ANNUAL REPORT 2017-18

Bangladesh Agricultural Research Council

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National Agricultural Research System (NARS)

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

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Executive Summary

The Annual Report of this year presents the activities of Bangladesh Agricultural Research Council associated with governance, management and development of research programmes in the National Agricultural Research System. Highlights of the progress of the activities during 2017-2018 have been focused in this report.

Executive Council Meeting

The 24th -29th meeting of Executive council were held on 05 August 2017, 27 August 2017, 20 November 2017, 24 December 2017, 05 February 2018 and 11 June 2018 respectively in BARC conference room. The 24th meeting considered among others the approval of the recommendation of promotion and the recruitment committee-2, research achievement of BINA and SRDI of 2016-17 and research programmes of 2017-18 with budget. The 25th meeting considered among others the promotion and recruitment of committee 2 and 3. The research achievement of 2015-16, research progress of 2016-17 and research programme 2017-18 of BFRI(fish) were also discussed. The 26th meeting discussed the honouraria of PhD scholarship under PIU-BARC NATP-2, revision of evaluation criteria for promotion and direct recruitment for NARS Scientists, research review of BSRI, BTRI and research programme of 2017-18 with budget. The 27thmeeting considered the advantage of different scientist and officer of BARC, revision as evaluation criteria for promotion and direct recruitment for NARS scientists and the approval of the project under PBRG of PIU-BARC. The 28th meeting discuss about the approval of the project under PBRG of PIU-BARC, research achievement of 2015-16, research progress of 2016-17 and research programmes of 2017-18 with budget. Revision of evaluation criteria for promotion and direct recruitment of NARS scientists are also discussed. The 29th meeting considered the promotion and recruitment of committee 2 and 3, the final approval of four project of PBRG under PIU-BARC NATP-2, revision the budget of CRG and final approval of increasing allowance of foreign tour.

Project Development andFinancing

Development Project Proposals (DPP) titled *Strengthening of Research and Development of Bangladesh Agricultural Research Council* and *Research and Development of Seaweed Cultivation in Coastal Areas of Bangladesh* have been submitted to Ministry of Agriculture (MoA). Ten CRG Sub-projects and 3 PBRG Sub-projects of NATP-II have also been coordinated BARC.

Monitoring, Reviewing and Evaluation of Programmes of NARS institutes

Teams were formed with the scientists of BARC for field monitoring of the Competitive Research Grant (CRG) projects carried out during the year. The teams were assigned to visit and monitor the NATP Phase-II, PIU, BARC funded CRG activities in different locations of Bangladesh which were implemented by different NARS and associate institutes.

Adaptive Trials on Seaweed Cultivation in Coastal Areas

The project is coordinated by Planning and Evaluation Division, BARC and implemented by BARI. The area of the project is St. Martins Island, Nuniachara and Inani beach of Coxôs Bazar. People of Bangladesh are not much aware of the seaweedsô huge potential. Only people of the St. Martins Island (SMI) and Nuniachara, Coxôs Bazar collect seaweeds especially *Hypneamusciformis*, dry it and sale to Myanmar and nearby areas, respectively. Research on seaweed cultivation is fragmentary which include growing *Hypnea* and *Caulerpa* on floating ropes in the SMI (Zafar, 2007), and COAST Trust, a NGO. Adaptive trials for cultivating seaweeds were conducted and implemented under the direct supervision of OFRD, BARI and in collaboration with Dhaka University for first six months and coordinated by BARC to explore the potentiality of seaweed, determine appropriate species, cultivation techniques followed by manpower development for up scaling production. The technical details were, collection of selected seaweeds from the SMI and Inani beach, cultivation and determining nutritional quality of harvested seaweeds, quantity of phycocolloids, ensuring food quality, etc.

Manpower Development Activities

During the reporting period (July 2017 to June 2018) a total of 3464 scientists/officers from the National Agricultural Research System (NARS) institutes including Bangladesh Agricultural Research Council (BARC) and other associate organizations participated in the revenue/other sourcesô funded training/workshop/seminar/higher study programs at home and abroad.

CGIAR Advisory Committee Meeting

The 6th Consultative Group of International Agricultural Research (CGIAR) Advisory Committee (CAC) meeting was held at BARC Conference Room. The representatives from CG Centers like IRRI, CIMMYT, WorldFish, IFPRI, CIAT, and CIP and IFDC were present in the meeting. An overview of the CGIAR activities in Bangladesh and the objectives of CAC Meeting was highlighted. Ministry of Agriculture acknowledged the CG centersô for their continued support towards the agricultural development in Bangladesh and hoped that CAC would continue its activities with the spirit of partnership among the national and international organizations, thereby contributing towards ensuring of food and nutrition security in Bangladesh. It is hoped that the collaboration between CG centers and the government of Bangladesh would further be strengthened. CG Centre presenters briefly described their ongoing programs/activities/projects in Bangladesh and their impacts in the agricultural development of Bangladesh.

Government Performance Management System (GPMS)

A two-day training program on Government Performance Management System (GPMS) was organized at BARC conference room-1 during 2-3 June 2018 in accordance with the instructions of the Ministry of Agriculture. Resource persons were from the Ministry of Agriculture, BARC and MRDI who discussed the topics like Guidelines for Annual Performance Agreement (APA), APA Monitoring and Evaluation, Grievance Redress System, Concept of Government Management Performance System (GPMS), Innovations for Improvement of Service Delivery, E-filing and Right to Information Act 2009 etc.

HIGHLIGHTS OF RESEARCH AND DEVELOPMENT

CROPS

Project Development and Implementation

CRG and PBRG project Concept note evaluation: Out of 189 CRG projects Concept note Technical committee of crops division selected 62 CRG projects and out of 41 PBRG project Concept note 12 were not selected. Eight technical committee meetings were organized for this purpose. DPP Evaluation: Strengthening of Pulses Research and Development at Greater Faridpur and Barisal Region, BARI

Collection, Conservation and Characterization of Important Plant Genetic Resources: Programme Based Research Grant Project entitled *Collection, Conservation and Characterization of Important Plant Genetic Resources* funded by NATP Programme-2, PIU, BARC, Which coordinated by Crops Division, BARC with eight components named: BARI, BRRI, BINA, BJRI, BSRI, BSRTI, CDB and BAU.

Coordination of Seaweed & Crop Zoning Project: Member Director Crops, Coordinated Seaweed & Crop Zoning Project.

Provide technical support of research based on the National Agriculture Policy to address the challenges of stress environment through arranging progress review workshop 2017-18 on (i) Crop Improvement Programme,(ii) Plant Production and (iii) Crop Protection Programmeof NARS institutes.

Monitoring and Evaluation of Research Projects

a. As a team member (formed by Crops division, BARC) the scientist of crops division have monitored 22 CRG Projects (2017-2018) implementing by different organization during January-February 2018. The monitoring reports were also presented in the review workshop organized by PIU, BARC, NATP-Phase-2 on 15 May 2018.
b. Scientists of crops division desk monitored 62 CRG projects implemented by different NARS institutes and universities.
c. As a team member (formed by Planning and Evaluation division, BARC) the scientist of crops division have monitored Research Project activities under Special Budget of MoA (2017&2018) implementing by different organization during February - March 2018 . Team monitored total 14 projects out of 15 projects activities, among which 7 projects (BARI) monitored on 20 February 2018, 6 projects at BRRI and 1 project at CDB on 13 March 2018. Team also submitted the monitoring report to the Planning and Evaluation Division, BARC.

Regional and International Collaboration and Cooperation

a) Workshop on *Reporting on the State of Plant Genetic Resources*

Dr. Md. Abdus Salam, PSO (Crops), National Focal Point of ITPGRFA attended the Workshop on *Reporting on the State of Plant Genetic Resources* held at FAO Headquarters in Rome, Italy from 29 November to 01 December 2017. The commission on Genetic Resources for Food and Agriculture, at its 16th Regular Session, requested FAO to consult members and observes on options for further simplifying the reporting format for monitoring the implementation of the Second Global Plant of Action for Plant Genetic Resources of Food and Agriculture, to prepare a proposal for review by the Intergovernmental Technical Working Group for Plant Genetic Resources for Food and Agriculture. The Commission further requested FAO to assist countries in assessing their national reporting obligations and improving data and capacity to report on indicator 2.5.1 of the Sustainable Development Goals (SDG).

The overall objective of the workshop is to identify ways for enhancing quality and coverage of data reporting on the state of plant genetic resources for food and agriculture under the ongoing monitoring frameworks on the implementation of the Second Global Plan of Action of SDG target 2.5. Total 35 participants were attend the workshop from different member countries of the ITPGRFA.

b) Sixth Meeting of the BIMSTEC Expert Group on Agricultural Cooperation

Dr. Shah Md. Monir Hossain, Principal Scientific Officer, Crops Division, BARC participated to the Sixth Meeting of the BIMSTEC Expert Group on Agricultural Cooperation which was held in Chiang Rai, Thailand during 12-16 December, 2017. Delegations from the 07 member countries including Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka and Thailand participated in the meeting.

The Meeting reviewed the implementation status of the Nine Identified Common Projects and and proposed the following agendas for submission to the First BIMSTEC Ministerial Meeting on Agricultural Cooperation to be held in Myanmar in 2018-19, for deepening the agricultural cooperation among the Member States: (i) Creation of Corpus Fund by the Member States for successful implementation of the Identified Common Projects and (ii) Introduction of BIMSTEC Scholarships to pursue Masterôs and Ph.D. programmes in Agriculture and related disciplines in the Agricultural Universities of the BIMSTEC Member States. The Meeting also underscored the need to improve the coordination between the Secretariat and the National Focal Points (NFPs) in the respective Member States for better facilitation of the BIMSTEC activities and requested the Secretariat to provide contact details of the National and Sectoral Focal Points on the BIMSTEC website to enable the Member States to follow-up on the decisions of the Meetings and for informal discourses to take place among the concerned sectors and the stakeholders, as and when required.

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

The seventh session of the Governing Body (GB-7) of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) held on 30 October - 03 November 2017, at the Kigali Convention Centre in Kigali, Rwanda. About 430 participants from 144 members country attended the meeting. Dr. Md. Abdus Salam, Principal Scientific Officer (Crops), Bangladesh Agricultural Research Council and National Focal Point (NFP) of ITPGRFA, Bangladesh attended the seventh session of the Governing Body meeting. The session was preceded by two

days of regional and inter-regional consultations, and a special event on genomics information. Held under the theme ñThe 2030 Agenda for Sustainable Development and the Role of Plant Genetic Resources for Food and Agriculture,ò the session was address items on general policy and implementation of the Treaty and its Multilateral System (MLS) of access and benefit-sharing (ABS); and administrative and budgetary matters. Among other issues, GB-7 discussed - the Funding Strategy; farmersô rights; sustainable use; the Global Information System (GLIS); and the report of the Compliance Committee. It addressed the launch of the fourth Call for Proposals under the Benefit-sharing Fund (BSF); further development of the Multi-Year Programme of Work for the Treaty; a communication strategy; approval of Kent Nnadozie as the new Secretary, and procedures for future appointments; and cooperation with the Convention on Biological Diversity (CBD) and other international organizations and processes. Deliberations were focused on measures to enhance the functioning of the MLS, resulting from inter- sessional work. These included a draft revised standard material transfer agreement (SMTA), including a subscription system; modalities for a possible expansion of the coverage of the MLS; and a launch mechanism.

d) 5th South Asia Biosafety Conference

Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC attended ñ5th South Asia Biosafety Conferenceò organized by South Asia Biosafety Programme (SABP) at Bangalore, India during 11-13 September 2017.

e) Regional Expert Consultation on Underutilized Crops for Food and Nutritional Security in Asia and the Pacific

The Regional Expert Consultation on Underutilized Crops for Food and Nutritional Security in Asia and the Pacific was held in Bangkok, Thailand during 13 to 15 November, 2017. Dr. Rina Rani Saha, Principal Scientific Officer, Crops Division, BARC participated to Regional Expert Consultation which was organized by the Asia-Pacific Association of Agricultural Research Institutions (APAARI) and Council of Agriculture (COA), Taiwan, in collaboration with World Vegetable Center. ICRISAT, Crops for the Future, ICARDA and Bioversity International. The objectives of the Regional Expert Consultation were i) to create much needed awareness on the role and value of underutilized bio-resources that have potential for diversification of food basket to ensure better food and nutritional security in Asia Pacific ii) to share experiences and learn lessons to accelerate the use of underutilized plants as crops for the future iii) to assess research and development status on priority crops and policies that are needed to promote the use of these ócrops for Futureô in Asia and the Pacific region. At total of 47 participants including senior officials from organizers, NARS, CG Centres, experts in the fields of underutilized crops, representatives of research institutions, donors, private sector, NGOs and farmers attended the meeting. Dr. Rina Rani Saha presented on Status of Underutilized Crops for Food and Nutrition in Bangladesh. She also participated to working group discussion regarding Utilization of Underutilized Crops: Value addition, Marketing and Export.

f) Training on "Master Class in Agriculture Research Leadership and Management

Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC attended Training on *Master Class in Agriculture Research Leadership and Management* organized by World Fish and APAARI at Penang, Malaysia, on 30 October to 03 November 2017.

g) 10th South Asia Economic Summit Dr. Harun attended in the 10th South Asia Economic Summit and acted as a panelist in the parallel session "GOVERNANCE OF INTELLECTUAL PROPERTY FOR PLANTS IN SOUTH ASIA" held on 14-16 November 2017 at Kathmandu, Nepal.

AFACI Projects

h) AFACI Program Workshop on Basic Agriculture

An AFACI funded project entitled *Collection, characterization and promotion of rice, chilli, cucumber and melon in Bangladesh* is being implemented by BARI and BRRI through the coordination of BARC. Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC and Principal Investigator of the project was participated to ñAFACI Program Workshop on Basic Agricultureò for reporting the progress of the project exchange the views with other participants. The workshop was held at Kyrgyzstan during 02-04 August 2017. Participants of 14 member countries including Bangladesh, Cambodia, Lao PDR, Indonesia, Kyrgyzstan, Mongolia, Nepal, Philippines, Sri Lanka, Thailand, Vietnam, Korea, an Bhutan and Myanmar were attended to this workshop. Dr. Md. Aziz Zilani presented Country Report for AFACI Pan-Asian Project on "Collection, Characterization and Promotion of Rice, Chilli, Cucumber and Melon in Bangladesh". Under this project several teams of PGRC, BARI explored 98 upazilas (sub-district) of 34 districts and collected a total of 861 germplasm of targeted three crops (chilli-382, cucumber-201 and melon-271) through direct and indirect collection approach. The collected germplasm are cleaned, processed and stored in mid-term storage of BARI genebank that will be further multiplied and conserved in the long term storage of BARI genebank. Besides, 154 chilli, 143 cucumber and 256 melon germplasm have been characterized morphologically; 65 chilli germplasm have been evaluated against Rhizoctonia solani and molecular characterization was done for 96 chilli and 96 melon germplasm. Previously collected 88 chilli and 97 cucumber, 157 newly collected melon germplasm have been regenerated.

BRRI collected one hundred ninety seven (197) germplasm from Narsingdi, Manikganj, Dhaka, Munshiganj, Jhalakathi, Pirojpur, Tangail, Gazipur, Bhola, Jessore, Chuadanga and Rangamati districts of Bangladesh through direct and indirect collection approach. The collected germplasm were cleaned, processed, dried and stored in short term storage of BRRI genebank and some materials were multiplied in respective season and some genotypes also will be further multiplied in respective season and conserved in mid and long term storage of BRRI genebank only after confirmation that they are unique. Thirty one (31) Aus germplasm has been characterized during 2015 and one hundred fifteen (115) germplasm of which 45 Boro, 30 Jhum (Aus) and 40 T. Aman rice were characterized using BRRI rice germplasm descriptor and evaluation form during 2016. Moreover, molecular characterization of 31 previously collected Aus rice germplasm have been completed using BRRI rice germplasm descriptor and evaluation form and 48 SSR/ILP markers during 2016. Besides, forty (40) Boro rice germplasm were characterized in Boro 2016-17 season and 34 rice germplasm are in the field in Aus 2017 season for characterization and further assessment which are in the flowering stage. After presentation, there was open discussion session on country reports and sharing knowledge among the members of different countries.

i) Collection, characterization and Promotion of rice, chilli, cucumber and melon in Bangladesh (Jan 2015 to December 2017) (2nd Phase)

- It is a BARC coordinated project implementing by BARI and BRRI. Submitted Project Completion Report to AFACI Secretariat, Korea.
- BARI and BRRI explored 121 upazilas (sub-district) of 35 district of Bangladesh and collected a total of 1119 germplasm of targeted four crops (rice-195, chilli-382, cucumber-241 and muskmelon-301) through this project. Collected germplasm were stored as active and base collection in BARI and BRRI seed genebank.
- A total of 800 germplasm (rice-220, chilli-224, cucumber- 100 and muskmelon- 256) were characterized morphologically, while molecular characterization was done for 31 rice, 96 chilli and 96 muskmelon germplasm.
- A total of 800 germplasm (rice-220, chilli-224, cucumber- 100 and muskmelon- 256) were regenerated.
- Yield potentiality and quality parameters of collected germplasm were assessed during characterization. Chilli germplasm BD-10906, BD-10912, BD 10916, and BD-10913 were found tolerant to drought. Seven cucumber germplasm namely, AC-201, AC- 92, AC- 183, AC-379, BD-4241, BD- 4247, BD-4249 were found high yielding. Ten rice genotypes namely, Begunbichi, Asamiboro, Shakti-R, Mongkhoi, Kaliboro, Aloi, Jirashail, Kamarang, Abdul Hai and Khirsabad were identified as higher yielder.
- Six scientists, one from BARC, three from BARI and two from BRRI attended the AFACI International Training Workshop on ñGermplasm Management System (GMS)ò.
- Four scientific articles were published in the reputed journal-
    - Rahman, S., M. A. Hossain and R. Afroz. Morphological characterization of chilli germplasm in Bangladesh. 2017. Bangladesh Journal of Agriculture Research, 42(2): 207-219.
    - Siddique, M. A., M. Khalequzzaman, M. Z. Islam, E. S. M. H. Rashid, M. H. K. Baktiar and M. A. Z. Chowdhury. Genetic Diversity in Aus rice genotypes using ILP Markers. 2016. Bangladesh Rice J., 20(2): 13-19.
    - Molla, M. R., I. Ahmed, S. Rahman, M. A. Hossain, M. A. Salam, M. A. Z. Chowdhury and M. M. Rohman. 2017. Genetic diversity among muskmelon (*Cucumis melo L.*) germplasm in Bangladesh as revealed by microsatellite markers. African Journal of Agricultural Research (IJAR). Vol. 12(44): 3203-3213.
    - Akter, N., M Z Islam, M. A. Siddique, T Chakrabarty, M. Khalequzzaman and M. A. Z. Chowdhury. 2016. Genetic diversity of Boro rice (Oryza sativa L.) landraces of Bangladesh. Bangladesh J. Pl. Breed. Genet. 29(2): 33-40.

j) AFACI Program Workshop on Horticulture (GAP and Postharvest)

Dr. Mian Sayeed Hassan, Chief Scientific Officer (Crops), BARC and Principal Investigator (PI) of the AFACI-GAP project participated to the AFACI Program Workshop on Horticulture (GAP and Postharvest) which was held in Dhaka, Bangladesh during 18-22 July, 2017. Delegations from the 13 member countries including Bangladesh, Bhutan, Cambodia, Indonesia, Lao PDR, Mongolia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam and Korea were participated in the Workshop. Principal Investigator (PI) of the AFACI-GAP project from thirteen countries presented their implementation progress and future plan in the workshop.

k) Linkage with International Organizations and Development Partners

Joint Agricultural Working Group (JAWG) of Bangladesh visited Chile under the Singed MoU between the Peopleôs Republic of Bangladesh and the Republic of Chile. The five members JAWG headed by Mr. Mohammad Nazmul Islam, Addition Secretary (PPC), Ministry of Agriculture, Bangladesh visit Chile on 23-29 June 2018. The other members of the JAWG were Mr. Mohammad Mohsin, Director General, Department of Agriculture Extension; Mr. Md. Anwar Hossain Khan, Deputy Director (Export), Department of Agriculture Extension; Mrs. Maksuma Akter Banu, Deputy Secretary (IC-2), Ministry of Agriculture; Dr. Md. Abdus Salam, Principal Scientific Officer (Crops Division), BARC. The following topics were discussed during JAWG meeting:

Fruit-fly Management Program, Agricultural Surveillance, Pest Risk Analysis, Agricultural Intelligence, Post-entry Quarantine, Phytosanitary Certification Program, Inspections, Agricultural Quality Management Systems, e-Commerce. JAWG team also visited laboratory facilities, quarantine system of import &export of seaport and airport. Chile has vast experience in the field of quarantine. Bangladesh may take the opportunity to use Chile experiences to improve the quarantine system.

National and International Linkages (MoU/Bilateral agreement, Collaborative Workplan signed. Highlights of activities undertaken under the MoU/Agreement, etc.

- Reviewed the draft MoU between BARI, Bangladesh and Michigan State University, America under *Feed the Future Biotechnology Potato Partnership Program* for developing late blight resistant variety of potato through genetic engineering and sent to MoA.
- Prepared comments regarding renew the signed MoU between Bangladesh and Myanmar and sent to MoA.
- Prepared the revised proposal considering the opinion of Hungery on draft MoU between Bangladesh and Hungery regarding agricultural cooperation and sent to MoA.
- Proposal on cooperation in the field of Agriculture sent to MoA based on MoU between Bangladesh and China.
- Preparation of draft MoU in the field of Agriculture between Bangladesh and Brunei.
- A draft on Renewal of the MoU in the field of Agriculture between Bangladesh and Iran prepared and sent to MoA.
- A draft MoU between Michiegan State University, USA and BARC on ñFeed the Future Biotechnology Potato Partnershipò prepared and sent to MoA.
- Comments on MoU between BRRI and Africa Rice Centre.
- Preparation of draft MoU between BARC and Khuzestan Water and Power Authority (KWPA).
- Signing MoU between Michiegan State University, USA and BARC on ñFeed the Future Biotechnology Potato Partnershipò.
- Preparation of draft MoU between Bangladesh and United Arab Emirates.
- Preparation of draft MoU between Bangladesh and Nigera.

Preparation of Policy Documents and Providing inputs on Policy Documents

- Prepared monthly progress report on the implementing activities according to the direction of Honourable Prime Minister and sent to Planning and Evaluation Division of BARC.
- A gazette on Development of Potato Varieties, Release and Registration method is published through the initiative of Crops Division, BARC
- A committee led by of MD Crops, BARC as formed by the Ministry of Agriculture- i) Classified Seed Potato produced through Tissue Culture ii) Determined field standard and Seed standard of Potato and iii) Drafted a Guideline for establishing tissue culture laboratory for Potato in Bangladesh.
- Proposal on cooperation in the field of Agriculture sent to MoA based on MoU between Bangladesh and China.
- Preparation of draft MoU in the field of Agriculture between Bangladesh and Brunei.
- A draft on Renewal of the MoU in the field of Agriculture between Bangladesh and Iran prepared and sent to MoA.
- A draft MoU between Michiegan State University, USA and BARC on ñFeed the Future Biotechnology Potato Partnershipò prepared and sent to MoA (3).
- Comments on MoU between BRRI and Africa Rice Centre.
- Preparation of draft MoU between BARC and Khuzestan Water and Power Authority (KWPA) (5).
- Signing MoU between Michiegan State University, USA and BARC on ñFeed the Future Biotechnology Potato Partnershipò.
- Preparation of draft MoU between Bangladesh and United Arab Emirates.
- Preparation of draft MoU between Bangladesh and Nigera.
- Comments on draft MoU between BSRI and Bangladesh Atomic Energy Commission.
- Comments on draft of National Plant Genetic Resources Institute-2017 as per opinion of the expert committee and relevant stakeholder.
- Comments given on the document of collaboration between BRRI and Africa Rice. in the field of agriculture.
- Provided comments on the proposed Bangladesh Center Agricultural Genomics (BCAG) by BJRI to the MoA. A matrix on legal and structural aspects of BCAG comparing with other genomic centre was prepared and sent to the MoA.
- A draft Act on BCAG establishment was prepared and submitted to the MoA.
- Scientists of Crops Division played vital role for preparing ecosystem based rice production plan for the country and submitted to the MoA.
- Biotechnology time bound action plan (short: 2 years, medium: 5 years, long term: 10 years) finalized through conducting several meetings of Plant Biotechnology Technical Committee following the Biotechnology Policy 2012.
- Comments on National Agricultural Policy-2018 (Draft)
- Comments on National Agricultural Extension Policy-2017 (Draft)
- Comments on National Intellectual Property Policy 2018 (Draft)
- Comments on Tea Rules 2017(Draft)
- Comments on Agricultural Technology dissemination report
- বাংলাদেশ ও হাঙ্গেরির মধ্যে ঋঙঈ সভায় ব্যবহারের নিমিত্তে কৃষি বিষয়ক ইনপুট/মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।

- জিনোম গবেষণাকে প্রাতিষ্ঠানিক রুপ প্রদানের লক্ষ্যে বাংলাদেশ সেন্টার ফর জিনোম রিসার্চ (বিসিজিআর) গঠনের ওপর মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- Comments on the draft MoU for cooperation in Agriculture Research and Development between the SAARC Agriculture Centre and the Postgraduate Institute of Agriculture of the University of Peradeniya (PGIA-UoP)বিষয়ে মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- জিনোম গবেষণাকে প্রাতিষ্ঠানিক রূপ প্রদানের লক্ষ্যে Bangladesh Centre for Agricultural Genomics (BCAG)গঠন সম্পর্কে মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- ঢাকায় অনুষ্ঠেয় বাংলাদেশ ও যুক্তরাষ্ট্রের মধ্যকার ৬ষ্ঠ Partnership Dialogue এর জন্য মতামত/ইনপুটস তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- জাতীয় কৃষি সম্প্রসারণ নীতি-২০১৭ (খসড়া) এর উপর মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- গত ০৬ জুলাই ২০১৭ তারিখে ঢাকায় অনুষ্ঠিত বাংলাদেশ ও থাইল্যান্ডের মধ্যে পররাষ্ট্র মন্ত্রী পর্যায়ে যৌথ কমিশনের ৭ম সভারঅমৎববফ গরহঁঃবংএর কৃষি মন্ত্রণালয় সংশ্লিষ্ট অংশের উপর মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- Australian High Commission for a call on the Hon'ble Agriculture Minister by CEO, Australian Centre for International Agricultural Research (ACIAR) মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- Africa Rice Centre (Africa Rice) ও বাংলাদেশ ধান গবেষণা ইনস্টিটিউট (ব্রি) এর মধ্যে পারস্পারিক সমঝোতা স্মারক (গড়ট) স্বাক্ষরের বিষয়ে মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- Consultations between the Ministry of Agriculture of Bangladesh and the Ministry of Agriculture of the Russian Federation on Cooperation in Agriculture মতমত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- COMCEC এর ৩৩তম অধিবেশনে বাংলাদেশ প্রতিনিধি দলের অংশগ্রহণ বিষয়ে মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- বিএসআরআই, ইশ্বরদী, পাবনা এবং বাংলাদেশ আনবিক শক্তি কমিশন, সাভার, ঢাকা এর মধ্যে সমঝোতা স্মারক বিষয়ে মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- ন্যাশনাল প্ল্যান্ট জেনেটিক রিসোর্সেস ইনস্টিটিউট আইন ২০১৭ এর খসড়ার ওপর বিশেষজ্ঞ কমিটি ও সংশ্লিষ্ট অংশিজনদের মতামতের আলোকে সংশোধন করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- গত ০৮ নভেম্বর ২০১৭ তারিখে ঋঅঙকর্তৃক প্রস্তুতকৃত Towards a SAARC Food and Nutrition Security Framework and Stragegic Plan of Action এর উপর বিশেষত: গবেষণা ও উন্নয়নের জন্য ঝঅঅজঈ রাষ্ট্রসমূহের মধ্যে জনপ্রিয় ফসলের জাত/প্রযুক্তি বিনিময়, নিরাপদ খাদ্য ব্যবস্থাপনা বিষয়ক দক্ষতা বৃদ্ধি বিষয়ক মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়।
- কৃষিখাতে সহযোগিতার সুযোগ বিশেষত: উদ্যানতাত্ত্বিক ফসল উৎপাদন, মাটি ব্যবস্থাপনা, সেচ ব্যবস্থাপনা, রোগ-বালাই দমন এবং শস্যবিন্যাস বিষয়ক তথ্যাদি উন্মোচনের নিমিত্ত ওমানে বাংলাদেশ প্রতিনিধিদল প্রেরণ সংক্রান্ত বিষয়ে মতামত তৈরি করে গত ১০ জানুয়ারি ২০১৮ তারিখে কৃষি মন্ত্রণালয়ে প্রেরণ।
- বাংলাদেশ কৃষি গবেষণা ইনস্টিটিউট কর্তৃক প্রস্তাবিত বৃহত্তর ফরিদপুর এবং বরিশাল অঞ্চলে ডাল গবেষণা ও উন্নয়ন জোরদারকরণ শীর্ষক প্রকল্পের উপর মতামত তৈরি করে সংশ্লিষ্ট প্রতিষ্ঠানে প্রেরণ করা হয়।
- খসড়া চা বিধিমালা ২০১৭ এর উপর মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ।
- গত ২১-২২ ডিসেম্বর ২০১৭ তারিখে অনুষ্ঠিত বাংলাদেশ-ভুটান দ্বিপাক্ষিক বানিজ্য সচিব পর্যায়ের ৬ষ্ট সভার সম্মত কার্যবিবরণীর উপর মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ।
- গত ০১ মার্চ ২০১৮ তারিখে অনুষ্ঠিত বাংলাদেশ-তুরস্ক যৌথ কমিশনের আসন্ন ৫ম সভার এজেন্ডা নির্ধারণ ও ৪র্থ সভায় গৃহীত সম্মত কার্যবিবরণীর বাস্তবায়ন অগ্রগতি প্রেরণ সংক্রান্ত আন্ত:মন্ত্রণালয় সভার কার্যবিবরণীর উপর মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ।
- বাংলাদেশ কৃষি গবেষণা কাউন্সিল এবং ইরানের Khuzestan Water and Power Authority (KWPA) এর মধ্যে লবনাক্ততা প্রতিরোধী ফসলের জাত উদ্ভাবন/উন্নয়ন বিষয়ে যৌত কার্যক্রম/প্রকল্প বাস্তবায়নের লক্ষ্যে প্রস্তাবিত খসড়া সমঝোতা স্মারক এর উপর মতামত তৈরি করে কৃষি মন্ত্রণালয়ে প্রেরণ।
- পরিবেশ অধিদপ্তর কর্তৃক প্রস্তাবিত (১) বাংলাদেশ জীবনিরাপত্তা নীতি ২০১৮; (২) বাংলাদেশ জীবনিরাপত্তা বিধিমালা ২০১৮; (3) Revised Biosafety Guidlines of Bangladesh 2018 এবং (4) Monitoring and Enforcement Manual for এগঙএর উপর মতামত তৈরি করে নীতি-১ শাখা, কৃষি মন্ত্রণালয়ে প্রেরণ।
- চিকিৎসা জীবপ্রযুক্তি বিষয়ক কর্মপরিকল্পনা ২০১৮ এর উপর মতামত তৈরি করে নীতি-৪ শাখা, কৃষি মন্ত্রণালয়ে প্রেরণ।
- আলুর টিস্যুকালচার ল্যাব প্রতিষ্ঠার গাইডলাইনের উপর প্রাপ্ত মতামত পর্যালোচনা সভা বিষয়ে পত্র তৈরি করে কমিটির সকল সদস্যবৃন্দের নিকট প্রেরণ করা হয়।

- বাংলাদেশ কৃষি গবেষণা কাউন্সিল (বিএআরসি) এবং ইরানের এর মধ্যে লবনাক্ততা প্রতিরোধী ফসলের জাত উদ্ভাবন/উন্নয়ন বিষয়ে যৌথ কার্যক্রম বাস্তবায়নের লক্ষ্যে প্রস্তাবিত খসড়া সমঝোতা স্মারকের উপর মতামতের আলোকে পুন:র্গঠন করে গবেষণা অধিশাখা-১, কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।
- বাংলাদেশ কৃষি গবেষণা কাউন্সিল এবং ইরানের Khuzestan Water and Power Authority (KWPA) এর মধ্যে লবনাক্ততা প্রতিরোধী ফসলের জাত উদ্ভাবন/উন্নয়ন বিষয়ে যৌথ কার্যক্রম/প্রকল্প বাস্তবায়নের লক্ষ্যে প্রস্তাবিত খসড়া সমঝোতা স্মারকের উপর মতামত তৈরি করে গবেষণা-১, অধিশাখা, কৃষি মন্ত্রণালয়ে প্রেরণ করা হয়েছে।

h) Meeting on wheat blast and potato late blight Disease

Meetings was arranged on 10 January 2018 at Conference room-01, BARC for controlling the wheat blast and potato late blight diseases in Bangladesh through development of fact sheet of wheat blast (six lac) and potato late blight diseases (two lac) and management and distributing fact sheet among field level extension, BADC personnel and farmers for increasing awareness**.**

i) Coordination Meeting on AFACI-IMPGR Project

As a coordinated organization, BARC organized two co-ordination meetings on 18 September 2017 and 11 January 2018 to finalize the project completion report and catalogue.

j) Meeting on data update of Global Plan of Action and Reporting of Sustainable Development Goal Indicator 2.5.1

Meeting was organized on 20 December 2017 at Conference room-01, BARC for data update of Global Plan of Action and Reporting of PGR based on Sustainable Development Goal Indicator 2.5.1. Total 20 participants were attended the meeting from different crops research institute, BAU, BSMRAU and private sector.

k) Coordination Meeting on AFACI-Postharvest Application of improved postharvest handling of Mango in postharvest industry: Coordination Meeting was organized under implementing project of AFACI-Postharvest Application of improved postharvest handling of Mango in postharvest industry 2nd Phase for application of improved postharvest handling of Mango in postharvest industry.

l) NTCCB Core Committee meeting: Organized a NTCCB Core Committee meetings organized for reviewing and evaluating the documents submitted application of CDB.

m) Meeting on establishment of NPGRC: Organized meetings for developing Act on establishment of National Plant Genetic Resource Centre (NPGRC) in Bangladesh at BARC. Dr. Md. Aziz Zilani Chowdhury, Member-Director (Crops) (Officiating), Bangladesh Agricultural Research Council acted as member secretary of the committee and proposed Act submitted to MoA.

n) National Seed Board Meeting: Dr. Md. Aziz Zilani Chowdhury, Member-Director (Crops) (CC), Bangladesh Agricultural Research Council,participated 4 (four) National Seed Board Meeting.

o) NSB Technical Committee Meeting: Dr. Md. Aziz Zilani Chowdhury, Member-Director (Crops) (CC), Bangladesh Agricultural Research Council, participated 5 (five) National Seed Board Technical Committee Meeting as a member secretary of the committee.

p) PTAC Meeting: Dr. Md. Aziz Zilani Chowdhury, Member-Director (Crops) (CC), Bangladesh Agricultural Research Council, participated 2 (two) PTAC Meeting as a member of

the committee. Sub PTAC Meeting: CSO (Crops), Bangladesh Agricultural Research Council, participated 3 (three) sub PTAC Committee Meeting as a member of the committee.

q) Meeting on Ecosystem based rice production plan: A number of meetings were conducted to finalize the formats for collecting data on ecosystem based rice production data (area coverage, major rice varieties in the field and their maximum and average grain yield), selection of recommended rice varieties to be adopted over the time, projection of production increment in different ecosystems.

r) Meeting on national biotechnology action plan: A good number of meetings were conducted to finalize the time bound biotechnology action plan. The compiled action plan was sent to the ministry of agriculture.

s) Meeting on establishment of BCAG: Organized a number of meetings for developing a draft Act on establishment of Bangladesh Centre for Agricultural Genomics (BCAG) in Bangladesh.

t) Intellectual Property Rights (IPR): Conducted training on Intellectual Property Rights for the NARS scientists, officers of DAE, BADC and private sectors on 8 May, 2018.

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

Dr. Md. Harunur Rashid acted as a resource person in the training session "Development of resource conservation technology for sustainable agriculture" in the training on Agronomic Research and Technology Development of Major Crops organized by Agronomy Division, BARI(3-7 June 2018).

- Dr. Md. Harunur Rashid acted as a resource person in the training session "Introduction to Intellectual Property Rights" in the training on Intellectual Property Rights organized by Crops Division, BARC (8 May 2018).
- Dr. Md. Harunur Rashid acted as a resource person in the training session "Manuscript Preparation for Impact Factor Journal" in the training on Technical Report Writing and Editing organized by AIC, BARC (25 February to 01 March 2018).
- Dr. Md. Abdus Salam, Principal Scientific Officer, participated as a resource person in the training programme ñProject Development and Managementò at BJRI (May 2018).

Routine Activities

- Member Director, Participated at different programmes as Session Chair and expert member in the Internal Review of BARI, BJRI and BTRI provided technical directions.
- Prepared monthly progress report on the implementing activities according to the direction of Honourable Prime Minister and sent to Planning and Evaluation Division of BARC.
- Proposal on cooperation in the field of Agriculture sent to MoA based on MoU between Bangladesh and China.
- Preparation of draft MoU in the field of Agriculture between Bangladesh and Brunei.
- A draft on Renewal of the MoU in the field of Agriculture between Bangladesh and Iran prepared and sent to MoA.
- A draft MoU between Michiegan State University, USA and BARC on ñFeed the Future Biotechnology Potato Partnershipò prepared and sent to MoA (3).
- Comments on MoU between BRRI and Africa Rice Centre.

- Preparation of draft MoU between BARC and Khuzestan Water and Power Authority (KWPA) (5).
- Signing MoU between Michiegan State University, USA and BARC on ñFeed the Future Biotechnology Potato Partnershipò.
- Preparation of draft MoU between Bangladesh and United Arab Emirates.
- Preparation of draft MoU between Bangladesh and Nigera.
- Comments on draft MoU between BSRI and Bangladesh Atomic Energy Commission.
- Comments on draft of National Plant Genetic Resources Institute-2017 as per opinion of the expert committee and relevant stakeholder.
- Provided comments on the proposed Bangladesh Center Agricultural Genomics (BCAG) by BJRI to the MoA. A matrix on legal and structural aspects of BCAG comparing with other genomic centre was prepared and sent to the MoA.
- A draft Act on BCAG establishment was prepared and submitted to the MoA.
- Scientists of Crops Division played vital role for preparing ecosystem based rice production plan for the country and submitted to the MoA.
- Biotechnology time bound action plan (short: 2 years, medium: 5 years, long term: 10 years) finalized through conducting several meetings of Plant Biotechnology Technical Committee following the Biotechnology Policy 2012
- 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, AFACI Review Workshop, Organic Farming Workshop etc.)
- Scientists of Crops 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, International Mother Tongue Day etc.).
- Crops Division Scientists acted as rapporteurs in different workshops conducted by BARC and the MoA (e.g. Quality Seed Production, Annual Research Review Workshops of NARS institutes for different disciplines)
- Preparation of proceedings for different meetings and seminars (Ensuring the quality seed production workshop)
- Opinion on Report of the 6th Meeting of the BIMSTEC Expert Group on Agricultural Cooperation
- Report on Contact details of the BIMSTEC-Focal Point (Agricultural Cooperation) and the list of Agricultural Universities and Research Institutions in Bangladesh.
- Inputs for Honôble Prime Ministerôs Visit to Italy for Participation in IFAD Governing Council Meeting
- Brief/Talking Points for Honorable Minister, Ministry of Agriculture, Bangladesh for participation in the Governing Council of IFAD Meeting
- Input for the visit of Honourable President of Vietnam in Bangladesh
- Inputs for Honourable Prime Minister of the Peopleôs Republic of Bangladesh to visit Singapore
- Inputs for the Foreign Office Consultation (FOC) between Bangladesh and Nepal
- Opinion for the Funding Agreement between Bangladesh and the CGIAR System Organization (IRRI)
- Inputs on 6th Partnership Dialogue" between Bangladesh and USA
- Opinion on Meeting with Planet, USA and Excel Geomatics, India
- Report on follow-up of COMCEC ministerial policy recommendations

- Prepared annual report (2016-17) and newsletter documents (2017-18) which submitted to AIC, BARC

Technology Transfer Monitoring Unit

To transfer of technologies according to the Work-plan 2017-18 (Julyô 2017-Juneô 2018), TTMU has organized 4 training programmes, 4 monitoring tours, submitted PBRG Proposal. Seed Extension project is on-going. The details activities conducted by TTMU during 2017-18 have described below:

Project Development/Project Financing

PBRG Full Proposal: **NATP-2**

a. *Transfer of Agricultural Technologies to Farmers' Level for Increasing Farm Productivity* and submitted to PIU-BARC. Dr. Fauzia Yasmin, PSO (TTMU), BARC is involved as Associate Coordinator.
b. Dr. Fauzia Yasmin, PSO (TTMU), BARC is involved as Co-P.I. A coordinated project on *Preparedness Peste Des Petits Ruminants(PPR) in Goat* and submitted to PIU-BARC by Livestock Division.
c. Dr. Suraya Parvin, SSO (TTMU), BARC is involved as Co-P.I. A CRG project on *"Development and Up-gradation of Digital Contents of National Agricultural Display Center(NADC) at BARC"*submitted to PIU-BARC by Computer & GIS unit.

Project Financing

AFACI Funded Demonstration Project to Distribute National Superior Seeds of Food Crops and Transfer Agricultural Technology(Seed-Extension): Total Budget: AFACI funded $42000 USD, Project Duration: July 2016 to June 2019.

Funding for 2017-18: All funds for BARI part had allocated in favour of Director, Wheat Research Centre, Noshipur, Dinajpur.

Project Implementation

AFACI Funded Project: Demonstration Project to Distribute National Superior Seeds of Food Crops and Transfer Agricultural Technology (**Seed-Extension**).

i. Progress Activities: Presentation on AFACI Seed-Extension Project progress activities was held 01-8-2017.

ii. Major Achievement

- A total of 3.5 tons seeds of 5 wheat varieties were distributed to 262 farmers of the project areas. Training on quality seed production and seed preservation was imparted to them before the growing season.
- Based on the varietal performance in the yield trial of last year, the selected varieties- BARI Gom 28 and BARI Gom 30 were demonstrated in 0.5 ha of farmersô field each at Rajshahi and Bhola. Farmers rally and field days were organized at the maturity stage of the crop on the demonstration plots.
- Seeds of BARI Gom 28 and BARI Gom 30 were multiplied each in 1 ha land at RWRC, Rajshahi and WRC, Dinajpur, respectively. The crops were harvested mechnically and are now under drying, cleaning and grading processes to store for the use in next season.

- Farmers gained skills and experience of quality seed production of wheat through four batches of training. The performance of new wheat varieties and keys to quality seed production have been demonstrated through two farmers rally and field days in the project areas.

Research and Innovation fund of Ministry of Agriculture

- Research proposals had called from 9 institutes (BARI, BRRI, BINA, BSRI, BJRI, SRDI, CDB, BIRTAN and BADC).
- Conduction of meeting of technical committee. Technical committee recommended 44 proposals out of 82.
- Conduction of meeting of Research Coordination Committee. 44 Research proposals have been approved by Research Coordination Committee. Finally 44 Research proposals budgeted for 986.00 lakh Tk. had sent to Ministry of Agriculture.
- Progress review workshop of research programme of 2016-17 and 2017-18 was held on 8 January 2018.
- Progress review workshop of research programme of 2016-17 and 2017-18 was held on 27-28 June 2018.
- 7 Monitoring team formed to monitor the research activities of 2016-17 and 2017-18 under research and Innovation fund of Ministry of Agriculture.



Activities of Innovation Team, Computer & GIS, BARC for Agricultural Ministry:

An Innovation Idea: Visit Roof Gardening: According to the decision of innovation work-plan meeting at Computer and GIS Unit, Dr. Fauzia Yasmin, PSO (TTMU) contacted with Abdulla Hel Baki, Deputy Director, DAE, Mrs. Nurjahan Metropolitan Officer, DAE, Mirpur, Dhaka and Mr. Minto Khan, Deputy Assistant Agriculture Officer. Mr. Md. Hamidur Rahman Director, Computer and GIS Unit has sent official letter to Abdulla Hel Baki, Deputy Director, DAE. The members of Innovation Committee Meeting, Mr. Md. Hamidur Rahman, Director, Computer and GIS Unit, Mr. Md. Rafique Mostafa Kamal, Director(AIC),Dr.Kabir Uddin Ahmed, PSO (P and E), Dr. Fauzia Yasmin, PSO (TTMU) visited two roof gardens; one of Mr. Md. Siddique Abedin, 112, East Rajabazar and another of Mr. Md. Tofazzol Hossain, 31, Indira Road at Farmgate Block, Dhaka arranged by DAE. on 02.1.17.

i. At Siddiq Abedin, East Rajabazar, Farmgate Block, Dhaka

The visited roof garden is mainly fruits' garden where about 20 species of fruits' plants are found. Some of flowers and very few of vegetable plants are found. Actually they started roof gardening almost 15 years ago


which inspired by their village-home. The personnel of DAE, linked with Mr. Md. Siddique Abedin through sharing problems and maintaining Register Book. The specialty of this roof gardening is, the involvement of rearing of Turkey. Both roof gardening and Turkey rearing is profitable.

ii. Mr. Md. Tofazzol Hossain, Indira road Fa rmgate Block, Dhaka arranged by DAE

The roof garden mainly fruits' garden where about 10 species of frui ts' plants few of flowers and very few of vegetable plants are found. They started roof gardening few years ago. They were inspired by seeing others' roof gardening. The personnel of DAE, FAO and Green Saver linked with Mr. Md. Tofazzol Hossain, Dhaka. The specialty of this roof gardening is some cement made pots instead of drums.

Transfer and Monitoring Activities

BARI Developed Fruit Saplings and Sweet Potato Vines for Green Economy: Honourable Prime Minister Shiekh Hasina said, green economy should be brought in the mainstream in all national activities to achieve Sustainable Development Goals (SDGs). On this background to disseminate the BARI generated sapling of fruit and sweet potato vines to all over the country through DAE and BADC, 3 meetings were held under the coordination of Technology Transfer and Monitoring Unit (TTMU), BARC. According to the decision of the meeting, BARI developed 3211 fruit saplings and 15,000 sweet potato vines transferred to 78 number of Horticulture Centers, DAE and 976 fruit saplings and 6500 sweet potato vines at 23 number of Horticulture Centers, BADC in 2015 and 2016. In 2017, BARI transferred 100 and 150 saplings of Mango BARI-11 to BADC and DAE in 2017 respectively. BARI transferred 60 saplings of Guava BARI-4 to DAE. Scientists of Fruit Saplings Monitoring and Evaluation Committee organized two monitoring programs on fruit saplings and sweet potato vines. On 07.12.17, they monitored at Kashimpur Horticulture Development Division, BADC and on 28.12.18 at Sobhanbagh and Rajalak, Savar Horticulture Centres, DAE.

Monitoring Reviewing and evaluation report of programs/activities of NARS institutes

Monitor the transferring fruit mother sapling & sweet potato vines

Monitoring program on 7 December 2018 at Kashimpur, BADC:

Dr. Modon Gopal Saha, and Dr. Monoranjan Dhor; CSO HRC, BARI, Gazipur, Dr. Md. Golam Mostafa, Manager (Horticulture) BADC, Dr. Mahbub Alam, Joint Director; Kashimpur, BADC and Dr. Fauzia Yasmin, PSO, TTMU, BARC, Dhaka monitored Horticulture Development Center, BADC, Kashimpur. Total 631 number of fruit saplings of 19 fruits (Mango,Lemon, Malta, Litchi, Sofeda, Dragon fruit, Amloki, Jamrul, Guava, Amra, Asfol, Bilati gab, Kul, Jackfrui, Orange, Kamranga, Strawbary, Tetul and Lotkon) were distributed to 8 centres of Horticulture Development Division, BADC (Kashimpur, Putia, Rajshahi, Jessor, Bogra, Comilla, Kushtia, Muktagasa). Horticulture Development Division, BADC. They found total 325 number of fruit saplings are in good condition at Horticulture Development Division, BADC, Kashimpur. Total 2025 sweet potato vines were distributed to 7 centers (Kashimpur, Putia, Rajshahi, Jessoer, Bogra, Tangail and Kushtia) Horticulture Development Division, BADC. At Kashimpur, the number of sweet potato vines was total 1000; among which vines of Sweet Potato BARI-2 , BARI-4, BARI-5, BARI-8, BARI-12 and BARI-13 were distributed in number of 200, 200, 200, 200,100 and 100 respectively. The most of the vines were already distributed to farmers on free of costing during 2015-17.

Monitoring programme at DAE, Savar on 28 December 2018

Dhaka Dr. Monoranjan Dhor, CSO, HRC, BARI, Gazipur and Mr. Md. Khairul Alam, Assistant Director (Horticulture) BADC, Kashimpur; Mr. Md. Zohirul Haq Deputy Director, Sobhanbag, DAE and Mr. Md.

