-41025272	abdus.salam@barc.gov.bd
35.	Md. Hanif	System Analyst	Computer and GIS Unit	02-41025283	hanif@barc.gov.bd
36.	Dr. Zakiah Rahman Moni	Principal Scientific Officer	TTMU	58157492	zrmoni@yahoo.com
37.	Dr. Md. Taibur Rahman	Principal Librarion (AC)	Support Service Unit	222242631	sad.proc@barc.gov.bd
38.	Md. Al Mobasher Hussen	Principal Training Officer	Training Unit	02-41025284	mobasher1973@gmail.com
39.	Mirza Tosaddeque Hossain	Executive Engineer	Engineering Section	222242662	exn@barc.gov.bd
40.	K.M. Ali Haider	Senior Asst. Director (Establishment)	Support Service Unit	48118660	haiderbarc@gmail.com a.haider@barc.gov.bd
41.	Md. Sazzadur Rahman Sarker	Senior Reprogr-aphic Officer	Agricultural Information Centre	02-41024773	sazzadur.rahman@barc.gov.bd
42.	Mst. Deloara Khushi	Programmer	Computer and GIS Unit	02-41025256	d.khushi@barc.gov.bd
43.	Md. Mominul Islam	Senior Assistant Director	Finance Unit	02-41024771	mominul.islam@barc.gov.bd
44.	Kamrul Hasan	Senior Assistant Director (Budget)	Finance Unit	02-41024772	kamrul.hasan@barc.gov.bd
45.	Dr. Mst. Sufara Akhter Banu	Senior Scientific Editor	Agricultural Information Centre	02-41025265	sufara.akhter@barc.gov.bd
46.	Md. Jobair Reza	Assistant Director (Audit)	Finance Division	48110172	mjobair2906@gmail.com
47.	Shohag Fakir	Assistant Director (Establishment)	Support Unit Service	58154916	shohag1988@yahoo.com
48.	S.M. Mustafizur Rahman	Personal Secretary	Office of the Executive Chairman	02-41025252	mustafizur.rahman@barc.gov.bd
49.	MD. Saimum Hasan	Information Officer	Agricultural Information Centre	02-41024774	saimum.hasan@barc.gov.bd
50.	Mohammad Nazmul Islam	Graphics Designer	Agricultural Information Centre	02-41024775	nazmul.islam@barc.gov.bd
51.	Mohammad Tawfiqur Rahaman	Assistant Director (CS)	Support Service Unit	02-58154915	tawfiq@barc.gov.bd

SL	Name	Designation	Office	Phone (Office)	Email
52.	Md. Mostafa Kamal	Data Entry Officer (CC)	Executive Chairman's Office	222242666	mkamal.barc@gmail.com
53.	Aysha Siddika	Assistant Director (CC) (Establishment)	Support Service Unit	-	aysa.barc@yahoo.com
54.	Md. Sirajul Islam	Assistant Director (AC) (Store)	Support Service Unit	-	sirajbarc@gmail.com
55.	Abu Hashem Mostofa Kamal	Security Officer	Support Service Unit	222242654	-
56.	Md. Monowar Karim	Deputy Assistant Engineer (Deputation)	Engineering Section	-	monwar380@gmail.com
57.	Md. Wasiuzzaman	Junior Bibliographic Officer	Agricultural Information Centre	-	wasibarcaic@gmail.com
58.	Madhab Banik	Site Engineer	Engineering Section	222242662	sengr.barc@gmail.com

ANNEXURE-II

THE GOVERNING BODY
BANGLADESH AGRICULTURAL RESEARCH COUNCIL (BARC)

1	Honorable Minister, Ministry of Agriculture	Chairman
2	Honorable Minister, Ministry of Fisheries and Livestock	Co-Chairman
3	Honorable Minister, Ministry of Environment, Forests and Climate Change	Co-Chairman
4	Begum Matia Chowdhury, Parliament Member, Sherpur-2	Member
5	Umme Kulsum Smrity, Parliament Member, Gaibandha-3	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 Sugarcrop 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 (Regulation- 1 Branch), Ministry of Public Administration	Member
23	Chief Conservator of Forests, Forest Department	Member
24	Dr. Atiur Rahman, Honorary Professor, University of Dhaka and Former Governor of Bangladesh Bank	Member
25	Dr M. Matiur Rahman, Former Director General, Bangladesh Agricultural Research Institute	Member
26	Dr Md Nazirul Islam, Former Director General, Bangladesh Agricultural Research Institute	Member
27	Dr. Abu Bakar Siddique, Agricultural Entrepreneur, Fulbari, Mymensingh	Member
28	Alimul Ahsan Chowdhury, Managing Director, Alim Industries Limited and Alim Construction Limited	Member
29	Mr. Shykh Seraj, Director and Head of News, Channel i	Member
30	Member Director (Administration and Finance), BARC Member	Member Secretary

ANNEXURE-III

THE EXECUTIVE COUNCIL
BANGLADESH AGRICULTURAL RESEARCH COUNCIL

1	Executive Chairman, Bangladesh Agriculture 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 General, 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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BANGLADESH AGRICULTURAL RESEARCH COUNCIL

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