Kazi Nazrul Islam, associate Director, DAE, Rajalakh and Dr. Fauzia Yasmin, PSO, TTMU, BARC monitored Horticulture Development Center, DAE, Sobhanbag and Rajalak, Savar, Dhaka.

i. DAE, Sobhanbag, Savar

The monitoring team found the growth of BARI developed 18 saplings of 5 fruits (Mango, Jamrul, Multa, Litchi, Sofeda) are in good condition which are collected on 20.8.2015 by the Horticulture Centre of DAE, Sobhanbag, Savar. But 8 saplings of Mango BARI-10(2) Jamrul BARI-2(2) Malta BARI-1(2) Litchi BARI-4 (2) are died due to water logging problem.They also found Fruit saplings of 13 fruits (Lemos, Amloki, Litchi, Kamranga, Guava, Amra, Asfal, Bilati Gab, Mango, Jamrul, Kul, Jackfruit, Lotkon which were collected by the centre of DAE, Sobhanbag, Savar on 22.08.16, 11 Saplings of Guava BARI-2(2), Amra BARI-1(2), Bilati Gab BARI-1(1), Kul BARI-1 (2) Jackfriut BARI-2(2), Jackfriut BARI-3(2) were died due to water logging. The growth of other saplings are in good condition. DAE, Sobhanbagh , Savar did not collect any Sweet Potato Vines.

ii. DAE, Rajalakh, Savar

BARI developed sapling of 14 fruits (Mango, Lemon, Amloki, Jamrul, Litchi, Guava, Amra, Asfol, Biloti Gab, Kul and Jackfruit) which were collected by DAE, Rajalakh, Savar on 03.10.2016 were found in good condition. But Amloki, BARI-1, Amra B-1, Kul B-1 saplings died due to water logging problem. DAE, Rajalakh, Savar did not collect any Sweet Potato Vines.

Research Project activities under Special Budget of MoA for the financial year 2016-17 and 2017-18:

The team is assigned to visit and monitor different research organizations projects under Special Budget of MoA for the financial year 2016-17 and 2017-18. On this background, 7 Teams have made and a four members monitoring Team-1 was formed by Planning & Evaluation Division, BARC to observe the activities/implementation progress of 15 projects which were implemented by Research Institutes (BARI, BRRI, CDB) for the period 2016-17 and 2017-18 at Gazipur district. The Team leader was Dr. Md.Aziz Jilani Chowdhury, Member Director (Crops) and members were Dr. Md. Abdus Salam, Director (SS), Dr. Fauzia Yasmin, PSO (TTMU) and Dr. Md. Kabir Uddin Ahmed PSO (P&E). The monitoring was contacted through personal contact with concerned officers through e-mail and over telephone. By sending letter informed the date of monitoring on 20.2.18 at BARI and 13.3.18 at BRRI and CDB.

The financial & technical progress reports of the respective projects were collected in the well-structured monitoring format provided by Planning & Evaluation Division, BARC for report writing. The Team firstly discussed with concerned officers (PIs' and Co-PIsô) of the institutes. After discussion Team-1 visited demonstration fields/labs and interviewed about their field condition. Team-1 monitored total 14 out of 15 projects activities among which 7 projects (BARI) on 20 February 2018, 6 projects from BRRI and 1 project from CDB on 13 March 2018.

Research Programme under Special Budget of MoA for the financial year 2016-17 and 2017-18:

The team is assigned to visit and monitor different research organizations projects under Special Budget of MoA for the financial year 2016-17 and 2017-18.

On this background, 7 Teams have made and a three members monitoring Team-07 was formed by Planning & Evaluation Division, BARC to observe the activities/implementation progress of 14 projects which were implemented by Research Institutes (BJRI, SRDI, BIRTAN and BADC) for the period 2016-17 and 2017-18 at Dhaka. The Team leader was Dr. A. S. M. Anwarul Haque (AERS) and members were Dr. Md. Monirul Islam, Director (Nutrition) and Dr. Suraya Parvin, SSO (TTMU), BARC. The monitoring was contacted through personal contact with concerned officers through e-mail and over telephone. By sending letter informed monitoring on 25-28 February/2018.The financial & technical progress reports of the respective projects were collected in the well-structured monitoring format provided by Planning & Evaluation Division, BARC for report writing. The Team firstly discussed with concerned officers (PIs' and Co-PIsô) of the institutes. After discussion Team-07 visited demonstration fields/labs and interviewed about their field condition. Team-7 monitored total 14 research programmes among which 8 research programmes are on going. 5 research programmes on 25 February 2018 at BJRI, 5 research programmes from SRDI on 26/02/2018, 1 research programmes from BIRTAN on 26/02/2018 and 3 research programmes at BADC on 28 February 2018.

Preparation of Policy Documents and Providing inputs on Policy Documents

(1) Inputs /Comments of BARC on women activities: i. Chid Marriage and ii.Joyeeta Foundation

(2) জাতীয় দুর্যোগ ব্যবস্থাপনা কাউন্সিল সভার কার্যবিবরনীতে উল্লেখিত কৃষি মন্ত্রণালয় সংশ্লিষ্ট বিষয়ে সিদ্ধান্ত ও সুপারিশ এর উপর মতামত

(3) **Agricultural Research Challenges, Priorities and Way Forward in Bangladesh-এর উপর প্রবন্ধ তৈরীকরণ**

(4) Proceedings writing: (1) 14/01/2018 তারিখে অনুষ্ঠিত জাতীয় সবজি মেলা ২০১৮ এর কার্যবিবরণী তৈরীকরণ

(5) Writing Speech-2017:

- ফলদ বৃক্ষ রোপন পক্ষ ২০১৮ উৎযাপন উপলক্ষ্যে আয়োজিত "*অগ্রতিরোধ্য দেশের অগ্রযাত্রা , ফলের পুষ্টি যোগাবে নতুন মাত্রা*" শীর্ষক সেমিনারের সম্মানিত অতিথি মহোদয়ের এর ভাষণ ।
- Society for Bangladesh Agricultural Extension Network (BAEN) Launching Program and Annual General Meeting (AGM) এর বিশেষ অতিথি মহোদয়ের এর ভাষণ
- ৬-৭/১২/২০১৭ তারিখে অনুষ্ঠিত বাংলাদেশ প্রাণিসম্পদ গবেষণা ইনষ্টিটিউটের বার্ষিক গবেষণা পর্যালোচনা কর্মশালা-২০১৭ বিশেষ অতিথির ভাষণ
- ২১/১২/২০১৭ তারিখে অনুষ্ঠিত বিএআরআই এর "প্রযুক্তি হস্তান্তর কর্মশালা-২০১৭" এর উদ্বোধনী অনুষ্ঠানে বিশেষ অতিথির ভাষণ
- ১৬/১০/২০১৭ তারিখে অনুষ্ঠিত বিশ্ব খাদ্য দিবস ২০১৭ - বিশেষ অতিথির (২) ভাষণ
- ১১/০১/২০১৭ তারিখে অনুষ্ঠিত জাতীয় সবজি মেলা ২০১৭ - বিশেষ অতিথি (২) এর ভাষণ
- ৭-৮/১০/২০১৭ তারিখে অনুষ্ঠিত National Conference on Food and Nutrition Security in Bangladesh: Interdisciplinary Approaches-এ বিশেষ অতিথির ভাষন তৈরী

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

Training on matured Technology of Fisheries for Fisheries Officers, DoF

Inaugural Session of ToT Training Program, BFRI, Mymensingh.

i) Upazilla Fisheries Officers Training at BFRI, Mymensingh: Technology Transfer Monitoring Unit (TTMU), Bangladesh Agricultural Research Council (BARC) organized training programme on ***"Fisheries Technologies"*** for Upazilla Fisheries Officers on 03 January, 2018 at Bangladesh Fisheries Research Institute (BFRI), Mymensingh.The objective of the training programme was to update the Upazilla Fisheries Officersô knowledge regarding fisheries technology and transfer latest technologies generated by the scientists of BFRI to the farmersô field. Scientists of BFRI, acted as resource persons on the training course.

Following latest generated technologies were included in the training schedule-

1. Mixed fish culture of Koi with Singh and Tilapia
2. Artificial breeding potentiality of Tengura fish culture at salinity area
3. Fingerlings production and artificial breeding of Tengura and Parse fish

4. Soil and Water quality for fish cultivation
5. Disease and health management of fish

Total 40 participants (Upazilla Fisheries Officers, DoF and scientists of BFRI) from Mymensingh District attended the training programme. In the inaugural session the Chief Guest Dr. Yahia Mahmud, Director General, BFRI opined that there is no alternative but use of technology. He also stated that the training programme would be a very effective tool for quick dissemination of the recent fisheries technologies generated by BFRI, Mymensingh. The Training Director, Dr. Nurulla, BFRI was the Chair Person and Dr. Director S.M. Bokhtiar was Course Director and PSO, Dr. Fauzia Yasmin was the Course Coordinator of training programme. They were Special Guests also. In the closing session, mentioned that similar training programme should be arranged frequently so that extension officers can interact with scientists to have solutions of their problems and put opinion regarding field of research for the future as well.

ii. Training on matured Technology of Livestock (Livestock Officers, DLS)

Upazilla Livestock Officers Training at BLRI, Savar:

Inaugural Session of ToT Training Program, BRLI, Savar, Dhaka.

According to the Annual Work Plan 2017-2018, Technology Transfer Monitoring Unit (TTMU), Bangladesh Agricultural Research Council (BARC) organized a ToT training program on 30 January, 2018 for Upazilla Livestock Officers at Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka. The objective of the training programme was to update the Upazilla Livestock Officersô knowledge regarding livestock technology generated by the scientists of BLRI and transfer these to the farmersô field. Scientists of BLRI, Savar, Dhaka acted as resource persons on the training course. Following 5 (five) generated technologies were included in the training schedule-

1. Preservation of fresh and wet straw during rainy season
2. Goat rearing under stall feeding
3. BLRI feed master mobile application
4. Cattle fattening package
5. BLRI model for PPR disease prevention

Forty Participants (Upazilla Livestock Officer) from different Upazilla attended the training programme. The participant opined that this type of training will open new pathway of linkage between DLS & BLRI. Upazilla Livestock Officers also mentioned that such kind of training would make strong bond between extension and research organizations which eventually built up an intensive communication system so that problem in field can be solved immediately.

In both the inaugural and closing sessions, Dr. Nathu Ram Sarkar, Director General, BLRI was the Chief Guest, the Additional Director, Mr. Md. Azharu Amin, BLRI was the Chair Person, Dr. S.M. Bokhtiar, Director and Dr. Fauzia Yasmin, PSO, TTMU, BARC were Special Guests. Dr. S.M. Bokhtiar was Course Director and Dr. Fauzia Yasmin, was the Course Coordinator of training programme. At certificate giving participant expressed their highest gratitude to BARC for organizing this type of useful training. They have requested to conduct similar training programme to other regions.

iii. Training on matured Technology of crops' production and varieties for Agricultural Officers, DAE

Upazilla Agriculture Officers Training at BARI Gazipur: A training programme on *"Fruit production Management for Producers"* was organized by TTMU, BARC, on 01 March 2018 at BARI, Gazipur. The objective of the training programme was to train producers regarding management of fruits production. A total forty Upazilla Agricutural Officers from 33 districts were attended in the training course. Specialized scientists of fruit

Inaugural Session of ToT Training Program BARI, Gazipur

division, BARI, Gazipur delivered lectures on production management for fruits. These are as follows:

1. Introduction to BARI Developed Fruit Varieties
2. Advanced/ Improved Technologies on production of Mango and Litchi
3. Advanced/ Improved Technologies on production of Banana and Papaya
4. Advanced/ Improved Technologies on production of Jackfruit and Guava and
5. Advanced/ Improved Technologies on production of Malta and Ber.

In the inaugural session of the training , Dr. Md. A. Halim Director (HRC), BARI was the Chief Guest. Dr. S.M. Bokhtiar, Director (Course Director) and Dr. Fauzia Yasmin, PSO (Course Coordinator) TTMU, BARC were Special Guests. Dr. Paritas, Director(Training) was the Guest of Honour. Dr. Madan Kumar Saha, CSO, BARI was presided over the inaugural session. Director Dr. S.M. Bokhtiar was Course Director and Dr. Fauzia Yasmin, Principal Scientific Officer, TTMU, BARC was the Course Coordinator of training programme. During certificate giving ceremony, participants expressed their highest gratitude to BARC for organizing this type of useful training for them. They have requested to conduct more than 1 day training programme.

Implemented as Workshop on Technologies to control Blast disease of wheat (Stress prone Location Specific: Hoar, salinity, water logging, drought)

Training on Technologies for Safe, Healthier and Harmful Chemical Free Mangoes Production

A two days long three batches training programme on Technologies for Safe, Healthier and Harmful Chemical Free Mangoes Production was organized by Technology Transfer and Monitoring Unit (TTMU), BARC on 11-16 March, 2018 at Chapainawabganj Sadar, Shibganj and Volahat Upazila of Chapainawabganj district. This training programme was funded by PIU, BARC, NATP-2 project. First batch training was held on 11-12 March, 2018 at Volahat, Chapainawabganj. Dr. Shaikh Md. Bokhtiar, Director (TTMU), BARC was presented as chief guest at the inaugural session of the training programme at Volahat and Chapainawabganj Sadar, Chapainawabganj. Upazila Nirbahi Officer, Volahat, Chapainawabganj and Dr. Md. Hamim Reza, Chief Scientific Officer, Regional Horticulture Research Center, Chapainawabganj were attended as special guest at Volahat and Sadar, Chapainawabganj. Upazila Agriculture Officer, Volahat, Chapainawabganj was presided over the inaugural session at Volahat, Chapainawabganj. 2nd batch training was held on 13-14 March, 2018 at Shibganj, Chapainawabganj. Mr. Md. Mahmudul Hasan, Deputy Commissioner, Chapainawabganj was presented as chief guest. Dr. Mian Sayeed Hassan, Director, PIU, BARC, NATP-2, Pouroshova Chairman of Shibganj Pouroshova and Dr. Shaikh Md. Bokhtiar, Director (TTMU), BARC were attended as special guest. Mr. Md. Monjurul Huda, Deputy Director, DAE, Chapainawabganj was presided over the inaugural session of the training programme at Shibganj and Chapainawabganj Sadar, Chapainawabganj. Third batch training was held on 15-16 March, 2018 at RHRS, Chapainawabganj Sadar, Chapainawabganj. Upazila Agriculture Officer, Chapainawabganj Sadar, Chapainawabganj was presented as special guest.

Progress Review Workshop on Research Programme of 2016-17 and 2017-18 under Research and Innovation fund of Ministry of Agriculture

A day long Progress Review Workshop on Research Programme of 2016-17 and 2017-18 under Research and Innovation fund of Ministry of Agriculture was organized by Technology Transfer and Monitoring

Unit, BARC on 08 January, 2018. Mr. Fazle Wahed Khandoker, Additional Secretary (Research), Ministry of Agriculture was presented as chief guest. Dr. M. Kabir Ikramul Haque, Executive Chairman, BARC chaired in this inaugural session and also chaired in technical session. Mr. Md. Sirajul Haider, NDC, Additional Secretary (Admin. and Input), Ministry of Agriculture attended as special guest and Dr. Poresh Chandra Golder, Member-Director (Planning and Evaluation), BARC delivered vote of thanks to the participants. The welcome address was delivered by Dr. S.M. Bokhtiar, Director (TTMU), BARC. In two technical sessions principal investigators from nine institutes (BARI, BRRI, BINA, BJRI, BSRI, SRDI, CDB, BIRTAN and BADC) participated in this workshop and presented 28 research programmes of 2016-17 and 44 research programmes 2017-18. After detail discussion, the following recommendations were made by the experts and participants which could be considered in developing research programme of special fund of MoA:

- The money should be utilized properly in according to special fund Nitimala/2016.
- Research Programme monitoring team could be formed by inclusion of scientists and officers from MoA and NARS institutes.
- Research priority fields which are mentioned special fund Nitimala/2016 should be properly reflected in research programme.
- Research programme should be conducted for adaptive research and basic research.
- Technologies generated by the scientists should be disseminated properly and constraints should be removed for transferring technologies to the farmers.
- This special fund of MoA provides budget for the continuation of those research programmes which are terminated due to lack of money.

Transferable Technology

i. Book (240): *Matured Technologies of NARS Institutes (2014-2016)* under process for printing
ii. Total 700 Technologies Transferred through the website of the CRG Project (NATP-2): *"Development and Up-gradation of Digital Contents of National Agricultural Display Center (NADC) at BARC " on* 06 June 2018.
iii. 15 technologies transferred through Training (Mentioned above).

Presentation of research articles in different programme: Presentation of research articles as Country Report on Demonstration Project to Distribute National Superior Seeds of Food Crops and Transfer Agricultural Technology (Seed-Extension) in Thailand by Dr. Md. Siddiqun Nabi, SSO, Wheat Research Center, BARI, Dinajpur, 2017.

PLANNING AND EVALUATION

Project development/Project financing

Two Development Project Proposals (DPP) titled *Strengthening of Research and Development of Bangladesh Agricultural Research Council* and *Research and Development of Seaweed Cultivation in Coastal Areas of Bangladesh* have been submitted to Ministry of Agriculture (MoA). The Review meeting of these two projects will be held on 08 October 2018 at MoA. Ten CRG Sub-projects and 3 PBRG Sub-projects of NATP-II are also coordinating by Planning & Evaluation Division, BARC. There are as follows:

CRG Sub-projects

1. Increasing the Productivity of Cropping System in Coastal Region of Bangladesh (Project ID-442)
2. Agricultural Imaging Systems for Crop Disease Detection and Management in Agro-Field (Project ID -554)

3. Enhancing Agricultural Research Information Services through Digitization of Research Outputs (Project ID -612)
4. Development and upgradation of digital contents of National Agricultural Display Center (NADC) at BARC (Project ID -629)
5. Crop Productivity in Beel Areas of Bangladesh (Project ID -688)
6. Crop Productivity in Beel Areas of Bangladesh (Project ID -688)
7. Developing Mobile APPS for Enhancing Rice Productivity (Project ID -715)
8. Screening of sugarcane clones based on adaptive mechanisms under drought, salinity, heat, water-logging and flood stress due to climatic change (Project ID -746)
9. Development of mobile APPS for assessment of nitrogen fertilizer in cereals crops (Project ID -769)
10. Offline Fertilizer Recommendation Through Mobile Apps Program: IOFRMAP (Project ID -787)

PBRG Sub-projects

1. Integrated Farming Research and development for Livelihood Improvement in the Plain land Eco-system (Project ID-061)
2. Improvement of Farm Productivity through Intervention with Improved Agricultural Technologies in Char land Eco-System (Project ID-096)
3. Climate Resilient Farming Systems Research and Development for the Coastal Ecosystem (Project ID-098).

Monitoring, reviewing and evaluation report of programs/activities of NARS institutes

Three teams were formed with the scientists of Planning & Evaluation Division, BARC for field monitoring of the Competitive Research Grant (CRG) projects carried out during the year. The teams were assigned to visit and monitor the NATP Phase-II, PIU, BARC funded CRG activities in different locations of Bangladesh which were implemented by different NARS and associate institutes.Team composition for field monitoring of Research activities under CRG project of NATP Phase-II, PIU, BARC are as follows:

Team-01

Project ID	Sub-project title	Name of the PIs	Institute & Locations	Team Members
442	Increasing the Productivity of Cropping System in Coastal Region of Bangladesh	Dr. Swadesh Chandra Samanta Professor, Department of Agronomy	Patuakhali Science and Technology University (PSTU), Patuakhali	1. Dr. Paresh Chandra Golder, MD (P&E) & Team Leader; 2. Dr. Md. Abdul Awal CSO (P&E) & Team Member; 3. Dr. Kabir Uddin Ahmed PSO (P&E) & Team Member
554	Agricultural Imaging Systems for Crop Disease Detection and Management in Agro-Field	Dr. S.M. Taohidul Islam Associate Professor, Department of EEE	Patuakhali Science and Technology University (PSTU), Patuakhali	
688	Crop Productivity in Beel areas of Bangladesh	Dr. Md. Abul Khayer Mian PSO, Agronomy Division	Bangladesh Agricultural Research Institute, Bualmari, Faridpur	
Team-02				
688	Crop Productivity in Beel areas of Bangladesh	Dr. Md. Abul Khayer Mian PSO, Agronomy Division	Bangladesh Agricultural Research Institute, Tarash, Chalan Beel, Sirajgonj	1.Dr. Md. Abdul Awal CSO (P&E) & Team Leader; 2. Dr. Kabir Uddin Ahmed

			Guro Daspur, Natore	PSO (P&E) & Team Member
746	Screening of sugarcane clones based on adaptive mechanisms under drought, salinity, heat, water-logging and flood stress due to climatic change	Dr. M. Kohinoor Begum, PSO, Physiology and Sugar Chemistry Division	Bangladesh Sugarcrop Research Institute (BSRI) Godagari, Rajshahi	
Team-03				
787	Offline Fertilizer Recommendation Through Mobile Apps Program: IOFRMAP	Dr. Mohiuddin Ahmed, PSO	SRDI, Dhaka	1. Dr. Paresh Chandra Golder, MD (P&E) & Team Leader; 2. Dr. Md. Abdul Awal CSO (P&E) & Team Member; 3. Dr. Kabir Uddin Ahmed PSO (P&E) & Team Member
612	Strengthening Services of Agricultural Information Centre for Enhancing Agricultural Research	Md. Rafique Mostafa Kamal Director, Agricultural Information Centre	BARC, Farmgate, Dhaka	
629	Development and upgradation of digital contents of National Agricultural Display Center (NADC) at BARC	Director (Computer and GIS), BARC	BARC, Dhaka	
769	Development of mobile APPS for assessment of nitrogen fertilizer in cereals crops	Shamim Ara Begum, SSO, Seed Technology Division	BARI Head Office, Gazipur	
715	Development of Mobile APPS for Enhancing Rice Productivity	Dr. Md. Ismail Hossain, PSO & Head, Agricultural Statistics Division	BRRI Head Office, Gazipur	

The information of monitored CRG projects are:

Project title: Enhancing Agricultural Research Information Services through Digitization of Research Outputs (Project ID-612)

Objectives:

- Develop the e-resource base of the important reports, proceedings documents like Acts, Guidelines, Handbook, Manual etc., strategy papers, five-year plans etc.
- Improve the library housekeeping operations to promote the economical and efficient delivery of information to researcher, policy-makers and other end users;
- Introducing on-line publishing process of research results (journal) and publish and make available in the web.

Implementing Agency and Division/Section: Agricultural Information Centre (AIC), Bangladesh Agricultural Research Council

Coordinator/Principal Investigator: Md. Rafique Mostafa Kamal, Director, Agricultural Information Centre, BARC, New Airport Road, Farmgate, Dhaka-1215.
Implementation locations: Agricultural Information Centre, BARC

Major activities performed:

Sl. No.	Planned Activities	Implementation Status
1	Preparation of Technical Specifications of the Hardware and Terms of Reference of the vendor	Completed
2	Identification of the Information sources for Tagging	Completed

	required for the RFID Security System, arrangement of digitization of necessary documents Installation of server and software and customization	
3	Identification of the Information sources for Tagging required for the RFID Security System, arrangement of digitization of necessary documents and the materials required for enhancing library housekeeping.	Completed
4	Installation of server and software and customization Recruitment of Contractual Staff	Completed
5	Installation of server and software and customization	Completed

Budgetary Information:

Total Approved Budget (Tk.)	:	45,50,560/-
Fund Released (Tk.)	:	27,05,020/-
Fund Spend (Tk.)	:	24,32,184/-

Constraints/Suggestions: No problem faced.

Project title: Development and Up gradation of Digital Contents of National Agricultural Display Center (NADC) at BARC (Project ID-629)

Objectives:

- To collect detail information of displayed items in NADC including developed Agricultural technologies by NARS institutes.
- To digitalize and/or develop contents through text, image and audio-visual format.
- To develop a user friendly web application and make the contents available through LAN and Internet.

Implementing Agency and Division/Section: Bangladesh Agricultural Research Council

Coordinator/Principal Investigator: Md. Shohid Uddin Bhuyan**,** System Analyst, Computer and GIS Unit, Bangladesh Agricultural Research Council (BARC)

Implementation locations: Bangladesh Agricultural Research Council (BARC), Farmgate, Dhaka.

Major activities performed:

Sl. No.	Planned Activities	Implementation Status
1	Contractual staff recruitment	Completed
2	Collection of recent ICT related information	Has been collected
3	Organization of inception workshop	Has been done
4	Procurement of office supplies (Stationary, computer and other accessories) is being under process	Completed
5	Hiring of IT farm	Done
6	Data collection in text format, translation in Bangla and English and uploading to the application software.	Done

Budgetary Information:

Total Approved Budget (Tk.)	:	50,00000/-
Fund Released (Tk.)	:	8,58,422/-.

Constraints/Suggestions: No constraint was found.

Project title: Crops Productivity in Bell Areas of Bangladesh (Project ID-688)

Objectives:

- To identify technology (7) for improving crop productivity
- To adapt HYV with best crop management practices (5)
- To improve knowledge of farmers (120)

Implementing Agency and Division/Section: Bangladesh Agricultural Research Institute, Gazipur.

Coordinator/Principal Investigator: Dr. Md. Abul Khayer Mian

Implementation locations: Dobilla, and Khalkhola, Tarash-Sirajong and Charkadaho, Gurudaspur- Natore, and Surjacj-Boalmari, Faridpur

Major activities performed:

Sl. No.	Planned Activities	Implementation Status
1	Experimentation on fertilizer and weed management of B. *aman* rice in beel area	Completed
2	Experimentation on fertilizer and weed management of ratoon rice in beel areas.	Completed
3	Experimentation (Ten) in *rabi* season in beel areas	Completed
4	Organize capacity building training for farmers	Done

Budgetary Information:

Total Approved Budget (Tk.)	:	3000000/-
Fund Released (Tk.)	:	1246700/-
Fund Spend (Tk.)	:	1241053/-

Constraints/Suggestions:

- Fund is released to DG, not to PI. Some additional conditions are added form there. So, PI cannot do work independently
- No fund released from December 2017. No money for a long time.
- More and more wanting of information with format

Project title: Developing Mobile APPS for Enhancing Rice Productivity (Project ID-715)

Objectives:

- Strengthen and capacity building of BRRI employee in ICT and e-governance in association of SMART/precision agriculture
- To increase agricultural productivity through developing mobile apps and rice database for researcher, extension worker and farmer etc.

- To improve research and development in agriculture through ICT innovations for sustainable development.

Implementing Agency and Division/Section: Bangladesh Rice Research Institute (BRRI)

Coordinator/Principal Investigator: Dr. Md. Ismail Hossain, Principal Scientific Officer (PSO) & Head, Agricultural Statistics Division, BRRI, Gazipur-1701

Implementation locations: BRRI HQ & 09 (nine) Regional Stations (R/S)
Major activities performed:

Sl. No.	Planned Activities	Implementation Status
1	Firm hire for mobile app	Completed
2	Firm hire for database	Completed
3	Yearly subscription fee for Mobile app & database hosting for Google Play Store	Completed

Budgetary Information:

Total Approved Budget (Tk.)	:	24,98,000/-
Fund Released (Tk.)	:	11,38,500/-
Fund Spend (Tk.)	:	2,14,485/-

Constraints/Suggestions:

- Timely delivery of fund
- Fund disbursement process make disturbance to continue the project
- Cheque transfer procedure destroys time when it transferred from DGôs account to Project account

Project title: Screening of sugarcane clones based on adaptive mechanisms under drought and salinity stress due to climatic change (Project ID -746)
Objectives:

- To select drought and salt tolerant clones of sugarcane
- To select better stress tolerant cane clones.

Implementing Agency and Division/Section: Physiology and Sugar Chemistry Division, Bangladesh Sugar crop Research Institute, Ishurdi, Pabna
Coordinator/Principal Investigator: Dr. Mst. Kohinoor Begum, Principal Scientific Officer (cc), Physiology and Sugar Chemistry Division, Bangladesh Sugarcrop Research Institute, Ishurdi-6620, Pabna.
Implementation locations: BSRI, Rajshahi, Thakurgaon, Khulna and Satkhira
Major activities performed:

Sl. No.	Planned Activities	Implementation Status
1	Screening of sugarcane Clones against drought and salinity stress condition.	Completed
2	Improvement of lab facilities for selecting abiotic stress tolerant sugarcane clones.	Completed

Budgetary Information:

Total Approved Budget (Tk.)	:	3455190/-
Fund Released (Tk.)	:	1703815/-

Fund Spend (Tk.) : 773500/-

Constraints/Suggestions: No problem found.

Project title: Development of mobile APPS for assessment of nitrogen fertilizer in cereal crops (Project ID-769)

Objectives:

- To use digital camera image and software for assess leaf nitrogen of rice, wheat and maize at different growth stage.
- To establish a relationship between morpho-physiology parameters with image parameters of rice, wheat and maize.
- To develop a mobile phone applications for phenotyping and assessment of nitrogen requirement by image analyses

Implementing Agency and Division/Section: Bangladesh Agricultural Research Institute, Gazipur

Coordinator/Principal Investigator: Shamim Ara Bagum, Senior Scientific Officer, Seed Technology Division, BARI, Joydebpur, Gazipur-1701

Implementation locations: Gazipur, Chittagong and Dinajpur

Major activities performed:

Sl. No.	Planned Activities	Implementation Status
1	Three experiments set up in different locations like Gazipur, Dinajpur and Chittagong	Done
2	Data entry, Data collection and validation	Done
3	Algorithm development for software and Apps developments	Done

Budgetary Information:

Total Approved Budget (Tk.) : 40000000/-
Fund Released (Tk.) : 1393165/-
Fund Spend (Tk.) : 1359549/-

Constraints/Suggestions: Delay fund release

Project title: Offline fertilizer Recommendation through Mobile Apps. (Project ID-787)

Objectives:

- To provide location specific offline fertilizer recommendation through mobile app directly to the farmers as well as beneficiaries i.e. agricultural extension worker, entrepreneurs of UDC, Scientists of SRDI and other Organization.
- To reduce the misuse of chemical fertilizers as well as increase crop production by using union wise soil test based balanced fertilizer through this mobile app.

- To develop and diseminate a union wise soil fertility and fertilizer use database that will lead to establish an integrated and effective soil, crop and fertilizer management in Bangladesh in the long run.

Implementing Agency and Division/Section: Soil Resource Development Institute, Regional Laboratory, Krishi Khamar Sarak, Farmgate, Dhaka-1215

Coordinator/Principal Investigator: Dr. Mohiuddin Ahmed, Principal Scientific Officer

Implementation locations:

Major activities performed:

Sl. No.	Planned Activities	Implementation Status
1	Collection of soil ~~y~~ land physiographic map along with Upazila Nirdeshika	Completed
2	Classifying the chemical data (soil test values) on the basis of land type, soil texture, soil group	Completed
3	Upazilla and union wise processed data entry	Completed
4	Calculation appropriate doses of fertilizer on the basis of average soil test value	Completed
5	Integration of the methods of fertilizer application	Completed
6	Preparation of mobile apps by making android mobile version	Completed
7	Uploading this apps to the Google play store	Completed
8	Procurement of goods	Completed

Budgetary Information:

Total Approved Budget (Tk.)	:	2999,415/-
Fund Released (Tk.)	:	1457,805/-
Fund Spend (Tk.)	:	768,704/-

Constraints/Suggestions: No problem is faced**.**

Project title: Development of a sustainable agricultural risk management technology in areas affected by flash flood using numerical climate modeling data analysis (Project ID-512)

Objectives:

- To assess the risk of meteorological disasters; disease and pest damage using meteorological numerical model projection data along with a suitable crop simulation model.
- To develop a scenario of different crop production in areas affected by flash flood

Implementing Agency and Division/Section: Department of Agricultural Construction and Environmental Engineering, Sylhet Agricultural University, Sylhet-3100

Coordinator/Principal Investigator: Dr. Md. Altaf Hossain, Associate Professor

Implementation locations:

Major activities performed:

Sl. No.	Planned Activities	Implementation Status

1	Data collection	Completed
2	Procurement	Completed
3	Computer simulation for model preparation	Completed
4	Synthesized Cropping pattern	Completed
5	Model Validation	Completed
6	Preparation for training manual and training materials	Completed
7	Training on flash flood trend (Climatic Parameters) analysis model and crop simulation model	Completed
8	Preparation on adaptation frameworks manuals	Completed
9	Yearly report preparation	Completed
10	Final report and workshop	Completed

Budgetary Information:

Total Approved Budget (Tk.)	:	29,99,415/-
Fund Released (Tk.)	:	14,57,805/-
Fund Spend (Tk.)	:	768,704/-



Views of field monitoring

Field Monitoring of FSRD Projects

Field monitoring was done in the FSRD sites of BSRI, Ishurdi and BINA, Jamalpur, under Charland ecosystem.

Training on *Natural Resources Management and Climate Smart Agriculture*, Institute of Natural Resources, University of Manitoba, Canada and University of Guelf, Onterio, Canada.

Dr. Md. Abdul Awal, Chief Scientific Officer, Planning and Evaluation Division, Bangladesh Agricultural Research council attended a training on ñ*Natural Resources Management and Climate Smart Agriculture*ò held during 27 April to 06 May 2018 at the Institute of Natural Resources, University of Manitoba and Canada University of Guelf, Onterio, Canada. The training lectures were on Canola, Wheat, Potato, late blight of Potato, Potato Storage Technologies, Horticulture Research etc. Both the universities of Canada expressed their interest to exchange views and ideas on agricultural technologies between these countries through Memorandum of Understanding (MoU).

Fig: Bangladeshi participantsô in-front of the University of Manitoba, Canada

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

The project is coordinated by Planning and Evaluation Division, BARC and implemented by BARI. The area of the project is St. Martins Island, Nuniachara and Inani beach of Coxôs Bazar. People of Bangladesh are not much aware of the seaweedsô huge potential. Only people of the St. Martins Island (SMI) and Nuniachara, Coxôs Bazar collect seaweeds especially *Hypneamusciformis*, dry it and sale to Myanmar and nearby areas, respectively. Research on seaweed cultivation is fragmentary which include growing *Hypnea* and *Caulerpa* on floating ropes in the SMI (Zafar, 2007), and COAST Trust, a NGO.
Adaptive trials for cultivating seaweeds were conducted and implemented under the direct supervision of OFRD, BARI and in collaboration with Dhaka University for first six months and coordinated by BARC to explore the potentiality of seaweed, determine appropriate species, cultivation techniques followed by manpower development for up scaling production. The technical details were, collection of selected seaweeds from the SMI and Inani beach, cultivation and determining nutritional quality of harvested seaweeds, quantity of phycocolloids, ensuring food quality, etc.

Among 12 indigenous seaweeds (*C. racemosa*var.*uvifera/furgusonii*(=*cactoides*)), *U. linza,H. börgesenii/musciformis, Chr. agardhii, D. ciliolata/robusta, Sp. asperum, Ds. australis S. flavicans/tenerrimum*) considered in the present study, *H. börgesenii, H. musciformis*and *C. racemosa*var. *uvifera* were found suitable for ñOne-step seedsò (a portion of the seaweed that is attached to ropes)

production and cultivation. Growth of *H. börgesenii*and *C. racemosa*var. *liui* was low (75-77 g and 45-47 g per ñseedò after 70 days, respectively) in the nursery pond (land-based) but grew well at Noapara, Teknaf. Rest of the seaweeds (*H. musciformis* was not grown in the nursery) either died or could not grow due to high turbidity and temperature and did not produce attachment organ.

H.musciformis, growing on Nuniachara sand-flat (open-seawater), Moheshkhali Channel was grown in a large scale using ñOne-step seedsò for about seven months from mid-September. Seeds were attached in ropes at 20 cm gap, and the gap between rope lines was 40 cm. All the cultivation methods were tested, of which ñSingle-line floating ropeò method was found best on sand-flat and produced 1.3 (lowest), 3.0 (average) and 6.1 (highest) kg/m^2 fresh weight, respectively equivalent to 13, 30 and 61 metric tons/ha in 30-35 days.

Decreased salinity and increased turbidity severely affected seaweed growth. Therefore, for land-based system crystal clear seawater is needed and the cultivation site should be selected about 5 km away from river estuary. Stagnant water body in the nursery for some time in 24 hours was responsible for low seaweed growth. *H. börgesenii, H. musciformis*and *C. racemosa* var.*uvifera* have so far been screened form cultivation.

It was possible to grow large bulk of *H. musciformis* in aquariums including *H. börgesenii, C.racemosa* var. *uvifera, C. furgusonii,U.linza* etc. It was found that using 5 m long seeded ropes and growing in a tank of 200 litres capacity on roof top it was possible to produce as many as 400 one-step seeds in 30 days in August weather and cultivated in open-seawater at Nuniachara. In mid November both the *Hypnea* spp.grew well but *H. börgesenii* showed better growth than *H. musciformis* within 7 days. As *H. börgesenii* was bushy and fragile, growing the seaweed in a relatively low tide area for large scale cultivation has been suggested.

Ulva linza commonly called sea-lettuce produced ñMulti-step seedsò in the laboratory using UV light and only 5 cm rope was found to contain over 200 seedlings, thus the seaweed is found suitable for large scale cultivation. *H. musciformis* had high protein (27.2%), amino acid profile, βcarotene (11.54%) and minerals but low crude fat, and has been considered as nutritious sea-vegetables than *H. börgesenii*. Among greens *Ulva linza* having high protein content (22.05%) is also suitable as sea-vegetable. Phycocolloids determined in the seaweeds were also high. Agar was found to be 27.2% in *H.musciformis,* Carrageenan was 55.16% in *H. börgesenii* and Alginate was 46.42% in *S. flavicans.* Occurrence of high Agar and Carrageenan in the two cultivable species at Nuniachara is lucrative.

Various training programs were carried out and one of the trainees Md. Mozibur Rahman successfully cultivated *H. musciformis* in two ha sand-flat at Nuniachara and kept the area under his possession for cultivation in the coming year. A manuscript titled ñAdaptive Trials on Seaweed Cultivationò has been submitted for publication in the Bangladesh J. Botany. A manual in Bengali titled ñAn introduction of seaweed.

FISHERIES

Progress Review of CRG Sub-projects, PIU-BARC, NATP-2 Project under Fisheries Division, BARC

A workshop on ñProgress Review of CRG Sub-projects, NATP-2 under Fisheries Division, BARCò was held from 10 to 11 April 2018 at the Conference room-1 of Bangladesh Agricultural Research Council (BARC), Farmgate, Dhaka. Dr. Md. Kabir Ikramul Haque, Executive Chairman,

BARC graced the inaugural session of the workshop as the Chief Guest and Dr. Mian Syeed Hassan, Director (PIU-BARC), NATP-2 project attended as the Special Guest. Dr. A. S. M. Anwarul Huq, Member-Director (Fisheries), Additional charge, BARC presided over the inaugural session. The two-day workshop exercise included four technical sessions including a concluding session. A total of 90 participants including principal & co-principal investigators (PI & Co-PI) of 30 CRG sub-projects, research management experts of PIU-BARC, scientists, professors, and fisheries experts from various other GO and NGOs attended the workshop. The Chief Guest in his inaugural speech, emphasized the generation of need based technology particularly suitable for small and marginal farmers of the rural areas for increase their contribution in national fish production and to improve their socio-economic status. In this respect, selection of research areas, smooth implementation of project activities at field level through efficient utilization of resources (knowledge and fund) is important, he added.

The Special Guest of the inaugural session pin points the need for fisheries technology generation not only as food source but also as an important source of protein and income generation. He urges upon the role of frequent and effective review process to achieve the desire specific objectives of the research project within the planned stipulated timeframe.

The Chairman of the inaugural session in his concluding words expresses his gratefulness to the Chief Guest and Special Guest for their fruitful presence and valuable suggestions. He further thanked all CRG researchers and expert members for spare their valuable time for this workshop. He emphasized the role of all categories of participants by putting their in depth observation and inputs on each of the progress report of the individual research projects to be presented in this two-day workshop and make this exercise successful.

A total of thirty CRG fisheries research projects were presented in the four consecutive technical sessions of the two-day workshop. Each presentation was developed under a prescribed guideline of the Fisheries Division of BARC covering project goal and objectives, baseline information, methodology of the research, technical progress and achievement, financial progress and future work plan etc. Technical sessions were alternatively chaired by Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC and Dr. Saleh Uddin Ahmed, Former Director, BFRI, Mymensingh. In the open discussion sessions at the end of each technical session all participants actively participated in threadbare discussion on each individual project and put their valuable comments/suggestions for further improvement of the projects (where necessary). Session-wise recommendations/comments made against each sub-project presented in the workshop and other general comments/recommendations made by the participants have been summarized in the following tables (Table I and Table II) separately:

Table I: Specific comments and recommendations of the workshop on each CRG fisheries sub-project

Day-I Technical Session: I		
Research area & code	**Title of the project**	**Comments/Recommendations**
Aquaculture		
825	Adoption of culture technologies of short cycle fish species in the semi-arid zone of Bangladesh	1. Feeding behavior of each selected fish species and their interaction with the target species in food competition need to be explained in future presentation and in reports; 2. Growth and production rate of all other non-target species should be reflected; 3. Level of adoption and cost-benefit analysis should be shown in separate table.
833	Production enhancement	1. Information on physical characteristics of the pan developed, its

	of carps and tilapia in creeks of Chittagong hill districts	size/area along with materials used, species density and size at stocking is lacking in the presentation; 2. Cost-benefit analysis should be included; 3. Replications of each treatment should be focused clearly.
Wet land/Flood plain aquaculture		
462	Study on environmental and socio-economic impact of Daudkandi model floodplain fisheries management	1. Project activities should clearly emphasize on environmental and socio economic aspects; 2. Local breeding migration of native fish species and observation on fish bio-diversity not focused in the presentation; 3. Lacking information on income, education and nutrition intake level change of the community people; 4. Title should be clear according to objectives of the study. 5. Sample size should be increased for justifying the huge budget of this socio-economic study; 6. Actual Daudkandi model should be clarified. 7. Impact study must be followed with consideration of specific parameters.
674	Production and Productivity Improvement of Haor Floodplain Fisheries for Upliftment of Fishersô Livelihood	1. Local arrangements of scientific nursing of cultured specie emphasized for increasing survival rate in the culture system; 2. Need to include information/observation on bio-diversity changes of the Haor fish species; 3. Selection process of fishers and mechanism of group formation and their operation need to be reflected in the presentation; 4. Reflection of cost and benefit status is not shown after completion of a particular step of the culture experiments. However, at the end of the experiment, this needs to be showed clearly.
484	Management of Indigenous Fishes in Wetland (Gajner Beel, Pabna) Ecosystem	1. Other than occasional sampling of fish species from Beel for fish bio-diversity study, available fish sample from local fish markets may also provide additional informal in this respect. Year round sampling advised; 2. Information on seasonal available fish broods, their fecundity and breeding, local migrations, gear use and efficiency including gear character, harvesting efforts need to be gathered for development of a sustainable fishery management plan of the respective Beel; 3. To get the detail results, this study needs to be continuing for at least two seasons.
Fish feed and nutrition		
510	Development of nanomaterial mediated smart feed for growth and development of fishes	1. Normal diet should be mentioned and compare with control. 2. Micronutrients other than Fe (cu, Mn and Zn) could be incorporated as nanomaterials. 3. Role of Zn and Fe in triggering the biological growth of fish-should be explained; 4. Application rate of Fe in each treatment should be clarified.
364	Study on quality of fish feed, brood use and fingerlings produce in commercial fish farm of Bangladesh	1. Title and goal are conflicting. The goal needs to be focused clearly. 2. Review of the total PP is necessary to make it consistent with the goal of the project with its activities and methodologies; 3. Critical desk and field monitoring of the project activity is suggested before further funding.
Fish genetics and breeding (Part)		

502	Molecular identification of local and exotic strains of koi (*A. testudineus*) for strategic conservation management	1. Contribution of the findings of the research to our aquaculture industry should be properly explained with appropriate justification; 2. Literature based information on molecular identification character of local and exotic strains of koi should be incorporated in the text; 3. Authenticity of samples should be ensured in each study.
Technical Session: II		
Product development		
316	Effects of vacuum and modified atmosphere packaging on microbiological and biochemical properties of fresh fish stored at refrigeration temperature (4°C).	1. Repetition and duplication of work should be avoid; 2. Consumer preference study did not follow standard protocol. It is very difficult to complete the planned work in schedule time; 3. Information on microbiological & biochemical quality of dressed/whole/portion of fishes to be added; 4. Information on overall nutritive quality and shelf-life of products should be added; 5. Laboratory test of this experiment should be done in designated time. 6. Proper statistical method should be followed for random sampling.
489	Development of Quality Value Added Fish Products and Utilization of By-products	1. Similar kind of work was done at the Fisheries Department of Rajshahi University under World Bank HACUP project. Review of previous work needed; 2. Presented results are not found consistent with the stated objectives; 3. Laboratory test of this experiment should be completed in designated time; 4. Details of product development value addition and utilization of by-products should be explained in the future presentation and reports.
Fish health management		
817	Biochemical and molecular assay for detection of Vibrio spp at Shrimp and Shrimp Farms in Bangladesh	1. Literature review should be properly carried out and compare with the present study; 2. Duplication of research should be avoided. 3. Similar work was done at Microbiology department (Prof. Dr. Manjural Karim) at Dhaka University. Should check with the published paper of the D.U Microbiology department.
497	Evaluation of the suitability and efficacy of potato and wheat as prebiotic compounds on the growth performance, survivability and tissue composition of Labeo rohita and catla catla	1. AS probable test item, maize can be used as prebiotic source instead of wheat due to its availability in the country; 2. Role of prebiotic to enhance the activity of probiotic should be explained clearly and a clear picture of the probiotic contents should be reflected in the next presentations and reports; 3. The work was done for only 15 days and in aquarium. Field experiment is essential.
493	Characterization of commercial probiotics using for fish and shrimp culture in Bangladesh	1. Overlapping and repetition of work should be avoided; 2. The research is still in its initial stage. Major part of the research not yet started. Researcher should give thrust on timely completion of the work as per plan; 3. Composition of probiotics should be studied and type of bacteria should be specified.
823	Residual Assessment of	1. First step research should cover residual assessment and its effect

	Hazardous Pesticides and Antibiotics in Shrimp/Prawn Farming Systems of South-West Bangladesh with its Traceability Identification and Risk Quantification on Human Health	on shrimp/prawn; 2. MRL for human needs to be assessed which will indicate the risk level also. Not necessary for separate work on risk quantification on human health; 3. Heavy metals can also be included along with pesticides and antibiotics.
Aquabussiness		
363	Business opportunities of ornamental fisheries in Bangladesh: Development of a production and economic assessment model	1. Title, objectives and methodology are conflicting and confusing. 2. There is no indication of developing economic model for production and business promotion. 3. ñEconomic assessment modelò should be clarified. 4. Breeding and seed production technology is needed and farmers should be trained up for technology implementation. 5. Literature should be searched properly as 91 ornamental species have already been identified in Bangladesh so far; 6. Priority should be given for native ornamental fish species breeding technology development, its popularization and marketing chain.

Day-II Technical Session: I		
Research area& code	**Title of the project**	**Comments/Recommendations**
Fish genetics and breeding		
305	Breeding biology and induced breeding technique of the freshwater gangmagur, *Hemibagrus menoda* (Hamilton, 1822)	1. Base line information mostly discussed with the contribution of total fishery sector of the country, but not on research on Gang Magor specially; 2. Breeding response against each attempt was not clearly shown in the achievementô This part of research need refinement; 3. More emphasize should be given to increase the survival rate of larvae in the next period.
397	Seed production of Bhagna, Labeo ariza (Hamilton, 1807) through line breeding trial in Bangladesh	1. Results presented have inconsistencies with the project objectives; 2. Similar projects of SUFER-UGC and FAO works and National Fishery Policy needs to be review; 3. The number of sampling needs to be increased;
471	DNA Barcoding of Freshwater Fishes of Bangladesh: Implication for Conservation and Management	1. Considering the present progress achievement and to facilitate future research, preservation of fish and fish protein sample for further DNA bar-coding research, the project may be provided required fund support for procuring required preservation instrument (as there is no provision for such purchase in the present proposal); 2. Sample collection method and preservation techniques need to be specified; 3. DNA barcoding to be repeated at least twice for each species; 4. The sequenced 164 fish species have been public accessed in the web to be informed NATP2 prior to process for public domain.

609	DNA barcoding and metabarcoding of coral associated fish and zooplankton community of Saint Martinôs Island for effective conservation of marine life	1. Previous work done on the biodiversity of St. Martins Island needs to be referred and to get status; 2. The sequenced DNA of fish species to be stored under -80^0 C.
553	Induction of breeding and laeval rearing of Botia Dario and Lepidocephalichthys guntea) for aquaculture and recreational use in Bangladesh	1. Breeding biology study of the two species under experiment is essential, which are not present at this stage; 2. Gonadal development study of the species and their histological changes should be supported by appropriate photograph in each stage; 3. Breeding protocol is not clean; 4. The previous and the ongoing works done by others to be reviewed adequately before working on the test species; 5. Standardization of the specific dose of the hormone needs to be mentioned.
488	Development of artificial breeding technique for Cirrhinus reba collected from different regions of Bangladesh	1. Information on breeding biology study of the species under experiment is require to present in the next presentation and reports; 2. Breeding model is not clear; 3. The previous works done by others especially at BFRI to be reviewed adequately before working on the test species; 4. The genetic variation study is excess workload better to concentrate on breeding work. 5. How the specific dose of the hormone was standardized -to be mentioned.
Aquaculture (Part)		
587	Impact of aquaculture on agricultural production in greater Noakhali Districts.	1. All aspects of baseline data and long term data are required; 2. The number of FGD is very high. No output in FGD findings and the analysis. 3. Sampling method to be standard one; 4. Progress of the project so far made seems not satisfactory. Authority should rethink about the contribution of the project in future fishery development.
Climate Change impact		
718	Study of the climate change impact on fisheries resources and fishersô especially women and children in selected climate hotspot zone of Bangladesh	1. The study require analysis of long time (30ï 40 years) secondary information on climate change factors; 2. The output of the baseline survey to be reported; 3. Sample size, sampling technique and the type of questionnaire to be mentioned; 4. Expected output was not mentioned. 5. Require consultation with an economist for developing methodology, data analyses and reporting; 6. How the climate change affecting the growth season (spawning season) of fishes to be studied. 7. It is difficult to achieve the objectives of this sub-project within the timeframe of the CRG project.
Technical Session: II		
Coastal aquaculture		

333	Development of green mussel *Perna viridis* farming system in coastal areas for boosting blue economy of Bangladesh	1. Add nutritional value and commercial importance of culture the species in the respective part of the project; 2. Studies related to the project activities need to be reviewed; 3. Limnological methods need to be clarified. As many of the data are found to be over worked; 4. The methodology for amylase profiling not mentioned;
410	Development of Sustainable Aquaculture System in the Inundated Low-laying Agriculture Land in the Coastal Region of Bangladesh	1. Nutrition composition of the grass and the nutritional requirement of the species should be studies and considered in species selection for culture; 2. Include of black carp in this culture system without consider its food and feeding behavior should be rethink; 3. Production statistics not clear in this presentation; 4. For ammonia, P and N data as essential parameter use titration method to analyze accurately; 5. Working with a single grass Hygroryzaaristata does not represent the title; 6. Show the cost ï benefit analysis after each phase of culture and treatments;
778	Fine tuning of short cycle culture of shrimp *Penaeus monodon* in rotation with tilapia in the coastal ghers	1. Repetition of the first phase experiment is important to get a complete result of the study; 2. PCR tested PL need to be used.
779	Improvement of live feed culture for Brackish water hatchery operation	1. Analysis of nutritive value of each live feed under culture is important to know the role of the feed on growth and survival of fish larvae and grown up fish; 2. Extra effort should be given to complete the research as per scheduled plan.
827	Development of Mixed Culture Technology of High Valued Galda (*Macrobrachium rosenbergii*) with Two Native Catfish, Shing (*Heteropneustes fossilis*) and Magur (*Clarias batrachus*) in South-western Coastal Ghers of Bangladesh	1. Use of settled underground water in the experimental ghers to minimize iron problem suggested; 2. All the three species under experiment are bottom feeder and they are all highly carnivorous. Acceptable justification for selecting the species for such a combined culture experiment should highlighted with special consideration to feed competition and growth performance; 3. Statistical analysis and cost benefit ratio to be presented.
464	Production of Asian Seabass (Lates calcarifer) in brackish and freshwater earthen pond under natural and artificial feeding regime in South-west Coastal zone of Bangladesh	1. Growth performance of sea bass under the culture system was reported poorly; 2. Sea bass is an active feeder like to have live animals as prey. Justification of use of tilapia species and plan of mutual feeding arrangement/support from the tilapia production should be estimated and accordingly designing of the feeding plan should be tested; 3. There should be an analysis of output and provision for benefit-cost analysis after each phase of experiment; 4. Adding of salt with artificial feed is strongly discouraged.
Fisheries sector development		

648	Potentials of modernization in fisheries sector of Bangladesh: Study on the peoplesô profile, technologies and policies	1. This is a huge work basically require multidiscipline technical people from biological scientist to social scientist. Progress so far made is not up to the requirement. This study may be confined for selected technologies within selected areas; 2. Tools and socio-economic instruments are using for the sub-project to be informed; 3. Huge tasks may not be possible to finish during project period; 4. Sample number to be increased; 5. Brahmanbaria to be included as a hot spot; 6. National Fishery policy and related study of FAO to be consulted; 7. Area/ecosystem wise output to be reported.

General comments and recommendations

In addition to the comments and recommendations of the workshop specifically made against each of the CRG fisheries projects, the workshop also came up with a number of general comments and recommendations for further improvement of CRG fisheries research activities so that a concrete result of the research can be achieved**.** Such important comments/recommendations are summarized in the following table (Table II).

Table II: General comments/recommendations of the workshop for further improvement of the CRG fisheries sub-project research activities.

Sl. No.	Comments/recommendations
01.	A number of generated technologies of the CRG projects at the end will require replication and testing of trials in different aqua-eco-system for refinement and maturation. Approved time frame of the present project will not permit this. Therefore, extension of time with adequate funding support may be needed for selected research projects to get a polished technology.
02.	In a research implementation process, determination of valued activities and efficient utilization of time and resources (money) is very much crucial which was neglected in a number of projects under presentation. Few projects spent more than 50% time for a small survey work whereas the PI could organize simultaneously both survey and laboratory activities within the same span of time. This could offer better progress of the project through proper utilization of money and time. This should be taken care of by the respected PI of the project in the rest of the project period.
03.	Some presentations showed misleading information and inconsistencies among the title, goal, specific objectives and activities done of the project. In such a situation reviewer face trouble get any pin point idea about progress of the project. If it happens due to approved PP structure, then an immediate revision for necessary correction/modification by respective authority suggested.
04.	In project preparation process, strong checking needed for avoiding repetition or duplication (partial or full) of previous research works.
05.	Proper correction in research methodologies and activities should be done following the specific comments/recommendations made against each sub-projects.
06.	To ensure operation and implementation of research plan as per approved plan, routine and efficient monitoring process should be established by the respective authority.
07.	Considering present need, more research thrust should be given on aquaculture for draught prone areas, hill lake, wet land fisheries conservation, community based haor and flood plain management, product development and coastal-mariculture.
08.	In case of a project with different wings, it is suggested to include social scientists/economist/statistician or environment scientist where necessary as co-PI or as supportive technical staff etc.to perform a proper and effective team work.

In the workshop concluding session Chairman Dr. S. M. Anwarul Huq, Member Director (Fisheries), BARC, in his concluding, remarks once again thanks all the participant and guests for their active role and

contribution by putting valuable inputs toward getting a fruitful result of the present CRG fisheries projects. He once again recalled the valuable presence of the Chief Guest and the Special Guest in spite of having their preoccupation with important works. Finally, the Chairman urges upon the need for incorporation of todayôs workshop recommendations in project operation in a judicious manner for achieving a better research output and then declare the two-day workshop close.

NUTRITION

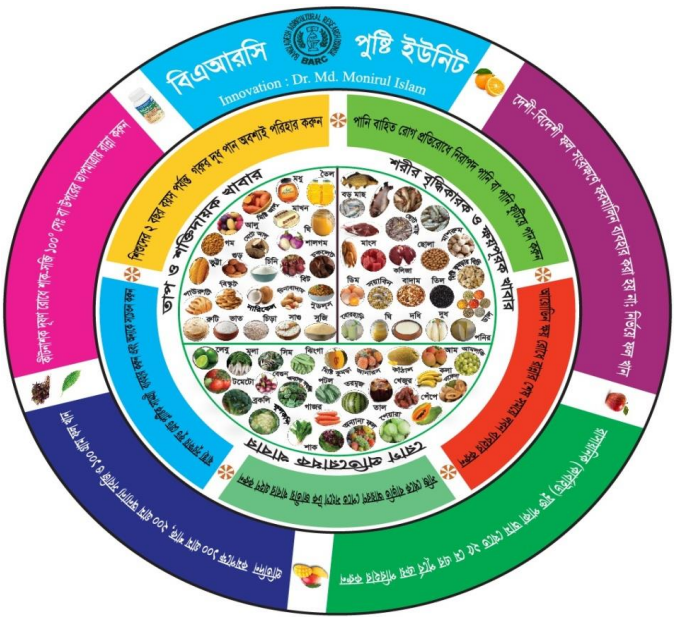
Nutrition Unit, BARC is involved and been involving in different dimension of works such as project development, supervision, execution, technology development, monitoring and evaluation of the research projects, coordinate research programmes with the NARS Institutes, BCSIR, BFSA, BIRTAN, universities and the agencies which are engaged in nutritional research and development. Also, itôs 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 field of nutrition in agricultural research and technologies; reporting national issues, review of scientific papers, expert opinion and advisory services.

In addition, maintaining liaison with national and international agencies for collaboration and strengthening national research and developmental programme in nutrition along with agriculture. Moreover, the technical advisory services also provided to the Ministry of Agriculture (MoA) on different issues related to agricultural research (including crop, livestock, fisheries & nutrition as a whole) and development. A brief description of activities done by the Nutrition Unit during the reporting 2017-2018 period are given below:

Printing of extension materials/Behaviour Change Communication (BCC) Tools

Nutrition unit working for a better human nutrition. In this regard, Nutrition Unit, BARC, based on the research findings and time based need to minimize malnutrition and awareness building to mass people on balanced died food adulteration and contamination, communicable materials (such as leaflet, booklet, food plate etc.) were generated and distributing as a regular basis through training, workshops, seminar among the different stakeholders like school children, formal and non-formal teachers, researcher, academician, traders, farmers, extension workers as well as policy makers with necessary guidelines to disseminate the nutrition information and knowledge.

BCC tools, a new colorful *Food Plate* with key messages in particular was produced and designed with the key messages of food utilization, way to reduce chemical hazards of food, balanced diet, daily requirement of fruits and vegetables, cooking process to restore food value and overall food safety and quality. Family members, children's and lactating mothers, in particular will be benefited through the message while they used this tools as a "Food Plate" three times a day during their daily meal. Other hand, people can also be used as a showpiece in their house by which relatives and neighbours who come to visit could be aware while they see it.



Food Plate

In addition, Director (Nutrition) also attended in telecast programm, talk show to share and disseminate nutrition knowledge related to food and nutrition, food adulteration, mitigation measures in different electronic media viz., Channel 24, Atn News, Jamuna tv., ntv, Rtv, Channel 71, DBC, Samoy tv, Boishakhi tv etc. including radio furti.

Policy Level Contribution

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

Expert Committee

a. Acting as a expert Member of the Tender Evaluation Committee, NATP Project, PIU, DLS component
b. Acting as a Member of the õFish and Fisheries Products (AFDC -23)ôCommittee of BSTI;
c. Acting as a Member of the ñOils, fats and allied productsò Sectional Committee of BSTI, Dhaka.
d. Acting Member, Agriculture and Food Division Committee (AFDC), BSTI, Dhaka
e. Acting as a one of the examiner of the Department of Fishries and Technology, Patuakhali Science and Technology University (PSTU), Dumki, Patuakhali.
f. Acting as expert member of the Food Safety Authority (FSA) (Fruits and vegetables Committee/crop sector)
g. Member of the National Plan of Action on Nutrition (NPAN)
h. Member, Nutrition Working Group (NWG)

National Level Collaboration and Linkages

Nutrition Unit continued to be closely involved in the process of programme development, review mechanism of various food and nutrition related activities of NARS, relevant institutes and universities. Besides, the unit is also involved in planning and organization of activities undertaken by the institutions,

like, DAE, BIRTAN, BNNC, IFST, BFSA, ICDDRôB WFP, INFS, FAO etc., working in the field of food and nutrition, food safety, food adulteration and mitigation, primary health care, food habit, food utilization and cooking practices.

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

Dr. Md. Monirul Islam, Director (Nutrition) was also actively engaged with BFSA and contributed to produce the Recommended Level/MRL of Pesticides Residue and Food additives and Preservatives for Bangladesh standards.

Research Management and Coordination

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

Field Monitoring and Evaluation

Nutrition Unit, BARC also regularly monitors and evaluates 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 BJRI, SRDI, BADC, BFRI during the reporting period. Thereafter, the activities done under the core research programm reporting to the Planning and Evaluation Division in prescribed format and finally presented the field observation in the workshop organised by the BARC in the presence of Principal investigators of the project and other relevant scientists.

Also monitor the ongoing CRG sub-project activities implementing by BARI, SAU, KU, BAU, BSTRI under the supervision of Nutrition Unit, BARC.

Field Monitoring activities

NATURAL RESOURCES MANAGEMENT

Agricultural Engineering, NRM

Different policy oriented comments were prepared for appropriate steps on emerging problems and prospective issues in the field of Agricultural Engineering and other related fields. All comments were submitted to the Ministry of Agriculture as per their request through EC, BARC. Some of the activities are given below:

1. খসড়া বাংলাদেশ পানি বিধিমালা ২০১৭ এর উপর মতামত প্রেরণ.
2. খসড়া কৃষিনীতি ২০১৮ এর সেচ ও পানি ব্যবস্থাপনা এবং কৃষি যান্ত্রিকীকরণ এর উপর মতামত প্রেরণ
3. "বাংলাদেশ বিদ্যুৎ উন্নয়ন বোর্ড আইন-২০১৭ " এর খসড়ার উপর মতামত প্রেরণ.
4. জাতীয় পানিসম্পদ পরিষদের নির্বাহী কমিটির ১৬ তম সভার জন্য তথ্য প্রেরণ.
5. মাননীয় প্রধানমন্ত্রীর অস্ট্রেলিয়ার সফরের উপর আন্তঃমন্ত্রণালয় সভার মতামত/ইনপুট প্রেরণ

Monitoring, reviewing and evaluation report of /activities of NARS institutes

a. Desk Monitoring

Conducted desk monitoring of 16 (sixteen) CRG sub-projects during July 2017-June 2018.

b. Field Monitoring

1. Conducted Field Monitoring of CRG Projects at Bangladesh Jute Research Institute (BJRI) and Sher-e-Bangla Agricultural University on 11February 2018. Research Projects were ôDesign and Development of Jute-Cotton Reinforced Polymer Composite for Rural Poultry Housingô, ôInnovation of dyed jute knitted fabric in textile technical sectorsôof BJRI and ôAchieving adaptation to climate change and sustainable livelihood through Moringa based agroforestry practice in Bangladeshô of Sher-e-Bangla Agricultural University. Visited the laboratory &research fields and discussed with the concerned scientists, field staffs 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. Provided some on the spot suggestions regarding project activities for smooth running of the project.

2. Conducted Field Monitoring of CRG Projects entitled ôSimulation of water, nutrient and productivity from existing agroforestry systems in Sylhet region for food security through

provisioning the site specific climate-smart farming systemô, ó Growth and Productivity Improvement of Agar Plant (Aquilaria agallocha Roxb.) Through Agronomic Managementô and ó Develop a hydrogeological framework and a sustainable crop establishment period for haor areas of Bangladeshô at Sylhet Agricultural University during 17-19 February 2018.

Visited the laboratory & 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. Provided some on the spot suggestions regarding crop management and other project activities for smooth running of the project.

3. Conducted Field Monitoring of CRG Projects entitled ó Development and adaptation of water saving irrigation techniques for upland crops (ID # 814)ô at Koyra, Khulna during 17-19 March 2018.

   Visited the research fields and attended in the training programme. Also 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. Provided some on the spot suggestions regarding crop management and other project activities for smooth running of the project.

Project Development and Implementation

Implementing two PBRG projects:

- Groundwater resources management for sustainable crop production in northwest hydrological region of Bangladeshò and
- Up scaling of solar pump for smallholder irrigation and household appliances in the central coastal region of Bangladeshò under funding of PIU-BARC.

Evaluation of Projects & Reports: Evaluated Half yearly and Annual Project Report of 10 (ten) CRG projects during July 2017-June 2018.

National and International Linkage

Maintained strong Linkage with the engineering professional bodies in home and abroad like CIMMYT, IRRI, IEB, BWDB, CSAM, WARPO, BSTI, NGOs (IDE, BWP /GWP), FAO, BANCID and Universities etc.

Worked as Member in the Different Committee

Worked as member in the different committee as mentioned below:

a. Technical committee, Agricultural Mechanization Project of DAE, Dhaka.
b. Technical committee of Bio-gas, Infrastructure Development Company Limited (IDCOL), Dhaka.
c. Board of Management, National Museum of Science and Technology (NMST), Ministry of Science and Technology.
d. Governing Council of CSAM, United Nations Economic and Social Commission for Asia and the Pacific
e. BANCID Study and Publication Sub-Committee.
f. Technical committee ó CRG and PBRG Project evaluationô
g. Technical Advisory Committee (TAC) of KGF

h. Advisory Committee of **Appropriate-scale Mechanization Innovation Hub-Bangladesh**
i. Governing Board of the lnter disciplinary Centre for Food Security (lCF), Bangladesh Agricultural University (BAU
j. Focal Point of Women in Development
k. Recruitment committee of CRG & PBRG projects for different institutes.

Participated in ñThe 13th Session of the Governing Council of the Centre for Sustainable Agricultural Mechanization (CSAM) during 12-14 December 2017 at Kathmundu, Nepal. This program was organized by UNESCAP- FAOCSAM.

Participated in the regional workshop on óRole of Mechanization in Strengthening smallholder Resilience through Conservation Agriculture in Asiaô UNESCAP- FAOCSAM organized this workshop during 18-20 April 2018 at Combodia.

Participated in óData-informed Policy-making for Sustainable Development Goals (SDGs) Workshop on Developing a Regional Database of Sustainable Agricultural Mechanization in Asia and the Pacificôin Bayview Hotel, Georgetown, Penang, Malaysia on 28-29June 2018.

As a resource person conducted a session on óImpact of Climate Change on Actual Crop Evapotranspiration of Boro Rice in Bangladeshô in the training course entitled óUse of Farm Machinery and Efficient Irrigation System Managementô which was organized by Agricultural Engineering Unit, BARC and held on 4-8 March 2018 at the training room, Training Building of Bangladesh Agricultural Research Council, BARC, Dhaka.

Attended meetings/seminar/workshops organized by FAO, CEGIS, IWM, WARPO, BARI, BRRI, BCAS and BARC.

Worked as a member in the different committee of BARC (Goods Receiving Committee, Recruitment Committee of NATP-II, Vegetable Fair Committee 2018, Fruit Tree Plantation Committee 2018 etc.)

The Unit has the responsibility of research management in the three distinct areas under agricultural Engineering, namely, Farm Machinery, Irrigation and Water Management and Post Harvest Processing Engineering. The Unit oversees the major program being undertaken by the NARS institutes for the purpose of further improvement.

Brief Highlights of R & D of the concerned NARS Institutes

1.1 Farm Machinery

Adoption of two wheel tractor operated bari seeder: Power tiller operated seeder is used for different crops seeding along with seed bed preparation which works shallow tilling, seeding in line, seed covering and land leveling at a time maintaining the standard agronomic practices. The PTOS was demonstrated in different locations in the farmerôs field of Rajshahi, Barishal, Patuakhali, Faridpur, Rajbari, Noakhali and on station trial in Gazipur 2017ï 18. The seeder performed seeding operation minimizing 7-9 days turnaround time utilizing the residual soil moisture. It maintained uniform seeding depth, uniform seed distribution and better seed soil contact which transfer soil moisture to seeds quickly for enhance better plant establishment and yield. PTOS able to complete planting operation in a single pass and average field

capacity was 0.13 ha/h. Similar yield of wheat (3.9 t/ha) and soybean (3.5 t/ha) was found but significantly higher yield of lentil (1.3 t/ha), maize (8.6 t/ha), mungbean (1.88 t/ha), cowpea (1.49 t/ha) and mustard (1.11 t/ha) was found for using PTOS than conventional method. Cost of wheat seeding was Tk.1950/ha which was 65.8% less than conventional method (Tk.5695.0/ha). This seeder covered 127.67 ha area with PTOS under different adaptive trial and field demonstration in seven districts of Bangladesh. Total 1345 number of PTOS were sold during 2017ï 18 in different districts of Bangladesh which was 25% higher than those sold during 2016ï 17.

Development and adoption of two wheel tractor operated potato planter: A low-cost power tiller operated cup type potato planter was developed in Bangladesh Agricultural Research Institute(BARI) which can plant whole tuber potato seeds automatically in furrows at predetermined regular intervals. An experiment was taken to improve the potato planter and evaluate the performance. Metering device in previous model was duel cup type but it was single cup type in improved model. Mould casted metallic cups of 40mm size were used instead of plastic cup. There were 10 cups instead of 13 pairs of potato cups fixed on a 40 mm flat belt, forming an endless loop. According to the design criteria, potato cups were positioned 110mm apart from each successive cup which was changed to 90 mm with transmission ratio 1.15 in the improved model. Forward speed of 2.4 km/h was the best in respect of uniformity of spacing and missing seeds. Potato planter was evaluated at Gazipur, Bogura and Jashore and there was a special program at Panchagarh. Potato planter required 4 man-days/ha compare to 67 man-days/ha in conventional manual planting method. Potato planting cost were Tk.4804/ha. On the other hand, using whole tuber and cut piece seed, manually potato planting cost was Tk.14,740/ha and Tk.16940/ha, respectively. There was no yield difference between potato planter and conventional methods. Potato planter saved 94% and 67% of labour and planting cost, respectively compared to conventional manual potato planting method. Total 8.43 ha area was planted with potato planter in different districts of Bangladesh.

Design and development of a four wheel tractor operated seeder for cereal crops: A four wheel tractor operated multi crop seeder was designed and developed in the workshop of Wheat Research Centre, BARI, Nashipur, Dinajpur during 2016-17. The treatments were T_1 ï wheat seeding with tractor operated seeder, T_2 ï wheat seeding with power tiller operated seeder, T_3 ï wheat seeding by conventional method. The seeder performance was tested for direct seeding of wheat during 2017-18. For this, an eight teeth, 4.5 cm outer diameter fluted type seed metering device was used. The field capacity of the machine was 0.36 ha/h. It has provision for arrangement of depth of placement for different seeds. The average depth of placement for wheat was found 5 cm. The missing and damage rate was 3%. The maximum yield was 5.52 t/ha from treatment with tractor operated seeder. The experiment will be continued in next year for improvement and fine-tuning of the seeder for better performance and final recommendation.

Design and development of a manually operated multi-crop vegetable seedling transplanter: Farm Machinery and Postharvest Process Engineering Division of Bangladesh Agricultural Research Institute, Gazipur has designed and developed a manually operated multi-crop vegetable seedling transplanter during 2016-17 and 2017-18. During 2017-18, the transplanter was used for transplanting tomato seedling. The average depth of placement for seedling chamber (5.5×5.5) cm was 1.4 cm and for seedling chamber (4×5.5) cm, was 0.5cm. The damage and missing rate was 2% and 0% respectively. Under three treatments, T_1=Transplanting by the transplanter at BARI recommended spacing, T_2 =manual transplantation at BARI recommended spacing and T_3= Transplanting by the transplanter at farmersô practice (row to row 30 cm and plant to plant 20 cm), there were three replications. Between T_1 and T_2, no significant difference in yield was observed. T_3 resulted in a lower yield than the rest. The transplanter is effective enough under skilled handling otherwise, time requirement and performance varies profoundly. The design is being modified to improve its performance. The experiment will be continued in the successive year for better representation.

Design and development of a low cost battery operated rotary type weeder for up-land crop: The overall goal of this experiment was to develop and evaluate the performance of a DC motor operated

rotary type weeder for upland crop production. A rotary type DC motor operated dry land weeder was designed and developed. Field trials was done and performance was quite acceptable for wide row crop. Fields trials were conducted on maize, chili, Eggplant at different locations of Bangladesh. Weeding indices of battery operated weeder for maize, chili and eggplant were 81.16%, 74.73%, 95.38% respectively. The effective field capacities of battery operated weeder for maize, chili and eggplant were 0.048 ha/h, 0.037 ha/h and 0.026ha/h respectively. Cost of weeding by battery operated weeder was almost one third compare to other two methods and there was no significant difference in yield among these three methods.

Design and development of a low cost boom sprayer for fruit tree and field crops: A low cost robust power operated boom sprayer was improved in the Farm Machinery & Postharvest Process Engineering Division of BARI Gazipur and all set up re-installed on a tri-cycle van during 2007-18. It was improved by reducing the van height for easy starting. The water tank was replaced behind the driver while engine and compressor was at the long end because the engine heat and smoke can disturb the driver and there found no operational problem by this arrangement. The boom sprayer was tested for spraying mango and litchi trees. Presently, farmers are interested in horticultural crops for high value, comparatively low risk, less hazard, and easy marketing of product compare to field crops. Crop yields are reduced mainly due to attack of pests, diseases and weeds. The developed boom sprayer consists of small diesel engine, high pressure pump, pesticide tank, boom with nozzle, and tri-cycle. The chemicals are sprayed as the most effective and efficient techniques for applying small volume of spray liquid to protect horticultural crops. The boom sprayer can produce uniform effective spray pattern using minimum amount of spray materials. The spray boom has hollow nozzle and can spray in tall tree. The effective field capacity of the sprayer was 0.3 ha/hr. The field performance of the boom sprayer was found satisfactory at a pressure of 3 bars. The average spray capacity 2.85 lit/min at 3 bar pressure. The power requirement about 4 Hp for operating the pump. Operating cost of garden boom sprayer was Tk. 595/day and foot sprayer was Tk.1029/day, respectively. The entire boom assembly fixed on a rickshaw van behind of the operator seat. It is safe in adverse wind condition.

Design and development of low cost microcontroller based automatic irrigation systems for orchard and field crops: An experiment is going on at Hill Agricultural Research Station, Khagrachari to develop automatic irrigation systems affordable for medium and marginal farmers to apply exact amount of water at the right time with minimum involvement of human labourers. These systems will work based on Arduino open-source microcontroller. Soil moisture sensor, sonar sensor and PIR motion sensor will be used along with relevant electronic components. Primary goal is to fabricate a prototype and on the basis of laboratory observations proper modifications will be made to set in the fields. In the first year essential and basic components have been procured including both software and hardware. Prototypes will be fabricate in the next year.

Development and adoption of two wheel tractor operated potato harvester: A low cost two-wheel tractor driven potato harvester has been developed and improved with locally available materials in Farm Machinery & Postharvest Process Engineering Division of BARI, Gazipur to facilitate small farmers to harvest their potatoes at low cost. The developed potato harvester is a semi-automatic digging machine consisting of (i) digging blade (ii) conveyer flat chain (iii) Guide plate and (iv) Power transmission arrangement with a dimension of 900 mm x 850 mm x 950 mm. Potato harvester was tested in the research farm of FMPE, Gazipur. Field performance was evaluated at Regional Agricultural Research Station (RARS), Bogura and Jessore and Breeder Seed Production Station, Panchagarh during the crop season 2017ï 18. The field capacity of the potato harvester covers daily average 1.2 ha land depending on operator skillness. Potato harvester requires labour 21 per ha only instead of 60 labours per ha in traditional manual method. Total cost of potato harvesting by the potato harvester is Tk. 11,935 per ha but manually harvesting cost is Tk. 29,600 per ha Moreover, there are no potatoes remain under the soil. Potato damage percentage is less than 1.2%. Potato farmers always pass risk of bad weather especially harvesting time. So, potato harvester can cover large areas within short period of time, escape bad weather uncertainty, and sustain potato production stable.

Development of a power operated sunflower thresher: A study was conducted for solving the problem faced by the farmers in separating the seeds from the sunflower. Farmers use the manual methods due to unavailability of suitable machinery for sunflower threshing. During manual sunflower production, the most time and labor consuming operation is the threshing of sunflower by beating the sunflower heads with a stick, rubbing wear heads against a rough metal surface or power tiller treading machine. The aim of the experiment is to design and develop a power operated machine which will separate the seeds from the sunflower. An orthographic projection was drawn with SolidWorks 2016 Software. The sunflower thresher was then fabricated according to drawing in FMPE Divisional workshop as per design with available local materials during 2017-18. The main components required to fabricate the machine are: the electric motor, the pressing roller, the sieve, pulleys and belts and the fan. The space between pressing roller and sieve is an adjustable part which automatically changed due to spring action. The fabrication pressing roller separated grains from the head of the harvested sunflower. Two to three head could feed at a time. The capacity of the power operated sunflower thresher was 106 kg/h which was 57 and 66% higher than pedal thresher and manual threshing respectively. Unshelled sunflower seed was 8.96% and Broken seed was 4.48%. The experiment will be continued in the next year.

Design and development of a sunflower seed dehuller: Sunflower is one of the principle oil-seed crops which has a nice fitting in existing cropping pattern and adapted well to coastal agro-climatic conditions of the country. Dehulling of sunflower seed is an important process prior to its oil extraction. Manual dehulling of sunflower seeds is a time consuming and tedious operation. Therefore, an experiment was conducted to design and development of sunflower seed dehuller. An orthographic projection was drawn with Solid Works 2016 Software. The dehuller was then fabricated according to drawing in FMPE Divisional workshop as per design with available local materials during 2017-18. The machine was operated by 0.5 hp electric motor. The weight of the dehuller was 80kg. Average capacity of the dehuller was 11.29 kg/h. Dehulling efficiency of the machine was 65.12%. Whole kernel recovered by the machine was 11.77% and broken kernel was 16.57%. The dehuller produced 27.15% unshelled seed. The observed capacity was much lower than the expected capacity and whole kernel recovery was minimum for which some parts of the dehuller will be redesigned in the next year.

Development of a low cost two wheel tractor mounted mobile maize sheller: Power tiller (Two wheel tractor) is a very common tillage tool in Bangladesh. A low cost simple power tiller front mounted spike tooth type mobile maize sheller has been developed in Farm Machinery & Postharvest Process Engineering Division of BARI, Gazipur during 2015ï 16 and it is evaluated in the farmersô field during 2016-17 and 2017-18 with a view to easy way shelling maize in rural areas and eliminating botheration of transportation of traditional maize sheller from place to place. The main components of the sheller are hopper, rotating cylinder, concave, grain delivery out let, shelled cob delivery out let, sheller fixing arrangement, main pulley with power transmission arrangement. It is an anticlockwise rotating cylinder, axial flow type sheller and grain separated with a frictional force between spike tooth and concave. The maize sheller is attached with nuts and bolts in front of the engine base of two wheel tractor (2WT). The operating power of the sheller comes from the fly wheel of the engine of the tractor through óVò belt pulley arrangement. The average shelling capacity of the mobile sheller is 2 t/h, broken kernel 2.7%, and shelling efficiency 96%. The average cost of shelling maize is Tk. 0.22/ka compare to traditional custom hire rate Tk.1.0/kg. The benefit cost ratio of the mobile maize sheller was 3.48. The service provider of the two wheel tractor can transport the mobile maize sheller long distance in operatorôs seating position as it attached with the 2WT which minimized transportation hazard of maize sheller. So, it can reduce maize sheller installation and starting time, and quick return to another farmer.

Development of a low cost two wheel tractor mounted mobile maize sheller: Power tiller (Two wheel tractor) is a very common tillage tool in Bangladesh. A low cost simple power tiller front mounted spike tooth type mobile maize sheller has been developed in Farm Machinery & Postharvest Process Engineering Division of BARI, Gazipur 2015 and it is evaluated in the farmers field in 2016-17 with a

view to easy way shelling maize in rural areas and eliminating botheration of transportation of traditional maize sheller from place to place. The main components of the sheller are hopper, rotating cylinder, concave, grain delivery out let, shelled cob delivery out let, sheller fixing arrangement, main pulley with power transmission arrangement. It is an anti clockwise rotating cylinder, axial flow type sheller and grain separated with a frictional force between spike tooth and concave. The maize sheller is attached with nuts and bolts in front of the engine base of two wheel tractor (2WT). The operating power of the sheller comes from the fly wheel of the engine of the tractor through óVò belt pulley arrangement. The average shelling capacity of the mobile sheller is 2.1 t/h, broken kernel 2.1%, and shelling efficiency 97%. The average cost of shelling maize is Tk. 0.22/ka compare to traditional custom hire rate Tk.1.0/kg. The service provider of the two wheel tractor can transport the mobile maize sheller long distance in operatorôs seating position as it attached with the 2WT which minimized transportation hazard of maize sheller.

Improvement of existing bari maize sheller for shelling unhusked maize cobs: Hand peeling of maize is common practice before shelling which is laborious and time consuming. An improved BARI maize sheller was designed during 2014-15 and was fabricated during 2015-2016 in Farm Machinery & Postharvest Process Engineering Division, BARI, Gazipur so that both peeling and shelling can be done in the same machine. During 2016-2017, some modification has been done such as fabrication of husk outlet, modification of frame and reducing gear size for roller gap adjustment. During 2017-18 the attachment of peeling part with sheller as well as some modification of peeling and shelling part have been done. This machine has two part in which peeling is done in upper part and husked cobs are delivered to lower part for shelling. After peeling operation dehusked maize cods is delivered to the shelling part of the maize through the outlet of peeling part. During 2015-17, data of peeling maize cob was taken at the moisture content of 19%-34%. The peeling capacities of the manual and power peelings were 87kg/h and 1054 kg/h respectively at 22% moisture content of maize cobs. The shelling capacity including peeling operation simultaneously at 20-33% moisture content was found to be 538-890 kg /h. The highest shelling capacity of 890 kg/h was obtained at lowest moisture content of 20.5%. The average cylinder loss and separation loss were found to be 0.6% and 7%. The average efficiency of the machine was found to be 92.5%. The shelling capacity can be increased by operating the machine with lower moisture content and increasing the capacity of peeling part of the machine. By increasing axis angle of the frame of the machine, peeling capacity will be increased which ultimately increases the shelling capacity of the machine. As the fabrication of blower was not completed so dirt of cob was mixed with shelled grain which will be solved in the next year by fabricating blower part at the lower portion of the machine.

Improvement and validation of root crop washing machine: A higher capacity root crop washing machine was designed and fabricated at Farm Machinery and Postharvest Process Engineering Division, BARI, Gazipur during July to December 2016. The overall dimension of the machine was 2200 × 910 × 920 mm. It was fabricated with MS sheet, MS flat bar, nylon shaft, brush, MS shaft, FL bearing, chain-sprocket, wheel, motor, gear reducer, magnetic contact, and Off-On switch etc. The main parts are: i) Half circle tank; ii) Nylon brush roller; iii) Power transmission system; and iv) delivery chute. The rollers were rotated by an electrical motor of 2.2 kW at 1400 rpm. Three large wheels were attached to the machine. Brush rollers were set in order that any roller can detach from the machine if any problem. Capacity of the machine was 120 kg carrots per batch and required time was 6-7 minutes fresh harvested carrots and 10 minutes for cold storage carrots. The unwashed carrots were found contaminated with E. coli, an indicator bacterium of faecal origin. In addition, the total aerobic count, total coliform count and total yeast and mold count was within the maximum permitted level. On the contrary, water washed was able to completely eliminate E. coli from the carrots. In addition, approximately 1.0 log CFU/g of reduction of APC, TCC and TYF count was recorded in washed carrots. The price of the machine is Tk. 2.0 lac. The washing cost was 340 Tk./ton. The machine can save about 500 Tk/ton which was equivalent to 66% saving of washing cost compared to conventional manual carrot washing method. Therefore, there is a good opportunity for farmers and traders to increase income and generate employment using the machine.

Improvement and performance evaluation of a mini oil expeller: A mini oil expeller was redesigned and fabricated at the workshop of the Farm Machinery and Postharvest Process Engineering Division of Bangladesh Agricultural Research Institute, Joydebpur, Gazipur during the period of 2017-2018. Overall dimension of the expeller was 1200×570×1280 mm and power required to operate the machine was 4.5 hp diesel engine. The oil expeller was set on a rickshaw van for its easy movement. Minimum two kilograms of oilseeds were expelled per batch. The engine speed was reduced to machine using a gear box of 100:1. The average engine and machine speeds were 1550 and 16 rpm, respectively. Different types of oilseeds such as mustard, sesame and sunflower were crushed in this machine. The expelling capacity of the oil expeller for oilseeds was 12-20 kg/h. Average oil recovery was 34.0%. The improved oil mill ran smoothly during operation. Benefit cost ratio of oil expeller was found to be 1.66 and the pay-back period was about two months. Therefore, the mobile oil expeller is economically profitable for custom hire business. One field demonstrated was conducted at Nandina, Jamalpur and farmers showed interest for using this machine. The machine may be recommended for crushing of small-scale oilseeds in the rural areas of Bangladesh.

Design and development of a cream separator: A prototype of cream separator machine was designed and fabricated in Farm Machinery and Postharvest Process Engineering (FMPE) Division, BARI, Gazipur during 2017ï 2018. The machine was made of motor, SS rod, SS sheet and SS bar etc. Two types of milk sample named control (fresh milk) and treated (fermented) was prepared for churning in the machine for testing. The control milk (cow milk) sample produced ghee of 0.08 kg (1.6% of total milk) from 0.26 kg (5.2%) cream which was derived from 5 kg milk sample after 15 minutes of churning. The treated sample yielded 0.140 kg ghee from 0.160 kg butter which was also derived form 5 kg of milk sample. The fresh milk fat was determined 3.30% while the amount down to 1.57% when churned in the machine and the separation efficiency found 52%. However, for treated milk sample the separation efficiency was 85%, while the fat down from 3.25% to 0.47%. This means control sample need 58 kg milk to prepare 1 kg ghee while the treated milk need only 36 kg. Fermented and control sample pH was 4.67 and 6.36 respectively. Thus acidic sample produce more bacterial and help in coagulate. Milk contains almost 3.5% protein and machine operation has no significant ($P>0.05$) effect on protein change in milk.

Design and development of coconut tree climber: Coconut tree climber is a device which helps to climb on coconut tree without much human efforts. It is very difficult to climb on coconut tree manually due to the constant cylindrical structure and single stem. In other type of trees there are branches for holding and to support the climber. Due to the risk involved now-a-days very less people are coming forward to climb on coconut trees. During 2016-2017, Farm Machinery and Postharvest Process Engineering Division has been developed a standing type coconut tree climbing machine. During 2017ï 18 improvement of the machine has been done through NATP Phase- II CRG sub project titled ôImprovement of coconut harvesting and dehusking machineô. Different persons were taken with different height, weight and age during operation. Before and after climbing on a tree operatorsô blood pressure data were taken for ergonomic evaluation. After improvement the average speeds of machine during climbing on a tree and climbing down from the tree were found to be 6.36 m/min and 7.43 m/min respectively. The price of the machine is about 8800 Tk and harvesting cost of the climber was found to be 25 Tk/tree. It was also found that payback period of the climber was 25 days. During 2017-2018 a sitting type coconut tree climbing machine was designed and fabricated for coconut harvesting considering operator comfort and ease of operation. It will be give more support to the user as there is a provision for sitting. During this year the design of the machine was completed and field performance will be taken in the next year.

Improvement of coconut dehusking machine: Coconut produced annually about 0.37 million tons in Bangladesh. Husk of coconut is removed for getting nut and shell as raw materials in coconut oil industries and for edible purposes in household level. Husking is done manually by sharp iron in oil industries and retail markets in our country. The work is hard and required high skill and strength. The study was undertaken to develop a power coconut husking machine for dehusking coconut easy and quickly. Farmers harvested numbers of coconuts in summer and winter in average 289 and 192

respectively. The highest yield of coconut was found in summer than that of winter whereas price of the coconut in winter season was higher than that of summer season. Ninety one percent farmers sold coconuts with husk and 9% farmers sold coconuts without husk. The most of the farmers used *Dha* for dehusking the coconut and other farmers used *Sarasi* and *Khanti*. Retailers sold 66% coconut with husk and 34% coconut without husk. Forty seven percent traders dehusked coconut using *Khanti*, 37% traders using *Sarasi* and 16% traders using *Dha*. All trader of Fultala, Khulna dehusked coconuts using *Khanti.* Dehusking capacities of *Dha,Sarasi* and *Khanti* varied from 20 to 25 nuts/h, 43 to 75 nuts/h and 100 to 175 nut/h respectively. Improved coconut dehusking machine was designed and fabricated with locally available materials at Farm Machinery and postharvest Process Engineering Division. Bangladesh Agricultural Research Institute, Gazipur. The overall dimensions of the dehusker was 920×750×1120 mm. The weights of the dehusker was 258 kg. The price of the dehusker was Tk. 71000.00. The average capacity of dehusker was 309 nuts per hour at the speed of 27 rpm. The breakage percentage of coconut was found to be 6-10. The dehusking cost of the dehusker was found to be 0.27 Tk./nut. The payback period of the dehusker was 80 days and benefit cost ratio was 1.33. Therefore, coconut dehusk by the dehusker could be profitable to traders when the annual use of the dehusker exceeds 500 hours. The machines would be useful for commercial purpose in coconut growing areas and coconut oil industry, wholesale and retail market for shelling coconuts.

Preparation of maize stalk fodder for cattle: Shortage of feed supply of the cattle during the dry season or flood period is an important issue which could be partially met by maize stalk. An experiment was conducted to prepare maize stalk fodder for cattle. The BARI chopper was improved for chopping maize stalk in smaller size (7-8mm). Total chopping cost per hour was 0.23 Taka per kg. The chopped maize stalk in both fresh and dried conditions with different combinations were served to the cattle and found that smaller sized chopped piece of both dried and fresh maize stalk could be feed in both raw and mixing with salt, wheat bran and water with little molasses. Maize stalk block also prepared with different combinations and found that block made by liquid *Gur* was better in both physically and cattle likeness. Total cost of block per kg was 13.85, 31.35, 28.85 and 36.35 Taka for MS block 1, MS block 2, MS block 3 and MS block 4, respectively. Chopped and dried maize stalk were preserved in polybag, open drum and store room were liked by the cattle up to three months of the storage. Flatten and dried maize stalk were not liked by the cattle due to their long size and hardness.

Design and development of a chilli seed separator: Bangladesh produces 102.25 thousand tons of chilli per year. Until today, chilli seeds are separated manually. Conventional method requires operators to cut chilies into small pieces and then squeeze manually by bare hands to remove the seeds. Other practices include, sun drying of red ripe chilli followed by hammering chilli with wooden stick or, separating seeds from husk by hand. In Bangladesh, there is no specific machine to separate seed from its pulp. This manual method is quite tiresome mainly due to the inhalation of fine particles of chilli fruits by labourers. Its pungency results in continuous sneezing and irritation for labors. Hence, it is necessary to eliminate laborious work and time consumption. The mechanical method of chilli seed extraction will be a better solution for this problem. A chilli seed separator wa designed by FMPE Division, BARI, Gazipur. The design and fabrication is still ongoing. The experiment will be continued in the successive year for better performance.

Up-scaling and application of solar photovoltaic pump for smallholder irrigation and household appliances in the central coastal region of Bangladesh: Solar pump is gaining popular worldwide because the power is environment friendly and renewable in nature. A 900 W centrifugal type dc motor operated solar pump was fabricated at Farm Machinery and Postharvest Process Engineering Division, Bangladesh Agricultural Research Institute, Gazipur during 2017-18. The size of both the suction and delivery pipe was 51.0 mm. The input power was 1000 W_p. The nominal volatge of solar pump was 48 V. Average solar radiation, voltage and current were found 236.630 W/m^2 44.87 V and 12.31 A, respectively during testing of solar pump. The average discharge was obtained 180 L/min at the suction head of 1.0-6.5 m. This experiment will be continued next year with more laboratory and field trials.

Determination of technological options for biogas production from crop residue: The research aims to increase the biogas potential of straw by using various pretreatment processes as well as to produce biogas from crop residues through anaerobic digestion. Fungal interposed degradation of rice straw was investigated with *Trichoderma hergianum* fungi for different time intervals. Pre-treated paddy straw shows an enhanced biogas production of 13.6% for 15 days pre-treatment period. A small scale biogas plant was designed and fabricated at the workshop of Farm Machinery and Postharvest Process Engineering Division of Bangladesh Agricultural Research Institute, Gazipur during 2017-18. Biogas was generated from both treated and non-treated paddy straw. Biogas production is ongoing and the experiment will be continued to the next year for better performance.

Development and performance evaluation of a solar assisted cabinet dryer for vegetable seeds: Drying of seeds in Bangladesh is normally carried out by traditional sun drying method which is very slow and it often results in inferior quality due to dependence on weather conditions and vulnerability to contaminate with insects, pests, dust and dirt. Sometimes, continuous rain occurs for a few days spoils the seeds. A solar cabinet dryer was designed and fabricated at Farm Machinery and Postharvest Process Engineering Division, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur for drying of 10-20 kg of moist vegetable seeds. The solar cabinet dryer was fabricated with locally available materials such as MS (mild steel) angle bar, MS sheet, insulation materials, MS flat bar, blower, PV module, etc. The dryer was designed to generate desirable temperature (<45°C) from solar radiation suitable for vegetable seed drying. The average solar radiation during testing period was 140.6 W/m^2. Dryer inlet or collector outlet average temperature was 17.53 ^{o}C higher than that of ambient temperature. The maximum dryer out temperature was 42.2 ^{o}C which suitable temperature for drying temperature for seeds. This experiment will be continued next year for detailed study.

Effect of mechanization on productivity, energy efficiency and profitability of potato production: Potato occupied the first position among all the vegetables in respect of area and total production. Effective and efficient use of energy are necessary for an improved agricultural production. Therefore, a programme was undertaken for potato production to assess productivity, quantify energy flow and financial profitability of different production systems. The systems are manual planting and manual harvesting, machine planting and manual harvesting, manual planting and machine harvesting and machine planting and machine harvesting. The experiment was conducted at Farm Machinery and Postharvest Process Engineering (FMPE) Division, BARI during 2017-18. Yield of potato including yield contributing characters for different treatments were not significantly varied. Direct energy consumption was accounted for only a small proportion of the total energy consumption. Direct energy was the highest in mechanical planting and harvesting system (25%) and the lower manual planting and harvesting system (18%). Indirect energy shared 82% in manual planting and harvesting system (T_1), 78% in machine planted and manually harvested plot (T_2), 80% in manually planted and mechanically harvested plot (T_3), and 75% in machine planted and machine harvested plot (T_4). The largest source of indirect energy consumption was from fertilizer (22-27% for the total energy). The higher specific energy was found in manually planted and mechanized harvesting system (T_2). The higher product value was from T_3 for manual planting and mechanically harvested plot. The highest BCR (2.25) was found from T_4 followed by T_3 (2.16), T_2 (1.93) and T_1 (1.91). Thus, mechanically planted and harvested systems can be recommended for potato production since it can reduce 52% labour requirement than manual method and can give higher BCR among the tested production methods.

Improving the performance of mechanized seeding through innovations in seed metering and delivery system: Seeding is one of the most crucial agricultural operations which is mostly done manually in Bangladesh. Manual planting is precise but a tedious and labour and cost intensive operation. Mechanized planting of maize is fast and can save time and money significantly, but not precise when compared to hand planting seeds one by one. Therefore, this research project was invited to test different maize meters and to develop a precision metering system for adoption in two-wheeled tractor operated maize planters. The project tested three types of conventional maize seed meters used in Bangladesh (BARI, WRC and VMP) and an imported Precision seed meter (CPM) at low, medium and high

rotational speeds and inclination angles of seed meters. The tests were conducted using seeder test rig and soil bin facility of the FMPE Division, BARI. Two tests were conducted ï one at steady state (zero vibrations) and the other at dynamic state (running prototype seed boxed on a PTOS to take in vibrations). Data collected were percentages of singles, doubles, multiples, missings, bridgings and gaps. Results showed that the CPM seed meter outperformed other seed meters for the maize varieties tested (NK40, Elite and BHM9) giving a minimum of 92% single seeds that went up to as high as 97% depending on the operational settings. Thus, the CPM is a highly desirable seed meter that can used on seeders to improve precision of maize planting. All these tests were repeated as a dynamic test to identify the seed meters effectiveness under vibrations (due to engine and roto-tilling). Data of this dynamic test are being processed and results will be included in the central review report. It is expected that the CPM will perform equally good under field vibrations and hopefully open up opportunities for precise planting of maize and other bold seeded crops while saving seeds, time and cost of planting operation.

Appropriate conservation machinery for rice based cropping pattern in the southern delta of Bangladesh: The field experiment was conducted at Mundopasa, Wazirpur, Barishal; Hazipur, Kolapara, Patuakhali and Charwapda, Subarnachar, Noakhali during rabi season of 2017-18 for testing, adoption and popularization of different conservation machinery such as zero till planting method (ZT), strip till planting method (ST), and power tiller operated seeder (PTOS) along with conventional tilling and of sowing method. Mungbean (BARI Mung-6) was planted in Barishal and Patuakhali and soybean (Shohag) was planted in Noakhali. The effective field capacities of ZT, ST, PTOS and power tiller were found to be 0.093, 0.097, 0.102 and 0.089 ha/h, respectively. The average field efficiencies of ZT, ST, PTOS and power tiller were estimated as 71.14, 71.55, 69.99 and 71.63%, respectively. The fuel consumptions for operation of all machines were similar except power tiller. ZT, ST, PTOS saved about 62% fuel than power tiller for complete land prparation. There were no significant differences of yield and yield contributing parameters of mungbean among the treatments in Mondupasha, Barishal and Holdibaria, Patuakhali. Significantly higher (16%) grain yield was obtained from PTOS (1.98 t/ha) than CT (1.70 t/ha) in Charwapda, Noakhali. In mungbean planting, 36-39% planting cost was saved by CA machine (PTOS, ZT and ST) and in soybean planting 53% planting cost was saved by PTOS over conventional method. The experiments will be continued next year for confirmation of results.

Improvement and validation of bari seeder for grain crops under different cropping patterns and soil conditions: Existing BARI seeder was modified and an improved seeder was fabricated. The seeder is suitable for planting different types of crops such as wheat, maize, lentil, mungbean, soybean, cowpea, etc. During Rabi 2017-18, wheat and lentil were planted in Rajshahi and maize and mungbean were planted in Patukhali by the improved seeder. The field performance of seeder was found satisfactory in both Rajshahi and Patuakhali. There were three treatments (PTOS, strip tillage and conventional method) in field experiments of Rajshahi and four treatments (PTOS, strip tillage, zero tillage and conventional method) in Patuakahli. About 2.26 ha of wheat and 1.72 ha of lentil were planted by improved PTOS at Dhamdhum, Tanore, Rajshahi. In Belpukur, Godagari of Rajshahi, 1.33 ha of wheat and 0.86 ha of lentil were planted by the same PTOS. In Tulatoli of kolapara upazila, Patuakhali, 0.53 ha of maize and 1.52 ha of mungbean was planted by the improbved machine. About 0.86 ha maize and 1.06 ha mungbean were planted by the improve PTOS at Muradda of Dumki upazila, Patuakhali. Significantly the highest crop yields were found from improved seeder (PTOS) than strip tillage, zero tillage and conventional methods. PTOS found effective in crop planting in all project locations. Aus rice was planted at Tulatoli, Patuakhali and mungbean was planted at Belpukur, Rajshahi by the improved seeder as a new crop in the project locations in the Kharif-1 cropping season. The technical capacity of manufacturing workshop (R. K. Metal) was developed for fabricating seeder through training. Four field days were arranged in four upazila of the project locations during the maturity stage of the crops. Participating farmers were interested to use BARI seeder due to rapid planting time, low diesel cost with better crop yield. The experiment will be continued next year.

Development of fertilizer deep placement applicator for increasing fertilizer use efficiency and farm productivity: The research works on fertilizer deep placement has been conducting since May, 2017 to

date in three districts viz., Faridpur Barishal and Bhola. In this regard, a series of works have been conducting on different types of fertilizer applicator laboratory testing, designing, test in the test bed, modification and field test. The deep placements of prilled urea and USG has been doing by newly designed applicators in different upland crops (maize, potato, sunflower, brinjal, chili, cauliflower, cabbage, tomato, bottle gourd, sweet gourd, snake gourd, watermelon) and wetland crops (T.aman and Boro rice). The experiment was designed as randomized complete block. Data was collected, interpreted on different activities and field experiments. The recorded data have been moderating and analyzing using R software. For all crops, (summer tomato, Aus rice, T. Aman rice, Bottle gourd, sweet gourd, cabbage, cauliflower and potato) the yield parameters were found higher in USG and prilled urea deep placement. The farmer practice gave the lowest results in all cases.

Use of farm machinery for increasing cropping intensity and crop productivity in southern region of bangladesh: Cropping intensity in southern region is low compared to other region of Bangladesh. To increase cropping intensity in the region, BARI developed HSRT and PTOS were used for land preparation and seed sowing in Barisal, Patuakhali, Fridpur and Rajbari districts. Both machines were used for sowing wheat, pulses, oilseeds, maize onion and jute. Area covered by different crops were wheat 6.25 ha, mungbean 28.42 ha, lentil 3 ha, cowpea 6.7 ha, onion 11 ha, maize 1 ha, mustard 2 ha and jute 23.5 ha. Yield of harvested crops were; wheat, T_1-3.02 ton/ha, T_2-3.76 ton/ha; lentil, T_1-1.15 ton/ha, T_2-1.41 ton/ha; mungbean, T_1-1.05 ton/ha, T_2-1.80 ton/ha; cowpea, T_1-0.08 ton/ha, T_2-1.49 ton/ha; mustard, T_1-0.82 ton/ha, T_2-1.30 ton/ha. Use of machines reduced turnaround time, production cost and increase yield. Use of machines highly encores the farmers for line sowing practice. For getting the benefits of faster land preparation and line sowing, farmers prefer HSRT and PTOS for growing different crops.

Adoption of conservation agriculture based seeding mechanization for resources savings and sustainable crop production: Conservation agriculture (CA) based tillage technology permits direct seeding through the moderate level of crop residue. Farmers showed interest on CA based tillage technologies considering the direct advantages of reduced cost of tillage operation, fuel savings, and minimum turn around time between the previous crop and next crop planting. Up land crops are more suitable under these tillage technologies. Most of the developed tillage implements are operated by the available Chinese power tiller in addition to its tilling works. Local manufacturers in the project areas are being fabricated spare parts of these cost effective machinery in their shop (small minimum tillage seeder, zero till planter, and strip till planter) of Southern Bangladesh. Focus group discussion along with researcherôs, extension workers, working site selection, farmers selection, and CA machinery distribution completed in the project area of Barisal (Sadar, Babugonj) and Patuakhali (Sadar & Dumki). These seeding technologies are being started using through the participation of DAE and OFRD, BARI in Southern district for resources savings and crop production. Rice-wheat; Riceï mungbean seems to be suitable for these technologies. Yield of wheat, mungbean, maize under CA planting method were 3.0 t/ha, 1.5 t/ha, 11.2 t/ha and conventional method were 2.4 t/ha, 1.2 t/ha, 10.2 t/ha, respectively. Minimum till, strip till and zero till planting saved fuel 55.0%, 66.8%, 62.8%, respectively. Cost saving of minimum till strip till and zero till over conventional method is 61.8%, 65.5%, 61.4%, respectively. There are seed saving 20%. Area coverage of the planter 0.10-0.13 ha/h. About 13 ha land brought under mechanized crop cultivation and 75 farmers engaged in CA seeding activities in Barisal and Patuakhali area. Local operator-7, mechanic 5, manufacturer-3 gained practical experiences on CA machine operation, repair maintenance and spare parts making locally. Awareness builds up among the advanced farmers and extension workers using seeding machinery for wheat, mungbean, maize cultivation after T aman rice harvest. Excess soil moisture seems to be more critical in the Southern district for initial crop establishment. There is a big prospect bring fallow land under cultivation, increasing cropping intensity, and involve more farmers into farming activities through the use of machinery.

Present status of using dies, jigs and figs by the local manufacturers in Bangladesh: Tool, die and mold making is a process to convert materials into a required shape using machine tools, either general or specialized. The principal advantages of this process are its quickness and economy and the practically

absolute interchangeability of all punches made from the same die. Local manufacturers are using indigenous tools for producing the machinery. Thus, this study was taken to determine the status of the tool and die available in the local manufacturing workshop. The survey was done at Mahbub Engineering workshop, Jamalpur; Janata Engineering, Chuadanga; R K Metal, Faridpur; Kamal Machine Tools, Bogura; The Metal (Pv.) Ltd, Gazipur. Experiences of the manufacturers were ranged 12-29 years. Education level of 91% of the workers were below SSC. All surveyed manufacturers used lathe machine as key working machine and very few have modern machines-like milling machine, power press machine etc. Total 5070 numbers of different agricultural machinery were produced by those five manufacturers during 2017-18. None of the manufacturer have used fixture and only Kamal Machine Tools and The Metal (pvt.) Ltd have used Jigs in their workshop. Manufacturers have some dies for their machine production. Kamal Machine Tools have 300 dies since their main products are cast iron foundry parts. Manufacturers expected some facility for quality improvement. This study will be continued in the next year in others manufacturer to find status of the manufacturers in Bangladesh.

Design and development of manual rice transplanter: The major components of BRRI manual rice transplanter were fabricated using plastic materials. The mold of main parts of rice transplanter was developed under Public Private Partnership (PPP) at Alam Engineering Works, Wari, Dhaka. Locally available materials were used to fabricate the machine. The capacity of the machine was about 12-15 decimal/h. The number of seedlings per hill varies from 3 to 5 depending on seedling density. The number of missing and floating hills was found 3-5% and 1-2% respectively which is quite similar to international standard. Comparing with traditional hand transplanting, the machine can save about 60% labour and 45% transplanting cost. One-person can operate this machine up to one hours continuously and it needs two persons to operate the machine alternately for increasing machine efficiency and reducing human drudgery. It is an intermediate technology for marginal farmer before introducing of power operated mechanical rice transplanter.

Design and development of whole feed type mini combine harvester: A second prototype of whole feed mini combine harvester was fabricated using locally available materials in Janata Engineering workshop, Chuadanga under Private Public Partnership (PPP). BRRI provides design, drawing, technical and financial support to develop and fabricate the machine. The faults of first prototype were taken into consideration to fabricate the second prototype. The study was aimed to design, fabrication and testing the performance of the prototype. The preliminary performance of the 1stversion was tested in wheat and Aus 2016 season to find out the capacity, efficiency, operation fault etc. The field test revealed functional problem in gear system and cleaning mechanism. The harvesting capacity and fuel consumption were found 0.15~0.20ha/h, 2.75~3.00 l/h respectively. The success of this machine may create a new era in Bangladesh agriculture for harvesting and also mitigate the labour shortage.

Design and development of USG fertilizer deep placement (FDP) technology for existing walking type rice transplanter: A study was conducted to incorporate the USG deep placement (UDP) technology with the existing rice transplanter (DP 480) to avoid the present problems of USG placement and accelerate the adoption of mechanized rice transplanting and UDP technologies to the end users. Walking type 4-rows Rice Transplanter was selected for UDP technology based on power transmission facility and available space for necessary attachment. Push-pull type (Injector) UDP technology was designed for incorporation. Mechanism was developed for both the USG briquette of 1.8 and 2.7 g size. Engine power available at high rpm (more than 1800 rpm) was conveyed to the applicator with the arrangement of belt-pulley, worm gearing, shaft-bearing, rotary cam and bevel gear with an engage-disengage facility resulting in about 23 rpm of the UDP injector. From gear pulley, power transmitted to the worm gear to reduce the power at a ratio of 1:35. Bevel gear also used in the gear box to change the direction of power at 90 degree intersecting shaft. From output shaft of the gear box, power transmitted to the cam operating shaft with the same velocity ratio. Cam system was connected to operate the push-pull handle of the applicator vertically. The interval of push-pull handle is synchronized with the driving speed of the transplanter. Cam was used to convert the circular motion to the linear vertical motion of the push-

pull rod. The developed FDP technology with rice transplanter performed well in preliminary tests by transmitting power from engine to the applicator, receiving and placing granules properly.

Performance evaluation of BRRI prilled urea applicator (BPUA) for long duration Boro rice variety: An experiment was conducted during the Boro season of 2017-2018 at Rajpat, Kashiyani, to evaluate the performance of BRRI Prilled urea applicator (BPUA) and urea (N) fertilizer deep placement for long duration rice variety of BRRI dhan29. The treatments were T_1 = Urea deep placement by BPUA (70% urea fertilizer of recommended dose), T_2 = Urea deep placement by BPUA (80% urea fertilizer of recommended dose), T_3 = Hand broadcasting (Recommended dose of urea @ 270 kg ha^{-1}) and T_4 = Control (-N). The treatments were arranged as randomized complete design with three replications. Both actual and theoretical field capacity was found less for operation of the machine at 20% saving of fertilizer due to frequent feeding of fertilizer in the hopper of the applicator. Field efficiency of the applicator was 59 and 53% for operation at 30 and 20% saving, respectively. Actual saving percentage of urea fertilizer was noted 34 and 24% in the field against the calibration of 30 and 20% of saving. There was no significance difference of plant height and number of tillers between 70 and 80% of recommended dose of urea fertilizer application in the non-oxidize zone by the BPUA. Deep placement of the urea fertilizer (70 and 80% of recommended dose) gave significantly higher yield (6.7-6.8 t/ha) compared to hand broadcasting of urea (6.1 t/ha). Straw yield and harvest index did not vary with the mode and rate of fertilizer. The agronomic efficiency and partial factor productivity for N observed higher in urea fertilizer deep placement field compared to broadcasting whereas both the parameters did not varied for 30 and 20% saving rate. BPUA accounted the highest BCR (1.72 and 1.67) for 80 and 70% of the recommended urea fertilizer application in non-oxidized zone compared to the hand broadcasting of urea fertilizer (1.56). Farmer can apply 80% of urea fertilizer in non-oxidized zone by the BPUA for long duration rice variety.

Design and development of a double row weeder: A push-pull type manually operated double row rotary weeder was designed and fabricated in the FMPHT divisional research workshop. It consists of four rotors. The weight of the Double row weeder is 7.5 kg. Effective width of operation is 35-37 cm. An observation trial was done and the fabricated weeder was primarily tested in the BRRI research field, Gazipur. It was observed that about 70-80% weeds were uprooted and buried successfully by the rotors during push-pull operation of the weeder. The performance of the double row weeder was primarily found satisfactory and suitable to control weeds in the line transplanted field. Fine-tuning and modification of the rotors and blade is under process.

Design and development of a head feed mini combine harvester: This study was aimed to design, fabrication and testing the performance of the developed prototype of head feed combine harvester. This was designed and fabricated using locally available materials in Janata Engineering workshop, Chuadanga under Private Public Partnership (PPP). BRRI provide engineering design, fabricated drawing, technical and financial support to develop and fabricate the machine. The preliminary performance of the 1st version was conducted in Aman 2017 season to find out the field capacity, working efficiency, operation fault etc. Functional problems in gear system and cleaning mechanism were identified during the study. The harvesting capacity and fuel consumption were found 0.2~0.25 ha/h and 2.45~3.5 l/h respectively. A second prototype of head feed mini combine harvester was re-designed and fabricated to overcome the identified problems of the 1st version. The field performance of 2nd prototype during Boro 2018 was observed and found some mechanical faults. The engine power (20 hp) is not enough for smooth operation, some un-threshed straw was observed and stripper belt frequently damaged during operation. Therefore, threshing unit need to be redesigned and fabricate.

Performance evaluation of power operated automatic seed sower machine: Uniform seedling density 2-3 seedling per square centimeter is prerequisite condition for smooth operation of mechanical rice transplanter. Seed sowing in uniform density by hand broadcasting is difficult, time consuming and laborious work. Thereby a mechanical seed sower machine was collected and calibrated to perform seed sowing mechanically. The uniformity of seed dispensing rate and different depth of soil in tray was

measured in different position of lever. The recommended depth of bed soil and depth of cover-up soil were found in the middle position of 3-4 and 2-3 of the adjusting lever, respectively. The desired seed rate was found in the middle position of 4-5 of the adjusting lever for medium grain size130~140 gm germinated seeds per tray. About 440 trays per hour were prepared at desired condition using two persons. Therefore, it is an appropriate and time saving technology to prepare seedling tray for mechanical rice transplanter.

Test, evaluation and modification of rubber roll de-husker: A de-husking machine was developed to improve the milling performance of rice processing. The developed de-husker was connected in series with the existing auto rice mill. The capacity of the developed de-husker was 647 kg/h. The husking efficiency was found more than 90% for BRRI dhan70 and milling recovery was 63% when it was polished in friction type polisher. The average head rice recovery based on input paddy was 54.6%, which was found promising for processing of premiere quality rice. Old steel engelberg huller can be replaced with the combination of de-husker and polisher. Besides, this combination gives similar milling recovery of the semi and automatic rice mill. In addition, separately collected husk and bran can be used for making briquette and extracting edible oil, respectively.

Study on milling recovery at different moisture content: Parboiled BRRI dhan29 was processed in the air blow type engelberg huller with six different moisture levels (9.2%, 10.3%, 11.2%, 12.3%, 13.2% and 14.1%) to find out the optimum moisture content for milling. Under parboiled condition, around 10-11% moisture content (wb) was found suitable for milling of parboiled paddy processed in the air blow type engelberg huller and around 10% moisture content (wb) was found best in terms of head rice recovery (63.5%).

Improvement of air-blow type engelberg huller: FMPHT division developed air blowing type (one-pass) engelberg huller used for processing parboiled paddy. Processing of un-parboiled paddy with this huller, FMPHT division took initiative to reduce rotor rpm by using different sizes of pulley. Among the five size of pulley, 254 mm size with 734 rotor rpm produced 45.40% head rice (based on input paddy supply) which found promising. Normally, engelberg huller operates more than 1200 rpm thatôs speed suitable for parboiled rice processing and at that rpm produces more breakage for un-parboiled paddy. In this experiment, 1200 rpm for processing un-parboiled paddy gives lowest head rice recovery (34%) and the highest broken rice (28%) percentage. Farmers and millers both will be benefitted by using modified huller mill for both parboiled and un-parboiled paddy in single pass operation.

Validation and adaptive field trial of BRRI developed solar light trap: Validation and Adaptive Field Trial of BRRI Developed Solar Light Trap program, a sponsored research activity receiving fund from the Special Research Budget Allocation of Ministry of Agriculture for the year 2017-2018. Aiming to validate and adaptive field trial of BRRI solar light trap to the end users, manufacturer and resource poor farmers which reduce the application of insecticides. For testing the suitability of BRRI solar light trap five sides namely, Gazipur sadar (Rice), Chowgacha of Jashore (Vegetable and rice), Sherpur of Bogura (vegetable and rice), Shibpur of Narsingdi (vagetable and rice) and Koyra of Khulna (Rice and fish) were selected for this research cum adaptive trial program. BRRI solar light trap was fabricated in the BRRI research workshop and large scale (120 no.) manufacturing was done in a local manufacturer workshop with the help of BRRI provided design, guidance and project financial support. Fifteen solar light traps were distributed at each location with the help of DAE among the potential farmerôs field and insectôs data were collected from five solar light traps at each location for efficacy study. Rice insect pests including yellow stem borer (YSB), green leafhopper (GLH), white leafhopper (WLH), leaffolder (LF), caseworm (CW) and rice bug (RB) was the dominant in each solar light trap. Highest number of insect pests was trapped in May than that of April month. In brinjal field, significantly higher number of brinjal fruit and shoot borer (BFSB) were recorded in solar light trap than in pheromone trap. This result indicates that solar light trap is more effective than pheromone trap in brinjal field. A total 25 awareness cum demonstration and training program were conducted along with more than 1000 potential farmers, manufacturers, NGO personnel. Use of solar light traps both in rice and vegetable crops showed effective

tool for controlling insect pests. By means of, this solar light trap reduces chemical insecticide application and save environment.

Enhancement of crop productivity and reduction of production cost using farm machinery: Adaptive trial and field demonstration of farm machinery and technology was conducted in Rajpat, Kasiyani of Gopalganj district during Boro 2018 season. The technologies were seedling raising technique, mechanical rice transplanter, BRRI prilled urea applicator, BRRI weeder and reaper. BRRI dhan58, BRRI dhan50, BRRI dhan29 and BRRI dhan28 were cultivated in the trial plots. In total 101 field trials were conducted during Boro 2018 season. Four (4) trainings, four field days and one motivational tour programs were conducted during this season. About 40 plots covering 20 bighas of land in 12 different farmerôs field were harvested by the BRRI reaper as promotional activity. Prilled urea application by the BRRI prilled urea applicator gave the highest grain yield than hand broadcasting of urea due to uniform placement of urea in subsurface soil.

1.2 Irrigation and Water Management:

Effect of Deficit Irrigation and Mulching on Yield and Quality of Pumpkin: A two-year experiment was done at the research field of Irrigation and Water Management Division (IWM), BARI, Gazipur during the winter (rabi) season of 2016-2017and 2017-2018 to identify the effect of deficit irrigation and mulch on yield and quality of Pumpkin (var. BARI Hybrid Mistikumra-1). There were seven irrigation treatments, each replicated four times in a randomized complete block design (RCBD). The irrigation treatments were; T_1: full irrigation (FC100%) at 10-days interval, T_2: full irrigation (FC100%) at 15-days interval, T_3: deficit irrigation (FC100%) at 10-days interval, T_4: deficit irrigation (FC100%) at 15-days interval, T_5: deficit irrigation (FC100%) at 10-days interval, T_6: deficit irrigation (FC100%) at 15-days interval, and T_7: drip irrigation at 3-days interval. From the result of two years, it was found that yield contributing parameters such as number of fresh fruit per plant, unit fruit weight, etc. were highest in T_7, whereas the second highest values of those components were found in T_1. Yield of pumpkin was also significantly higher in these two treatments; 33.58 t/ha (Year 2), 22.64 t/ha (Year 1) in T_7 and 33.34 t/ha (Year 2), 21.49 t/ha (Year 1) in T_2, respectively. A significant yield reduction (about 12.7-34.0% in Year 2 and 13.4-27.8% in Year 1) was observed in deficit irrigation treatments (T_2, T_3, T_4, T_5 and T_6) than that of full irrigation treatment at 10-days interval (T_1). However, deficit irrigation treatments consumed less seasonal water to produce the optimum yield, therefore, water productivity were higher in these treatments (T_3, T_4, etc.). Highest water productivity (8.64 kg/m^3 and 8.59 kg/m^3 in Year 2 and Year1 respectively) was found in T_7 followed by T_6; 7.71 kg/m^3 in Year 2 and 6.41 kg/m^3 in Year 1. The results obtained from this research suggest that, when saving of water is priority than that of maximising yield; deficit irrigation is a wise option that can provide optimum yield but save water to irrigate additional croplands.

Effect of Deficit Irrigation on Yield and Water Productivity of Different Maize Varieties in Southern Areas: This study was conducted at the Regional Agricultural Research Station, BARI, Rahmatpur, Barishal located at Babugong Upazilla of Barishal District to determine the experimental evidence of the effects of deficit irrigation on yield and water productivity of different maize varieties during 2017-2018. The experiment consisted of two factors: irrigation and variety. The irrigation and mulch treatments were: Main plot: Irrigation (5): I1: Farmer practice, I2: Full irrigation at initial stage (20-25 DAS), I3: 50 % irrigation both at initial and vegetative (20-25 DAS and 50-60 DAS) stages, I4: 75% irrigation at initial, vegetative stage and silking (20-25 DAS, 50-60 DAS and 75-80 DAS) stages, I5: 50% irrigation at initial, vegetative, silking and grain filling (20-25 DAS, 50-60 DAS,75-80 DAS and 110-120 DAS) stages, Subplot: variety (5), V1:BHM-9, V2: BHM-7, V3: NK-40. I1 produced the highest grain yield of 10.75 t/ha. V3 (NK-40) produced the highest grain yield of 10.67 t/ha. The parameters had statistically significant effect for irrigation and variety treatments. The highest grain yield of 11.17 t/ha was obtained for I4V3 (75% irrigation at initial, vegetative stage and silking (20-25 DAS, 50-60 DAS and 75-80 DAS) stages; NK-40). BCR was found highest (3.24) at treatment I2V2 (Full irrigation at initial stage (20-25 DAS); BHM-7).

Response of Available Soil Moisture on the Growth and Yield of Chickpea: The experiment was conducted at the experimental field of IWM Division, BARI, Gazipur and farmerôs field of Godagari, Rajshahi during 2015 -2016, 2016-2017 and 2017-2018 to investigate the response to available soil

moisture on growth and yield of chickpea. Four levels of irrigation were applied for the experiment with three replications. Treatments were $T_{1=}$Rainfed, $T_{2=}$ one irrigation (light irrigation of 1.0-1.5 cm) at post-sowing, $T_{3=}$ one irrigation (light irrigation of 2-3 cm) at pod development (80-85 DAS) stage, $T_{4=}$ Two irrigations given each at post-sowing and pod development (80-85 DAS) stages. The results showed that most of the yield parameters were found higher in treatment T_2 and T_4 for both locations. The growth parameters (root length, shoot length, biomass) were found almost the highest when the water used also highest and the lowest was found in rainfed treatment. The soil moisture of treatment T_2 was higher than other treatments up to the pre-flowering (50 DAS) in 2015-2016, 2016-2017and 2017-18. The soil moisture of T_3 and T_4 were higher than other treatments up to the pod development (80-85 DAS) in Gazipur and it was also seen that treatment T_1 produced comparatively less biomass than all other treatments in 2015-2016, 2016-2017and 2017-18. The treatment T_2 gave the highest seed yield at Gazipur (1.55 t/ha) and at Rajshahi (1.33 t/ha) in 2015-2016, treatment T_4 and T_3 gave the highest yield in Gazipur (1.84 t/ha) and in Rajshahi (1.43 t/ha) in 2016-2017 and treatment T_3 gave the highest yield in Gazipur and Rajshahi at 2017-18 where enough rainfall occurred at post sowing stage. Hence, post sowing stage and pod development stages were found to be the critical stage of chickpea. If there is considerable rainfall (that will be helpful for pod development) then one irrigation at post sowing stage (T_2) will be effective but if there is no rainfall then one irrigation given at pod development stages (T_3) will be needed to produce highest yield. The highest BCR of 1.52,1.90 and 3.11 were found at Gazipur for T_2, T_4 and T_3 in 2015-2016, 2016-2017 and 2017-18.

Assessment of Water use on the Growth and Yield of White Grained Hybrid Maize: The experiment was conducted at the experimental field of IWM Division, BARI, Gazipur and farmerôs field of Godagari, Rajshahi during 2016 -2017 and 2017-2018 to assess the water use on the growth and yield of BARI hybrid maize-13. Six levels of irrigation were applied for the experiment with four replications. Treatments were T_1= Rainfed, T_2= One irrigation at vegetative (25-30) DAS stage, T_3= One irrigation at pre-flowering (55-65) DAS stage, T_4= One irrigation at grain filling (90-100 DAS) stage, T_5= Two irrigations each at pre-flowering (55-65 DAS) and grain filling (90-100 DAS) stages, T_6= Three irrigations each at vegetative (25-30 DAS), pre-flowering and grain filling stages. The results showed that most of the yield contributing character values found higher in treatment T_6 for both the locations where three irrigations at vegetative, pre-flowering and grain filling stages were applied. The treatment T_6 gave the highest yield in 2016-17 at Gazipur (6.80 t/ha) and in both the years at Rajshahi (5.80 t/h and 7.56 t/ha), and the lowest yield (4.77 t/ha and 6.57 t/ha) and (4.28 t/ha and 5.60 t/ha) were found in treatment T_1 at Gazipur and at Rajshahi where no irrigation was applied. But in 2017-18 at Gazipur, T_5 gave the highest yield (8.25 t/ha) and treatment T_6 and T_2 (8.02 t/ha) were almost similar to treatment T_5. Hence, three irrigations at vegetative, pre-flowering and grain filling stages might be played vital role for the highest yield and vegetative stage supposed to be critical of BARI hybrid maize-13. The highest BCR of 1.68 was found in treatment T_5 and T_2 in 2017-18 and 1.35 in treatment T_6 in 2016-17 at Gazipur.

Estimation of Crop Coefficient Values (Kc) for Groundnut at Different Crop Growth Stages by Lysimeter Study: This study was conducted at the experimental field of Irrigation and Water Management Division, Bangladesh Agricultural Research Institute (BARI), Gazipur during the rabi season of 2017-18 for the crop of Groundnut (BARI Chinabadam-8) in lysimeter tank to determine the crop coefficient values at different growth stages. Crop was grown inside and outside the tank to make same environmental condition for plant growth with necessary fertilizer and irrigation management. Irrigation was done with four irrigation levels (15, 20, 25 and 30 days interval allowing drainage) considering existing soil moisture. After harvesting it was found that 20 days interval irrigation gave the favorable environment for plant and highest yield. Hence this irrigation schedule was considered to calculate crop evapotranspiration and crop coefficient values at different growth stages of groundnut. It was found that Kc values of groundnut (BARI Chinabadam-8) at initial (32 DAS), development (40 DAS), mid-season (80 DAS), and late-season (35 DAS) are 0.47, 0.92, 0.94, and 0.77, respectively. Experimental results suggest that at initial stage ETc per day was much lower than that of the daily ET_o values, thus, Kc was the lowest (0.77). In contrast, at later two stages Kc was greater. Like most of the other crops, Kc value at late season went down again (0.77). Some of these values were found little bit

lower than that of the values determined by FAO; however, the findings could be handy for local agricultural researchers, academicians and farmers in proper irrigation scheduling as well as in water management planning.

Water Stress Effect on Wheat at Different Tillage Practices: The experiment was conducted during rabi season of 2017-2018 at Regional Agricultural Research station, BARI, Ishurdi, Pabna to find out the water requirements and appropriate deficit irrigation schedule of wheat on different seeding system. This study consisted of following irrigation treatments, like I_1= Irrigation at CRI stage, I_2= Irrigation at CRI and vegetative stages, I_3= Irrigation at CRI and grain filling stages and I_4= Irrigation at CRI, vegetative and grain filling stages on four tillage methods like T_1= *Bed Planting,* T_2= PTOS*, T_3= Strip tillage, and T_4= Zero tillage*and laid out in a factorial Randomize Complete Block Design with three replications. The result showed that spike/m2, spike length, grain/spike and yield were significantly affected by different tillage systems. At no deficit irrigation condition, highest grain yield (5.51 t/ha) was recorded on bed planting and lowest in zero tillage system. Itôs clearly, from the result that water deficit at grain filling stage on bed planting (T_1*I_2), yield was increased about 9.4%, 10.6% and 14.4% than no deficit irrigation on PTOS, ST, zero tillage treatment, respectively. The result also exhibited, yield was identical in PTOS, ST and zero tillage system. Besides, water deficit on vegetative and grain filling on bed planting, disclosed the highest yield compare to that of other tillage system. Grain yield and all yield contributing parameters were recorded highest in treatment I_4 where irrigation water was applied 3 times like CRI, vegetative and grain filling stages on all seeding system. Lowest yield as well as all yield contribution parameter found in treatment I_1 where irrigation water was applied one time at CRI stage on entire tillage systems. The lowest grain/spike and 1000 grain weight was detected in ST and zero tillage. Bed planting system achieved the highest WUE in no water deficit treatment as well as water deficit treatment.

Effect of Irrigation at Different Growth Stages of Mango in the Hilly Area: An experiment is being conducted at Hill Agricultural Research Station, Khagrachari on an existing orchard of BARI Aam-4 to find out the effect of irrigation on the primary growth stages of mango during dry months in hilly region of Bangladesh. Five treatments were distributed in Randomized Complete Block Design with 04 replications. The fruits are still in development stage. Therefore, experimental results can be evaluated after harvesting.

Potentiality of Biochar to Enhance Productivity of Tomato Cultivated Under Deficit Irrigation: This study was conducted at the research field of Irrigation and water Management Division (IWM) of Bangladesh Agricultural Research Institute (BARI), Gazipur to understand the potentiality of biochar in improving productivity of drip irrigated tomato cultivated under deficit irrigation condition, and its impacts on some soil properties. BARI Tomato-14 cultivar was used for this experiment. There were five different irrigation treatments; T_1: full irrigation (FI) with biochar @10 t/ha**;** T_2: deficit irrigation (75% of FI) with biochar; T_3: deficit irrigation (50% of FI) with biochar; T_4: FI with no biochar; T_5: 75% of FI with no biochar; T_6: 50% of FI with no biochar. The experiment is laid out in a Randomized Complete Block Design (RCBD), where each treatment was replicated thrice. Data on different growth and yield attributes of tomato were collected during the crop growing season and after harvesting. Necessary soil data were also collected periodically to determine the soil-moisture content, available nitrogen (N) status as well as the microbial-respiration of soil during the experimental period. The obtained result suggests that deficit irrigation reduced the plant height (highest in full irrigation > 75% irrigation > lowest in 50% irrigation); whereas, biochar application improved the plant heights (T_1>T_4, T_2>T_5 and T_3>T_6). The number of branches per plant did not show statistically significant difference among the irrigation treatments. In contrast to the plant height, root length was found higher in non-biochar treatments (T_4, T_5, T_6) than that of their opposite biochar treatments (T_1, T_2, T_3), where it increased as the water deficiency increased (T_1<T_2<T_3 or T_4<T_5<T_6). Again, both wet biomass and dry biomass weight was found highest in T_1, where the lowest values of both attributes were found in T_6. On the other hand, the number of fruit per plant, unit fruit weight and marketable yield were found highest in T_1 followed by T_4, T_2, T_3, T_5 and T_6. A significant yield reduction of about 5.6% and 10.5% between T_1 and T_3, T_4 and T_6, respectively suggests that irrigation deficiency (by 50%) significantly reduced the production of tomato. Moreover, the

marketable yield of T_1>T_4 (3.7%), T_2>T_5 (6.0%) and T_3>T_6 (7.9%) illustrates that biochar potentially increased the crop production, and it showed better performance when the irrigation deficiency increased. In addition, water productivity (WP) was found 5.5% higher in T_1 than T_4, 10.2% higher in T_2 than T_5, and 10.6% higher in T_3 than T_6. Soil moisture content dropped sharply in non-biochar treatments under deficit irrigation; however, biochar improved the moisture content status under the similar circumstances. The hetero-tropic respiration (CO_2 emission) were found higher in biochar amended treatment, where it was recorded highest in T_2 and lowest in T_6. Biochar with FI (T_1) had the highest available NH_4-N over the season followed by biochar with 75 % FI (T_2). But, available NO_3-N was highest in T_2, while T_6 had the lowest value. No significant variation on the fruit quality parameters were found between these two treatments. While carotenoids and total soluble solids (TSS) were also found slightly higher in biochar amended treatment (T_1), both Vitamin-C and Tritable acidity contents were marginally higher in treatment without biochar (T_4). Overall, biochar found to be promising in improving the growth and yield of tomato grown under deficit irrigation regimes, as well as the health of the soil. However, no discreet conclusion can be drawn unless the research continues for few more years.

Growth and Yield of Sweet Orange as Influenced by Timing of Fertilizer Application and Method of Irrigation: This study was carried out at the experimental field of Irrigation and Water Management Division, Bangladesh Agricultural Research Institute, Gazipur to determine the appropriate timing of fertilizer application and the irrigation method on the fruits yield and water use of sweet orange. The experiment was designed with five treatments and five replications. The treatments were: T_1=Rainfed (normal practice), T_2=Irrigation at 10 days interval by ring basin method (November-May) with recommended fertilizers applied two times in a year, T_3=Irrigation at 15 days interval by ring basin method (November-May) with recommended fertilizers applied four times in a year, T_4= Drip irrigation at five days interval (November-May) with fertilizer application at two months interval, T_5=Drip irrigation at five days interval (November-May) with fertilizer application at once in a month. Results of this study indicated that yield contributing parameters (fruit length, diameter, fruit number and unit fruit weight) and total fruits yield were found almost similar trend of T_2, T_3, T_4 and T_5 but higher than T_1.. The treatment T_3 with irrigation at 15 days interval by ring basin method with fertilizers applied at three months interval and the treatment of T_4 with drip irrigation at five days interval with fertilizer application at two months interval performed better in plant growth and fruit yield than other treatments. Seasonal irrigation water use was lower in drip irrigation system of T_4 and T_5 than ring basing of T_2 and T_3 in each year. Drip or ring basin method could be an irrigation strategy for sweet orange cultivation due to better plant growth, number of fruits, fruits length and diameter, yield and water use. However, this is an on-going study, and for the fifth time, excellent bearing is being observed during the year of 2016 and 2017. Definite conclusions may be drawn after the completion of the study cycle.

Yield and Water Productivity Indices of Different Onion Varieties Under Sprinkler Irrigation: To evaluate the performance of three onion varieties under sprinkler irrigation and their sensitivity to water stress, a study was conducted at the experimental field of IWM Division, BARI during the winter season of 2017-2018. The experiment comprised of five irrigation treatments with four sprinkler irrigation based on 60%, 80%, 100% and 120% crop water use (ETc) and a surface irrigation laid out in split-plot design with three replications. Irrigation water was applied at a fixed 6-day interval with sprinkler system and 15-day interval with surface irrigation throughout the crops growing season. Onion sensitivity to water stress was determined using a yield response factor (Ky) that derived from the linear relationship between relative evapotranspiration deficits (1-ETa/ETm) and relative yield decrease (1-Ya/Ym). Statistical analysis revealed that plant height was not much affected by the level of irrigation while, leaf number, bulb diameter, bulb unit weight and total bulb yield was affected significantly ($P<0.05$) by the irrigation regimes. Among the varieties, the highest plant height, bulb diameter and unit bulb weight contributed to the highest yield of 22 t/ha for Taherpuri King (V_3) under 120% water regime. Taherpuri super (V_2) produced the second highest yield of 19 t/ha which was comparable to the yield of 17 t/ha produced by the variety BARI onion -1 (V_1). Value of Ky determined for the whole growing season was found higher for V_3 (Ky 1.18) than other two varieties (0.93 for V1 and 0.96 for V2) indicates that variety V_3 is highly sensitive to water stress. This fact is also evident by the WP with higher value obtained under higher

water regimes in case of V_3; but for other varieties, higher WP was obtained from 80% ETc water regime. The amounts of water used for evapotranspiration under different irrigation regimes ranged from 151 to 253 mm, 153 to 256 mm and 158 to 260 mm, respectively, for V_1, V_2 and V_3 with minimum at 60% ETc and maximum at 120% ETc water regime. Though surface irrigation treatment received almost same amount of water as received by 80% ETc treatment, yield was lower and consequently WP was the lowest. Considering Ky as a limiting factor, application of irrigation at 80% ETc was a marginal for V_1 and V_2 and 100% ETc for V_3, beyond that yield losses are insupportable.

Performance of Fertigation System on Bottle Gourd Cultivation: An experiment was conducted at the research field of Irrigation and water Management (IWM) Division, Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur during the rabi seasons of 2017-18 to determine the performance of bottle gourd (var. BARI Lau- 3) under fertigation systems. Six different irrigation treatments T_1= Ring Basin irrigation at 7 days interval with recommended fertilizer doses, T_2= Fertigation at an alternate day with recommended fertilizer doses, T_3= Fertigation at an alternate day with 20% less N and K than recommended doses, T_4= Fertigation at an alternate day with 35% less N and K than recommended doses, T_5= Fertigation at an alternate day with 50% less N and K than recommended doses were selected. The highest yield of 37.20 t/ha was obtained from treatment T_4 by applying 35% less N and K than recommended doses through drip system followed by treatment T_5 (33.02 t/ha) by applying 50% less N and K than recommended doses through drip system. Water was needed 404 mm for ring basin method during the season whereas only 107 mm water was needed in drip method. The economic analysis reveals that the benefit cost ratio is the highest of 2.99 was obtained from treatment T_4 by applying 35% less N and K than recommended doses through drip system followed by treatment T_5 (2.67) by applying 50% less N and K than recommended doses through drip system.

Design, Development and Assessment of the Economic Suitability of a Permanent Floating Bed for Cultivating Vegetables Round the Year: The experiment was conducted at RARS, BARI, Rahmatpur, Barishal during 14 November, 2017 to 12 March, 2018 to develop a low cost permanent bed for floating farmers and to determine the socio-economic suitability of the permanent bed as compared with the traditional bed to grow crops round the year. Two plastic pipes (4″) of 20′ another two plastic pipes (4″) of 4′ 3′ and four elbows were used for making the permanent bed. The four elbows (4″) was connected at the end of two 20 long pipe (4″) by plastic gum. Then the two 4′ 3′ long pipe (4″) was jointed between four elbows (4″) by plastic gum. After that the permanent bed was covered by plastic sheet and net (1′′) to protect the bed materials (water hyacinth) from fish. The plastic layer was used, so that the sunlight could not affect the plastic pipe. As the bed height was short (9 inch) the fibrous roots was came out quickly, as they got some source of nutrient from the bed materials. The height was increased from 9 inch to 19 inch to protect the fibrous root of carrot (Redking). For carrot (redking) on floating bed cultivation it was found that the number of leaves per plant was highest 13.33, root lenth was 13.33 cm, root diameter was 12.11 cm, shoot length was 68.00 cm, fruit cortex length 13.00 cm, fruit cortex diameter 9.00 cm, leaf weight per plant 156.00 gm, fruit weight per plant was 136.00 gm and yield was 13.98 t/ha. The T_1 contains all the highest values for carrot. It was observed from table 3 that the plant height of potato (BARI Alu-72) was highest 113.00 cm, number of branches per plant was 9.67, number of leaf per plant was 13, number of tuber per plant was 13.00, weight of tuber per plant 197.00 gm. It was observed that the yield lf potato per bed was 45.12 t/ha at treatment T_1. For bushbean (BARI Jharsheem-2) it was observed from the data table 4 that the plant height was found highest 40.67 cm and number of pod per plant were 12.33. 50% flowering was occurred at 43 days after planting. The pod size was highest 15.67 cm; pod width 0.88 cm, number of green pod per plot was observed highest 311.33. 1st harvest was after 65 days to planting, individual pod weight was observed highest 12.67 cm, and 100 green seed weight 25.67 gm. In case of Snake gourd highest values was observed from the data table 5 that the fruit length was 44.06 cm and perimeter was observed 11.94 cm from treatment (T_1). The individual weight of the fruit was found height (252.447 gm) and yield (45.57 t/ha) at treatment T_1. It was observed from table 6 that the highest fruit length of yard long bean was 50.03cm and perimeter was observed 0.73 cm from

treatment (T_1). The individual weight of the fruit was found height (21.50gm) and yield (5.087 t/ha) at treatment T_1.

Growth, Yield and Quality of Mandarin as Influenced by Different Methods, Amount of Irrigation and Timing of Fertilizer Application in Hilly Region: An experiment was conducted at Hill Agricultural Research Station, Khagrachari on the existing orchard to find out the growth, yield and quality of mandarin influenced by fertilizer application, methods and amount of irrigation in the hilly region of Bangladesh. The experiment was set up during December 2016 at 4 years old orchard of mandarin (var. BARI Komola-2). Plant to plant spacing was about 5m × 5m. Six treatments were distributed in a Randomized Complete Block Design with 04 replications. The treatments were T_1: Farmersô practice; T_2, T_3 and T_4 consisted of irrigation by ring basin method at 15 days interval (November-May) with fertilizer applied at 2, 3 and 4 months interval, respectively; T_5 and T_6 were of drip irrigation at 5 days interval (November-May) with fertilizer application at 2 and 1 monthôs interval, respectively. Due to unusual rainfall during supposedly dry months and varietal contamination among plants of the experimental orchard, it is strongly suggested to restart the experiment at a new orchard.

Determination of Relationship between Soil Salinity and Irrigation Water Salinity: This study was conducted under the poly shed house of Irrigation and Water Management Division, Bangladesh Agricultural Research Institute (BARI), Gazipur during the rabi season of 2017-18 in pot to determine the relationship between soil salinity and irrigation water salinity. Three types of soil (Sandy loam, Clay loam and loam) were used with different levels of salinity where no crop was considered. Artificial salinity was prepared by using raw salt mixing with water through the trial and error method. To measure in situ soil salinity, direct soil EC meter was used. Irrigation water with different salinity level (4, 8, 12 and 16 dS/m) were applied up to field capacity at two intervals (15 and 30 days) and soil salinity were measured at two depths (0-15 and 15-30 cm). The results from the collected data demonstrates that soil salinity showed mostly increasing trend with time after applying different levels of saline irrigation water at 0-15 cm and 15-30 cm depth. It also found that deeper depth (15-30 cm) rose higher than lower depth (0-15 cm). However, this interpretation is given only from limited data. This experiment will be continued for the next year to collect more data to find out the relationship between soil salinity and irrigation water salinity.

Sustainable Groundwater Utilization For Crop Production in Rajshahi District: This study was conducted in nine upazilas of Rajshahi district for the sustainable groundwater use for crop production. Monthly water table data, data for irrigated crops, irrigated area, wetted area and meteorological data have been collected from Barind Multipurpose Development Authority (BMDA) and Bangladesh Meteorological Department (BMD). After collecting all relevant data, water table dynamics were analyzed with a model named ñMAKESENSò and in excel. Results showed that groundwater abstraction is increased as irrigated area increased. Less abstraction from the surface due to limited water sources and uneven rainfall distribution increased the withdrawal of irrigation water from groundwater for crop production especially in dry period. Long term trend of water table depth indicates that water level is decreased with time significantly in almost all upazilas and going to below threshold level in the last few years for some upazilas. Future predictions based on the present declining trend demonstrates that if this abstraction is continued then groundwater level will go below threshold level as well as suction limit of shallow tube wells in most upazilas. Then withdrawing groundwater in this way will not be sustainable at all. So, some effective measures will be needed to develop in the next year and adopted to avoid over exploitation and consequently to promote the sustainable use of groundwater for crop production.

Development and Adaptation of Water Saving Irrigation Techniques for Upland Crops: New emitter with low (gravity) drip irrigation system was developed to slowly apply water directly to individual plants at frequent intervals rather than broadcasting over the whole field area. Based on available raw materials in local market, the compensating type of emitter was developed by IWM Division, BARI, Gazipur through ARFA local manufacturer in Dhaka. New emitter with low pressure (gravity) drip irrigation system was installed, evaluated and compared with Chinese emitter to determine the hydraulic parameters at lab condition. New emitter discharge was measured under the variable operating heads and slopes at lab conditions of Gazipur. The hydraulic performance of the developed drip irrigation system was found better at 1.5 m to 2 m operating head with various slopes of 0% and 1%, and emitter discharge rate was found from 3 to 5 litre/hour. Two major location: Dinajpur (Drought area), Koyra, Khulna (Salt-affected area) and one additional site of IWM Research field, BARI, Gazipur were selected and conducted the field experiments. Total 10 famers (5 farmers from each site) were selected for adaptive trails. Six major crops, like as, maize, sunflower, potato, tomato, brinjal and watermelon were selected for adaptive trails. Site specific water saving technologies, like as, drip-irrigation at 3-5 days interval (Saline and non-saline area), AFI

(Saline & non-saline area) and FFI techniques (Salt-affected area) were conducted experiments at farmersô field conditions. Water saving techniques of alternate or fixed furrow irrigation saved seasonal crops (potato, maize, sunflower, brinjal) water use from 24 to 32% and it also improved water productivity from 28 to 40% while drip irrigation at 3-5 days interval saved seasonal crops (brinjal, tomato, watermelon) water use from 38 to 47% and improved water productivity from 50 to 60% compared to traditional furrow irrigation. Based on one year study, drip irrigation, alternate/fixed furrow irrigation methods are highly recommended to site specific areas of Bangladesh for a sustainable use of this natural water resources because of the insufficiency of surface and ground water resources and raising salinity. However, water saving techniques have the potential to save water without any sacrifice in yields of crops. Moreover, because of the insufficiency of surface and ground water resources and raising salinity, these efficient irrigation techniques are needed to continue and expansion of different rabi crops at drought and coastal salt affected areas of Bangladesh for sustainable food security.

Cropping System Intensification in the Salt Affected Coastal Zones of Bangladesh and West Bengal, India: The most common and traditional practices of cropping patterns followed in the coastal areas is mainly fallow-fallow-T. Aman. Therefore, the aims of the study to sustainably increase cropping intensity, productivity and gross margin in the salt-affected coastal zones of Bangladesh through integrated soil, water and crop management. The experiments were executed at the ACIAR-KGF project site of Amtali, Barguna during kharif-I season of 2017 to increase the intensification of cropping by developing economical cropping patterns using fallow land. In 2017, short duration and high yielding of T. Aus rice (BRRI dhan 48) was demonstrated in the salt-affected coastal zones under ACIAR-KGF project at the farmersô field of Sikandorkhali village, Amtali, Barguna to improve the productivity of existing cropping pattern by introducing early establishment of short duration of new modern variety of T. Aus rice (BRRI dhan 48) as well as higher yield and economic return for the farmers. The experiments were laid out in randomized complete block design with three replications under each farmer. Three farmers were selected at the site of Sikandorkhali, Amtali, Barguna under the polder no. 43/1. Data were collected through the direct field measurement and survey data of the selected farmers. After intervention of the project activities, the total growth duration of T. Aus (BRRI dhan 48) was 108 days. On average, the grain yield of T. Aus was found 4 t/ha with varied from 3.79 to 4.19 t/ha. The output-input ratio was found 1.86 with varied from 1.79 to 1.95. The growing of short duration and high yielding T. Aus rice might be feasible and could be more economical by increasing the same or similar type of short duration high yielding T. Aus variety to the all farmers under the similar type of farmersô block of the project site for growing three crops in a year instead of one crop (fallow-fallow-T. Aman) per year in the salt affected areas of coastal zone in Bangladesh.

Establishment of T. Aus Rice for Increasing Cropping Intensity, Productivity and Gross Margin in the Salt-Affected Coastal Areas of Bangladesh: The most common and traditional practices of cropping patterns followed in the coastal areas is mainly fallow-fallow-T. Aman. Therefore, the aims of the study to sustainably increase cropping intensity, productivity and gross margin in the salt-affected coastal zones of Bangladesh through integrated soil, water and crop management. The experiments were executed at the ACIAR-KGF project site of Amtali, Barguna during kharif-I season of 2017 to increase the intensification of cropping by developing economical cropping patterns using fallow land. In 2017, short duration and high yielding of T. Aus rice (BRRI dhan 48) was demonstrated in the salt-affected coastal zones under ACIAR-KGF project at the farmersô field of Sikandorkhali village, Amtali, Barguna to improve the productivity of existing cropping pattern by introducing early establishment of short duration of new modern variety of T. Aus rice (BRRI dhan 48) as well as higher yield and economic return for the farmers. The experiments were laid out in randomized complete block design with three replications under each farmer. Three farmers were selected at the site of Sikandorkhali, Amtali, Barguna under the polder no. 43/1. Data were collected through the direct field measurement and survey data of the selected farmers. After intervention of the project activities, the total growth duration of T. Aus (BRRI dhan 48) was 108 days. On average, the grain yield of T. Aus was found 4 t/ha with varied from 3.79 to 4.19 t/ha. The output-input ratio was found 1.86 with varied from 1.79 to 1.95. The growing of short duration and high yielding T. Aus rice might be feasible and could be more economical by increasing the same or similar type of short duration high yielding T. Aus variety to the all farmers under the similar type of farmersô block of the project site for growing three crops in a year instead of one crop (fallow-fallow-T. Aman) per year in the salt affected areas of coastal zone in Bangladesh.

Establishment of Short Duration T. Aman Rice for Increasing Cropping Intensity, Productivity and Gross Margin in the Salt-Affected Coastal Areas of Bangladesh: The aims of the study to sustainably increase cropping intensity in the coastal zones of Bangladesh in the dry season through integrated soil, water and crop management. Therefore, the experiments were executed at the ACIAR/KGF project sites of Amtali, Barguna and Dacope, Khulna during kharif II season over two years of 2016 and 2017 to increase the intensification of cropping by developing economical cropping patterns using fallow land. The most common and traditional practices of cropping patterns followed in the coastal areas is mainly Fallow-Fallow-Transplanted Aman. Short duration and high yielding T. Aman rice variety was tried in the salt-affected coastal zones under ACIAR-KGF project at farmersô field of Sikandorkhali village, Amtali, Barguna and Pankhali, Dacope, Khulna. BRRI Dhan 62 and BRRI Dhan 73 were disseminated in farmersô field to improve the productivity of existing cropping pattern by introducing early establishment of short duration new variety as well as higher yield and economic return for the farmers during 2016 and 2017, respectly. The experiments were laid out in randomized complete block design with three replications under each farmer. Three farmers were selected at the site of Sikandorkhali, Amtali, Barguna under the polder 43/1 and three farmers were selected at the site of Pankhali and Khatail, Dacope, Khulna under the polder 31. Data were collected through direct field measurement and survey data of the selected farmers. Mean values of T. Aman (BRRI dhan 62 and BRRI dhan 73) crop harvested 20 to 40 days earlier than traditional local varieties of Vojon and BR 23 although gross margin and benefit-cost ratio was lower than local varieties. Mean values over two years, the output-input ratio was found lower in T. Aman variety of BRRI Dhan 62 and BRRI dhan 73 (1.10- 1.24) than local variety of T. Aman (1.50-1.81). Farmers expressed their satisfaction for getting only earlier harvest and higher market price of BRRI dhan 62 and 73 but showed unsatisfaction for lower yield due to damage by birds, rats etc. Farmers cannot go for early rabi crops just after the harvest of this short duration due to waterlogging and high soil moisture in the field. These varieties might be more economical by increasing the same or similar type of short duration high yielding variety to the all farmers under the same block of the project site or by providing subsidy to the farmers, especially for short duration establishment- of T. Aman rice for growing three crops in a year instead of one crop per year in the salt affected areas of coastal zone in Bangladesh.

Cropping Pattern Based Water Management for Different Crops in Saline Prone Area of Bangladesh: Cropping pattern based water management is needed to sustain irrigated agriculture to intensify the system productivity in coastal regions of Bangladesh. Therefore, two years field experiments were conducted during 2016-2017 and 2017-2018 at the farmers' field of the village of Sikandorkhali at Amtali, Barguna under the ACIAR-KGF project at salt affected coastal regions of Bangladesh. The objectives of this study were (i) to find out the effect of cropping pattern on salinity, crops yield and water productivity, (ii) to evaluate the economic analysis of the cropping systems, (iii) to identify the suitable cropping pattern in terms of water use and profitability and (iv) to demonstrate and popularize the improved cropping pattern and suitable water management among the farmers. The experiments were carried out in three farmersô field with recommended irrigation treatments and replicated thrice. The treatments were: (i) CP1: Mustard/Watermelon -T. Aus (Optional) -T. Aman, (ii) CP2: Sunflower -T. Aus (Optional) -T. Aman, (iii) CP3: Maize -T. Aus (Optional) -T. Aman, (iv) CP4: Wheat ï Mungbean/sesame (Optional) ï T. Aman, (v) CP5: Fallow-Fallow-T. Aman (Farmersô practice, control). Results showed that the trend of soil water contents decreased at mid growing season (February 2017) and later growth stages of crops from sowing to harvest among the treatments in 60 cm profile with 15 cm increments due to lack of sufficient soil moisture as well as irrigation water. Salt accumulation at the growing season of sowing to harvest was substantially changes and soil salinity averagely ranged from 8 dS/m (January) to 17 dS/m (March) in 2017 and 4 dS/m (November 2017) to 9 dS/m (March 2018) and highest in February 2017 and March 2018 in 60 cm soil profiles with 15 cm increments. Similarly, the osmotic potential was obtained highest -680 kPa (on average) February 2017 and -845 kPa (on average) in February and March 2018. The changes in soil pH ranged averagely similar trend 6 to 7 in 2017 and 4 to 5 in 2018 among the treatments in the 60 cm soil profiles during the growing season. The highest soil salinity and osmotic solute were occurred in CP5 compared to other cropping patterns due to lower soil water content in 60 cm soil profiles. Results revealed that rice equivalent yields (REY), production

efficiency (PE) and total system productivity (TSP) was obtained highest in cropping system of CP2 in 2018 and CP3 in 2017 compared to other cropping patterns. In terms of crops yield and water use, cropping system CP3 produced highest total system water productivity compared to other cropping systems in both years (2017 and 2018). Gross margin and benefit cost ratio was in the order of CP3 >CP2 >CP4 >CP1> CP5 in 2016-2017 and CP2 >CP1 >CP3 >CP4 > CP5 in 2017-2018. Based on two-year study and in terms of crops yield, rice equivalent yields, total system of crop and water productivity, profitability of economics and reducing the risk of soil salinity, osmotic pressure and scarcity of available water, CP2, CP1 and CP3 would be practiced followed by CP4 and CP5 (Fallow-Fallow-T. aman) in coastal saline prone areas of Bangladesh. However, it may have concluded that diversified cropping system including mustard, sunflower and maize crops enhanced the mean productivity and profitability the cropping patterns of CP2, CP1 and CP3 which would be the most productive and profitable annual cropping system in coastal regions of Bangladesh.

Conjunctive Use of Fresh and Saline Water in Irrigation for Sunflower in Coastal Areas of Bangladesh: Conjunctive use of fresh (low-saline: pond water) and saline water (medium saline: canal water) for irrigation is a strategy to irrigate rabi crops in the coastal salt affected areas of Bangladesh where fresh water is not available. Therefore, the experiments were conducted during 2016-2017 and 2017-2018 at the farmers' field of the village of Pankhali at Dacope, Khulna and Sikandorkhali at Amtali, Barguna under the ACIAR-KGF project at salt affected coastal regions of Bangladesh. The objectives of this study were (i) to evaluate the effect of soil moisture, salinity, osmotic pressure, pH and plant biomass at different growth stages, (ii) to assess the effect of fresh and saline water irrigation on the crop performances, water use and water productivity and (iii) to find out the scope of saline and fresh water irrigation for sunflower crop cultivation. The experiments were carried out in two farmerôs field at Pankhali and three farmersô field with six irrigation treatments and replicated thrice. The treatments were: T_1: 2 IR at vegetative and flowering stage with FW, T_2: 2 IR given at vegetative with FW and flowering stage with SW, T_3: 2 IR given at vegetative with FW and grain filling stage with SW, T_4: 3 IR at vegetative, flowering and grain filling stage with FW, T_5: 3 IR at vegetative with FW and flowering and grain filling stage with SW, T_6:3 IR at vegetative and flowering with FW and grain filling stage with SW. Results showed that the conjunctive use of fresh water at early growth stages and saline water at later growth stages had no significant difference among the treatments. Soil moisture content decreased from the growing season to harvest, but plants extractable available soil water was not drasticaly reduced in 2017. In 2018, the plant growth and crop yield was affected because of insufficient supply of irrigation water in both locations. The highest changes in soil salinity occurred at the end of the growing season on average 9.62 dS/m (February 2017) compared to the beginning of the growing season on average 5.32 dS/m (December 2016) in 60 cm soil profiles. Soil salinity (EC_e) was found greater in treatment T2 and T5 than other treatments. The highest soil salinity was observed in T2 (12 dS/m) and T5 (10 dS/m) at Amtali and 7.1 dS/m in T5 at Dacope during 2018. On average, the osmotic potential was observed greater in treatments T_5 compared to other treatments in both years. The changes in soil pH ranged occurred averagely at around 7.8 to 8.2 in 2017 and 4 to 5 in 2018. In 2017, plant biomass was lower in treatments T1 and T2 than the treatments of T_4, T_5 and T_6. The seed yield of sunflower ranged was found 2.33 to 2.53 t/ha at Dacope and 1.65 to 1.93 t/ha at Amtali. In 2018, the sunflower yield ranged was obtained from 1.24 to 1.71 t/ha at Dacope and 1.2 to 1.55 t/ha at Amtali. In treatment T_6 produced highest yield 2.53 t/ha at Dacope and 1.93 t/ha at Amtali in 2017 and T5 produced highest yield at around 1.7 t/ha at Dacope and 1.6 t/ha at Amtali in 2018. Seasonal crop water use was obtained averagely 223 mm at Dacope and 248 mm at Amtali in 2017 and 160 mm at Dacope and 171 mm at Amtali in 2018. Mean values of water productivity was found 1.12 kg/m^3 at Dacope and 0.75 kg/m^3 at Amtali in 2017 and 0.93 kg/m^3 at Dacope and 0.82 kg/m^3 at Amtali in 2018. The average water salinity of pond and canal at 10 days interval during the crop growing season was recorded from 1.21 to 2.2 dS/m at Dacope and 0.47 to 4.4 dS/m at Amtali in 2017 and 1.13, 1.41 dS/m at Dacope 1.4 to 6dS/m at Amtali in 2018. Based on two years (2017 and 2018) study, the results indicated that seed yield and water productivity of sunflower and reducing the risk of soil moisture content, soil salinity, osmotic pressure, pH and scarcity of available water, an alternative irrigation scheduled and technique can be practiced by the conjunctive use of fresh

water (low sanityÒ1.5 dS/m) at early growth stages and saline water (1.5 Ó salinity Ò 5 dS/m) at later growth stages of crop in coastal saline prone areas of Bangladesh. Further studies are needed to expansion of rabi crops in coastal salt affected areas of Bangladesh where fresh water (non-saline) is not available for rabi crops cultivation in Bangladesh.

Assessing and Mitigating the Contamination of Vegetable Crops and Soil under Irrigation With Urban Wastewater: Proper irrigation methods and management can help farmers to harvest the benefits of wastewater irrigation while minimizing the risk of its use for crop production. This study, therefore, aims to assess the impacts of wastewater irrigation on leafy vegetables, root and salad crops in terms of safety, quality, and crop productivity and to minimize the contamination of crops through development of proper irrigation management technologies. A set of experiments were set up at the farmer's field of peri-urban areas in Terokhadia, Rajshahi and in Debidwar, Cumilla with the crops tomato, potato, spinach and Indian spinach. The management options tested for these crops were traditional furrow irrigation (TFI), alternate furrow irrigation (AFI), flood irrigation (FLI), broad bed furrow irrigation (BBFI) and drip irrigation. Not all these methods were tested for a single crop. Irrigation methods with wastewater were varied with the crops. For example, drip irrigation was not tested for leafy vegetable crops like Indian spinach, spinach but to test for tomato crop. Similarly, broad bed furrow irrigation was not used for potato. Effects of different fertilizer doses with wastewater irrigation on the yield of potato, spinach and Indian spinach were evaluated. Results showed that wastewater with 80% of recommended fertilizer dose (RFD) gave the yields of spinach and Indian spinach that were identical with that obtained under fresh water irrigation with 100% RFD. Irrespective of fertilizer dose, yields under flood and broad bed furrow irrigation were almost same. The yield of potato tuber was found highest under wastewater irrigation with 100% fertilizer dose closely followed by 80% RFD and the lowest was obtained from 60% RFD with wastewater irrigation. However, tuber yield under wastewater irrigation with 80% RFD was comparable to freshwater irrigation with 100% RFD. Among the irrigation methods, drip irrigation gave the highest tomato yield and the yield under AFI, BBFI and TFI were identical and the lowest yield was obtained from flood irrigation. Application of wastewater increased, to a smaller extent, the soil chemical properties like EC, pH, organic matter, N, P, K, S, Zn and B. However, no consistence changes were observed in case of heavy metals accumulation. As the quality of wastewater-irrigated produce is concerned, it was observed that wastewater irrigation enhanced the quality of crops with an elevated concentration of N, P, K, S, B, and Zn content. But a high bacterial contamination with fecal coliforms (FC), total coliforms (FC), total bacterial aerobic counts (TABC), fecal streptococci and Escherichia coli (E. coli) was observed in fresh spinach and Indian spinach irrigated with urban wastewater and it was observed that irrigation methods have significant role in minimizing the contamination. However, the crop was not contaminated with pathogenic bacteria of the Salmonella species. The bacterial contamination was found lower in BBFI than FLI system for spinach and Indian spinach. Similarly, lower count of these categories of bacteria was recorded in AFI than TFI for potato. For tomato, drip irrigation had the lowest bacterial contamination compared to other irrigation techniques. So, these irrigation techniques need to be practiced by the wastewater farmers to improve the product quality by reducing the contamination and to protect consumer health.

Dissemination of BARI Developed Water Saving Irrigation Technologies for Enhancing Crop Production in Coastal and Drought Prone Areas of Bangladesh: The study was initiated during the rabi season of 2017-2018 in Godagari and Tanore upazila of Rajshahi district, Sapaher upazila of Naogaon district (under draught prone area), and Kuakata of Patuakhali district under saline prone area. Three water saving irrigation technologies named drip fertigation, alternate furrow irrigation (AFI) and deficit irrigation were demonstrated for rabi crops like tomato, potato and wheat in drought prone area and watermelon, maize and sunflower in saline prone area. Nine farmers from drought prone area and ten farmers from saline prone area were selected to disseminate water saving technologies. Marketable yield of tomato in drip irrigation system is found highest (59.58 t/ha) followed by alternate furrow irrigation methods (56.76 t/ha). Water saved of tomato in furrow, alternate furrow and drip irrigation method which was found 19.82%, 47.3% and 55.8%, respectively over farmers practice. The highest yield of potato was found (34.56 t/ha) in alternate furrow irrigation method followed by furrow irrigation (32.44 t/ha)

method. The percentage of irrigation water saved of potato in alternate furrow irrigation and furrow irrigation method was 44.20% and 22.05%, respectively compared to farmers practice. The highest fruit yield of watermelon in all three trials (38.12 t/ha, 35.46 t/ha and 40.13 t/ha, respectively) were found in fertigation treatment. Water saved in drip fertigation in watermelon was about 21%, 23% and 19%, respectively compared to the farmers practice. The difference of grain yield of maize between furrow and alternate furrow method was only about 0.6-2.4%, which is very negligible. However, the amount of irrigation water applied was around 27-36% less in alternate furrow irrigation than that of every furrow irrigation in maize. Yield of sunflower was found higher in every furrow irrigation compared to alternate furrow irrigation but yield gap was marginal. Water productivity of sunflower was found higher (about 28% to 32%) in alternate furrow irrigation method than that of every furrow irrigation method. From the one year results it was found that the given water saving technologies performed better in all of the sites, therefore, farmersô responses were found positive. However, the dissemination program need to be continued in a greater scale to popularize these technologies among the local farmers.

Response of sesame cultivars to different drainage provisions: The objective of this experiment was to study the effect of different drainage spacing on sesame yield. The experiment was carried out at Lysimer field, BINA HQ, Mymensingh during the period from March 2018 to June 2018. The test varieties/cultivars were V_1 = Binatil-2, V_2 = Binatil-3, V_3 = Binatil-4. Experimental design was RCBD, with 3 replications. The imposed drainage treatments were: T_1 = Control (normal flat land, no special drain); T_2 = 100 cm wide beds and 20 cm drain (15 cm depth) between the beds; T_3 = 150 cm wide beds and 20 cm drain (15 cm depth) between the beds; T_4 = 200 cm wide beds and 25 cm drain (15 cm depth) between the beds. During the period of experiment, total 789 mm (268 mm in April and 488 mm in May 2018) rainfall was occurred specially vegetative and flowering stage of sesame. The cultivars showed significant difference in grain yield. Maximum yield (820 kg/ha) was obtained from V_1 (Binatil-2) and it is more capable to produce yield under drainage provision than that of V_2 (Binatil-3) and V_3 (Binatil-4). The treatments demonstrated significant effect on grain yield. Maximum yield (901.26 kg/ha) was obtained in T_4 (200 cm wide beds and 25 cm drain between the beds), whereas T_1 (normal flat land, no special drain) obtained 450 kg/ha.

Quantifying natural groundwater recharge using Tracer and other techniques: The objective of this experiment was to estimate the yearly recharge under field condition (at Ishwardi). Chloride tracer was applied as a pulse at 20cm depth within the soil profile (in the field, at 3 locations). Infiltration of precipitation transports the tracer downward. The subsurface distribution of applied tracers was determined in October by digging a trench for sampling. The Cl concentration was determined and recharge was estimated with standard procedure. Recharge was also estimated by water-balance method. The average recharge rate found (during 2017) under tracer technique was 49 mm, and 59 mm under water balance method; which in terms of percentage of rainfall, were 4.7% and 5.6%, respectively.

Irrigation management for Mustard at Nalitabari: The objective was to determine optimum irrigation requirement for higher yield of Mustard. The experiment was carried out in BINA Sub-station at Nalitabari during the period from 20 November 2017 to February 2018. The test varieties were V_1 = Binasarisha-9 and V_2 = Binasarisha-10. The experimental design was RCBD, with 3 replications. The imposed irrigation treatments were: T_1 = Control (Farmers practice /no irrigation); T_2 = Irrigation at early stage (15-17 days after sowing, DAS); T_3 = Irrigation at vegetative stage (28ï 30 DAS); T_4 = Irrigation at flowering stage (45ï 55 DAS); T_5 = Irrigation at early (15-17 DAS) and vegetative stage (28-30 DAS); T_6 = Irrigation at early (15-17 DAS), vegetative (28-30 DAS) and flowering stage (45-55 DAS). The cultivars showed significant difference except plant height. The irrigation treatments showed insignificant difference in except seed per pod. Treatment, T_5 (Irrigation at early (15-17 DAS) and vegetative stage (28-30 DAS)) produced highest yield (1.46 t/ha) among the treatments. From the results, it can be said that, for Mustard cultivation, irrigation at early (15-17 DAS) and vegetative stage (28-30 DAS) produced the highest yield.

Irrigation management for some Aman rice mutants (M4) under field condition: The experiment was carried out at field, BINA HQ, Mymensingh, to study the response of rice mutants to drought condition and to develop appropriate irrigation management strategy for the mutants. The seedlings (26 days old) were transplanted on 25 August 2017, and harvested on 29 October 2017. The cultivars were V_1 = N_{10}/300/P-2(1)-4-1(7), V_2 = N_{10}/300/P-2(1)-4-1(5), V_3 = N_{10}/300/P-2(1)-4-1(1) and V_4 = N_{10}/300/P-2(1)-4-1(8). The experimental design was RCBD, with 3 replications. The imposed irrigation treatments were: T_1 = Control [normal levee (Farmerôs practice), and rainfed]; T_2 = 20 cm height levee around the plot, and rainfed;
T_3 = 20 cm height levee around the plot, and supplemental irrigation during booting to soft-dough, if PASM drops below 85%. The cultivars showed significant difference grain yield, seed/panicle and Plant height. The irrigation treatments showed insignificant difference in grain yield and all yield attributing characters because of field condition. It was difficult to maintain treatment (T_3) properly due to excess rainfall. The highest yield (4.45 t/ha) was recorded in treatment T_2.

Irrigation management for wheat cultivars under saline condition: The experiment was carried out in the farmerôs field at Vatkhali, Shamnogor, Satkhira, during the period from December 2017 to April 2018. The test varieties were Binagom-1 and BARIghom-25. The experimental design was RCBD, with 4 replications. The imposed irrigation treatments were:
T_1 = Irrigation at CRI+ late tillering + booting-heading with existing saline water (with recommended fertilizer dose*), T_2 = Irrigation at CRI+ late tillering + booting-heading with existing saline water, with excess gypsum @90% (CRI + booting-heading); T_3 = Irrigation at CRI+ late tillering + booting-heading with 11-12 dS/m saline water, with excess gypsum @90% (CRI + booting-heading); T_4 = Irrigation at CRI+ late tillering + booting-heading with 11-12 dS/m saline water, with excess gypsum @50% (CRI + booting-heading) and + excess K @50% (CRI + booting-heading) [*Recommended dose : Urea-TSP-MoP-Gypsum-ZnSo4-Boric acid, as: 220-150-140-85-6-6 kg/ha]. The treatments showed insignificant difference in yield parameters except plant height. Treatment T_3 (Irrigation at CRI+ late tillering + booting-heading with 11-12 dS/m saline water, with excess gypsum @90% (CRI + booting-heading)) produced the highest grain yield (2.77 t/ha). The cultivars showed insignificant difference in yield parameters except seed/spike and grain yield. In conclusion, it can be said that, in saline area, Irrigation at CRI+ late tillering + booting-heading with 11-12 dS/m saline water, along with excess gypsum @90% (CRI + booting-heading) may be the practice for wheat cultivation.

Irrigation management and chemical amendment for soybean cultivars under saline condition: The experiment was conducted in the farmerôs field at Noakhali to identify critical stage of soybean with respect to salinity, and to develop appropriate irrigation management practice for higher yield of soybean. The scheduled treatments were: T_1 = Control (farmerôs practice/ no irrigation, no seed priming) ; T_2 = One irrigation at early/vegetative stage (20-22 DAS) ; T_3= One irrigation at flowering stage (45 DAS) ; T_4 = One irrigation at early stage + one irrigation at flowering stage ; T_5 = One irrigation early stage + one irrigation at pod formation stage (65 DAS); T_6 = No irrigation, with seed priming (18 hrs soaking in water, and then drying for 8 hrs) + 30% excess Gypsum; T_7 = No irrigation + Foliar application of Salicylic Acid (100 ppm, 20 DAS) + Sodium Silicate (100 ppm, at 45 DAS ; T_8 = 25% excess Gypsum and K + One irrigation at early stage + + Foliar application of Sodium Silicate (100 ppm, at 45 DAS); T_9 = Foliar application of Salicylic Acid at 20 DAS + One irrigation at flowering stage + Sodium Silicate at 60 DAS (100 ppm). The varieties were, V_1 = Binasoybean-3; V_2 = Binasoybean-5 ; V_3= BARI Soybean 6 (as Check). The design was RCBD, with split-plot. The cultivars showed significant difference in yield and yield contributing characters except plant height. The treatments showed insignificant difference in grain yield and all yield attributing characters. The cultivars produced reasonable yield under saline conditions. The experiment will be repeated in the next year to confirm the results.

Effects of Irrigation Management and amendments in Boro rice under Saline condition (Lysimeter study): The experiment was carried out at BINA Sub-station Satkhira (Lysimeter), to identify appropriate irrigation and other management practices for higher yield in saline area. The test varieties were

V1=Binadhan-8 and V2=Binadhan-10. The experimental design was RCBD, with 3 replications. The imposed irrigation treatments were: T_1 = Irrigation (at 0 DAD[1]) with 8-10 dS/m saline water at all stages (no amendment ï Control); T_2 = Irrigation with 8-10 dS/m saline water + Sodium Silicate (as basal) + excess gypsum @50% of recommended dose ** (at Vegetative + panicle initiation stage); T_3 = Irrigation with 8-10 dS/m saline water + excess gypsum @50% of recommended (at Vegetative panicle initiation stage) +Foliar application of Sodium Silicate (75 ppm, at 20, 40, 60 DAT[2]); T_4= Irrigation with 8-10 dS/m saline water + excess gypsum and K @50% of recommended (at Vegetative; + panicle initiation stage) +Foliar application of Sodium Silicate (75 ppm, at 20, 40, 60 DAT); T_5=Irrigation with 11-12 dS/m saline water + excess gypsum and K @50% of recommended (at Vegetative + panicle initiation stage) +Foliar application of Sodium Silicate (75 ppm, at 20, 40, 60 DAT); T_6= Irrigation with 11-12 dS/m saline water + Sodium Silicate (as basal) + excess gypsum and K @50% of recommended (at Vegetative + panicle initiation stage) + Foliar application of Salicylic Acid (75 ppm; at 20, 40, 60 DAT). The seedlings were transplanted on 7 February 2018 at Lysimeter, Satkhira sub-station. After establishment, treatments were followed. Due to inappropriate setting of drainage tap at bottom of the Lysimeter unit box, irrigation water was drained out quickly, and hence treatments could not be implemented properly. Among 18 sub-plot (Box), 2 boxes (R_2T_6 and R_2T_5) were damaged after starting treatment due to excess drain out of irrigation water.

Investigation of groundwater quality at Chapainawabgonj Sadar Upazila: The study was conducted at Nawabgonj Sadar upazila under Chapainawabgonj district to investigate the quality of water and make suggestion for different uses. The water samples were collected in the starting of irrigation period (Jan 30 -11 February 2018) and at peak of the irrigation period (23-30 April 2018) of Boro season. Different cations, anions, heavy metals (Zn, F) and different parameters such as Ec, pH, Sulfate, Chromium LR, Nitrite LR, Phosphate LR, TDS, Total Cl were determined. Zn, F, Total Cl, Sulfate, Chromium LR, Nitrite LR, Phosphate LR were determined by using HI 83099 COD Multiparameter Photometer. Ec, pH, TDS were determined by using Lovibond Water Testing Tintometer. The values of Zn, Cr, F were found below the maximum concentration value level recommended by the FAO (1985), WHO (2011), GOB (1997)& DPHE. If we consider FAO guideline based on TDS value, the water are suitable for irrigation at all location. But the pH value was little bit higher (FAO guideline range of pH 6.5-8.4) at the starting period of irrigation at all location. But at the end of the irrigation period the pH value became lower than the FAO recommendation maximum concentration of 8.4 at all location. The values of Zn, Cr, F were found below the maximum concentration level recommended by the FAO (1985), WHO (2011), GOB (1997) & DPHE.

1.3 Postharvest Technology of Crops

Effect of chitosan coating on the quality and shelf life of papaya: The experiment was conducted to standardize the chitosan coating on papaya during storage at ambient condition and investigated the quality and shelf life of papaya. There were five treatments using four different percentages of chitosan solution with one controlled. The physico-chemical compositions of the papaya were analyzed. The weight loss was gradually increased with storage duration but after full color development increasing rate was less for the 1.5 percent chitosan coating in papaya. The firmness and acidity contents of papaya were slightly decreased whereas the TSS, p^H, vitamin C, and ß-carotene contents were increased with the increases of storage duration. Using 1.5 percent chitosan coating showed better performance after 14 days of storage. Furthermore, the color parameters also give the best results using 1.5 percent chitosan coating in papaya for 14 days storage.Finally the results showed that the papayas were stored well up to 14 days at ambient conditions using 1.5 percent chitosan coating.

Standardization of sweet potato powder for soup: The study was undertaken to standardizethe sweet potato powder for soup preparation. The investigation was done for the changes of physico-chemical quality parameters and color of sweet potato as fresh and dried powder with and without blanched condition. The blanched sweet potato gave the less values both of physico-chemical quality parameters and color as compared to the without blanched condition. On the other hand, the blanched sweet potato

powder showed the less vitamin C and high ɓ- carotene content as compared to the without blanched powder but the reduction rate was slower in blanched powder after long time storage. Without blanched sweet potato powder showed light yellow color whereas the color was gradually increased and turned light orange color when it blanched. Finally, organoleptic test was done for preparing soup and it was concluded that the blanched sweet potato powder scored highest overall acceptance.

Standardization of processing method for pineapple juice: The experiment was conducted to standardization of processing method for pineapple juice during storage at ambient condition. It was investigated to produce value-added quality product from pineapple and how it would reduce postharvest loss. There were four treatments using four different pulp concentrations (15, 25, 35 and 45%). The physico-chemical compositions of pineapple juice were analyzed. The TSS, P^H, total and reducing sugar content were slightly increased and acidity content was decreased of stored pineapple juice. A substantial reduction was noted in ascorbic acid (vitamin C) and ɓ-carotene (vitamin A) contents of juice during storage. Therefore, the study results showed that the 45 percent pineapple pulp of total juice kept in glass container showed better quality of juice in an ambient condition.

Effect of vapor heat treatment on the postharvest quality of tomato at ambient condition: The experiment was carried out at Postharvest Technology Laboratory, Postharvest Technology Division, BARI, Joydebpur, Gazipur during 20 February to 8 March, 2017 to study the effect of vapor heatsterilization on self life and decay control of BARI Tomato 15. There were two treatment combinations comprising three maturity stages red, turning and matured green tomato at 55^0 C vapor heat for 5 minutes duration and with non treated. Total acidity and vitamin C content significantly affected by vapor heat treatment. Thus, ɓ- carotene content and total soluble solid significantly increases with increase in storage 5, 10 and 14 days of storage at 28^o C with 75% RH ambient condition. Vapor heat effectively controlled shrinkage and postharvest pathogenic rot of tomato, for that shelf life and marketability of tomato increased. The best performance observed in treated matured green tomato.

Effect of vapor heat treatment on the postharvest quality of mango at ambient condition: The experiment was carried out at Postharvest Technology Laboratory, Postharvest Technology Division, BARI, Joydebpur, Gazipur during 5 July to 19 July, 2017 to study the effect of vapor heatsterilization on shelf life and decay control of mango (Langra cultivar). There were two treatment combinations comprising at 55^0 C vapor heat for 5 and 10 minutes duration and with non treated. Vapor heat treatment significantly affects total acidity and Vitamin C content of mango, reduction depends on exposer time of vapor heat treatment. ɓ- Carotene content, total sugar content and total soluble solid were not affected by vapor heat. Postharvest pathogenic activities were suppressed due to vapor heat treatment, so infection and rot slowed down. Marketability and shelf life of tomato increased as a result.

Effect of heat stress treatment and edible wax coating on improving quality retention of sweet orange (var. Bari malta 1) during ambient storage: This research experiment was conducted in 2016 to determine the potential hot water treatments (HWT) plus fruit coatings that stimulate the fruit antioxidant system and will create a beneficial internal modified atmosphere which will be better maintain postharvest quality of sweet orange at ambient storage condition. Fruit dipped into hot water at 45°C for 30 mins performed best modify internal atmosphere that was determined earlier to conduct another experiment (5% O_2 and ~15% CO_2) and carnauba wax coating was selected as a surface coatings. Two factors having with hot water/without hot water and with coating/without coating were applied for the study. Fruit immediately after HWT using hand applicator on a washing & waxing line or left uncoated. Among the treatments, HWT+CRB fruit performed best in terms of overall quality and it significantly reduced weight loss (~8%) after 3 weeks fruit harvested from location 2 compared to other treatments. Wax coated fruit significantly increases fruit peel appearance (L, a*, b*) resulted fruit surface color turned from greenish to yellowish and exhibited shiny surface during storage. Coated fruit also showed more firmer than non-coated fruit after 3 weeks storage. Treatment, storage and fruit harvesting location interactions on TSS/TA ratio, weight loss, and firmness were significantly difference during storage. Consumer most preferred the overall quality of HWT + CRB fruit among the treatments. Consumers in

sensory panels ranked the overall acceptability in fruit harvesting location 1 (7.61 a) and location 2 (7.50 a) of harvested fruit treated with hot water plus carnauba-based coating higher than non-coated fruit for location 1 (6.17 a) and for location 2 (6.88 b) harvested fruit.

Effect of heat stress treatment and edible wax coating on improving quality retention of pomelo fruit (commercial var.) During ambient storage: This research experiment was conducted in 2016 to determine the potential hot water treatments (HWT) plus fruit coatings that stimulate the fruit antioxidant system and will create a beneficial internal modified atmosphere which will be better maintain postharvest quality of pomelo fruit at ambient storage condition. Fruit dipped into hot water at 45°C and ambient water for 45 mins that was determined to measure temperature profile without any fruit peel injury. Two factors having with hot water/without hot water and with coating/without coating were applied for the study and carnauba (CRB) wax coating was selected as surface coating for fruit. Fruit immediately after hot water treatment (HWT) using hand applicator on a washing & waxing line or left uncoated. Among the treatments, HWT+CRB fruit and hot water treated fruit performed best in terms of overall quality and it significantly reduced weight loss (~9%) after 3 weeks of storage compared to other treatments. Wax coated fruit significantly increases fruit peel appearance (L, a*, b*) resulted fruit surface color turned from greenish to yellowish and exhibited shiny surface during storage. Fruit also showed more firmer than non-coated fruit after 3 weeks storage. Temperature, coating and storage interactions on total soluble solids, ascorbic acid, total carotenoids, and titratable acidity content were also significantly difference during storage. Consumer most preferred the overall quality of HWT + CRB fruit and hot water treated fruit among the treatments. Among the treatments for location 1, most of the panelist marked higher score for hot water treated fruit with coated/without coated fruit (7.05 a) after 3 weeks storage. In case of overall fruit peel appearance, panelist extremely preferred hot water treated with wax coated fruit (7.55 a) and without wax coating (7.10 a). For harvested fruit from location 2, panelist ranked higher both coated and non-coated fruit considering overall acceptability but for overall peel appearance judgement, fruit treated with hot water then wax coated had higher score (7.50 a) among the treatments after 3 weeks storage.

Effect of vacuum frying temperature and time on the quality attributes of chips prepared from jackfruit slices: Quality attributes of jackfruit chips were investigated under vacuum frying temperature and time. After several trials it was found that jackfruit slices dipped into 80^0C water for 5 minutes and then fried into 110^0C to 130^0C temperature in vegetable oil for 10 to 30 minutes under vacuum condition is suitable for chips preparation. But, oil uptake is directly increasing with increase in frying temperature and time. According to the opinion of test panel judges the highest score considering all the sensory attributes was obtained by the chips preparted from 120^0 C frying temperature of 20 minutes frying time in the vacuum fryer machine followed by 110^0 C for 30 minutes and 130^0 C for 20 minutes.

Quality retention in litchi by postharvest treatments and modified atmosphere packaging: The experiment has conducted to investigate the effect of ascorbic acid, waxing material (carnova) and modified atmosphere packaging (MAP) on the shelf life and quality of harvested litchi fruit. Litchi fruits at commercial mature stage were fully immersed in the solutions of ascorbic acid for 5 minutes, coated with carnova and a combination of ascorbic acid and carnova was also applied. A hot air blower was used to quickly remove the water from fruit surface and then the fruits stored in 0.5% perforated polypropylene packets at 5±1° C.The MAP carried out by 0.5% perforated polypropylene packets delayed pericarp browning and fruit softening, and thus, extended the shelf life. The changes in fruit TSS, ascorbic acid, total acid contents and surface colour of fruit strongly suppressed and consequently extended at least 20 days extra storage life compared to control fruit.

Determination of formaldehyde in selected fruits and vegetables: The experiment was conducted to detect naturally produced formaldehyde in fruits and vegetables based on spectrometric analysis. Some vegetables like cabbage, brinjal and tomato and spices like onion and ginger were tested to estimate the amount of formaldehyde which was produced naturally. Boiling effect on naturally occuring formaldehyde was also be measured. Naturally occuring formaldehyde was detected in cabbage 2.573 ppm, brinjal 4.374 ppm,

green tomato 7.028 ppm amd ripe tomato 6.649 ppm. In spices group 6.744 ppm formaldehyde was determined in onion and 4.564 ppm in ginger respectively. Heat treatment like boiling can reduse formaldehyde concentration in agricultural produces.

Extension of shelf life of ridge and sponge gourd by maintaining postharvest treatments and temperature: Extensions of marketable life of ridge and sponge gourd using packaging and washing technique under different temperatures before marketing were evaluated. The marketable life of ridge and sponge gourd could be extended 15d more using 1.50% and 1.00% perforation polyethylene bag with maintaining temperature of $10\pm1^{o}C$ and $13\pm1^{o}C$ respectively. This storage conditions willmaintain freshness, color retention, low physiological loss in weight, reduce decay loss, retain nutrients like ß-carotene (8.21-61.33 and 35.19-61.13 µg/g) and vitamin-C content (8.25-4.71 and 8.65-8.21 mg/100 g) using perforated polyethylene bag (1.50% for ridge gourd and 1.00% for sponge gourd) as compared to ambient condition.

Effect of different pretreatments on quality attributes of dehydrated green chilli powder: A study was conducted to prepare green chilli powder using low cost processing technique and to study the physiochemical characteristics of green chilli powder. Chilli were treated with 200, 1000, 2000 and 3000 mg. Kg^{-1} $Na_2S_2O_5$ solution for 30, 60 and 120 min. followed by 3 min blanch and dried in 65^0C. 1% $CaCl_2$ solution and 2% ascorbic acid solution were used for two treatments. Furthermore drying temperature 50^0C was introduced for two samples. The results revealed that the SO_2 content of soaked chilli increased with increasing $Na_2S_2O_5$ concentration and soaking time. Thermal treatments from blanching and drying reduced the SO_2 residues in blanched and dried chilli. The nutritional quality in terms of proximate composition protein, fat, moisture, total carotene, vitamin C, ash and minerals contents of green chilli powder were also assessed. The results showed that the nutritional quality in all the samples of green chilli powder was almost higher than that of red chilli powder. Nonsulphited sample showed higher mineral content than sulphited sample. For colour measurement the range of maximum and minimum L*, a* and b* values are found 35.87-53.30, 82.84-123.83 and 13.17-25.89, respectively. After conducting organoleptic taste test of different treated and untreated green chilli powder packed in HDPE bag/plastic bouem and stored at room temperature (RT) and refrigerated temperature (RFT). The results for colour, smell, pungency and overall acceptability of 15 samples showed that pretreated with 1000ppm $Na_2S_2O_5$ solution for two hr. + blanched 3min + dried in 65^0C (S_1) and green chilli Soaking in water for 30 min. + 3 min blanched and dried in 65^0C (S_3) powder found better among other treated and untreated sample. In order to determine the suitability of those powder in a curry, it was decided to conduct organoleptic taste test of beef curry using above 2 samples with ripe chilli powder (collected from renowned company). The results showed that all the samples are statistically identical in respect of colour, flavour, pungency, taste and overall acceptability though there are little bit difference in scoring among each attributes.

Processing of annatto seeds and its potentiality of use as dye in food: The experiment was concerned to determine the processing technique of annatto capsule (AC) and to assess the overall acceptability as natural dye for food. Long shape (LS) AC showed better result compared to round shape (RS). Mid February harvesting time gave good colour compared to March. Processing was done in two ways; with seed and without seed. Water and fats were used as solvent for processing the annatto seed. The precipitation from water extraction, dehydrated in two different ways: firstly, in oven drying at variable temperature (60 and 80^0 C) and secondly, by sun drying ($35\text{-}40^0$ C). Drying time for oven were around 72- 96 hr and sun drying 190 hr. For conducting organoleptic taste test annatto dye of sun and oven dried with and without seed were evaluated. The final products of sun and oven dried (without seed) showed better result compared to others. The effects of treatments, packaging materials and storage time on the keeping quality of the annatto dye was determined. The dehydrated annatto powder (without seed) packed in plastic pot and stored at room temperature (RT) and refrigerated temperature (RFT). Both the products at RT and RFT were found better. The results for colour, flavour and overall acceptability of different samples showed that oven dried powder and fat extracted annatto oil found best among other treated (processed annatto powder with seed) sample. In order to determine the suitability of annatto

powder and annatto oil, it was decided to conduct organoleptic taste test of ñjarda polaoò compared to purchased colour (from market). These are S_1: Annatto oil (Extraction of annatto dye in fat), sample no. S_2: Purchased orange colour (from market, control), sample no. S_3: was prepared seed free annatto extraction in water followed by dehydration. The results showed that all the samples are statistically identical in respect of colour, flavour, texture and overall acceptability though there is little bit difference in scoring among each attributes.

Post harvest loss minimization of rice bran for quality bran oil: Heat treatment at 130-135^{0}C for 2 hrs, found suitable for stabilizing rice bran from increasing FFA% and lowering oil% for at least 28 days and it is expected that lipase activity might possibly inhibited or at least show down their activity by heat treatment even though we did not measure lipase activity in this experiment. We would like to recommend heat treatment as physical treatment, soon after harvesting bran from kernel in this regards. This particular physical treatment should be applied in auto rice mill promises just after harvesting fresh bran. In addition, it is necessary to explore biologically competitive inhibitor of lipase enzyme as an alternative approach which yet to be done. So there is a huge scope in basic research in this regard. Since RBO industries are facing challenges with lack of fresh bran, high FFA% containing bran with lower oil content and artificial crisis of bran even at harvesting season, so our findings could assist these RBO industries to stabilize rice bran with attainable quality up to 28 days after harvesting bran at parboiled milling condition. Industrial waste such as bleaching earth might have good potential to use as alternate fueling as well as fertilizer in Bangladesh.

Determination of physicochemical properties and quality of puffed, popped and flattened rice from newly released BRRI varieties: Puffed, popped and flattened rice were produced from 11 BRRI varieties to evaluate the quality of the products. Comparing few parameters (fully puffed rice, length and breadth increase percentage) with BR16 (Std), it was found that BRRI dhan59, BRRI dhan60, BRRI dhan62 and BRRI dhan66 varieties are more or less suitable for making puffed rice. Considering physical parameters, BRRI dhan60, BRRI dhan62, BRRI dhan65, BRRI dhan66 and BRRI dhan67 varieties can be used commercially for popped rice production. Among the tested varieties, BRRI dhan62, BRRI dhan64, BRRI dhan65, BRRI dhan66 and BRRI dhan68 produce similar/better quality flattened rice comparing with BR16.

Study on the effect of protein content on the basis of varietal difference, regional variation and different doses of nitrogen application at Boro season as well as seasonal variation at Boro, Aus and Aman season: The highest milling outturn (73%) of BR3, BRRI dhan28 and BRRI dhan29 was found in Rangpur but the lowest milling outturn (69%) of BR3, BRRI dhan28 and BRRI dhan29 was found commonly in Sonagazi with other regions. The lowest amylose content of BR3, BRRI dhan28 and BRRI dhan29 was found in Barisal but the highest amylose content was found in Shatkhira. The lowest protein content of BR3, BRRI dhan28 and BRRI dhan29 was found in Kushtia but the highest protein content was found in Barisal. Different varieties had different physicochemical properties. Higher dose of urea application on BRRI dhan29 increases higher protein content and higher yield but decreases amylose content. The lowest milling outturn and head rice recovery were found in Aus season. The lowest paddy length and 1000-grain wt. were found in Aman season. The highest protein content (9.5%) was shown in Boro season.

Forestry, NRM

Development/Financing/MoU/Evaluation of Research Projects

1. Germplasm conservation and farm productivity enhancement through the interaction of shade trees and tea based agroforestry system to mitigate the climate change.
2. Exploration, Identification, Characterization, Multiplication and *Ex-situ* Conservation of Endangered Forest Genetic Resources Including Medicinal Plants of Bangladesh.

3. Upliftment of Farmers Livelihood and Enrichment of Environment through Improved Agroforestry Practices in Char Land Ecosystem of Bangladesh.

Project Implementation

Implemented FAO funded project ñAddressing the 2030 agenda on climate change and food security through Climate Smart Agriculture" during 2017-2018.

Policy Level Contribution

Furnished Comments on the following aspects/ issues and send to the MOA

১. UNIDO Country Program Strategy 2017-2021
২. ভারত সরকারের Ministry of Earth Science কর্তৃক প্রণীত খসড়া Concept Paper
৩. জাতীয় রাজস্ব বোর্ডের আয়োজনে বাংলাদেশে অনুষ্ঠেয় বাংলাদেশ-ভারত Joint Group of Customs এর ১১ তম কেন্দ্রীয় সভার জন্য আলোচ্যসূচী প্রেরণ এবং ১০তম সভায় গৃহীত সিদ্ধান্ত বাস্তবায়ন অগ্রগতি প্রতিবেদন
৪. কলম্বো, শ্রীলংকাতে জলবায়ু পরিবর্তন অভিযোজন এবং কৃষির দুর্যোগ ঝুকি ব্যবস্থাপনা বিষয়ক কর্মশালায় উপস্থাপনের জন্য Country Paper
৫. লক্ষীপুর বিজ্ঞান ও প্রযুক্তি বিশ্ববিদ্যালয় আইন, ২০১৭
৬. বাংলাদেশ সুগারক্রপ গবেষণা ইনষ্টিটিউট আইন, ২০১৭
৭. বায়ুমন্ডলের ওজোনস্তর রক্ষায় গৃহীত Montreal ProtocolGi Aaxÿb Kigali Amendment অনুস্বাক্ষরের Bangladesh Development Forum(BDF) এর সভায় উপস্থাপনের লক্ষ্যে কৃষি মন্ত্রণালয়ের প্রতিবেদন/Concept Note
৮. পরিবেশ অধিদপ্তর কর্তৃক বাস্তবায়িত Bangladesh Third National Communication (TNC) to the UNFCCC শীর্ষক প্রকল্পের আওতায় প্রণীত Third National Communication প্রাতবেদনের
৯. সরকারি খাতে পন্য পরিবহনে জাহাজ ভাড়াকরন নীতিমালা, ২০১৮
১০. Submission on agriculture by Bangladesh to UNFCCC বিষয়ে মতামত
১১. জাতীয় দুর্যোগ ব্যবস্থাপনা গবেষণা ও প্রশিক্ষণ ইনষ্টিটিউট বিধিমালা, ২০১৮
১২. বন আইন, ১৯২৭ এর বাংলা ভাষান্তর এবং এর প্রস্তাবিত সংশোধনীর
১৩. ইট প্রস্তুত ও ভাটা স্থাপন নিয়ন্ত্রন আইন ২০১৩ এর সংশোধনীর
১৪. পরিবেশ, বন ও জলবায়ু সেক্টরের খসড়া জাতীয় বিনিয়োগ পরিকল্পনা (Country Investment Plan-CIP) এর মনিটরিং প্রতিবেদন

Research Management/Financial Management and Coordination

Review of forestry research Program of BFRI

Reviewed research program of Bangladesh Forest Research Institute and other organizations involved in forestry research and development have been reviewed and necessary guidelines have been provided. It was observed that BFRI took about 75 research programs, BFRI was suggested to undertake research program in future to cater to the needs of the end-users. Similarly, forestry activities of IFESCU and Khulna University were reviewed and a national program was developed.

Monitoring, Reviewing and evaluation report of programs of NARS institutes

Monitoring and evaluation of ongoing research activities of Bangladesh Forest Research Institute are regularly carried out by the Forestry unit, BARC. Monitored 11 CRG Sub-projects under Forest Unit, NRM Division in Dhaka, Norsindhi, Sylhet, Moulovibazer during January and February, 2018

Photo 3. Farmers field visit at Sylhet, CRG-NATP Phase-2 project; Agar research field

Photo 4. Visiting Agar industries at Sylhet making Agar oil from Agar plant

National and International Linkage

FAO funded project ñAddressing the 2030 agenda on climate change and food security through Climate Smart Agricultureò was launched by FAO. Dr. Md. Saifullah has selected as NPC (National Project Coordinator) in Bangladesh part. The project will be implemented within 6 member countries (Bangladesh, Laos, Mayanmer, Philppines, Cambodia and Vietnam).

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Project development/project financing

Cost and Return Analysis of Selected Crops in Bangladesh (ID:021), PBRG Coordinated Sub-project, PIU-BARC, NATP-2 Project

Project Implementation

Cost and Return Analysis of Selected Crops in Bangladesh (ID:021), PBRG Coordinated Sub-project, PIU-BARC, NATP-2 Project. Implementing Organization: Agricultural Economics Division of BARI and BINA

Policy Level Contribution

Different policy oriented comments were sent to the Ministry of Agriculture according to their needs /requirements. Some of those are as follows:

(i) Comments on the Trade Agreement between Bangladesh and Cambodia.
(ii) Comments on the draft Country Programme Evaluation (CPE) of FAO.
(iii) Suggestions to the Working Committee-3 on the Agreement on Agriculture and SPS.
(iv) Inputs for making Bengali version of Bangladesh Economic Review 2018.
(v) Comments on the DPP entitled ñestablishment of Jute Research Sub-station at Madarganj upazila in Jamalpur districtò.
(vi) Inputs for Bangladesh-Vietnam 2nd Joint Trade Committee held in Vietnam on 20-21 November 2017.
(vii) Comments on the draft Internal Cereal Procurement Plan-2017 for finalization.
(viii) Comments on the permission for paddy import from abroad.

(ix) Inputs for the Concept Note on Bangladeshôs LDC Graduation: Challenges, Opportunities and Actions for Achieving the Goal of the Ministry of Agriculture.
(x) Inputs for Bangladesh-India Secretary of Trade level meeting held in Dhaka on 7-8 February 2018.
(xi) Suggestions of BARC for discussion in the pre Budget Seminar:2017-18 organized by KIB.
(xii) Comments on the changes, modification and correction of Export Policy, 2015-2018.
(xiii) Comments on the Mungbean export from Bangladesh.
(xiv) Comments on the draft Bangladeshï UAE Trade Agreement.
(xv) Inputs for review of the 5th Bangladesh Trade Policy.

Monitoring, reviewing and evaluation report of programs/activities of NARS Institutes

Total 10 CRG Sub-projects as well as one PBRG Sub-project financed by PIU-BARC, NATP-2 project were monitored by the research personnel of AERS division. The implementing organizations were BARI, BRRI, BSRI, BAU, SAU (Dhaka), SAU (Sylhet) and BINA, Mymensingh. Besides, 21 of Research Activities under Special Budget of Ministry of Agriculture were monitored during this period and the implementing organizations were BJRI, SRDI, BADC & BIRTAN, Dhaka and BINA, Mymensingh. However, the expected research outputs were satisfactory in all projects.

Participation in the Training, Workshop, Seminar, Training-workshop etc (Local):
All personals attended in many Trainings, Workshops, Seminars, Training-workshops etc (Local) organized by different organizations.

National and International Linkages (MoU/Bilateral agreement, Collaborative Work plan signed. Highlights of activities undertaken under the MoU/Agreement, etc.

- Participation in the CAPSA-MARDI regional training workshop on Transfer of Agricultural Technology with Specific Focus on "Application of ICT for Resilient Agricultureò held in Malaysia.
- Participation in the 14th Session of the Governing Council of CAPSA held at UNCC in Bangkok, Thailand

Research Finding Highlights of the NARS Institutes

Bangladesh Agricultural Research Institute
Agricultural Economics Division

BARI 1
Socio-Economic Performance of *Bt* Eggplant Cultivation in Bangladesh
A study was conducted in 35 districts of Bangladesh during 2016-17 winter season for assessing the farm level performance of *Bt* eggplant in reducing pesticide use and cultivation cost and farm income. Five hundred five *Bt* eggplant farmers were selected purposively and 350 non-*Bt* eggplant farmers were selected randomly for the study. Net returns per hectare were Tk. 179,602 for *Bt* eggplant as compared to Tk. 29,841 for non-*Bt* eggplant. Pesticides were applied 11 times to *Bt* eggplant where as it was 41 times to non-*Bt* eggplant for controlling sucking pests. The *Bt* eggplant farmers saved 61 percent of the pesticide cost compared to non-*Bt* eggplant farmers,

experienced no losses due to fruit and shoot borer, and received higher net returns. The experience with *Bt* eggplant technology was encouraging most of the locations and off course this technology will significantly improve their socio-economic conditions in future as reported by the *Bt* respondents. All *Bt* and 86% non-*Bt* farmers wanted to cultivate *Bt* eggplant in the next year if they are provided with good quality *Bt* eggplant seeds/seedlings from the research station. For getting higher yield and economic benefits, in the course of technology dissemination, the importance of appropriate production practices must be emphasized.

BARI 2

Impact of BARIMung Varieties in Selected Mungbean Growing Areas of Bangladesh

The study was conducted in four mungbean growing districtsof Bangladesh namelyJashore, Rajshahi,Natore and Patuakhali. The study assess the level of adoption, impacts of using improved mungbean technologies and to explore the constraints to BARI Mung cultivation. A total of 120 farmers were selected by using simple random sampling technique and data were collected during rabi season of 2017-18. The findings of the study revealed that 92% farmers adopted BARI Mung-6, 7% farmers adopted BARI Mung-4 and 1% farmers cultivated BARI Mung-7 variety. Adoption of urea and MoP were found high but the use of TSP was medium and gypsum was low dose. About 41% farmers used mungbean seeds from their own source. Per hectare cost of BARI Mung cultivation was estimated to be Tk. 50851 on total cost basis and Tk. 31032 on variable cost basis. The major share in total cost was hired human labour (34%), followed by family supplied human labour (25%), and land use cost (15%). Per hectare average yield of BARI Mung was 1303 kg with gross return Tk. 84044/ha and gross margin Tk.53012/ha. The benefit cost ratios were 1.66 and 2.72 on full cost and variable cost basis. BARI Mung farmers found 115% higher yield and 28% stover than local variety. The adoption of BARI Mung has created employment opportunities, now BARI Mung seeds are available to most of the farmers. Farmers become enthusiastic towards BARI Mung cultivation due to less cultivation cost and financial benefit. About 45% farmers are interested to increase their mungben area in future. Infestation of insects and diseases, high wage rate of labour and heavy rainfall were the major constraints to BARI Mung cultivation. Breeders should develop stress tolerant variety as early as possible. Multiple picking of pod is a labour intensive procedure so mechanical devices should be evolved to harvest mungbean.

BARI 3

Adoption and Impact of BARI Musturd-14 at Farm Level in Bangladesh

BARI mustard-14 variety is a prominent mustard variety that is widely accepted by the farmers of Bangladesh. Adoption of this variety has created tremendous impacts on farmersô income and livelihoods. Data regarding this issues are scarce in Bangladesh that need to be evaluated. Therefore, the study was carried out to determine the impacts of adoption of BARImustard-14 variety on productivity, farm income and livelihood of the farmers in Tangail, Cumilla and Rajshahi districts. Propensity score matching method was used to assess the impacts of BARImustard-14 variety adoption. Asset pentagon approach was also used to find out the change of livelihood of farmers. It was found that the rate of adoption of BARImustard-14 was 38.95% at farm level. Probit model showed that education of the farmer, farm size, availability of seed, and influence of SAAO enhanced the adoption of BARImustard-14 variety. According to the result of the Propensity Score Matching method, BARImustard-14 variety adoption on average increased mustard productivity and farm income by 297 kg/ha and 15 to 59% respectively for adopters compared to non-adopters. Again, all kinds of adoptersô assets were also increased to some extent due to adoption of BARImustard-14 variety. Electricity use increased by 96.05%,

mobile phone increased by 88.82%, and sanitary situation improved by 86.84%. Most farmers mentioned that unfavorable weather, lack of knowledge on production technology, and price flexibility of output were the serious problems in cultivating BARImustard-14 variety, and the computed values of constraint facing index (CFI) were 121, 70, and 27 for BARImustard-14 farming. The study recommended to provide training to the farmers with the up-to-date information regarding BARImustard-14 cultivation technology. Agricultural extension agents can play a crucial role in this regard.

BARI 4

Study on Socioeconomic Condition, Risk and Uncertainty of Crop Production and Adaptation Strategy of *Haor* Community in Bangladesh

The study was conducted in four haor districts to examine the socioeconomic condition, livelihood pattern, existing cropping pattern, risk and uncertainty on crop production and their adaptation strategy during vulnerable situation. A total of 400 samples were interviewed taking 100 hundred from each district. Purposive simple random sampling technique was used for the selection of study areas and sample respondents. Both primary and secondary data were used in the study and data were collected during 2017-18. The study revealed that the education level of the highest 43% sample farmers were in primary level and 56% farmers were only engaged with agriculture. On the basis of farm category, landless farmers were found highest (48%) in Kishoregonj, small farmers were found highest (34%) in Netrokona district, Marginal farmers were found highest (40%) in Moulovibazar district and large farmers were found highest (4%) in Sunamgonj district. The percentage of most dominant cropping pattern only Boro based cropping pattern; Boro-fallow-fallow were found highest (74%) in Sunamgonj district. On the other hand only Boro-Fallow-T.Aman covered 56.7% in netrokona district. Early flash flood, hailstorm and thunderstorm, embankment broken, excessive rainfall & inundation and drought were the major risk and uncertainty found in the haor areas of Bangladesh. Construction of house, establishment of embankment, cultivation of short duration variety and migration were the major adaptation strategy of the haor community. Flash flood, lack of fallow land utilization, low water table and stony layer, siltation in land, river bank erosion, hailstorm and thunderstorm, labour shortage during Boro season, threshing and drying problems due to excessive rainfall, lack of short duration and HYV seed were the major constraints to expansion of agriculture in haor areas. Permanent establishment of haor protection embankment, construction of water reserve and rubber dam, expansion of low lift pump and fita pipe, expansion of usage of combined harvester, digging of haor and river every year were the steps needed to overcome the constraints.

BARI 5

Adaptation Strategy of Farming in Flash Flooded Haor Areas of Kishoreganj District

Bangladesh is a disaster prone country. Flash flood is the most frequent form of disaster that ravage millions of life, thousand acres of crops and ultimately breakdown the economic backbone of the country. Therefore, the study aims to describe adaptation/coping strategies usually practiced by the farmers against flash flood. The data contained in this paper were collected from both primary and secondary sources. Primary data were collected through structured questionnaire from 150 farm households in five haorupazilla under Kishoreganj district. The results show that farmers have a developed perception of climate change. These changes are translated by rainfall disturbance (early rainfall, delay cessation, bad rainfall distribution etc.), shortening of the winter season, increasing of temperature and sometimes violent winds. The study reveals that farmers of the haor areas adopt many strategies in response to climate change. The important adaptation strategies include adopting new crop varieties,

changing planting time, migration to cities, homestead gardening and crop diversifications. Among various crop varieties adopted by haor farmers, most of the area covered with short duration BRRI dhan28 (60%) followed by BRRI dhan29 (36%), ñ*Dhani Gold*ò variety, of Bayer crop science and ñ*Topa*ò/ñ*Chokka*ò/ò*Arparina*ò (4%) are found in the study area during 2017-18. Livestock, poultry and duck rearing could be encouraged with appropriate policy support.Targeted policy interventions are required to promote agro- based industries to create employment opportunities for the unskilled agricultural laborer and thus limit their migration

BARI 6

Adoption and Profitability of BARI Malta-1 in Some Selected Areas of Bangladesh

The study was conducted in three malta growing districts namely Khagrachari, Pirojpur and ChapaiNawabganj to know the adoption status of BARI malta-1 (sweet orange) variety, its farm level profitability and constraints, and impacts of malta cultivation on the livelihood of farmers. A total of 180 farmers taking 60 farmers from each district were randomly selected for this study. Data were collected through a pre-tested interview schedule during January-March, 2018. It was found that 91% malta farmers adopted BARI malta-1 variety in their gardens. Higher yield, profitability, sweetness, and less insect-pests infestations were the prime reasons for choosing BARI malta-1 at farm level. Besides, human labour, education, farm size, training on BARI malta-1 production, availability of quality saplings, and influence of extension personnel had significant influence on BARI malta-1 variety adoption. Farmers did not follow the recommended doses of manures and fertilizers due to lack of adequate knowledge on recommended doses. The establishment cost of a malta garden was estimated at Tk 7,62,650 per hectare. Among various cost items human labor, saplings, and rental value of land were the main cost items. The highest yield was reported to be 19.6 t/ha at $(5\text{-}10)^{th}$ year garden. The highest gross return was found Tk15,68,000at $(5\text{-}10)^{th}$ year garden and the lowest return was Tk8,28,160 at 3^{rd} year garden. The investment in establishing BARI malta garden is highly profitable since its rates of returns (BCR, NPV and IRR) were very high. Scarcity of saplings, green color, and lack of technical knowledge were the major constraints to BARI malta-1 cultivation. The study suggested to make saplings locally available, provide hand-on training to the interested farmers, and ensure low price of inputs for higher adoption of this variety.

BARI 7

Adoption and Impact of BARI Aam-3 on Farmer's Livelihood in Some Selected Areas of Bangladesh

The study was carried out to assess the impact of BARI Aam-3 adoption on the farmerôs livelihood in four mango growing districts namely Khagrachori, Bandorban, Naogaon, and Satkhira of Bangladesh. A total of 128 BARI Aam-3 growers and 72 non-growers were selected using multi-stage random sampling technique. The study revealed that among all the varieties, BARI Aam-3 appeared to be the most popular variety in the study areas in terms of last four year sale of stions (stock+scion). The estimated benefit cost ratio was 1.69 for BARI Aam-3 and 1.52 for other mango varieties which affirms investment in BARI Aam-3 is very much feasible than the other varieties. Besides, 43% respondents earned more profit by practicing intercropping. Respondent farmers met up 45% of their food consumption cost from the income of BARI Aam-3 followed by 20% for education purposes, and 20% for the development of garden. About 98% farmers opined that the cultivation of BARI Aam-3 mango variety has changed their life and brought solvency to their well-being. Due to the adoption of BARI Aam-3, small farmers could improve their human and physical capital by 54.34% and 48.17% respectively. In the case of medium farmer, human capital, financial capital and physical capital were increased by 68%,

60%, and 58% respectively. Absence of alternate bearing, higher preference of consumer, smaller size, and low disease infection were the important features of BARI Aam-3 for which it covered 47.5% of the total mango orchard in the survey area. On the other side, marketing problem, physical damage during rainy season, and short duration were the major constraints that created confusions on further adoption of this variety. Logit function indicated that age, family size, training, farm size, and extension linkage had positive and significant impact on BARI Aam-3 mango variety adoption and dissemination at the farm level. Further expansion is possible if extensive research was carried out to solve the problems of BARI Aam-3. Accordingly respective authority should take urgent action to create a sustainable market environment to ensure a better market price for the mango growers.

BARI 8

Financial Profitability of Barley Cultivation in Selected Areas of Bangladesh

The study was conducted in Pabna, Rajshahi and Tangail districts to assess the profitability of barley cultivation in Bangladesh. A total of 150 barley cultivating farmers, taking 50 farmers from each district, were randomly selected for this study. Descriptive statistics was used to analyze data. Comparatively aged farmers were cultivating barley by inherently. Nearly all of the farmers (99%) had agriculture as main occupation. Average farm size of the sample farmers was 1.26 ha and only 0.20 ha land were under barley cultivation which was about 22% of total cultivable land. About 32% farmers of each village were cultivating barley in their field. Highest percentage (41%) of the farmers had 2 to 11 yearsô experience of barley cultivation. All of the farmers except one (BARI-6) cultivated local variety of barley. Per hectare average yield of barley was found 1.80 ton which was highest in Pabna (2.85 ton) and lowest in Rajshahi (0.93 ton). Per hectare average gross return was estimated Tk. 79531 which was highest in Rajshahi (Tk. 100391) and lowest in Tangail (Tk. 46120). Per hectare average total cost was estimated Tk. 50251 which was highest in Pabna (Tk. 58917) and lowest in Rajshahi (Tk. 41712). Per hectare net return was estimated Tk. 29280 which was highest in Rajshahi (Tk. 58679). Average BCR on total cost basis was calculated as 1.58 which was highest in Pabna (1.56) and lowest in Tangail (0.92). On an average 41% farmers reported that they had no access of high yielding variety. To increase area under barley cultivation the researchers should encourage the barley farmers by giving high yielding variety and arranging training about its nutritional value and cultivation process.

BARI 9

Profitability Analysis of Elephant Foot Yam Production in Some Selected Areas of Western Part of Bangladesh

The study was conducted in Jashore, Kushtia and Satkhira areas during 2017-18 to know the agronomic practices of elephant foot yam farmers and to determine productivity and profitability of elephant foot yam as well as to identify the constraints to elephant foot yam production and to suggest some policy implications for further improvement. A total of 150 samples taking 50 samples from each district were randomly selected for data collection. Tabular and statistical analyses were done. Findings revealed that majority farmers were used Madrazi variety of elephant foot yam and inputs use were differed from area to area and manure and chemichal fertilizers use was seemed to be higher in all study areas which affect net profit of the farmers. The average cost of elephant foot yam production was estimated at Tk 463098/ha and Tk 424418/ha, respectively on the basis of total cost and total variable cost. The average yield of elephant foot yam was 27.457 t/ha in all areas. The average gross return, gross margin and net return were found to be Tk 770766/ha, Tk 346349/ha and Tk 307668/ha, respectively in all study

areas. Benefit cost ratio (BCR) was found to be 1.63 on total cost basis in all study areas. Though elephant foot yam production was found to be profitable in all study areas. But, farmers faced some constraints which hampered yield. The major constraints were lack of improved production technology and attack of viral and fungal diseases of elephant foot yam. So, research thrust was given on that line for better improvement of the crop.

BARI 10

Socio-Economic Study ofKharif Cauliflower Production in Jashore and Meherpur Districts of Bangladesh

The study was conducted in Jashore and Meherpur districts to estimate the profitability of cauliflower production and to find out constraints to its production during 2017-2018. Most prominent cauliflower varieties were Nimja, Marbel, Snowgade, Excel, Leader etc. The average cost of cauliflower production was Tk 220195/ha. The average head yield of cauliflower was recorded 22.66 t/ha in all study areas while it was 18.646 t/ha in Jashore and 26.674 t/ha in Meherpur. The average gross return, gross margin and net return of cauliflower were found to be Tk377325/ha, Tk180940/ha and Tk 157131/ha. Benefit cost ratio was found to be 1.73 on the basis of total cost.The cultivation of cauliflower was profitable to the farmers since per hectare total cost, gross return and net return of cauliflower. Major constraints were lack of good quality seed and variety, severe attack of pests, high price and adulterate of used seed, lack of training, high price and adulterate of pesticides and lack of knowledge about improved management practices. So, research thrust was given on that line for better improvement of the crop.

BARI 11

Socio-Economic Study of Kharif Cabbage Production in Jashore and Meherpur Districts of Bangladesh

The study was conducted in Jashore and Meherpur district to know the agronomic practices and profitability of kharif cabbage production during 2017-18. Farmers were cultivated Super sun, Autumn, Tropic sun, Quick, KK cross, Green sixty and Tropical queen variety of cabbage. Inputs use seemed to be higher in the study areas. The average cost of cabbage production was Tk203169/ha in all areas. The average yield of cabbage was recorded 33.08 t/ha in all study areas. The average gross and net return of cabbage was found to be Tk 267368/ha and Tk 64199/ha in all study areas. Benefit cost ratio was found to be 1.33 on the basis of total cost. Severe attack of insect (leaf feeder, cut warm etc.), disease (leaf spot, leaf curl, leaf blight, etc.), lack of knowledge about improved management practices were major constraints. So, research thrust should be taken for improvement of the crop.

BARI 12

Socioeconomic Impact of Agricultural Technologies Developed by the Research Stations in Chattogram Region

The study was carried out in three research stations namely RARS, Hathazari, ARS, Pahartoli and OFRD, Noakhali for identifying developed technologies by the research stations in last decade. In the case of impact study of the selected technology, 210 farmers was interviewed covering 13 villages under three Upazilaôs namely Hathazari, Fatikchari and Satkania in Chattogram District during 2017-18. Findings revealedthat in total 21 technologies have been developed by the three mentioned research stations. OFRD, Noakhali developed the highest number (10) of technologies followed by ARS, Pahartoli (6) and RARS Hathajari (5). In case of documentation the research stations documented their technologies in different forms such as scientific papers, leaflets. booklets, posters, books and scientific reports. Among the three

stations, the documentation status of the developed technology was found to be non-satisfactory except OFRD, Noakhali. Out of technologies, only BARI felon-1 has been assessed for impact study in the selected villages of Chattogram District due to resource and time constriants. Results revealed that the average area under Felon cultivation was reported to be 0.158 ha in all locations. The rate of Adoption of BARI Felon-1 was reportedly found 71%. The highest percentages of the respondents gathered information about BARI Felon-1 from DAE (58.63%) followed by seed dealers (31.77%), research stations (19%) and NGOs (17%). The average yield was found to be 413.57 kg/ha for all areas. The adoption status of individual technology of BARI Felon-1 was found unsatisfactory in all areas.The respondents had agreed on significant rate of positive socio-economic impacts of Felon cultivation in their livelihood. The variety of BARI Felon-1 gave the yield was not at per pointedly because of ignorance of the farmers, followed mixed cultivation practices, lack of knowledge or not following the modern production technologies, lack of irrigation water in dry season, not using the recommended dose of manures and fertilizers and on. But it still projects promise if the farmers could be acquainted, trained and put in practice with the modern production technology of BARI Felon-1. To overcome these problem, farmers should follow the recommended production technologies of BARI Felon-1 (for short term interventions) and to collect local germplasm and develop new variety of Felon for the region (for long term intervention) accordingly.

BARI 13

Present Status, Challenges and Opportunities of Pulses Crop in Some Selected Southern Char Land Areas of Bangladesh

Assessing the present status, challenges and opportunities of pulses crops on southern char land areas like -Madaripur, Shariatpur and Barishal was made through an extensive field survey during 2017-2018. The study revealed the present status with the profitability as well as challenges and opportunities of pulses crop. Farmers get a gross margin of Tk. 30785, Tk. 30814, Tk. 24402, Tk. of 24607 and Tk. 26347 per hectare by cultivating lentil, mungbean, chickpea, blackgram and grasspea, respectively. The study shows education, family members, farm size, experience and training are the significant determinants of willingness to cultivate more pulses crop. The study revealed that pulses production is becoming challenging due to losses of agricultural char land, adverse climate condition, lack of technological knowledge, attack of insect and diseases, lack of quality seeds, problems regarding marketing of pulses crop. But still there are lots of opportunities to grow more pulses with the fulfillment of the following criteria like proper utilization of fallow char land, use of flood or salt tolerant varieties, use of quality seed, adoption of new technology, and ensuring fair price of pulses crops.

BARI 14

Supply Chain Analysis of Major Vegetables Produced in Hilly and Coastal Regions of Bangladesh

Bangladesh witnessed a revolution in vegetable production over the last decade. According to the recent releases FAO report, Bangladesh has ranked third in the list of vegetables producing countries in the world. The country produced a total of 14.23 million tons of vegetables in 2014-15 while the growth rate marked a steady six percent yield in each of the last three years (MoA, 2016). In the existing supply chain, there are a number of middlemen which causes a huge gap between vegetable growers and end consumers. Again, the vegetable marketing information system rarely exists in proposed location for which the vegetable growers unable to get vegetablesô price and demand information. Therefore, the study was undertaken in hill and coastal region to examine the production technique, existing market, marketing system, supply chain and market infrastructure of selected vegetables market. Total approved budget for the study was Tk.19, 97,895/-. Two unfavorable situations were considered viz; Hilly and costal area

in Bangladesh. Four important vegetables, taking two from hill area and another two from coastal area were selected. Vegetables selection was finalized. Brinjal and Yard long bean were selected in hill areas on the other hand Cucumber and Bittergourd were selected in coastal region. The total sample size of the study was 1140 (600 farmers + 540 traders). Both primary and secondary data collection were going on. Primary data related to producer and traders of the selected vegetables were gathered from720 samples from four project locations out 1140 samples. The project will generate the information on production technique in unfavorable condition, different stresses in vegetable production, different marketing and supply chains of selected vegetables, detailed cost, margin, and profit at different levels of the supply chain, inefficiencies of supply chain for recommendation and constraints of vegetables production and marketing at different levels of supply chain in unfavorable condition.

BARI 15

Production, Marketing and Postharvest Loss Assessment of Guava in Bangladesh

The study was conducted in three districts namely Pabna, Rajshahi and Pirojpur during 2017-2018 to estimate the profitability, supply chain and postharvest loss of guava and explore related problems. A total of 120 farmers and 110 traders were selected randomly for the study. Per hectare average cost of guava cultivation was Tk. 2, 91,751. Per hectare average yield of guava was 14.7 ton. Per hectare net return from guava cultivation was Tk. 1, 90, 327. Guava cultivation was profitable in the study areas since the (BCR 1.99), net present value (Tk. 27, 58,191) and internal rate of return (76%) was very high. Four major marketing chains were identified. Marketing costs and marketing margin of Bepari were the highest among the intermediaries. The average postharvest losses were estimated to be of 11% and 8% at the farmersô and traders level, respectively. Total production and distance to the market were positively significant whereas sale price and packaging dummy were negatively significant to postharvest losses at farm level. Die of tree, lack of quality saplings and disease and insect and infestation were major production problem for guava. However, higher price of transportation and lack of efficient transport were the main marketing problem.

Bangladesh Rice Research Institute (BRRI)

Agricultural Economics Division

BRRI 1

Farm level adoption and evaluation of modern rice cultivation in Bangladesh

BRRI dhan28 and BRRI dhan29 were the leading Borovarieties which covered about 62% of total area. The adoption of modern varieties in this season was more than 99% of which BRRI varieties coverage was about 71%. In T. Aman season, BRRI dhan49 (11%) and BR11 (7%) occupied about 18% areas, where the coverage of the BRRI varieties was about 48%. In Aus season, the adoption of modern varieties was about 90% and the BRRI varieties covered almost 67% areas. BRRI dhan48 ranked the topmost (17%) position by the area coverage followed by BRRI dhan28 (15%). BRRI dhan29 was the utmost yielder (6.41 ton/ha) followed by BRRI dhan58 (5.98 ton/ha) in Boro season. Average yield of hybrids was 7.23 t/ha; whereas BRRI developed hybrids produced 7.58 t/ha in Boro season. In T. Aman season, BRRI dhan49 was the top yielder (4.60 t/ha) as followed by BRRI dhan52 (4.55 t/ha). On the contrary, BRRI dhan48 was found the out yielder (4.04 t/ha) in Aus season.

BRRI 2

Tracking of Climate Resilient Rice Varieties and Its Economic Performance at the Farm Level in Bangladesh

Adoption status of stress tolerant rice varieties

Submergence prone area

In T. Aman season of 2014, on an average area coverage of submergence tolerant rice varieties was 5.94%, among them BBRI dhan52 (4.30%) and BBRI dhan51 (1.63%) were dominant. During 2015, total area coverage of submergence tolerant varieties was 8.82%, which was higher compared to previous year.

Drought prone area

BRRI dhan56 and BRRI dhan57 are the two varieties for combating the drought situation in T. Aman season. For Aus season, BRRI dhan42, BRRI dhan43 and BRRI dhan55 are suitable to grow under drought condition. But the adoption rate of these varieties was not satisfactory at all both in T. Aman and Aus season during the study period (2014-15).

Saline environment

On an average, the adoption of saline tolerant rice varieties in T. Aman season was 6.14% during 2014,which slightly increased to 7.66 % in 2015. BRRI dhan41 covered the highest area (5.53%) among other stress tolerant rice varieties in Patuakhali district during Aman season of 2014. In Boro season of 2015, highest area coverage of BRRI dhan47 was 22.09%, which increased to23.45% during 2016 in *Patuakhali* district. However, on an average adoption rate of saline tolerant rice varieties was 3.79% in 2015, and 4.40% during 2016.

Yield of stress tolerant rice varieties

Yield of submergence tolerant rice varieties. During 2014, average yield of submergence tolerant rice varieties was3.65 t/ha, among them BRRI dhan52 yielded the highest (3.84 t/ha) and in 2015, yield of stress tolerant rice varieties was almost similar as in 2014.

Yield of drought tolerant rice varieties: During 2014, average yield of drought tolerant rice varieties was 3.75 t/ha in T. Aman season, among them BRRI dhan56 produced highest yield in Kushtia(4.09 t/ha) followed by Natore(3.96 t/ha) district. In 2015, yield of BRRIdhan56 and BRRI dhan57 was a bit lower compared to 2014, as a result average yield (3.14 t/ha) decreased a bit compared to 2014 in Aman season. In Aus season, BRRI dhan42 was the highest yielder (2.76 t/ha) followed by BRRI dha55 (2.65 t/ha) and BRRI dhan43 (2.61 t/ha) in drought prone area during 2014, and the average yield was 2.66 t/ha. In 2015, it was BRRI dhan55 (2.72 t/ha) and BRRI dhan42 (2.60 t/ha) as the top yielder and the next one, respectively. Average yield was 2.52 t/ha in this season.

Yield of salinity tolerant rice varieties: BRRI dhan40 produced the highest yield (3.85 t/ha) in Bagerhatand, Khulna district averaging 3.67 t/ha, followed by Satkhira (3.50 t/ha)in **T. Aman** season, and on an average, stress tolerant rice varietiesô yield was estimated to be 3.74 t/ha during 2014 and 3.43 t/ha in 2015. BRRI dhan47 yielded 5.33 t/ha and BRRI dhan55 yielded4.73 t/ha in Khulna region during Boro season of 2015, and average yield of stress tolerant varieties was 4.55 t/ha in the study area during 2015, which was (4.59 t/ha) almost similar to the yield of non-stress tolerant MVs. During 2016, although average yield of different stress tolerant rice varieties was mostly similar, performance of BRRI dhan55 and BRRI dhan61 appeared to be better yield and area coverage. The yield of Boro (4.27t/ha) was higher than T. Aman and Aus season in all the environments, consequently gross return was also higher compared to other seasons. Thus, development and dissemination of higher yield potential stresses tolerant variety

may enhance productivity and profitability of rice cultivation at the farm level in the stress ecosystem.

BRRI 3

Insight of Seasonal Agricultural Credit on MV Boro Rice Cultivation at Farm Level in Chapainawabganj District

RAKUB provided about 75% of total credit requirement of the farmers in the study villages during Boro, 2016/17. Although, there was large gap between the need and receipt of credit for small farmers (33%) followed by medium (25%) and large (18%), but small farmers used 48% of their credit for MV Boro rice cultivation, indicating that the they were more efficient to utilize their credit in rice production purposes compared to medium (35%) and large (23%) farmers. Insufficient amount of loan, higher non-interest cost and complicated credit rules were the major constraints as reported by 93%, 85%, and 75% farmers, respectively.

BRRI 4

Estimation of Costs and Return of MV Rice Cultivation at the Farm Level

Boro growers obtained higher yield consequently; higher gross returns followed by MV T. Aman and Aus growers. However, MV T. Aman growers received higher net return than that of Boro and Aus due to better market prices. Aus crop is riskier than in Boro and T. Aman. The increase in adoption of the recommended practices, stress tolerant varieties, and reduced seasonal price variation may facilitate higher production, and increase economic viability of rice production.

BRRI 5

Comparative economic viability of modern and local transplanted Aman rice cultivation in the coastal area of Bangladesh

Modern wet-season rice variety was a profitable farm enterprise at typical seasonal yield and current price even under farmersô practice. Besides, WS rice farming was found as a better option for livelihood other than offï farm waged activities. Gross income of rainfed wet season rice is significantly varied due to seasonal dispersion of yield and market uncertainty. In some of case, under farmerôs practice the chance of occurring negative net income of MV WS rice is also significant. However, economic viability (profitable and less risky) of the rainfed WS rice under research managed plot was tremendously higher than farmerôs practice. The key insight of modern technology introduction (variety and agronomic management) is associated with reduction of the risk of the rainfed crop cultivation along with profitability.

BRRI 6

Value Chain Analysis of Rice Bran Oil in Bangladesh: An Economic Investigation

Total production capacity of seven surveyed rice bran oil mill was147000 ton/year during 2016 and they produced 97,900 tons of oil, indicating that only 67% of the capacity of bran oil was utilized. Lower utilization of capacity of rice bran oil mill was due to shortage of bran to the mill. Total cost of rice bran oil production including byproducts was Tk.176,206/ton. However, about Tk. 89,187/ton was generated from byproducts of rice bran oil like wax, gum, DRBO and FFA etc. After deducting the returns from byproducts; manufacturing cost of bran oil was Tk. 87019/ton.

BRRI 7

Farmers' Perception of Climate and Environmental Change and Adaptation Practices to these Changes and Constraints of Cropping Systems Intensification in Southern Coastal Bangladesh

In Southern Coastal Bangladesh, farmersô adaptation strategies could be referred by the adoption of modern varieties, shifting of planting time, providing supplementary irrigation, growing dryï season rice and other crops, rice/fish/shrimp culture, homestead gardening, raising livestock, receiving credit, and carrying out off/non-farm work. The constraints of cropping system intensification included inadequate access to fresh-water for irrigation, soil salinity, excess soil moisture at sowing time of Rabi crops, inadequate access to suitable technologies at local level, lack of stress tolerant varieties, technologies and extension supports and price fluctuation. There exists great prospect to increase cropping intensity in the area through judicious use and management of reserved fresh-water, improving farmersô knowledge on crop management and increasing adoption of stress tolerant variety.

BRRI 8

Preference analysis of T. Aman rice varieties in the coastal areas in Bangladesh

In the preference analysis, the check variety BR11 and Sowarnagota were the most preferred T. Aman varieties in Dacope and Amtoli, respectively which are more typically risk escaping for small farmers in coastal regions. In addition to quantity of grain and straw, quality and stem strength, other phenotypic traits like growth duration substantially influenced to vote in favour of BRRI dhan73 and BRRI dhan66 in Dacope. Similarly, BRRI dhan53 and BRRI dhan66 were voted in Amtoli because these varieties could escape the occurrence of water stagnation in the fields. Besides, farmers could establish most DS crop within optimum seeding windows. Farmers rejected BRRI dhan62 and BRRI dhan54 in part because of high susceptibility to water lodging and infestation of vertebral pests. The preference analysis implied that environmental adaptability of a variety especially at maturity stage is more crucial consideration of farmers to select a new variety along with higher yield, plant height, strong stem, tillers per hills, panicle length, and grain size.

BRRI 9

Effectiveness of Boro Rice/Paddy Procurement Program in Some Selected Areas of Bangladesh

Government procurement program has positive impacts on both farmers and millers. Farmers obtained higher returns through selling paddy at procurement center than selling paddy at local market. Incremental margin per quintal paddy rice and clean rice of farmers and miller were Tk. 462 and Tk. 451, respectively. Inadequate quota, undue expectation of procurement staff, strict regulation about quality of paddy, husked rice, and payment system would be reported as major limitation of inefficient procurement systems.

BRRI 10

Rice Cultivation in Newly Independent Enclaves of Bangladesh: A Field Level Investigation

In both the study locations, most of the cultivated land was occupied by the modern rice cultivars. It also was noted that short duration varieties with less input demand and higher productivity were the big drivers to motivate the farmer regarding intensive practice of such varieties. Therefore, adoption of BRRI dhan58 in Boro and BRRI dhan49 in T. Aman season heralded the rapid adoption of new rice varieties in Patgram and Fulbaria, respectively. Farmers in both locations sell rice in the local market. They relied on Grameen Bank and some NGOs (RDRS and ASA) for agricultural and non-agricultural credit. However, the rice cultivation was badly constrained with higher irrigation cost, inputs price, disease catastrophe, and natural disasters. Good irrigation facility, smart extension service, and awareness regarding disease and

climate hazards with adaptation technologies could be suitable remedies to sustain the desirable productivity of rice farms.

Bangladesh Sugarcane Research Institute

Agricultural Economics Division

BSRI 1

An Economic Analysis of Yield Gaps of Sugarcane in Bangladesh

- Yield gap between theoretical and experimental yield is 15 t/ha. On the otherhand, the gap between experimental and potential yield is 10.50 t/ha between experimental and potential farm yield.
- The gap between potential farm yield and actual farmersô yield is 37.47 t/ha.
- The farmers used less inputs compared to experimental farm and potential farm trial. As a result they got less yields.
- The farmers used 40-30% less inputs compared to experimental and potential trial.
- BSRI varieties have the negative and significant impact on yield gap.
- Management practices like use of fertilizers, insecticides, irrigation and labour use for intercultural operation have the negative impact on yield gap.
- Farm size has the positive impact on yield gap.
- Family size, education level of farmers and contact with extension agents have the negative impact on yield gap.

BSRI 2

An Empirical Study of Street Marketing of Sugarcane Juice and its Economic Impact

- In Rajshahi district, juice vendor sells on an average 300 glass of juice per day. This amount of juice needs 150 pieces of sugarcane and Tk. 3,000/ day have been earned at the rate of Tk. 10/glass.
- In Dhaka district, juice vendor sells an average 300 glass of juice per day from 100 piece of sugarcane and they earn Tk. 4500/day. The price of one glass of juice was Tk. 15
- For making juice, 88% of juice vendors use their own crusher machine and rest of them used by rented crusher machine.
- Regarding experience of juice making business, 18% vendor has got 1 to 3 years, 50% has got 4 to 7 years and 32% for 7 and above.
- The working time of juice vendor is 5 to7 hours per day.
- Juice vendor received BCR 2.48 in Rajshahi and 2.50 in Dhaka city.
- There are only one sugarcane supply chain in Rajshahi district :
- Many problems are encountered by the juice vendors. In fact they do not have any specific place for making and selling sugarcane juice. They do this work at the crossroads. If they get a suitable place in the market, they can run their business smoothly.
- It was observed; the vendors were making and selling the juice in the open place which is not hygienic. However, if a clean net or cloth is placed around the crusher machine, it would be good for health aspects.
- There is a problem of drinking juice. Juice vendors used same glass repeatedly for drinking. The study suggested using one time glass or fresh bottle to solve the problem

Bangladesh Livestock Research Institute

Socioeconomic Research Division

BLRI 1

Climate Change, Livestock Production and Income Vulnerability- Bangladesh Perspective

The study identified some factors which had devastating effects on livestock growth and development such as extreme temperature, high humidity, less average rainfall, prolonged drought length duration, flash flood, cyclone, tornado, tidal surge and salinity in the costal belt and very recent added thunder storm with heavy lightening. Among the sampled farmers, 81% of the respondents opined that major livestock species were reducing over the last three decades. Livestock population were reducing over the years and 56% respondents stated this scenario. On the other hand, livestock rearing cost was increasing alarmingly and it was found 4.45 times compared to three decades ago. The study found a scenario of major livestock population which indicated that livestock population per household was declining over the decades. The study considered the household income flow of the respondentsô farmer from agriculture (crop, livestock, and fisheries), business and service sectors. All agricultural components are strongly influenced by climatic factors for its production behaviour, therefore, income variability occurred. Among the studied farm household 93% and 84 % were found vulnerable at present and 30 years ago, respectively. At present and 30 years ago average vulnerability was estimated 0.93 and 0.85, respectively. Frequent occurrence of viral and bacterial diseases caused huge economic losses to the HH. It was evident from the findings that farmers knowledge on disease is out broken now and then indicated that viral and bacterial diseases are fatal to livestock production. Heat stroke, repeat breeding and less conception rate fall livestock production into jeopardized condition. It would be wise to adapt with predictable and unpredictable climate change for sustainable and profitable livestock enterprise in future.

Bangladesh Institute of Nuclear Agriculture (BINA)
Agricultural Economics Division

BINA 1

Profitability of BINA Released Sesame Variety Binatil-3 in Some Selected Areas of Bangladesh

- **Estimation of the Cost and Return of Binatil-3 of Production**
- Total cost consists of variable cost and fixed cost that covered 91.53% and 8.47% of total cost for Binatil-3 production.
- The highest production cost was for human labour (42.62%), followed by fertilizer use (16.03%), power tiller (11.65%), and irrigation (10.11%).
- The average net return per hectare was Tk. 23232.57. The net return was highest in Kushtia (Tk. 33149.58 ha^{-1}) followed by Magura (Tk. 25318.01 ha^{-1}), Jhenaidah (Tk. 23824.76 ha^{-1}), Faridpur (Tk. 19362.44 ha^{-1}) and Madaripur (Tk. 14511.05 ha^{-1}), respectively.
- The average Benefit cost ratio was estimated at 1.48 and 2.16 on full cost and cash cost basis implying that the Binatil-3 cultivation at farm level was highly profitable. The highest BCR was found in Kushtia (1.66) followed by Magura (1.52), Jhenaidah (1.49), Faridpur (1.41) and Madaripur (1.32), respectively.

Major constraints to Binatil-3 cultivation

- Although Binatil-3 was a profitable crop in the study areas, farmers faced various constraints to Binatil-3 cultivation.
- About 81% farmers opined inadequate supply of quality seeds at proper time as a top ranked problem of Binatil-3 cultivation.
- Other constraints were infestation of root rot disease (70%), lack of technical know-how (60%), natural calamities (46%), higher price of fertilizers & insecticides (19%).

BINA 2

Yield gap of potential Aman rice variety Binadhan-7 in some selected areas of Bangladesh.

- The estimated yield gap I was 0.46 t h^{-1} (8.51 %.) and yield gap II was 0.54 t h^{-1} (10.80 %.). The lowest gap was 0.72 t h^{-1} (14%) observed in Rangpur district and it was the highest 1.24 t h^{-1} (24.20 %) in case of Jhenaidah district. Considering all, the average yield gap was 1 t h^{-1} (19.38%) and much scope for yield enhancement in the variety.
- Most of the farmers did not consider the recommended doses of seed rate, fertilizer and seedling age. The average seed rate was 33.65 Kg h^{-1}, Urea 105.58 Kg h^{-1}, TSP 86.70 Kg h^{-1}, MoP 57.70 Kg h^{-1} and seedling age 27.10 days respectively, indicating that they are either below or above the recommendation.
- In average 77% responded maintained line to line and plant to plant distance, 49 % used power tiller more than two times, 40% irrigated their lands 1-5 times and 57 % weeded their lands and 63 % spray pesticide and insecticide to control disease and insect.
- The coefficients for power tiller, seed, urea, tsp, mop, wedding, irrigation, farm size & experience were found to be positively significant at 1%, 5% and 10% level.

Bangladesh Forest Research Institute

Forest Economics Division

BFRI 1

Impact of participatory forestry on financial and livelihood of local people in northern region of Bangladesh.

Pilot survey was conducted to assess the required number of representable sample plots (area 100 m^2) as sample size for the forest resources assessment of selected strip plantations year under Pabna and Dinajpur SFD. Group discussions were arranged with local participants of three Forest Range Office areas in each SFD that were directly or indirectly have benefited from selected strip plantation. Most of the planted areas of 2000-01 in Dinajpur SFD, in the meantime, were already harvested. Due to unavailable data, no information on that plantation year was included. The required number of sample plots as sample size for the study areas were determined as 155 plots at 6.04% and 180 plots at 9% margin of error in the SFD of Pabna and Dinajpur respectively. Stratum (plantation year) wise that sample plots were allocated for data collection on the selected strip plantations year. The collected information were Girth/Diameter at 1.3 meter height of trees, number of tree species per plot, nursery and management cost, species and girth size wise tree round log prices, fuel wood price etc. The Stratified Random Sampling method was followed to assess the number of tree stocking, volume and biomass of trees and forest carbon storing in the selected year of plantations under the SFD of Pabna and Dinajpur.

BFRI 2

Impact of Co-management on forest resources and livelihood of forest dependent people in Chunati Wildlife Sanctuary (CWS), Chattogram.

Status of Forest Resources :

- Total number of species 63 nos.
- Average number of tress/ha. 838.33 nos. (dbh > 5cm)
- Average number of sapling/ha. 1933.33 nos. (height >1m, dbh 1-5cm)
- Average number of seedling/ha. 4750.00 nos. (height < 1m, dbh < 1cm)
- 95% trees lies in GBH class 15.70 cm-80.00cm
- Forest is very poor in compare to forest product

Computer and GIS

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 involves overall management of Information and Communication Technology (ICT) related activities in view of hardware, software, networking etc. The ultimate goal was to establish BARC as information hub of NARS so that overall agricultural research system becomes strengthened and robust in terms of information availability, accessibility, dissemination etc. through online system to cater information need of stakeholder in agriculture sector. The unit plays a vital role to establish/strengthen ICT infrastructure to facilitate MIS related activities/services among NARS institutes. The activities also involved in preparing technical specification for procurement of computer hardware, software, networking and related goods/accessories, evaluating technical proposal, receiving and distributing ICT goods etc. The unit also provides support for troubleshooting of hardware, software, network, internet/email and related services for smooth running of the system. In addition to that, it conducts various ICT based capacity building training, workshop, seminar for the personnel of BARC and NARS institutes. Besides, the unit conducts a lot of other activities such as preparation of progress report, need assessment, review and evaluation of research program, recruiting of computer personnel etc. Personnel of the unit are also working as innovation officer and member of innovation team of BARC formed under Governance Innovation Unit (GIU) of Prime Ministerôs Office.

Geographic Information System (GIS) is another important functional part of the unit. Maintenance, necessary updating and output preparation of AEZ land resources database and local level Upazila Nirdeshika database (soil, land, nutrition and others) is an on-going activity of this unit. Land suitability assessment and crop zoning was an important outcome of GIS activity.

The unit has also provided strategic and technical support in establishing the National Agricultural Display Center (NADC) at BARC.

Major activities of Computer & GIS Unit

The personnel of Computer & GIS Unit accomplished the following activities during the period from July 2017 to June 2018:

Data Centre Operation

Following activities regarding server and network administration performed:

Bit Defender antivirus (no. of user licence 140) was procured and installed in all computers (desktop, laptop, workstation and server) of BARC for the protection of computers from malware and virus. The Bit Defender antivirus is a light software and it is managed centrally from cloud.

Procurement and distribution of PC, Printer and Scanner etc. was done.

Upgradation of BARC internet bandwidth to 60 Mbps from 20 Mbps is done. Internet service availability and email account creation (email under barc.gov.bd domain) for BARC officers was done for newly recruited officers time to time. It is a part of routine activities.

National Agricultural Display Centre (NADC) Operation

Supervised, monitored and provided technical support in ensuring smooth functioning of the digital part such as Kiosk, Digital signage, TV screen, storage server for digital content, network devices etc. through troubleshooting and maintenance activities.

Development and up-gradation of digital contents of National Agricultural Display Center

Upgradation of digital display center through a web portal, 102 agricultural technology of 12 NARS Institutes & text image video are display through LAN and internet

An inception workshop of ñDevelopment and up gradation of digital contents of National Agricultural Display Center (NADC) at BARCò held at BARC on 15 Feb 2018. About 60 participants from BARC & focal point of 12 NARS Institutes attended in the workshop

PI visited 6 (SRDI, BARI, BRRI, BJRI, CDB, BLRI) institutes personally, others were communicated through phone and e-mail, requested to send the published/unpublished documents including videos/photographs, etc.

Development of Upazila land suitability assessment and Crop Zoning System of Bangladesh project

Crop Zoning project is being implemented with the coordination of Crops Division of BARC. Following activities were done during this period:

- Recruitment of manpower
- Organized inception workshop
- Procurement of goods and equipment
- Formation of expert committee for crop rules and socio economic data
- Awareness workshop at BARI
- Two meeting with expert committee and relevant stakeholder
- Selection of 300 upazila out of 491
- Updated land and soil information of 20 (twenty) upazila
- Finalization land suitability assessment and crop zoning methodology framework
- Creation of 32 new upazila admin and soil map
- Finalization of 70 (**s**eventy) crops selected on priority basis (area coverage and importance) for suitability analysis under the crop zoning study
- Prepared draft crop rules (soil, climate, water requirements of crops) for 50 (fifty) crops
- Finalization of socio-economic factors and questionnaire for socio-economic data collection
- Development of demo software for socio-economic data management.

Establishment of Climate Service for Agriculture Management and Crop Monitoring System for Bangladesh

Facilitate BARC with Server (1), Storage (1), Desktop PC (3), Laptop (1), TV with camera and speaker for video conferencing (1), 8GB RAM (20)

Facilitate on the job training on ñApplication of GIS and Remote Sensing for Agriculture and Drought Monitoringò at ICIMOD, Nepal. Two participants (one from BARC and one from BARI) attended 12 days training program at Nepal.

Arranged training workshop on ñUse of satellite data products for drought monitoringò held on 15-19 April 2018 at BMD.

Arranged training workshop on ñUse of satellite data for ground water monitoringò held on 26 April 2018 at BARC

Filled up baseline survey questionnaire named ñSERVIR Capacity Self-Assessment: HKH Partnersò and sent to ICIMOD

Establishment of Agricultural Technology Information Network in Asia

During this period e-content of agricultural production technologies of 16 crops were developed and uploaded to AFACI website.

Crop calendar for 5 (five) crops have been prepared and published 30,000 copies of five crops (6000 copies for each crop).

As an important activity of the project an annual evaluation workshop of AFACI projects in Bangladesh has been organized.

Updating of information in AFACI website (news and events, publications, technologies, etc.)

Success story of crop calendar published

A day long training on crop calendar was conducted at Narshingdi district

Directory of annual agricultural research programme of NARS for 2017-18 published.

Database and apps development

Project monitoring system simplified and web based software developed. Testing of the software is going on.

Previously developed applications are updated as needed during this period.

Maintenance and Updating of BARC Website

BARC web portal (www.barc.gov.bd) was updated regularly based on data received from different sections/division. Moreover BRRI cross checks BARC website as per instruction from MOA innovation team. It is update as per BRRI feedback and reported to MOA

Website update related report sent to MoA within 5th day of each month.

Continuation of GIS Activities

Maintenance and necessary output preparation of AEZ land resources database and local level upazila nirdeshika database (soil, land, nutrition and others) has been continuing as an on-going activity. AEZ land resources data was used for crop zoning study of Bangladesh. Also, the information of 15 (fifteen) upazilas of upazila nirdeshika database were used in SPGR GIS sub-project for crop zoning study.

Crop zoning project is utilizing the AEZ database. The 32 newly created Opazila is demarcated using the data of AEZ database

Support to BARC and different component of NATP as PEC and TEC member

Necessary supports have been provided to BARC and NATP for procurement of goods, works and services.

Support to Divisions/Sections of BARC for Hardware/Software; Data analysis; Information Sharing and Resource Management

Support provided to different divisions/sections to fix various types of computer hardware and software problems. Several types of maps, land resources, climatic and other data have been provided to scientists/researchers/extensionists as per requirement.

Support for planning, budgeting and procurement of computer resources (hardware, software & accessories etc.)

Support provided in the form of requirement assessment, specification preparation, budgeting for procurement of computer hardware, software and accessories under BARC and different projects i.e. NATP and KGF.

Functioning of BARC Innovation Team

Service innovation work plan-2018, Innovation Report-2017, Progress report of BARC activities according to ICT Policy 2015 were prepared and sent to MoA

Conducted 12 Innovation team meeting at BARC

Information of innovation team and its activities were uploaded to BARC website under the menu Innovation as per guideline of MoA

Attended all monthly innovation meeting arranged by MoA

Initiated the activities according to the Innovation workplan-2017-18. Online monitoring of projects has been developed. Testing is ongoing.

Developed Online project monitoring system

e-Filing administration and support

e-Filing administration activities including user creation, update, delete etc. performed

Report generation and send to MoA

e-Filing training and support to different unit/division

Human Resources Development

Sl. No	Title	Duration	Participant	Venue	Founded
1.	**Training on "Implementation of e-Filing"**	20-21 May 23-24 May 27-28 May	Total 76 participants attended in the training program.	Computer & GIS Unit, BARC	
2.	**Training on "ICT For Office Management" (Staff)**	29 May-4 Jun; 5 -11 un 2018	Total 56 participants attend in the training program	Computer & GIS Unit, BARC	
3.	**Workshop on "Digital Service Roadmap-2021"**	10-12 Jun ô18	Number of Participant ï 54		
4.	**Training workshop on "Use of satellite data**	15-19 Apr ĉ18	20 Participants from BARI, BMD, BRRI,	BMD	**ICIMOD**

Sl. No	Title	Duration	Participant	Venue	Founded
	products for drought monitoring"		DAE, SRDI, BJRI, CIMMTT, ICIMOD, IUB and BSMRAU attended in the program.		
5.	**Training workshop on "Use of satellite data for ground water monitoring"**	26 April 2018	17 participants from BARC, BARI, BRRI, DAE, BMDA, BWDB, IWM and CIMMYT attend in the program.	BARC	**ICIMOD**
6.	**Training on "Electronic Government Procurement (eGP)"**	2-4 Dec 2017	Total 20 participants attended the training.	BARC	
7.	**Training on "Crop Calendar"**	19-12-2017	40 participants (Farmer, UAO, and SAAO) of Narshingdi district attend in the training program.	Narshingdi	**ATIN, AFACI project**
8.	**Showcasing of innovative**	06-08-2017	Showcasing of innovative services held at BARC auditorium on 06-08-2017 with the assistance of MoA and A2I.		
9.	**Training on SPS (Service Process Simplification) with help of MoA and A2I.**		Training on SPS (Service Process Simplification) with help of MoA and A2I. 20 participant from BARC, BADC , and DAE attended in the program.		
10.	**Inception workshop of**	27-02-18	About 50	BARC	**Crop**

Sl. No	Title	Duration	Participant	Venue	Founded
	Crop Zoning project		participants from BARC, BARI, BINA, SRDI and relevant org. attend in the workshop.		**Zoning project**
11.	**Awareness workshop of crop zoning project**	25.06.18	47 participants of BARI attended in the program.	BARI	**Crop Zoning Project**
12.	**Inception workshop of NADC Project**	15 Feb 2018	About 60 participants from BARC & focal point of 12 NARS Institutes attended in the workshop	BARC	

Other activities

a. Meeting/seminar/workshop participation: The personnel of Computer and GIS unit attended various meetings/seminars/workshops under different capacity at BARC and other organizations during this period. Some of those are focal point meeting and workshop, PCR workshop, stakeholder workshop, monsoon and climate related workshop, innovation in service delivery workshop, social media adda etc.

b. International Visit: Mr. Hasan Md. Hamidur Rahman, Director (Addl. Charge), Computer and GIS attended in the (a) AFACI Program Workshop on Animal Science and Extension during 4-8 September 2017 at Lao PDR.

c. Report to MoA: During this period, following ICT related reports/documents prepared and sent to Ministry of Agriculture (MoA):

- Innovation activities report of BARC according to Innovation plan 2017-18
- Monthly e-Filing, e-GP reports
- Monthly website update/upload reports
- Input provided to admin section for monthly integration meeting of MoA
- Progress Report of BARC activities according to ICT Policy 2015
- Progress Report of BARC activities according to Digital Bangladesh Taskforce
- Online service & Process simplification Service Report
- Opinion of BARC on ñProposed Copernicus Cooperation Arrangementò
- Comments on two ICT related project proposal of DAE

d. Other Reports:
Published Directory of Annual Agricultural Research Programme of NARS institutes 2017-18
Published ñSuccess story of Crop Calendarò under ATIN-AFACI project

e. Digital World 2017 participation
Attended Digital World 2017 exhibition and showcase following 2 e-services from BARC:

1. Land suitability assessment and crop zoning of Bangladesh (*cropzoning.barcapps.gov.bd)*

2. Online crop calendar (*cropcalendar.barcapps.gov.bd)*

II. HUMAN RESOURCES DEVELOPMENT

Crops

Review workshop on Insect Management Programme of NARS Institutes: Research Progress 2016-17 & Research Programme 2017-18

A day long annual review workshop on Insect Management Programme of NARS Institutes: Research Progress 2016-17 & Research Programme 2017-18 was held on 02 August 2017 at Bangladesh Agricultural Research Council (BARC). The workshop was aimed to avoid duplication of programs among NARS institutes and to develop programme based on the national priority. The inaugural session of the workshop was chaired by Dr. Mian Sayeed Hassan, CSO and Member Director (Crops) (In-charge). Dr. Mohammod Jalal Uddin, the Executive Chairman of BARC was present as the Chief Guest. In the inaugural session Dr. Md. Harunur Rashid, Principal Scientific Officer, Crops Division, BARC welcomed the participants and presented the last yearôs expert opinion and recommendation. Scientists of Disease Management from eight NARS institutes viz. BARI, BRRI, BJRI, BSRI BINA, CDB, BTRI and BSRTI presented their research progress, 2016-17 and research programme, 2017-18. Four expert members of respective field were also present in the workshop and gave their opinion/suggestion of research based on the national demand. Proceedings prepared based on the comments and opinion made on the workshop was sent to the respective institutes for necessary actions.

Review workshop on Disease Management Programme of NARS Institutes: Research Progress 2016-17 & Research Programme 2017-18

A day long annual review workshop on DiseaseManagement Programme of NARS Institutes: Research Progress 2016-17 & Research Programme 2017-18 was held on 03 August 2017 at Bangladesh Agricultural Research Council (BARC). The workshop was organized for avoiding duplication of programmes among NARS institutes and sharing knowledge and experiences among the NARS scientists. The inaugural session of the workshop was chaired by Dr. Mian Sayeed Hassan, CSO and Member Director (Crops) (In-charge). Dr. Mohammod Jalal Uddin, the Executive Chairman of BARC was present as the Chief Guest. In the inaugural session Dr. Rina Rani Saha, PSO (Crops), BARC delivered welcome address and briefing on last year (2015-16) recommendations.Scientists of eight NARS institutes viz. BARI, BRRI, BJRI, BSRI BINA, CDB, BTRI and BSRTI presented their research progress2016-17 and research programme 2017-18on disease management of different crops. Four expert members of respective field were also present in the workshop and gave their opinion/suggestion of research based on the national demand. Proceedings prepared based on the comments and opinion made on the workshop was sent to the respective institutes for necessary actions.

Review workshop on Crop Improvement Programme of NARS Institutes: Research Progress 2016-17 & Research Programme 2017-18

A two day long review workshop on ñCrop Improvement Programme of NARS institutesò was held at BARC during 09-10 August, 2017. Dr. Mohammod Jalal Uddin, Executive Chairman of BARC was present as Chief Guest and Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC chaired the inaugural session. Dr. Md. Abdus Salam, Principal Scientific Officer (Crops), BARC gave welcome address with brief on the last year recommendation of the

workshop. Dr. Mohammod Jalal Uddin have given special emphasis on the crop improvement programme for achieving high crop productivity, food security as well as nutrition security to meet the demand of growing population of the country and also fulfill the Sustainable Development Goal (SDG). He also mentioned that research thrust should be given on high yielding Aus rice variety and bio-fortified rice variety. The chief guest opined to ensure nutritional security, more thrust to be given on vegetables and fruits research and development. The chairperson of the session Dr. Md. Aziz Zilani Chowdhury said that collaboration among the NARS institutes needs to be strengthened for the development of agriculture sector. He stressed on to develop climate resilience technologies. He also mentioned that to enrich gene pool, collection of genetic resources program should be strengthened. He highlighted on adaptive research in the stress-prone areas and mentioned research emphasis should be given on emerging issues like wheat blast.

Five technical sessions covering Varietal Improvement through Conventional Breeding of Cereal Crops (rice, wheat, maize, sorghum, millets etc.), Oilseeds and Pulses, Horticultural Crops (fruits, vegetables, spices, tuber crops etc); Varietal Improvement through mutation, Varietal Improvement through Biotechnological approaches and recommendations sessions were included in two dayôs workshop. Scientists of BARI, BRRI, BINA, BJRI, BSRI, CDB and BSRTI participated in the workshop. Dr. Mohammod Jalal Uddin, Executive Chairman, BARC; Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops); Prof. Dr. Lutfur Rahman, Adviser ACI Ltd. and Dr. Md. Shamsher Ali, Former Director General, BINA chaired the Technical Session I,II, III and IV respectively. Dr. Mohammod Jalal Uddin, Executive Chairman, BARC chaired the Recommendation Session. Dr. Lutfur Rahman, Adviser, ACI Ltd.; Prof. Dr. Md. Shahidur Rashid Bhuiyan, Dept. of Genetics & Plant Breeding, SAU, Dhaka; Prof. Dr. Lutful Hassan, Dept. of Genetics and Plant Breeding, BAU; Prof. Dr. Rakha Hari Sarker, Department of Botany, DU and Dr. Md. Mamtazul Haque, Former CSO, BARI were present as Expert Member in two day long workshop.

Respective scientists of seven NARS institutes presented their research progress (2016-17) and research programmes (2017-18) on crop improvement. Almost all major crops such as rice, wheat, maize, oilseed, pulses, vegetables, fruits, tuber crops, spices, flower, jute, sugarcane, cotton and silkworm & mulberry were included in the crop improvement programme.
The expert members of the review workshop are satisfied to see the research programme and achievement in different crops addressed by the NARS institutes. However, the comments and suggestions were made by the experts and valued participants, which could be considered in developing research programmes towards achieving SDG Goal as well as food and nutritional security of the country.

Review workshop on Crop Production Programme of NARS Institutes: Research Progress 2016-17 & Research Programme 2017-18

A three day long review workshop on crop production of NARS Institutes was held at BARC during 6-08 August, 2017. The objective of the workshop was to review the progress of 2016-17 and research programme of 2017-18 of the NARS Institutes. Besides, the review of the workshop is to avoid duplication of research and to take coordinated programmes as well as improving the research programmes. A total of 80 participants composed of the NARS Institutes such as BARI, BRRI, BJRI, BSRI, BINA, BTRI, BSTRI CDB, Extension Department (DAE) and BARC. Five renowned scientists in the relevant field from Agricultural Universities and Research Institutes acted as expert members in the workshop. The inaugural session was chaired by the Executive

Chairman of the BARC where Dr. Akram H. Chowdhury, Chairman, Barind Multipurpose Development Authority (BMDA) and Mr. Chaitanya Kumar Das, Director, Field Service Wing, Department of Agriculture Extension (DAE) were present as the chief guest and special guest, respectively. Dr. Mian Sayeed Hassan, CSO (Crops), BARC presented the recommendations of 2015-16 made for each institutes and coordinated the review workshop .The workshop was divided into five technical sessions and also a recommendation session. Research progress for 2016-17 and proposed research programs for 2017-18 were thoroughly discussed and expert members of respective fields gave their valuable opinion/direction of research based on the national demand. Finally some general as well as institute-wise comments were made and sent to respective institute for implementation.

Progress Review Workshop on CRG sub projects of NATP Phase-2 under Crops Division, BARC

A three day long workshop on ñProgress Review of CRG Sub projects under NATP Phase-2ò was held at BARC during 25, 26 and 28 February 2018. Principal investigator of 62 CRG sub-project, Scientists of BARC, Expert members and invited Scientist were participated in the workshop. Dr. Md. Kabir Ikramul Haque, Executive Chairman of BARC was present as Chief Guest, Dr. Mian Sayeed Hassan, Director, PIU-BARC, NATP Phase-2 was present as Special Guest and Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC chaired the inaugural session. Dr. Md. Abdus Salam, Principal Scientific Officer (Crops), BARC gave welcome address with the brief of program. Principal Investigator of 62 CRG sub-project presented their research progress. The expert members of the Progress Review Workshop and participantsexpress their views on project activities. Four expert members were also present in the workshop and gave their opinion/suggestion for successful completion of the CRG sub-projects.

Project Completion Workshop on Integrated Management System of Plant Genetic Resources: Pan Asian AFACI Project- "Collection, characterization and promotion of rice, chilli, cucumber and melon in Bangladesh"

A Project Completion Workshop on Integrated Management System of Plant Genetic Resources: Pan Asian AFACI Project - ñCollection, characterization and promotion of rice, chilli, cucumber and melon in Bangladeshò was held on 22 August 2017 at BARC Conference Room-1, Farmgate, Dhaka to finalize the project completion report and catalogue. In the inaugural session, Mr. Mohammad Nazmul Islam, Additional Secretary (PPC), Ministry of Agriculture was present as chief guest and Dr. Abul Kalam Azad, Director General, BARI and Dr. Bhagya Rani Banik, Director General, BRRI were present as special guest. Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC delivered the welcome address and Dr. Md. Abdus Salam, Principal Scientific Officer (Crops) presented the overall activities of the project. The inaugural session was presided over Dr. Mohammod Jalal Uddin, Executive Chairman, BARC. Professor Dr. Shahidur Rashid Bhuiyan, Sher-e-Bangla Agricultural University, Dhaka; Dr. Md. Khairul Bashar, Former Director (Research), BRRI and Dr. Md. Mamtazul Haque, Former CSO, BARI, Gazipur were present as the expert members of the technical session. The technical session was chaired by Dr. Mohammod Jalal Uddin, Executive Chairman, BARC. In this session, Bangladesh Agricultural Research Institute (BARI) and Bangladesh Rice Research Institute (BRRI) presented their project completion report and catalogue. After their presentation, an open discussion conducted and recommendations were made by the scientist and experts.

Inception Workshop of PBRG Project- Collection, Conservation and Characterization of Important Plant Genetic Resources

Programme Based Research Grant Project entitled *Collection, Conservation and Characterization of Important Plant Genetic Resources* Funded by NATP Programme-2, PIU, BARC, Which coordinated by Crops Division, BARC with eight components named: BARI, BRRI, BINA, BJRI, BSRI, BSRTI, CDB and BAU. A day long annual review workshop on Collection, Conservation and Characterization of Important Plant Genetic was held on 21 May 2018 at Conference Room-01 of Bangladesh Agricultural Research Council (BARC). The workshop was aimed to inform the objective and the component wise work plan for the sub-project and receive feedback from the participants and the experts to improve the activity plan and methodology based on the national priority. The inaugural session of the workshop was chaired by Dr. Md. Aziz Zilani Chowdhury, Member Director, Crops Division, BARC and the Coordinator of the sub-project. Dr. Md. Kabir Ikramul Haque, the Executive Chairman of BARC was present as the Chief Guest. Dr. Mian Sayeed Hassan, Director, PIU-BARC was also present as special guest.
The invited expert members in the workshop were Dr. M. Matiur Rahman, Former Director General, BARl, Prof. Dr. Md. Shahidur Rashid Bhuiyan, Dept. of Genetics and Plant Breeding, SAU, Dr. M. Khairul Bashar, Former Director (Research), BRRI, Dr. M. Mamtazul Haque, Former CSO, BARI, Dr. M. Shamsher Ali, Former Director General, BINA. The Principal (PI) or Co-PIs of eight NARS institutes viz. BARI, BRRI, BJRI, BSRI BINA, CDB, BSRTI and BAU presented their research programme.

Training Workshop Global Plan of Action Reporting and Collection & Documentation of Plant Genetic Resources in Bangladesh

The Training Workshop on ñGlobal Plan of Action Reporting and Collection & Documentation of Plant Genetic Resources in Bangladeshò held on 24 -26 April, BARC, Farmgate, Dhaka-1215. The overall objective of the workshop is to enhancing quality and coverage of data reporting on the Second Global Plan of Action and capacity development of stakeholder on PGR management system. About 35 participants from different NARS Institutes, Agricultural Universities and Private sectors were attended the training workshop. A foreign Resource Person Dr. Stefano, Secretary of the Intergovernmental Technical Working Group on PGRFA, Plant Production and Protection Division, FAO, Rome, Italy and seven local experts were attended the training workshop as resource person. Dr. Wais Kabir, Executive Director of KGF was present as Chief Guest, Dr. Stefano was present as Special Guest and Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC chaired the inaugural session. Dr. Kabir mentioned that we are fully committed to manage the countryôs rich biodiversity with the spirit of Constitution and that of the Convention on Biological Diversity to which Bangladesh is a party. He also told that plant genetic resources are the key components of not only the agricultural production system but also of the eco-system. Plant genetic resources are the basic material for Introduction, Domestication and Breeding Programmes. Dr. Stefano address on general policy and implementation of the Treaty and its Multilateral System (MLS) of access and benefit-sharing. Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC informed the reporting status of Second Global Plan of Action. He also mentioned the reporting importance of Sustainable Development Goal Indicator 2.5.1. The present PGR management activities are inadequate. More systematic conservation and characterization is urgently needed. Therefore, establishment of the National

Plant Genetic Resources (NPGRI) along with enactment of Plant Varieties and Farmers Right Protection Act is essential. Dr. Zilani well come Dr. Stefano, Secretary of the Intergovernmental Technical Working Group on PGRFA for coming Bangladesh and thanks for attending this training workshop as a resource person. Deliberations in the training workshop were focused on following topics:

- Overview of the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture.
- PGR reporting for the Sustainable Development Goals.
- Role of Biodiversity in Food Security.
- Plant Genetic Resources and its National & International Perspective.
- Exploration and Collection of Plant Genetic Resources.
- Characterization and Evaluation of Plant Genetic Resources.
- Characterization and Evaluation of Geographical Indication Crops.
- Conservation and Utilization of Plant Genetic Resources.
- Plant Genetic Resources: Legal Issues.

Farmers and field level extension officers training on Fruits and Vegetable Production following Good Agricultural Practices (GAP)

Farmers & field level extension officers training on ñFruits and Vegetable Production following Good Agricultural Practices (GAP)ò under AFACI-GAP project was conducted 01 December, 2017, at Narsingdi District. Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC was attended as Chief Guest while Mr. Md. Latafat Hoaasain, Deputy Director, DAE, Narsingdi was Chaired the inaugural session of the training. Twenty four participants including 18 demonstration farmers (brinjal, bitter gourd and banana) with six Sub-Assistant Agricultural Officers (SAAO) were participated in the training programme. Trainers from BARC, BARI and DAE have given lectures on GAP guidelines, production technologies including pest and disease management, and field management according to GAP of the focus crops. Farmers showed very keen interest on the new concept of GAP and they showed very much satisfaction to select Narsingdi as the GAP project site. This is the first GAP activities in Narsingdi District which is one of the commercial vegetables and fruits growing areas. Dr. Mian Sayeed Hassan, Chief Scientific Officer (Crops), BARC and Principal Investigator (PI) of AFACI-GAP project organized whole training activities.

Professional Training on Good Agricultural Practices (GAP)

Two batches of professional training on ***Good Agricultural Practices (GAP) Standard and Compliance Criteria in Fruits & Vegetables*** under AFACI-GAP project was organized in collaboration with Bangladesh Agricultural Research Institute (BARI) on 20 & 21 December, 2017 at BARI, Gazipur. Dr. Bhagya Rani Banik, Executive Chairman, BARC was the Chief Guest while Dr. Abul Kalam Azad, Director General, BARI was present as a Special Guest and Dr. G M Abdul Halim, Director, Horticulture Research Center Chaired the concluding session of the training and distributed the certificates among the trainees. Whereas Director (T&C), Director (Research) and Director (SS) of BARI were also present at the inaugural session and given their valued remarks on GAP. Dr. Mian Sayeed Hassan, Chief Scientific Officer (Crops), BARC and Principal Investigator (PI) of the AFACI-GAP project gave the welcome address covering training course brief. Eighty scientists from different Divisions, Regional Stations and

Sub-stations of BARI were participated in the training programme. Dr. Mian Sayeed Hassan, Chief Scientific Officer (Crops) and Dr. Rina Rani Saha, Principal Scientific Officer (Crops) as trainers from BARC covering 5 sessions in each batch on GAP Concepts, Principles, standards, Compliance Criteria, Checklists, Certification process, Auditing techniques etc. delivered through lectures. This training created huge interest among the participants and hopefully some trainers will be developed from this training. Scientists are interested for conducting research program on GAP for safe fruits and vegetables production. Dr. Mian Sayeed Hassan, coordinated the training activities.

Training on Phytosanitary Measures and Food Safety Issues in Bangladesh

A day long training programme on Phytosanitary Measures and Food Safety Issues in Bangladesh have been organized by the Crops Division, BARC and sponsored by Project Implementation Unit-BARC, National Agricultural Technology Program Phase II project on 09 May 2018 at BARC, Dhaka. The objectives of the training were to improve knowledge and skills of scientists and officials, dealing with phytosanitary and food safety matters in the country. A total of 40 scientists and officers from NARS institutes (BARI, BRRI, BJRI, BSRI, CDB BSRTI and BARC), BADC, DAE, BSTI, Hortex Foundation and other private organizations (BRAC, ACI Seed, Lal Teer Seed and PRAN) have were attended the training program. Dr. Md. Kabir Ikramul Haque, Executive Chairman of BARC was present as Chief Guest where Dr. Mian Sayeed Hassan, Director, PIU-BARC, NATP Phase-2 attended as Special Guest and Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops), BARC chaired the inaugural session. Dr. S. M. Khorshed Alam, Director (Manpower & Training), BARC, Farmgate, Dhaka gave welcome address with a brief of presentation of the program. Relevant specialized resource speakers from FAO, BARI, BAU, BARI and DAE were invited to deliver lectures on Sanitary and Phytosanitary Measures in Fruits and Vegetables Supply Chain; Pesticide Residues and Food Safety Issues for Fruits and Vegetables, Food Safety and Biosecurity Issues Related to Phytosanitary Measures in Bangladesh, Adulteration in Food and Human Health Hazards and Regulatory Framework for Plant Protection (Plant Quarantine), respectively. In the training manual, five theoretical lectures and in addition, the Plant Quarantine Act, 2011 has been included.

Planning and Evaluation

Training Workshop on Project Development and Management

A five day-long training workshop on ñ*Project Development and Management*ò was organized by the Planning and Evaluation Division, BARC during 14-18 January 2018. Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC was present as chief guest in the inaugural session. Dr. A.S.M Anwarul Huq, Member-Director (AERS) presided over the inaugural ceremony. Senior Officers comprising Member-Directors, Directors, CSOs and PSOs from different divisions of BARC were present in the inauguration ceremony. Dr. Md. Abdul Awal, Chief Scientific Officer (Planning & Evaluation), BARC and the course coordinator of the workshop delivered the welcome address. Twenty nine participants from the different NARS institutes including BARC attended the training workshop.

Resource persons were from BARC, National Academy for Planning and Development (NAPD), Office of the Comptroller General of Accounts and Directorate of Fire service and Civil defense, Ministry of Home affairs. The topics of the training workshop were project cycle, project appraisal, logical framework, preparation of different types of project documents (DPP/RDPP/TPP/RTPP), developing winning research proposals, result-based monitoring, PPR-2008, financial delegations, SWOT, objectives and problem tree

analysis etc. The training workshop was conducted based on class lectures, practical sessions and open discussions. The chief guest in his speech mentioned that this training workshop was organized to make the participants conversant with project planning and management. The chairperson of the training workshop in his speech expected that this training would be helpful for the participants to prepare and manage different kinds of projects properly and efficiently. The workshop ended on 18 January, 2018 through a certificate giving ceremony where the Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC was present as chief guest.

In the opening ceremony Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC was present as chief guest. Dr. A. S. M. Anwarul Huq, Member Director (AERS), BARC, Dr. Sultan Ahmmed, Member Director (NRM), BARC, Dr. Monowar Karim Khan, Member-Director, BARC and Dr. Md. Abdul Awal, Chief Scientific Officer, BARC were along with the chief guest.

Seminar on Action Plan of Ministry of Agriculture for achieving Sustainable Development Goals (SDG's)

A day-long seminar on ñAction Plan of Ministry of Agriculture (MoA) for Achieving Sustainable Development Goals (SDGôs)ò was organized by Planning and Evaluation Division, BARC on 12 February 2018 at BARC conference room-1. Dr Md. Kabir Ikramul Haque, Executive Chairman, BARC was presided over the Seminar. All Member Directors, Directors, Senior scientists and officers were attended the Seminar. The main objectives of the Seminar was the awareness building among the scientists/officers of BARC on the SDG Action Plan of MoA. Dr. Kabir Uddin Ahamed, Principal Scientific Officer, Planning and Evaluation Division presented the seminar paper. He reported that the world community has adopted 17 Goals with 169 Targets and 232 indicators. It aims are to end poverty and hunger, reduce inequalities empower woman and generate inclusive growth ñLeaving no one behindò. Dr. Kabir Uddin Ahamed highlighted the detailed Action Plan of MoA in his presentation which will be implemented up to 2030. Dr. Paresh Chandra Golder, Member-Director (Planning and Evaluation) of BARC mentioned that the Action Plan of MoA for achieving the SDGs was prepared by several meetings with contribution of different institutes/organizations under Ministry of Agriculture. Dr. Md. Kabir Ikramul Haque, Executive Chairman of BARC suggested in his concluding speech that all scientists of NARS should be taken research programs following the Action Plan of MoA so that we can achieve the targets by 2030.

Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC presided over the seminar. Senior scientists/officers are also present in the seminar. Dr. Kabir Uddin Ahamed, Principal Scientific Officer, BARC presented the seminar paper.

Director General of International Rice Research Institute (IRRI) visits Bangladesh Agricultural Research Council (BARC)

A five- member delegates of the International Rice Research Institute (IRRI) with the leadership of Dr. Matthew Morell, Director General visited Bangladesh Agricultural Research Council (BARC) on 07 March 2018. During interaction meeting with the scientists of the council, Dr. Morell briefed on the enhancement of nutritional and livelihood sensation by developing value added rice and promoting quality rice, He stressed more focused attention towards the development of rice cultivars for heat, drought and water logging tolerance. Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC briefed about the ongoing activities; and achievement of BRRI. He also mentioned about the extension collaborative works with internal organizations like AVRDC, CIMMYT, UK, DFID, etc. Dr. Nafez Meah, Representative, SA, IRRI and Dr. Humnath Bhandari, IRRI Representatives in Bangladesh was also present with the team.

Discussion between IRRI delegations and BARC scientists during the visit of Dr. Matthew Morell, Director General of IRRI at BARC office. Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC was present as chairperson.

Workshop on National Agricultural Policy-2018 (*Draft*)

A workshop on ñNational Agricultural Policy-2018 (Draft)ò on was held on 11 March 2018 at the Bangladesh Agricultural Research Council (BARC) with the financial support from Food and Agriculture Organization (FAO) of the United Nations. Matia Chowdhury MP, Minister for Agriculture, Government of the Peopleôs Republic of Bangladesh was present in the workshop as Chief Guest. Dr. Md. Abdur Razzak MP, Chairman of the Parliamentary Standing Committee, Ministry of Finance and member of Parliamentary Standing Committee, Ministry of Agriculture; and Mr. M. A. Mannan , MP, member of Parliamentary Standing Committee, MoA were present as Special Guests. Mr. Mohammad Moinuddin Abdullah, Senior Secretary, Ministry of Agriculture presided over the workshop. Dr. Wais Kabir, Executive Director, Krishi Gobesona Foundation and Ex-Executive Chairman, BARC presented the Key-note paper. A total of 400 participants from different ministries, Universities, NGOs, POs, Development Partners, Agriculture Entrepreneurs and farmersô representatives attended the workshop. A considerable number of suggestions/ recommendations were provided by the participants e.g. consideration of Hill agriculture following Hill Tractôs Council Act, Agriculture tourism, Renewable energy, Genetic Resource, Nanotechnology, Establishment of Gene Bank, linkage among Research, Extension and Education institutions, price support to farmers, Strengthening PPP in Agriculture, emphasis on the SDGs in the New Agricultural Policy, socio-economics etc. These suggestions and recommendations have been incorporated in the National Agricultural Policy 2018ò.

A view of the Chief guest, Special guests, Chairperson and key-note speaker in the workshop

A view of the participants comprising of the representatives of different ministries, Universities, NGOs, POs, Development Partners, Agriculture Entrepreneurs and farmers.

Inception workshop of Farming Systems Research and Development (FSRD), PBRG sub-projects of NATP-II

Three day long workshop for three FSRD projects was held during March 2018 titled ñClimate Resilient Farming Systems Research and Development for the Coastal Ecosystemò; ñImprovement of Farm Productivity through Intervention with Improved Agricultural Technologies in Char land Eco-Systemò & ñIntegrated Farming Research and Development for Livelihood Improvement in the Plain land Eco-systemò under NATP phase-II through the coordination of Planning and Evaluation Division of BARC. One hundred ninety five participants attended in the inception workshop including farming system specialists, BARC Scientists, Principal Investigators (PIs) and Co-Principal Investigators (Co-PIs) of the

respective projects from NARS institutes. Bangladesh Agricultural Research Council is coordinating all the three projects. Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI) and Bangladesh Institute of Nuclear Agriculture (BINA) are implementing institutions for the FSRD Coastal Ecosystem project. Bangladesh Agricultural Research Institute (BARI), Bangladesh Institute of Nuclear Agriculture (BINA), Bangladesh Sugarcrop Research Institute (BSRI) and Bangladesh Livestock Research Institute (BLRI) are working as implementing institutes in the Char land Eco-System project. The Plain land Eco-system project is being implementing by Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI) and Bangladesh Fisheries Research Institute (BFRI). A letter of agreement was signed on 04 February 2018 for the projects. Total budget for the three projects was Tk. 110000000.00 (Tk. Eleven Crores) of which Tk. 3,70,00,000.00 (Three Crore Seventy Lakh) for Plain land Ecosystem, Tk. 3,70,00,000.00 (Three Crore Seventy Lakh) for Charland Ecosystem and Tk. 3,60,00,000.00 (Three Crore Sixty Lakh) for Coastal Ecosystem. Duration of project is three years five months (February 2018-June 2021) for BARC component and three years (February 2018-January 2021) for NARS institutes. The plan of activities are discussed and revised based on the recommendations of the workshop.

View of presentation on the workshop

APA Review Meeting on 23 to 24 April, 2018

Planning & Evaluation Division of Bangladesh Agricultural Research Council organized a meeting on 23-24 April 2018 to review the draft APA of Agriculture Ministry for the fiscal year 2018-19. APA team management related expert pool members (Prof. Dr. M. A. Satter Mondal, Ex-Vice Chancellor, Bangladesh Agricultural University and Ex-Member, Planning Commission; Dr. Md. Nazmul Islam, Ex-Secretary, Ministry of Agriculture and Mr. Md. Enamul Haque, Ex-Director General, Department of Agricultural Extension) were present in the meeting. The meeting was presided over by Dr. M. A. Satter Mondal. A total of 110 participants comprising of the heads of Institutes/organizations under MoA along with APA chief and focal points attended the meeting. After in-depth discussion on the prepared draft APA of agriculture ministry and APA of respective departments/organizations, all members came to a common consensus to finalize the draft APA for fiscal year 2018-19.

Progress Review Workshop on Research Programme of 2017-18 under Research and Innovation fund of Ministry of Agriculture

A two day Progress Review Workshop on Research Programme of 2017-18 under Research and Innovation fund of Ministry of Agriculture was organized by Planning and Evaluation Division in association with the Technology Transfer and Monitoring Unit of BARC during 27-28 June, 2018. Mr. B. M. Enamul Hoque, Additional Secretary (Audit), Ministry of Agriculture was present in the workshop as chief guest. Dr. M. Kabir Ikramul Haque, Executive Chairman, BARC chaired in the inaugural session. Dr. Abul Kalam Azad, Director General (BARI) was present as special guest and Dr. Paresh Chandra

Golder, Member-Director (Planning and Evaluation), BARC delivered welcome address with brief presentation of special fund.

In four technical sessions principal investigators from nine institutes (BARI, BRRI, BINA, BJRI, BSRI, SRDI, CDB, BIRTAN and BADC) participated in this workshop and presented 44 research programmes of 2017-18. After detailed discussion, the following recommendations were adopted in the workshop.

- The achievements of research programmes of 2017-18 were found satisfactory and should be highlighted in 3-4 bullet points for sending to Ministry of Agriculture.
- The money should be utilized properly following to Special Fund Guideline -2016.
- The research and innovation fund of MoA will be provided for the continuation of those research programmes which are expected to be stopped or terminated due to shortage of money.
- The unspent money should be deposited to government treasury within the first week of July 2018.
- Research area should be in line with the priority areas mentioned in the Special Fund Guideline-2016 for the next year proposal,
- Research programmes which need continuation for 2018-19 should be well justified.

Mr. B. M. Enamul Hoque, Additional Secretary (Audit), Ministry of Agriculture inaugurated the *Progress Review Workshop on Research Programme of 2017-18* under Special Fund of Ministry of Agriculture as chief guest on 27 June 2018. Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC chaired the session and Dr. Paresh Chandra Golder delivered welcome address.

Nutrition

Human resource development is one of the major activities of Bangladesh Agricultural Research Council. As a part of the human resource development, Nutrition unit of BARC between the period of July 2017 and June 2018 organised a number of training programmes to create awareness building on nutrition knowledge, promote nutrition rich agricultural crops production and means to increase the knowledge of nutrition through capacity building . In this regard, the training programmes namely i). Awareness

building on the importance of nutrition information during 19-23 May 2018, Syedpur and 26-30 may 2018, Chandpur ; ii). Quality processing and Preservation of Agro - Products during 9-13 March 2018, Khulna; 6 -10 April 2018, Bagerhat and 23-27 June Syedpur and iii). Production of Dried Fish by Herbal Methods during 3-7 June 2018, Ishwardi was implemented.

A total of 30 participants in each training programme *viz.,* formal and non-formal teachers, sub-assistant. agriculture officer and other government agency extension workers were attended. The programme was organized to disseminate the messages focusing on food based nutrition with the view that acquired knowledge would be transferred to the students, which might be transmitted to the family members and neighbours.

Notably, training courses were designed with multidisciplinary sectors covering and emphasized the following areas *viz.,* agriculture products, fishery & livestock, food hygiene, sanitation, safe food and food security, ,micronutrient benefits, food utilisation, cooking process, food adulteration and mitigation measures, improvement of nutrition level, processing and preservation techniques of fruits and vegetables, quality control, etc.

In these programme resource speaker was selected from the multidisciplinary sector like Agriculture, fisheries and Livestock. 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 successful.

Deputy Director (DAE), Pabna, Chief Scientific Officer of Brackishwater Station,BFRI, Paikgacha, Khulna; Shrimp Research Centre, Bagerhat and Riverine Station, Chandpur were present as chief guests in inaugural and closing session of these training programmes respectively.

Pictorial views of the training activities

Uses of Colors in Food and Food products: Health Consequences

Under the part of human resource development activities, Nutrition Unit, BARC organised a number of workshops jointly with BIRTAN on *Uses of Colors in Food and Food products: Health Consequences* during 28 November 2017, Chapai nababgonj; 11 December 2018, Khulna; 7 February 2018 Sunamgonj; 22 February 2018 manikgonj and 19 April 2018 Rangpur 2018 respectively. In all of the programmes, key note paper was presented by Dr. Md. Monirul Islam, Director (Nutrition), BARC. In Chapai nababgonj and Sunamgonj, Deputy Commissioner of the said district were present as a chief guest. Deputy Director, DAE of Manikgonj and Rangpur was the Chief guest in rest of the workshop programmes respectively.

With the view to create awareness to the mass people, the participants *viz*., Upazilla Agriculture Officer including other officials at Upazilla level, teachers, magistrates, mango growers, traders, pesticide dealers and reporters from the print and electronic media were invited both of the workshop from the greater Rajshahi, Sunamgonj and Manikgonj districts.

Pictorial views of the workshop activities

Agricultural Engineering, NRM

Workshop on Research Review 2016-17 and Research Program 2017-18 on Agricultural Engineering of NARS Institutes

Organized workshop on ñResearch Review 2016-17 and Research Program 2017-18 on Agricultural Engineering of NARS Institutesò which was held at BARC conference room # 1 during 1-2 August 2017. National Agricultural Research Systems (BARI, BRRI, BINA, BJRI and BSRI), Bangladesh Agricultural Development Corporation, Department of Agricultural Extension, Rural Development Academy, Bangladesh Agricultural University and others Agricultural University etc. were the participants. The workshop was split into inaugural, three technical and concluding sessions. After thorough discussions draft recommendation was prepared & sent to Head of the Divisions .and their comments were addressed. Finalized recommendation was sent to respective stakeholders.

Workshop on Progress Review Workshop on Competitive Research Grant Sub-Projects under PIU-BARC (NATP Phase-2)

Organized workshop on *Progress Review Workshop on Competitive Research Grant Sub-Projects* under PIU-BARC, NATP Phase-2 was held at Conference Room #1 of BARC on 29 March 2018. The workshop was split into inaugural, two technical and concluding sessions. The inaugural session was held under the chairmanship of Dr. Sultan Ahmmed, Member Director (NRM), BARC and the chief guest was Dr. Paresh Chandra Golder, Member Director, (P&E), BARC. The 1st technical session was chaired by Dr. Sultan Ahmmed, Member Director (NRM), BARC and the 2ndone was chaired by Dr. Ahmad Ali Hassan, Ex-Director General, BINA. The day long technical programme included the presentations from the participated organizations on their respective water management activities and lively discussions

were made on all the presentations. The concluding session was chaired by Dr. Sultan Ahmmed, MD (NRM), BARC and the designated rapporteursô presented their reports. After thorough discussions recommendations were made at the end of this session.

Training Program on Use of Farm Machinery and Efficient Irrigation System Management

Organized training course on ñUse of Farm Machinery and Efficient Irrigation System Managementò during 04-08 March 2018 at BARC, Dhaka. In this training programme, forty participants from NARS scientists of BRRI, BARI and BINA; Universities, DAE; RDA; BADC and BMDA participated to update their knowledge.

Forestry, NRM

Conducted following training on Forestry and Agroforestry Technologies for Professionalsò during 27-29March, 2018 (40 NARS scientist and NGO personnel were attended).

Dr. Md.Saifullah, PSO, BARC addressing in the training on AgroForestry Technologies for Professionals

Participants guest in the training on AgroForestry Technologies for Professionals

National Seminar on Fruit Tree Plantation Program

1. Organized national seminar on fruit tree plantation program on 22 June, 2017 at KIB Auditorium, Farmgate, Dhaka entitled Ògvbem¤ú` Dbî qÿbcywó mgĂ× dÿji Ae`vbÓ. Honorable Minister Mr. AKM Mozammel Haque, MP, Minister Muktijhudda affair Ministry, as Chief Guest, Special guest was Motia Chowdhury, MP, Honarable Agriculture Minister and the Seminar was presided by Mr. Mohammad Mainuddin Abdullah. Secretary, Ministry of Agriculture. Prof. Dr. Kamal Uddin Ahmmed, VC, SAU, Dhaka was the keynote speaker.

2. Organized national seminar of World food day 2017onÒAwfevmÿbi fwel¨r e`ÿj `vI, Lv`¨ wbivcËv I MÖvgxY Dbî qÿb wewbÿqvM evovI Ó(Change the futre of migration. Invest in food security and rural development) during October 16, 2017 at KIB Auditorium, Farmgate, Dhaka. Honorable Minister Mr. Obaydul Kader, MP, Minister Sorok Poribon & Setu Ministry, as Chief Guest, Special guest was Motia Chowdhury, MP, Honarable Agriculture Minister and the Seminar was presided by

Mr. Mohammad Mainuddin Abdullah. Secretary, Ministry of Agriculture. Prof. Dr. Md. Abdul Mannan Akanda, Ex-VC, BSMRAU, Gazipur was the keynote speaker.

3. Organized workshop on ñProgress Review of CRG Sub-project, NATP-2 under Forest Unit, NRM Division, BARC" during 4 April, 2018

4. Organized Review workshop on "Research Review 2017-18 and Research Planning 2018-19 on Forestry and AgroforestryÓ during 23-24 June, 2018.

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

Crops

Dr. Md. Harunur Rashid Participated as a Panelist in the Seminar on Mungbean dissemination in the central south of Bangladesh.

- Presented the paper ñPotentials and Challenges of Agronomic Options for Intensifying Saline prone Regions with Fodder Cropsò in a seminar conducted by KGF (7 August 2017).
- Dr. Shah Md. Monir Hossain, PSO (Crops), participated at the conference BIMSTEC at its 20: Towards a Bay of Bengal Community on 20 March 2018 at BIMSTEC Secretariat, Dhaka.

- **AFACI-IMPGR Project Completion Report** Prepared AFACI-IMPGR project completion report ñCollection, characterization and promotion of rice, chilli, cucumber and melon in Bangladeshò

TTMU

Annual research, training and review Workshop, Seminar, Meeting etc. organized by NARS institutes and other agencies. Scientists of TTMU attended a good number of Worshop, Seminar and Meeting (ATECC) and Training.

Training: **Dr.Surya Parvin attended the following trainings:**

1) গত ১২-২৩ মার্চ ২০১৮ খ্রিঃ তারিখে কাঠমন্ডু, নেপালে অনুষ্ঠিতব্য " ***Training on Application of GIS and Remote Sensing for Agriculture and Drought Monitoring"*** শীর্ষক প্রশিক্ষণ কর্মসূচীতে অংশগ্রহণ

2) গত ২৫ জুন ২০১৮ খ্রিঃ তারিখে ব্যাংকক, থাইল্যান্ডে অনুষ্ঠিত ***Centre for the Alleviation of Poverty through Sustainable Agriculture Informal consultation on CAPSA transition*** শীর্ষক সভায় অংশগ্রহণ

Forestry, NRM

1. Participated workshop on ñAddressing the 2030 agenda on climate change and food security through Climate Smart Agriculture" FAO Project during 10-12 October 2017,Bangkok, Thailand
2. Participated workshop on ñNatural Resources Management and Climate Smart Agricultureò during 27 April-6 May, 2018in Institute of Natural Resources, University of Manitoba, Canada.

Manpower Development Activities

During the reporting period (July 2017 to June 2018) a total of 3464 scientists/officers from the National Agricultural Research System (NARS) institutes including Bangladesh Agricultural Research Council (BARC) and other associate organizations participated in the revenue/other sourcesô funded training/workshop/seminar/higher study programs at home and abroad.

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

ISAAA Seminar: Global Status of Commercialized/GM Crops: 2016

An international event titled ñISAAA Seminar: Global Status of Commercialized/GM Crops: 2016ò was organized by the Manpower and Training Unit of the Council on July 9, 2017 at BARC Conference Room-1. The scientists attending the seminar said introduction of Genetically Modified Organism (GMO) crops would help to meet 50 per cent increase in food demand by 2050. "Traditional technology is not enough for solving future problems in agricultural production ....Biotechnology is being used in agriculture sector for increasing nutritional value of crops and also to meet increasing food demand in future," said Dr Rhodora R Aldemita, Senior Programme Officer, International Service for the Acquisition of Agro-biotech Application (ISAAA), Philippines while addressing in the seminar at Bangladesh Agriculture Research Council (BARC). BARC Executive Chairman Dr Mohammad Jalal Uddin chaired the seminar while BARC Member Director (crops) Dr Md. Aziz Zilani Chowdhury gave the welcome address.

Mr. Md. Fazle Wahid Khandoker, Additional Secretary (Research), Ministry of Agriculture spoke as the chief guest while Mr. M Nasiruzzaman, Chairman of BADC, Director General of the Department of Agricultural Extension Mr. Golam Maruf and Director General of Bangladesh Agriculture Research Institute (BARI) Dr Abul Kalam Azad as the special guests. To enhance biotechnological research and development particularly in developing nations like Bangladesh, cooperation and collaborative research with developed countries, capacity building of the researchers are very important, said the chief guest. According to BARI paper, currently in Bangladesh around 6,000 farmers in 36 districts are cultivating four Bt Brinjal varieties--- BARI Bt-1 (Uttara), BARI Bt-2 (Kajla), BARI Bt-3 (Nayontara) and Bt-4 BARI (ISD006). Farmers from Rajshahi, Rangpur, Pabna and Gazipur started cultivation of the Bt Brinjal for the first time in 2014. With the journey of cultivating Bt Brinjal, Bangladesh has joined a group of 28 countries that grow GM crops.

AFACI Program Workshop on Horticulture (GAP-Postharvest)

Dr. S M Khorshed Alam, Director (Manpower & Training), BARC, and PI of AFACI-Postharvest Project is seen receiving Outstanding Award

A five-day AFACI-Program Workshop on Horticulture (GAP-Postharvest) was organized at Hotel Nascent Gardenia, Baridhara, Dhaka during 18-22 July 2017 by Asian Food and Agriculture

Cooperation Initiative (AFACI), Korea, in collaboration with Bangladesh Agricultural Research Council (BARC). The inaugural session was held on July 22, 2018. Dr. Mohammed Jalal Uddin, Executive Chairman, BARC chaired the session while Additional Secretary of the Ministry of Agriculture Mr. Md Fazle Wahid Khandker attended the session as chief guest and Joint Secretary (International Cooperation) of the Ministry of Agriculture Mr. Md. Hemayet Hussain as the special guest. The senior officers of BARC were also present on the occasion. A 9-member Korean delegation headed by Dr Hwang Jeong-hwan, Director General, National Institute of Horticulture & Herbal Sciences (NIHHS), RDA, Korea attended the workshop.

The objective of the workshop was to review the progress of the AFACI-GAP and AFACI Postharvest projects implemented by the AFACI member states namely Bangladesh, Bhutan, Cambodia, Indonesia, Kyrgyz Republic, Nepal, Sri Lanka Lao PDR, Mongolia, Myanmar, the Philippines, Thailand and Vietnam. The Concerned Principal Investigators (PI) from each member states attended the workshop. The PIs having good performance with project progress were also honored with awards. Dr. S M Khorshed Alam, Director (Manpower & Training), BARC, and PI of AFACI-Postharvest Project was honoured with Outstanding Award in recognition to the good performance of the AFACI-Postharvest project in Bangladesh. The AFACI authority sent a letter of appreciation thanking BARC authority as well as the Ministry of Agriculture for organizing this event.

Seminar on Ensuring the Production of Quality Seed

A seminar on Ensuring **Ensuring the Production of Quality Seed** was organized by the Unit as per the instruction of the Ministry of Agriculture on August 12, 2017. Mr. Mohammad Moinuddin Abdullah, Senior Secretary, Ministry of Agriculture attended the seminar as chief guest. Dr. Mohammad Jalal Uddin, Executive Chairman, BARC chaired the seminar. The seminar was attended among others by the senior officers from the Ministry of Agriculture and senior officers/scientists from BADC, DAE, BARC, BARI, BRRI, BJRI, BINA, BSRI, CDB, SCA and KGF. Two papers were presented in the seminar. A paper on ñCrop Nucleus And Quality Seed Productionò was presented by Dr. Naresh Chandra Dev Barma, Director, WRC, BARI and another paper on ñQuality Foundation/ Certified Seed Productionò was presented by Mr. Noor Mohammad Mandal, Managing Director (Seed), BADC. Based on the recommendations from this seminar, an action plan was prepared for ensuring the production of quality seed, thereby increasing the productivity in agriculture.

Training on Right to Information Act

A day long training program on **Right to Information Act** was organized by the M&T Unit of the Council on January 24, 2018 at Conference Room-1, BARC. As many as 50 officers of the Council attended the training program. Mr. Nepal Chandra Sarker, Information Commissioner of the Information Commission, Dhaka attended the inaugural session as chief guest. He was also a resource speaker for the 1st session. Dr. Md. Kabir Ikramul Haque, Executive Chairman of BARC presided over the inaugural session. Other resource persons were from the Information Commission, and MRDI, an NGO assisting the Information Commission for implementation of Right to Information Act. The training program was implemented as per the instruction of the Ministry of Agriculture

Field visit at Savar

Visit of Ethiopian Delegation

The Manpower and Training Unit of the Council is also responsible for coordinating the visit of any foreign delegation to BARC or for any NARS institutes or for any organization under the Ministry of Agriculture. As part of this activity, the Unit coordinated the visit of a five member Ethiopian delegation during 23-26 April 2018. The delegation members were: (1) Prof. Fassil Kebede, Advisor to the minister,

Ministry of Agriculture and Natural Resource (2) Ato Fikre Mekuria, Director, National Soil Testing Center, MoANR (3) Ato Kiflu Gudeta, Director, Soil Resource Mapping and Information Directorate, MoANR (4) Ato.Tefera Solomon, Director, Soil Fertility Improvement Directorate, MoANR and (5) Dr. Schulz, Steffen, Integrated Soil Fertility Project Head, GIZ-Ethiopia The delegation visited BARC and SDRI. In separate meetings the delegation exchanged views with BARC and Soil Resource Development Institute (SRDI) senior officers on the ways how a new Soil Resource Development Institute could be established in Ethiopia.

6th CGIAR Advisory Committee Meeting

The 6th Consultative Group of International Agricultural Research (CGIAR) Advisory Committee (CAC) meeting was held on 23 May 2018 at the BARC Conference Room. The meeting was chaired by Dr. Md. Kabir Ikramul Haque, Executive Chairman of BARC while Md. Fazle Wahid Khondaker, Additional Secretary (Research Wing), Ministry of Agriculture was present as chief guest. The representatives from CG Centers like IRRI, CIMMYT, WorldFish, IFPRI, CIAT, and CIP and IFDC were present in the meeting.

In his welcome address, Dr. Md. Aziz Zilani Chowdhury, Member Director (Crops Division), BARC, gave an overview of the CGIAR activities in Bangladesh and the objectives of CAC Meeting.

Mr. Md. Fazle Wahid Khondaker, Additional Secretary (Research Wing), Ministry of Agriculture acknowledged the CG centersô for their continued support towards the agricultural development in Bangladesh. He hoped that CAC would continue its activities with the spirit of partnership among the national and international organizations, thereby contributing towards ensuring of food and nutrition security in Bangladesh. He concluded his speech with an expectation that the collaboration between CG centers and the government of Bangladesh would further be strengthened.

Dr. Md. Kabir Ikramul Haque, Executive Chairman of BARC and chair of the CAC acknowledged the contributions of all CG centers in Bangladesh in ensuring food and nutrition security in Bangladesh. He hoped that the cooperation between the government and CG centers will continue to be strengthened in the days ahead. He urged the CG centers to come forward with their overseas knowledge and expertise to address the emerging challenges in Bangladesh agriculture.

The chair requested all the CG Centre presenters to briefly present their ongoing programs/activities/projects in Bangladesh. In the presentations, representatives from different CG Centers highlighted the major activities/programs/projects and their impacts in the agricultural development of Bangladesh.

Training on Government Performance Management System (GPMS)

Under the revenue funding, a two-day training program on Government Performance Management System (GPMS) was organized by the Manpower and Training Unit during 2-3 June 2018 at BARC

conference room-1 in accordance with the instructions of the Ministry of Agriculture. The training program was attended by 50 officers of BARC. Resource persons were from the Ministry of Agriculture, BARC and MRDI who discussed the topics like Guidelines for Annual Performance Agreement (APA), APA Monitoring and Evaluation, Grievance Redress System, Concept of Government Management Performance System (GPMS), Innovations for Improvement of Service Delivery, E-filing and Right to Information Act 2009 etc. The resource persons from the Ministry of Agriculture were among others Mr. Md. Sirajul Haider, ndc Additional Secretary (Admin & Input Wing), Mr. Mohammad Zakir Hossain, Joint Secretary (Admin Wing) and Mrs. Farida Jahan, Joint Secretary (Budget and Monitoring).

In Country PhD (Revenue)

One of the major tasks of Manpower of Training Unit of BARC is to accord higher studies for NARS scientists in various disciplines of agriculture. A total of 19 NARS scientists were awarded PhD fellowship during the financial year 2013-2014 under revenue funding in the country. The financial management and performance monitoring activities in this connection are being carried out as usual. Five researchers have already completed their study. The remaining researchers are expected to complete their research by the financial year 2018-2019.

In Country PhD (CSISA-BARC Scholarship Program):

There was a provision of five slots for in-country PhD under CSISA-BARC Scholarship Program. The five PhD researchers are: one from BARC and two from BARI, one from BINA and another from BFRI (fisheries). The program is being jointly funded by IRRI, CIMMYT and WorldFish Centre under CSISA-BD project. The financial management and performance monitoring activities in this connection are being carried out as usual. It may be mentioned one (from BARC) has completed PhD research and the remaining are about to complete by the financial year 2018-2019.

Foreign Training/seminar/workshop/study tour:

During the reporting period apart from in-country activities, Manpower and Training Unit initiated and implemented foreign training/seminar/workshop/meeting abroad. A total number of 30 research managers/scientists/personnel under different fields of agriculture and cross cutting issues attended 46 programs (training/seminar/workshop/study visit/meeting) to enrich their professionalism in order to achieve the countryôs ultimate goal to ensure food and nutrition security. Detailed information are furnished below:

Abroad Training/Workshop/Seminar/Meeting Abroad (2017-2018)

Sl. No	Name, Designation & Organization	Name of Program	Duration	Country	Funding Org.
01.	Dr. Susmita Das senior Documentation Officer, BARC	Participation in the ñCODATA International Training Workshop in Open Data for Better Science, Beijingò	10-21 July/2017	China	CODATA
		Participation in the ñExpanding Digital Footprints: Role of Libraries & Information Centersò	26-28 October 2017	India	Asian Library Association
		Participation in the ñOpen in Action: Bridging the information for Asian regional	02-06 December 2017	Kathmandu Nepal	Open Access Nepal

		meetingò			
02.	Dr. A.S.M Anwarul Huq Member Director (AERS), BARC	Application of ICT for Resilient Agriculture	18-20 July 2017	Putrajaya Malaysia	CAPSA-MARDI
03.	Dr. Shaikh Mohammad Bokhtiar, Director SAARC	Participate in the SAC Programmes	02-09 August 2017	India	SAARC
		Participate in the CGIAR Research Program on CCAFS partners meeting and workshop on Climate-Smart Agriculture in Asia.	20-23 Nov./2017	Honoi, Vietnam	CCAFS
		The Lauching program of the Grain Legumes and Dryland Cereals Agri-food Systems CGIAR Research Program.	14-16 February 2018	Addis Ababa, Ethiopia	ICRISAT
		i)SAC- Donor coordination Meeting ii) SAARC regional consultation meeting (GAP) iii) SAARC regional consultation meeting on ñAnimal Breedingò	05-13 April 2018	Kathmandu Nepal	SAC
		Participation in the Annual Conference for panel discussion on ñEvidence-informed policy making process in Africa & Asia-Sharing of experiencesò	27-29 June 2018	Accra, Ghana	LANSA
04.	Mr. Mohammad Shahjahan, CSO (Forest),BARC	Participate in the CDAIS and TAP Partners meeting.	18-22 September 2017	Vientiane, Lao PDR	CDAIS
05.	Dr. S M Khorshed Alam, Director (Manpower & Training) BARC	The 4th ISHS Asia Symposium on Quality Management in Postharvest System (Asia Postharvest 2017)	12-14 September 2017	Korea	AFACI
06.	Dr. Mian Sayeed Hassan, CSO (Crop), BARC	Stewardship Training Program and 5th South Asia Biosafety Conference	08-13 September 2017	India	FtFBP
		Participants to attend the Memorandum of Understanding (MoU) signing ceremony and Exposure visit.	02-11 November 2017	USA	BARC
07.	Dr. Md. Aziz Zilani Chowdhury, MD (Crop), BARC	Participation in the 5th South Asia Biosafety Conference	11-13 September 2017	India	CERA

		Participation in the ñCrawford Fund Master Class in Agriculture Research Leadership and Managementò	30 October to 03 Nov./ 2017	Penang, Malaysia	APAARI
08.	Dr. Md. Abdul Awal, CSO (P&E), BARC	The 21st Annual Meeting of the Council for partnerships on Rice Research in Asia (CORRA)	20-21 September 2017	China	CNRRI
		Participation to the training on ñIntegrated Approaches to Food Securityò	16-27 October 2017	Netherland	NICHE-BGD-156 Project
		Participation in the Knowledge sharing Wrokshop on óNatural Management and Climate Smart Agricultureô	27 April to 06 May 2018	Canada	Code-4829
09.	Dr. Md. Saifullah, PSO, NRM, BARC	Participate in the Regional Workshop ñClimate Action for Agriculture in Asia.	10-12 October 2017	Bangkok Thailand	FAO
		Participation in the Knowledge sharing Wrokshop on óNatural Management and Climate Smart Agricultureô	27 April to 06 May 2018	Canada	Code-4829
10.	Dr. Md. Abdus Salam, PSO (Crops), BARC	Participate in the 7th Session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture, Consultations and related events	27 Oct. to 03 Nov. 2017	Kigali, Rwanda	FAO
		Participate in the Workshop on Reporting on the State of Plant Genetic Resource	29 Nov. to 01 Dec. 2017	Rome, Italy	FAO
11.	Dr. Paresh Chandra Golder M-D (P&E), BARC	Participate in the 2017 Planning Workshop on New AFACI Projects.	23-27 October 2017	Korea	AFACI
12.	Dr. Bhagya Rani Banik, Executive Chairman, BARC	Participants to attend the Memorandum of Understanding (MoU) signing ceremony and Exposure visit.	02-11 November 2017	USA	BARC
		Visit to International Rice Research Institute (IRRI) Headquarters in Los Banos, Philippines	27-29 November 2017	Philippines	Ministry of Agriculture
13.	Dr. Rina Rani Saha, PSO (Crops), BARC	Participate in the ñRegional Expert Consultation on underutilized Crops for Food and Nutrition Security in Asia	13-15 Nov./2017	Bangkok, Thailand	APAARI

		and the Pacificò			
14.	Dr. Md. Harunur Rashid, PSO (Crops), BARC	Participate in the 10th South Asia Economic Summit	14-16 November 2017	Kathmandu Nepal	SAWTEE
		Regional Expert Consultation on Agricultural Biotechnology-Scoping Partnership to Improve Livelihoods of Farmers in Asia-Pacific	29-31 May 2018	Thailand	APAARI
15.	Dr. Kabir Uddin Ahmed, PSO (P&E), BARC	Participate in the ñClimate-Smart Agriculture in Asia: Beyond pilot evaluations and modelsò	20-23 Nov./2017	Hanoi, Vietnam	CGIAR and CCAFS
		Participate in the South-South Cooperation in South Asian Forum.	14-16 Dec./2017	Kathmandu	FAO
16.	Mr.Md. Mustafizur Rahman, PTO, BARC	The Workshop on Promotion of Agriculture Trade and Investment among BIMSTEC Member State	29-30 November 2017	Bhutan	BARC & MOA
		5th AFACI General Assembly, Vientiane, Lao PDR on	April 2-6,2018.	Lao PDR	AFACI
17.	Dr. Md. Monirul Islam Director (Nutrition), BARC	Asia-Pacific Symposium on Sustainable Food System for Healthy Diets and Improved Nutrition	10-11 Nov. 2017	Thailand	FAO
18.	Dr.Md. Mosharraf Uddin Mollah, PSO (AERS), BARC	Participate in the Fourteenth Session of the Governing Council of the Center for Alleviation of Poverty through Sustainable Agriculture (CAPSA)	13 December2017	Bangkok Thailand	BARC
19.	Dr. Sultan Ahmmed, CSO, (NRM), BARC	Participate in the 13th Session of the Governing Council of the Center for Sustainable Agriculture Machanization (CSAM)	12-14 December 2017	Kathmandu Nepal	CSAM
		The Workshop on the Role of Mechanization in Strengthening Smallholders Resilience through Conservation Agriculture	18-20 April 2018	Combodia	CSAM-UNESCAP
20.	Dr. Shah Md. Monir Hossain, PSO (Crops), BARC.	Participate in the Documents related to the Sixth Meeting of the BIMSTEC Expert Group on Agricultural Cooperation.	12-16 Dec./2017	Thailand	BARC

21.	Md. Abdul Mottakin, Deputy director (Establishment, BARC	Training on ñFanancial/Office Managementò	25 Feb- 04 March 2018	Malaysia	NATP Phase-II (BARC-Part)
22.	Dalil Uddin Basunia, Assistant Director (Common Service), BARC	Do	Do	Do	Do
23.	Md. Abu Hashem Mostofa Kamal Security Officer, BARC	Do	Do	Do	Do
24.	K.M Ali Haider, Assistant Director (Establishment) BARC	Do	Do	Do	Do
25.	Dr. Suraya Parvin SSO (TTMU), BARC	Participate in the ñTraining on Application of GIS and Remote Sensing for Agriculture and Drought Monitoringò	12-23 March 2018	Kathmandu Nepal	ICIMOD
		Participation in the Center for Alleviation of Poverty through Sustainable Agriculture (CAPSA) informal consultation	25 June 2018	Bangkok Thailand	CAPSA
26.	Dr. Nazmun Nahar Karim, CSO, BARC	The training program on óFarm Mechanization for Sustainable Intensification of Agriculture.	23-27 April 2018	Bhopal India	SAC
		Participate in the workshop on óData-informed Policy making for Sustainable Development Goalsô	28-29 June 2018	Penang, Malaysia	CSAM-UNESCAP
27.	Dr. Md. Kabir Ikramul Haque, EC, BARC	Participation in the Knowledge sharing Wrokshop on óNatural Management and Climate Smart Agricultureô	27 April to 06 May 2018	Canada	Code-4829

Officers from Other Institute

01.	Dr. Md. Mofazzel Hossain, PSO, BRRI, Gazipur	Participants for the AFACI Program Workshop on Food Crops.	26-30 September 2017	Indonesia	AFACI
02.	Mr.Md. Abu Kawochar, SSO, BARI, Gazipur	Do	Do	Do	Do
03.	Dr.Md. IliasHossain, PSO, Wheat Research Centre, Rajshahi	The Regional Expert Consultation Meeting on Conservation Agriculture in SAARC Member Countries	28-30 August 2017	Punakha, Bhutan	SAARC

In-country Training/ Workshop/ Seminar

During the reporting period 26 training programs and 23 workshops and six seminar/meetings were arranged by different divisions/units of BARC in which 3380 scientists/officers participated. Under revenue funding 22 training programs and 17 workshops were organized. The participant number for the training, workshop and seminar/meeting were 1247, 1838 and 325 respectively. Detailed lists are given below:

Training (Revenue)

Division/ Unit	Activity	Venue	Duration	No. of Participant
	Training on Intellectual Property Rights	BARC	8 May 2018	40
	Training on Collection and Documentation of Plant Genetic Resources (PGR) (Crop database management)	BARC	24-26 April 2018	40
TTMU	Training on matured Technology of Crops' production and varieties	BARC	1st March/18	40
	Training on matured Technology of Fisheries	BFRI, Mymensingh	03 Jan/2018	40
	Training on matured Technology of Livestock	BLRI, Savar	30 Jan/2018	40
AERS	Training on Policy Instruments for Environmental and Climate Change Economics	BARC	18-22 March/18	20
Computer & GIS	Training on Implementation of e-Filing (Officers and Staffs) (33 Emp &43 Officer)	BARC	20-21 May/18 27-28May/18	76
	Training on ICT for Office Management (Staff) (2 batch) (4th class 16) (40 +16)	BARC	29 May-4 june/18 5-11 June/18	56
NRM (Soils	Training Program on Climate Change, carbon sequestration and adaptation strategies	BARC	7-8 Feb/18	40
NRM (Forestry)	Training on Forestry & Agro-forestry Technologies for Professionals	BARC	27/3/2018	60
NRM (Eng.)	Training on Use of Farm Machinery and Efficient Irrigation System Management	BARC	4-8 March 2018	40
AIC	Technical Report Writing and Editing	BARC	25 Feb- March 1/ /18	25
P&E	Training on Project Development and Management	BARC	05 days 14-18 Jan/18	30
M&T	Training of Right to Information Act 2009	BARC	24/1/18	50

	Training on Government Performance Management (GPM) System	BARC	2-3 June/18	50
Livestock	Training Course on Peste des Petits Ruminants (PPR) (02 Batch 30x2)	CVASU Chittagong	5-6 Dec/2017	60
Nutrition	Training on Awareness building on the Importance of nutrition information(30 + 30)	Ishurdi Chandpur	12-16 May/18 & 26-30 May/18	60
	Training on Quality Processing and preservation of Agro-products (3 Batch 35x3)	Khulna Syeedpur	3-7 june/18 9-13 June/18 20-24 june/18	105
A&F	Training on how to improve personnel management performance (Class III Staff) (two batches) (18+31)	BARC	21-29 Dec./17	49
	Training on how to improve personnel management performance (4th Class employee) 2 Batch (31+30)	BARC	7-12 Dec./17 & 16-23 Dec/17	61
	Training on Awarness building, Trouble shooting and Maintenance of Vehicle (Driver)	BARC	24-30 Dec/17	20
	Training on Performance enhancement in Admin and Finance (3rd & forth Class Officers	BARC	6-12 June/18 (3rd Clas)	59
	Training on Performance enhancement in Admin and Finance (3rd & forth Class Officers	BARC	19-25 June/18 (4th Class)	56
	Sub Total (22)			**1117**

Training (AFACI-GAP/ATIN/Post-harvest funding)

Division/ Unit	**Activity**	**Venue**	**Duration**	**No. of Participant**
Crops	Training for BARI Scientists under AFACI-GAP Project, (Two batches) (40 +40)	BARI Gazipur	21-22 Dec/2017	80
Computer & GIS	Training on Crop Calender (20 farmers + 20 SAAO and AUA)	Narsingidi, DAE Office	19 /12/2017	40
M&T	Training on Postharvest Handling of Fruits and Vegetables	BARC	27-28 Dec/17	40
	Training on Improved Postharvest Management of Mango	ARS, Satkhira	30 May 2018	30
	Sub- Total (04)			**190**

Total Training (A+B)= 26; Total Participants: 1247

Workshop (Revenue)

Division/ Unit	Activity	Venue	Duration	No. of Participant
Crops	Review Workshop on Crop Improvement Programme of NARS Institutes: Research Progress (2016-17 & 2017-18)	BARC	9-10 August/2017	84
	Review Workshop on Crop protection (Insaect-pest Management: Research Progress (2016-17 & 2017-18)	BARC	3 August/2017	85
	Review Workshop on Crop Production(: Research Progress (2015-16 & 2016-17)	BARC	6-8 August/2017	84
	Review Workshop on Crop protection (Disease Management) Programme of NARS Institutes: Research Progress (2016-17 & Research Programs 2017-18)	BARC	01 (One) day August-2017	90
TTMU	Review Workshop on the technical and financial progress of the research programs under special grant for research and innovation 2016 -17 and 2017-18.	BARC	8/1/2018	75
AERS	Workshop: Review of Socio-Economic Research Programs of NARS Institute	BARC	27 June-2018	70
Computer & GIS	Workshop on "Public Service Innovation at BARC	BARC	10-12 Apr/18	20
	Showcasing Workshop	BARC	6/8/2017	55
	Innovation Workshop	BARC	10-12 June/18	300
NRM (Soils)	Research Review and Planning Workshop of Soils Programs of NARS Institute	BARC	7-9 August-2017	80
NRM (Forestry)	Review Workshop on Forestry Research Activities of different NARS Institute & Universities	BARC	23-24 June/-2018	80
NRM (Eng.)	Annual Workshop on Research Review 29016-2017 & Research Program 2017-18on Agril Engineering of NARS Institutes	BARC	02 (Two) August/2017	90

P&E	Annual Review Workshop on Implementation of Approved Program (2016-17) and Annual Action Plan for 2017-18	BARC	31 July 2017	50
	Workshop on APA	BARC	28/3/2018	50
	Review Workshop on Research/ Innovation Programmes under Special fund of MoA	BARC	27-28 June 2018	80
Nutrition	Safe Uses of Pesticides/Ripening chemicals in Fruits: Health effects and consumer awareness	Sylhet BARC	26 June/18 28 June/18	120
	Food Adulteration and Contamination: Health Hazards and consumer awareness	BARC	01 (One) day Dec/17-June/18	120
	Sub-total (17)			**1533**

Workshop (AFACI/KGF)

Division/Unit	**Activity**	**Venue**	**Duration**	**No. of Participant**
M&T Unit	AFACI Program Workshop on Horticulture(GAP-Postharvest)	Hotel at Baridhara	18-22 July 2017	40
	ASTI Focal Point Workshop	Dhaka	19 Nov. 2018	40
Crops	AFACI IMPGR Project Completion Workshop	BARC	22/8/2017	60
	AFACI Progress Review Workshop	BARC	28/6/2018	40
P&E	Workshop on Seaweed DPP	BARC	23/8/2017	60
Com& GIS	Inception Workshop on Crop Zoning	BARC	27/2/2018	65
	Sub-total (6)			**305**

Seminar/ Meeting (Revenue)

Division/Unit	**Activity**	**Venue**	**Duration**	**No. of Participant**
M&T Unit	ISAAA Seminar : Global Status of Commercialized/GM Crops: 2016	BARC	7/7/2017	75
	Discussion Meeting on preparatio Foundation Training Course Curriculu	BARC	20/8/2017	70
	Seminar on: Prospects and challenges of breeding for disease resistance in sheep and cattle	BARC	19 September 2017	40
	6th CAC Meeting	BARC	23 May 2018	40

	Graduate Admission Process in USA Universities	BARC	8 Jan 2018	50
P&D	Seminar on Generating on SDGs		12/2/18	50
	Total (6)			**325**

Higher Education

Summary of Higher Study at BARC (PhD) (2017-2018)

Sl No.		**PhD**		**Total**	**Remark**
		Foreign	**Local**		
1.	2013-2014 (Revenue)	-	19	19	Four-Completed Fifteen- About to be completed
2	2011-2012 (CSISA-BARC)	-	5	5	One: completed Others: About to be completed
	Total		**24**	**24**	

III. AGRICULTURAL INFORMATION AND PUBLIC RELATIONS

AGRICULTURAL INFORMATION

BARC devotes 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.

Development of Collection

Until June 2010 the library has a total collection of about 22,900 information materials, which includes books, reports, pamphlets and bound journals etc. The following information materials have been procured during the period under report:

Items	Quantity
Books and Reports	159
Current Journals/Newsletter	78

Literature Search

The Centre renders literature search services from full-text database - The Essential Electronic Agricultural Library (TEEAL) CD database to satisfy the researchers, agricultural scientists, planners and policy-makers. It also provides search services on specific requests received form teachers, students and users from NARS institutes and other organizations. The library provided search service from TEEAL to 20 external users.

Services and Users

During this period 275 users of different categories have used the library. Besides the BARC and NARS scientists, teachers and students of Universities, NGO and private organizational personnel are the users of this library.

Update and Maintenance of databases

- Database on Books and Reports contains 5,709 records out of which 251 records have been added during this year
- Database on Journals, Newsletters, and Periodicals contains 1110 records and being updated regularly.

Newsclipping Services

Newscliping of 3633 articles (Bangla and English) have been identified, processed in different format, compiled and prepared a content list and preserved in the library for users. One hardcopy has been given to Executive Chairman as reference copy.

Online Archive of Important Documents

Developed a database driven online archive based on Content Management Systems (CMS). The database contains digital contents of non-conventional documents of high archival value (Policy documents, Reports of all kinds, Proceedings and other mimeographs).

Resource Sharing

The library also performs resource sharing activities to serve the scientists. In this period, the library has collected information materials from FAO, BBS, BANSDOC and all NARS institutes.

AIC also has taken photographs of 85 workshops/ training/seminars/meetings and supplied 1889 photos in digital form to the concerned divisions and provided 1,06,290 photocopies of official documents, reports, letters, scientific literature etc. under 4,830 requests.

Other activities

- Prepared a good number of reports on Agriculture Standing Committee & Question-Answer including Supplementary, StarMarked and Non-StarMarked Questions by the Parliament Members and Concerned Ministers for 10th Parliament
- Designed, Prepared and distributed Eid, Nabo barsha, New year greeting Cards
- Monitoring research projects, participate as member of different team/committee , prepare speech for chief guest, special guest of different national seminar & master of ceremonies if different seminars and workshops.

PUBLICATIONS

Crops

- **AFACI-IMPGR Project Completion Report:** Prepared AFACI-IMPGR project completion report *Collection, characterization and promotion of rice, chilli, cucumber and melon in Bangladesh*
- **Catalogue on rice, chilli, cucumber and melon collected Germplasm:** Published Catalogue on rice, chilli, cucumber and melon germplasm collected in Bangladesh under AFACI-IMPGR Project.

Scientific Paper publications

- **Saha, R.R.,** A. Z. Sarker, A.H.M.M.R. Talukder, S. Akter and P. C. Golder. 2016. Variability in growth and yield of potato varieties at different locations of Bangladesh. Bangladesh Hort. 2(1):101-110.
- **Saha, R. R.,** F. Ahmed, N. Mokarroma, M. M. Rohman and P. C. Golder. 2016. Physiological and biochemical changes in waterlog tolerant sesame genotypes. SAARC J. Agri. 14(2):33-47.
- **Rashid, M H, P C Goswami, M F Hossain, D Malhalder, M K I Rony, B J Shirazy, T D Russell. 2018.** Mechanised non-puddled transplanting of boro rice following mustard conserves resources and enhances productivity **Field Crops Research, 25: 83-91**
- **Saha,** A, M Nasim, **M H Rashid** and S M Shahidullah. 2017.Crop Diversity and Cropping Patterns of Comilla Region. Bangladesh Rice Journal, 21(2): (in press).
- **Quais,** M K, **M H. Rashid**, S M Shahidullah and M Nasim. 2017. Crops and Cropping Sequences and their Diversity of Chittagong Hill Tracts. Bangladesh Rice Journal, 21(2): (in press).
- **Rashid**, **M H,** B J Shirazy, M Nasim and S M Shahidullah. 2017. Cropping Systems and their Diversity in Khulna Region. Bangladesh Rice Journal, 21(2): (in press).
- **Rashid, MH,** P. C. Goswami, B. J. Shirazy. 2017. Reduced Tillage and Mechanized Transplanting of Rice Enhances the System Productivity of Rice-Mustard-Rice Cropping

Sequence, In: Proceedings of the 2nd Conference on Conservation Agriculture for Smallholders (CASH-II). 14-16 February 2017, Mymensingh, Bangladesh. (Eds. ME Haque, RW Bell, WH Vance). pp. 50-51.

Other publications and technology transfer activities

- Prepared Training Manual on Global Plan of Action Reporting and collection & documentation of Plant Genetic Resources in Bangladesh.
- Prepared Training Manual on Intellectual Property Rights.
- Prepared Training Manual on Phytosanitary Measures and Food Safety Issues in Bangladesh.

TTMU

Publications in Scientific Journal

1. S.S. Ela, Akteruzzaman, **F. Yasmin** and A.K.M M. R. Golap (2017). Transforming Rice Land to Fish Farming and Its Impact on Income Despirity. *International Journal of Business, Social and Scientific Research,5(3): 23-28.*
2. S. S. Ela, Akteruzzaman, **F. Yasmin** and A.K.M M. R. Golap (2017). Profitability for Fish Farming under Different Farming Systems of Bangladesh. *International Journal of Business, Social and Scientific Research,5(2): 223-229.*

Publications as Thesis-2017: (1)

S. Sharmin. Ela, Akteruzzaman and **F. Yasmin** (2017), ñAn Economic Perspective of Transformation of Rice Land into Fish Farming in Greater Mymensingh Districtò, *M.Sc. Thesis, Agricultural Economics (Production Economics) BAU, Mymensingh. (Acted as Co- supervisor)*

Article/Input in Workshop Proceedings:

i. S. M. Bokhtiar, F. Yasmin and S.Parvin (2018). Annual progress (2016-17) and future work-plan (2017-18) of Technology Transfer and Monitoring Unit *Proceedings of the workshop on Annual progress (2016-17) and future work-plan (2017-18), Planning & Evaluation Division, BARC, Farmgate, Dhaka*, 2017.

ii. Hassan,S., Baktiar,M.H.,and ***Yasmin, F.*** (2017). Field Monitoring of Research Programme under **Revenue Fund for the financial year 2017-18** of BARC implemented in 2017 at BARI, BRRI and CDB in Gazipur and Shreepur by (Monitoring Team-1). *Proceedings of the workshop on Monitoring (2017-18), Planning & Evaluation Division, BARC, Farmgate, Dhaka*, 2017.

Publications as Training Manual-2017-18: (4)

i. Training Manual of ToT programme for Officers of DoF. Technology Transfer and Monitoring Unit, BARC, Farmgate, Dhaka.

ii. Training Manual of ToT programme for Officers of DLS. Technology Transfer and Monitoring Unit, BARC, Farmgate, Dhaka.

iii.Training Manual of ToT programme for Officers of DAE. Technology Transfer and Monitoring Unit, BARC, Farmgate, Dhaka.

iv.Training Manual of Mango programme for Officers of DAE. Technology Transfer and Monitoring Unit, BARC, Farmgate.

Publications as Report-2017: (14)

Monitoring Report:

Field Monitoring Report(4)

i. Chowdhury, A. Z., Baktiar, M.H., ***Yasmin, F.*** and K.U. Ahmed (2017). Report on Field

Monitoring of Research Programme under ñ**Special Budget of MoA for the financial year 2017-18**ò of BARC implemented in 2017 at BARI, BRRI and CDB in Gazipur and Shreepur by (Monitoring Team-1).

ii. Anwar, A. S., Monirul,I. and M.H., ***Parvin, S.*** (2017). Report on Field Monitoring of Research Programme under ñ**Special Budget of MoA for the financial year 2017-18**ò of BARC implemented in 2017 at BJRI, SRDI and BIRTAN in Dhaka and Gazipur by (Monitoring Team-7).

iii. **Yasmin, F.** (2017). Report on Field Monitoring of *"Distribution of Mother Sapling of Fruits"* implementing in 2017 at BADC, Kashimpur, Gazipur.

iv.**Yasmin, F.** (2017). Report on Field Monitoring of *"Distribution of Mother Sapling of Fruits"* BARC implementing in 2017 at DAE, Shobhanbag & Rajalakh, Savar, Dhaka.

Desk Monitoring Report(2)

i. Yasmin, F. (2017). Report on Desk Monitoring of *"Distribution of Mother Sapling of Fruits"*. Different centre at ***DAE*** Bangladesh

ii. **Yasmin, F.** (2017). Report on Desk Monitoring *"Distribution of Mother Sapling of Fruits"*. Different centre at ***BADC***, Bangladesh

Progress and Work Plan Report (6)

i. Three Months Progress Report (July-September' 2017): Prepared Three Months Progress Report of TTMU was sent to MoA

ii.Three Months Progress Report (October-December' 2017): Prepared Three Months n Progress Report of TTMU was sent to MoA

iii. Annual Progress Report (2017-2018): ñAnnual progressò, Technology, Transfer and Monitoring Unit, BARC, Farmgate, Dhaka.

iv.Annual Progress and Work-plan Report: (2017-2018): ñAnnual progress (2016-17) and future work-plan (2017-18)ò, Technology, Transfer and Monitoring Unit, BARC, Farmgate, Dhaka, 2017

v.Budget Report according to Work-plan: (2017-2018): ñBudget for future work-plan(2017-18)ò, Technology Transfer and Monitoring Unit, BARC, Farmgate, Dhaka.

vi. Annual Plan Agreement(APA) Report:(2017/18): APA Report of Technology Transfer and Monitoring Unit, BARC, Farmgate, Dhaka.

Presentation Report

Presentation Report Resource Person from TTMU, BARC: Transferred Technology at DAE **"গবেষণা প্রতিষ্ঠানসমূহ কর্তৃক উদ্ভাবিত ও প্রচলিত উন্নত প্রযুক্তি ও বিভিন্ন জেলায় এর সম্ভাবনা"**
রিসোর্স পারসন : ড. ফওজিয়া ইয়াসমিন, পিএসও (টিটিএমইউ), বিএআরসি।
প্রশিক্ষণ কর্মশালা: ২০১৬-১৭ রাজস্ব খাতের অর্থায়নে ফসল ও প্রযুক্তি প্রদর্শনী স্থাপন ও প্রতিগ্রহণ (Adoption) কার্যক্রমের ফলাফল, ২০১৭-১৮ সনের প্রদর্শনী বাস্তবায়নের অগ্রগতি এবং আগামী ২০১৮-১৯ সনের কর্মপরিকল্পনা" শীর্ষক প্রশিক্ষণ কর্মশালা, ১৭-১৮ এপ্রিল,২০১৮, কৃষি সম্প্রসারণ অধিদপ্তর, খামারবাড়ি, ঢাকা-১২১৫।

Planning and Evaluation

Nutrition

বোতলজাত ও জার পানির গুনগতমান ঃ জনস্বাস্থ্য ঝুঁকি, ড. মোঃ মনিরুল ইসলাম। প্রকাশকাল এপ্রিল ২০১৮. (Quality of Jar and Bottled water : Public Health Risk, Dr Md. Monirul Islam, 2018)

শাক-সব্জিতে কীটনাশক ঃ কতটা নিরাপদ বা ক্ষতিকর, ড. মোঃ মনিরুল ইসলাম। প্রকাশকাল মে ২০১৮. (Pesticide Residue in Vegetables : How Safe or Harmful ?

Soils, NRM

Agricultural Engineering, NRM

- Estimation of supplemental irrigation for *Aman* rice cultivation in Bogra and Dinajpur districts of Bangladesh. Progressive Agriculture, 2017.vol.: 28 (1): 42-54.
- Shifting from Boro to Braus paddy cultivation - Option to overcome water scarcity during dry season in Rangpur region.2017. BANCID Yearly Newsletter. pp. 05-06.
- Managed aquifer recharge: A viable option to tackle the water crisis in the coming days.2017. BANCID Yearly Newsletter. pp. 10-11.
- Published Books chapter on Agricultural Mechanization: Research and Development in Bangladesh. *In*: Gurung, T. R.; Kabir, W. And Bokhtiar, S. M. (Edit.), Mechanization for Sustainable Agricultural Intensification in SAARC Region, Published by the SAARC Agriculture Centre (SAC), BARC Complex, New Airport Road, Farmgate, Dhaka, ISBN: 978-984-34-3370-1, pp. 71-82.

IV. ADMINISTRATION AND FINANCE

ADMINISTRATION

Executive Council Meeting

The 24th -29th meeting of Executive council were held on 05 August 2017, 27 August 2017, 20 November 2017, 24 December 2017, 05 February 2018 and 11 June 2018 respectively in BARC conference room. The 24th meeting considered among others the approval of the recommendation of promotion and the recruitment committee-2, research achievement of BINA and SRDI of 2016-17 and research programmes of 2017-18 with budget. The 25th meeting considered among others the promotion and recruitment of committee 2 and 3. The research achievement of 2015-16, research progress of 2016-17 and research programme 2017-18 of BFRI(fish) were also discussed. The 26th meeting discussed the honouraria of PhD scholarship under PIU-BARC NATP-2, revision of evaluation criteria for promotion and direct recruitment for NARS Scientists, research review of BSRI, BTRI and research programme of 2017-18 with budget. The 27thmeeting considered the advantage of different scientist and officer of BARC, revision as evaluation criteria for promotion and direct recruitment for NARS scientists and the approval of the project under PBRG of PIU-BARC. The 28th meeting discuss about the approval of the project under PBRG of PIU-BARC, research achievement of 2015-16, research progress of 2016-17 and research programmes of 2017-18 with budget. Revision of evaluation criteria for promotion and direct recruitment of NARS scientists are also discussed. The 29th meeting considered the promotion and recruitment of committee 2 and 3, the final approval of four project of PBRG under PIU-BARC NATP-2, revision the budget of CRG and final approval of increasing allowance of foreign tour.

A view of Executive Council Meeting

FINANCE

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 BARCôs Finance Unit prepares the MBF/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.

Budgeting and Expenditure Control

The Govt. has implemented ñMedium Term Budgetary Framework (MTBF)ò 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.

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 2017-2018, BARC received Tk. 2487.05 lakh for Salary and allowances, Core Research, Technology Transfer , manpower development and operational fund. To implement the activities like technology transfer & manpower development etc. funds were released to the Agricultural Research Institutes (ARIôs) and associated organizations according to the budget plan. The overall financial progress made during the FY 2017-18 is as follows**:**

Financial progress under Revenue Budget:

(Taka in lakh)

Sl. No.	**Line items**	**FY 2017-18**		Achievement (%)
		Budget	**Expenditure**	
1.	Pay of Officer	380.00	374.60	
2.	Pay of Staff	310.00	294.50	
3.	Allowances	567.55	540.04	
4.	Research Expenses	140.00	137.36	
5.	Manpower Development/Training	115.00	114.87	
6.	Utility (Water,Elec.,Gas, Tel.)	191.00	191.00	
7.	Other operational	198.00	190.00	
8.	Contributory Provident Fund (Govt. part)	71.00	70.42	
9.	Repair and Maintenance	52.00	52.00	
10.	Leave Salary & Gratuity	320.00	320.00	
11.	Capital Expenditure	151.00	151.00	
	Total :-	**2495.55**	**2435.79**	**97.61%**
12.	**(-)** Self Income	**8.50**	**0.00**	
		2487.05	**2435.79**	

4. AFACI projects & others

Sl #	**Projects name**
1.	AFACI Post Harvest
2	AFACI ATIN Project BARC
3	AFACI Seed Extension
4	AFACI Salt tolenent Rice
5	AFACI GAP
6	CCSISA contribution to HRM in Agriculture
7	Feed the future Biotechnology potato partnership
8	Collection, Conservation and Characterization of important plant genetic resources
9	Development of Upazilla Land suitability assessment and crop zoning system of Bangladesh (KGF)
10	Capacity building for conducting adaptive trials seaweed cultivation in coastal area (KGF)

11	Nutrient management for diversified cropping in Bangladesh (KGF)
12	Updating of fertilizer recommendation through interpretation of research results generated by the NARS Institute (CRG) NATP-2
13	Development and up gradation of digital contents of National Agricultural Display Center(NADC) (CRG)

Accounting

BARCôs 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.

GOB Audit: GoB civil audit department not yet conducted audit for the FY 2017-2018.

Settlement of audit objections: During the year 2017-18 a remarkable number of audit objections have been settled out of 32 audit observations:

Sl. No.	Particular	Settled audit objections	Amount (Tk)
1.	Revenue	06	11,21,000.00
2.	Development	10	1,02,43,000.00
	Total :	**16**	**1,13,64,000.00**

Reporting

BARC Finance unit has kept all the record of expenditure incurred during the year and reported to the Agriculture Ministry, IMED, CAO, Development Partner and other Government offices monthly, quarterly, half yearly and annually for revenue and development programs..

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.

Reconciliation

BARC also reconciled the Accounts with CAO to prepare the Final Accounts which was submitted before the Public Accounts Committee (PAC) of the National Assembly.

Retirement benefits

During the year 2017-18, retirement benefits and CPF payment made to the Officerôs and Staff of BARC are shown below:

a) CPF Final payment:

1.	Officerôs & Staff (19 persons)	1,46,83,419.00
	Total Tk.=	**1,46,83,419.00**

b) Gratuity payment:-

1.	Officerôs & Staff (18 persons)	Tk. 3,21,44,380
	Total Tk.=	3,21,44,380

c) Leave Salary payment: Leave Encashment allowed to the Officerôs and Staff during the year are as follows:-

1.	Officerôs & Staff (10 persons)	Tk. 34,14,739.00
	Total Tk.=	34,14,739.00

d) CPF Loan: CPF loan provided to the Officerôs and Staff during the year is as follows:

1.	Officerôs (4 persons)	Tk. 35,50,000.00
2.	Staff (34 persons)	Tk. 89,78,652.00
	Total Tk.=	**1,25,28,652.00**

Income tax: Salary statement provided to the Officerôs and Staff for payment of Income tax during the year.

Group Insurance

BARC undertook Group Insurance scheme for well being of its Officers and Staff for any unavoidable incident with Jiban Bima Corporation since 39 years. We mourn of our one colleagues i) Late Monowara Begum, Office attendant during the year. We received an amount of Tk.3,53,280.00 as compensation under the Group Insurance from Jiban Bima Corporation for the aforesaid deceased and payment made to their nominees accordingly.

Professional Staff

Office of the Executive Chairman

Md. Kabir Ikramul Haque, PhD, Executive Chairman
Md. Hussyam Uddin Parvez, PS to Executive Chairman
Md. Monowar Karim, PhD, Member Director (Current Charge) (on deputation)

Crops Division

Md. Aziz Zilani Chowdhury, PhD, Member Director (Current Charge)
Mian Sayeed Hassan, Chief Scientific Officer, PhD
Md. Abdus Salam, PhD, Principal Scientific Officer
Md. Harunur Rashid, PhD, Principal Scientific Officer
Shah Md Monir Hossain, PhD, Principal Scientific Officer

Planning and Evaluation Division

Paresh Chandra Golder, PhD, Member Director
Md. Abdul Awal, PhD, Principal Scientific Officer
Kabir Uddin Ahmed PhD, Principal Scientific Officer

Natural Resources Management Division

Sultan Ahmmed, PhD, Member Director (Current Charge)
Mohammad Shahjahan, PhD, Chief Scientific Officer (Forestry)
Md. Abdus Satter, PhD, Chief Scientific Officer (Soils)
Shaikh Mohammad Bokhtiar, PhD, Principal Scientific Officer (Soils)
Md. Baktear Hossain, PhD, Principal Scientific Officer (Soils)
Nazmun Nahar Karim, PhD, Chief Scientific Officer (Ag. Engg.) (Addl. Charge)
Md. Saifullah, PhD, Principal Scientific Officer (Forestry)

Fisheries Division

A.S.M. Anwarul Huq, PhD, Member Director (Additional Charge)

Nutrition Unit

Md. Monirul Islam, PhD, Director
Zakia Rahman Moni, PhD, Senior Scientific Officer

Livestock Division

Shah Md. Ziqrul Haq Chowdhury, PhD, Member Director (Current Charge)
Md. Rafiqul Islam, PhD, Principal Scientific Officer

Agricultural Economics and Rural Sociology Division

A.S.M. Anwarul Huq, PhD, Member Director
Mosharraf Uddin Molla, PhD, Principal Scientific Officer

Technology Transfer Monitoring Unit

S.M. Bokhtiar, PhD, Director (Additional Charge)
Fauzia Yasmin, PhD, Principal Scientific Officer
Suraya Parvin, PhD, Senior Scientific Officer

Agricultural Information Centre

Md. Rafique Mostafa Kamal, Director (Current Charge)
Susmita Das, Senior Documentation Officer
Hosne Ara Fersous, Bibliographic Officer (Additional Charge)

Computer and GIS Unit

Hasan Md. Hamidur Rahman, Director (Additional Charge)
Md. Shohid Uddin Bhuiyan, System Analyst

Manpower and Training Unit

S M Khorshed Alam, PhD, Director (Addl. Charge)
Md. Mustafizur Rahman, Principal Training Officer (Addl. Charge)
Md. Mobashir Hossain, Senior Training Officer

Administration and Finance Division

Paresh Chandra Golder, PhD, Member Director

Support Service Unit

Abdus Salam, PhD, Director (Support Service) (Addl. Charge)
Md. Abdul Mottakin, Deputy Director (Establishment)
KM Ali Haider, Assistant Director (Establishment)
Shohag Fakir, Assistant Director (Establishment)
Dalil Uddin Boshnia, Assistant Director (Common Service)

Finance Unit

Ajit Kumar Chakraborty, Director (Finance) (Current charge)
Md. Jashim Uddin Chowdhury, Deputy Director (Budget)
Md. Mahabubul Hassan, Sr.Asstt. Director (Budget)
Md. Daloar Hossain, Sr. Asstt. Director (Accounts), Deputy Director (Accounts) Addl. Charge
Sk.Habibur Rahman, Asstt. Director (Audit)

THE GOVERNING BODY

BANGLADESH AGRICULTURAL RESEARCH COUNCIL

1	Honorable Minister for Agriculture	Chairman
2	Honorable Minister for Fisheries and Livestock	Co-Chairman
3	Honorable Minister for Environment and Forests	Co-Chairman
4	Mr. Nazmul Hasan, Parliament Member, Kishoregonj-6	Member
5	Mr. Abdul Mannan, Parliament Member, Bogra-1	Member
6	Secretary, Ministry of Agriculture	Member
7	Secretary, Ministry of Fisheries and Livestock	Member
8	Secretary, Ministry of Environment and Forests	Member
9	Member (Agriculture), Planning Commission	Member
10	Vice Chancellor, Bangladesh Agricultural University	Member
11	Chairman, Bangladesh Agricultural Development Corporation	Member
12	Executive Chairman, Bangladesh Agricultural Research Council	Member
13	Director General, Department of Agricultural Extension	Member
14	Director General, Bangladesh Agricultural Research Institute	Member
15	Director General, Bangladesh Rice Research Institute	Member
16	Director General, Bangladesh Jute Research Institute	Member
17	Director General, Bangladesh Institute of Nuclear Agriculture	Member
18	Director General, Bangladesh Sugarcane Research Institute	Member
19	Director General, Department of Livestock Services	Member
20	Director General, Department of Fisheries	Member
21	Joint Secretary, Finance Division, Ministry of Finance	Member
22	Joint Secretary (Discipline and Law), Ministry of Public Administration	Member
23	Chief Conservator of Forests, Forest Department	Member
24	Dr. M.A. Hamid Miah, Liaison Scientist, IRRI Bangladesh, House#9, Road#2/2, Banani, Dhaka	Member
25	Dr. Qazi Kholiquzzaman Ahmad, Chairman, Palli Karma-Sahayak Foundation, PKSF Bhaban, Plot-E, 4/B, Agargaon, Dhaka	Member
26	Professor Dr. M. Nurul Islam, BUET, Flat-7, Minakkhi Apartment, House#27, Road# 12A (New), Dhanmandi, Dhaka	Member
27	Mr. Motahar Hossain Mollah, President, Bangladesh Krishok League, Kapasia, Gazipur	Member
28	Mr. A.K.M. Azad, Proprietor, A.M. Traders, Globe Center, 28/1 Indira Road, Farmgate, Dhaka	Member
29	Representative from an NGO	Member
30	Member Director (Administration & Finance), BARC	Member Secretary

THE EXECUTIVE COUNCIL

BANGLADESH AGRICULTURAL RESEARCH COUNCIL

1.	Executive Chairman, Bangladesh Agricultural Research Council, Dhaka	Chairman
2.	Director General, Bangladesh Agricultural Research Institute, Gazipur	Member
3.	Director General, Bangladesh Rice Research Institute, Gazipur	Member
4.	Director General, Bangladesh Jute Research Institute, Dhaka	Member
5.	Director General, Bangladesh Institute of Nuclear Agriculture, Mymensingh	Member
6.	Director General, Bangladesh Sugarcrop Research Institute, Ishurdi, Pabna	Member
7.	Director General, Bangladesh Livestock Research Institute, Savar, Dhaka	Member
8.	Director General, Bangladesh Fisheries Research Institute, Mymensingh	Member
9.	Director, Bangladesh Tea Research Institute, Srimongal, Moulvibazar	Member
10.	Director, Bangladesh Forest Research Institute, Chittagong	Member
11.	Director, Soil Resource Development Institute, Dhaka	Member
12	Director, Bangladesh Sericulture Research and Training Institute, Rajshahi	Member
13	Executive Director, Cotton Development Board, Dhaka	Member
14	Executive Director, Krishi Gobeshona Foundation, Dhaka	Member
15.	Member Director (Crops), BARC	Member
16.	Member Director (Planning and Evaluation), BARC	Member
17.	Member Director (Natural Resources Management), BARC	Member
18.	Member Director (Agricultural Economics and Rural Sociology), BARC	Member
19.	Member Director (Livestock), BARC	Member
20.	Member Director (Fisheries), BARC	Member
21.	Member Director (Administration and Finance), BARC	Member Secretary