BARC

at a Glance

Bangladesh Agricultural Research Council
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Cover Picture
Middle center : BARC Complex, New Airport Road, Farmgate, Dhaka-1215, Bangladesh
Top right corner : Logo of the Mujib Year. 17 March 2020-17 March 2021
Birth Centenary Celebration of Father of the Nation Bangabandhu Sheikh Mujibur Rahman

Back Cover Picture
Middle center : Images for pictorial activities of different programs
Middle right : Senior management email addresses

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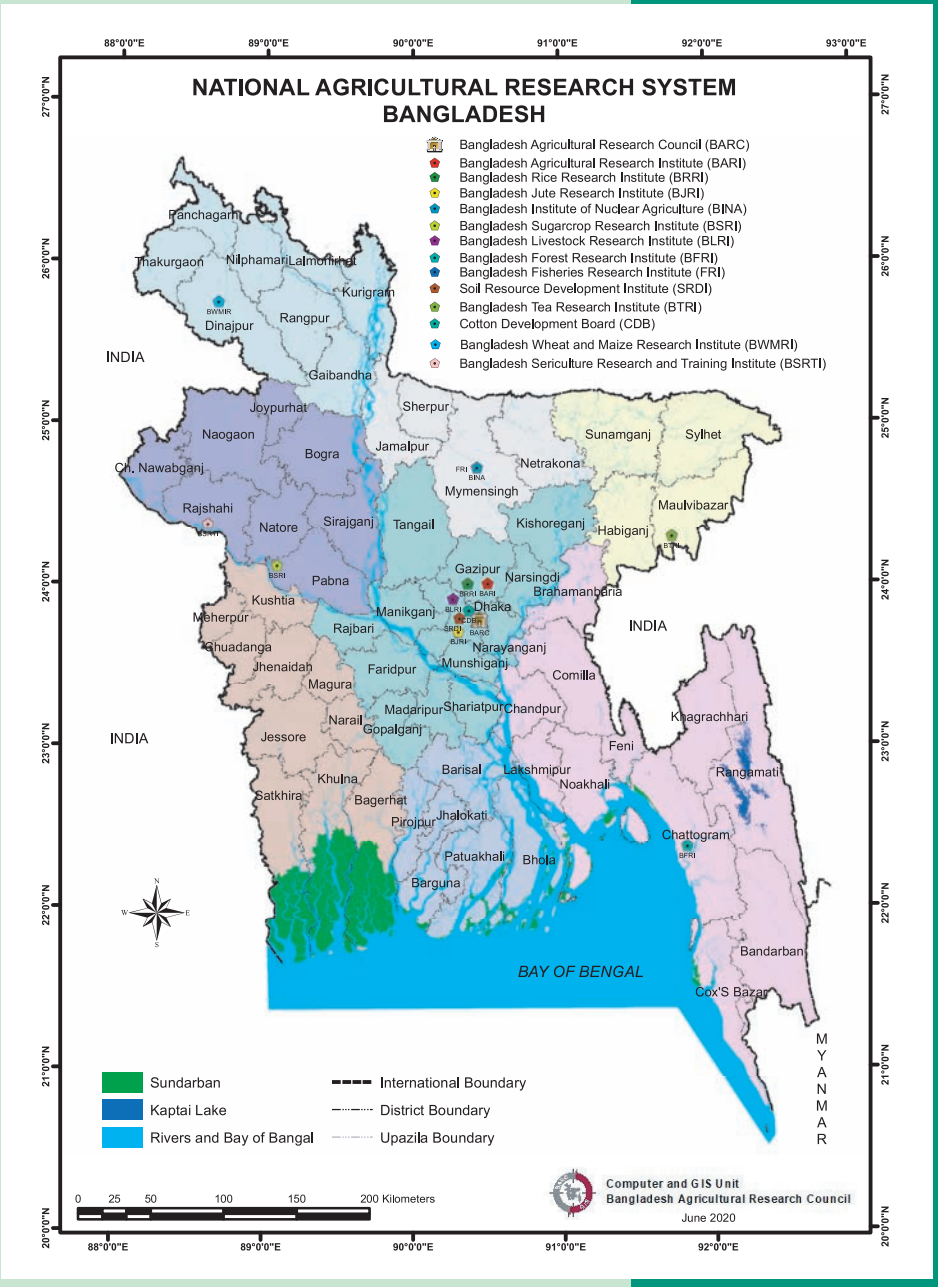

NATIONAL AGRICULTURAL RESEARCH SYSTEM IN BANGLADESH

MESSAGE

Dr. Shaikh Mohammad Bokhtiar
Executive Chairman, BARC

I am delighted to see the "BARC at a Glance", has come into effect to showcase its role, contributions and strengths in the field of agriculture both to the readers at home and abroad. It has now been almost a half century since the establishment of Bangladesh Agricultural Research Council (BARC), the Apex Body of the National Agricultural Research System (NARS) in Bangladesh. Since its establishment, BARC has gone through a series of reforms before the BARC Act 2012 was passed and enacted on March 8, 2012, through the amendment of BARC Act 1996.

On this Pleasant occasion of brochure publication, I humbly recall our Founding Father of the Nation Bangabandhu Sheikh Mujibur Rahman with heartfelt homage and solemnity who, soon after the independence of Bangladesh, pioneered different visionary steps for agricultural development including the establishment of BARC in 1973. In continuation to his dream, the present and past governments led by his dynamic and visionary daughter Hon'ble Prime Minister Sheikh Hasina, who took the agricultural development to new heights and recognized as a role model for many countries of the present world.

It's my great privilege to be the Executive Chairman of BARC just before the start of centenary celebrations of birth anniversary of the Founding Father of Bangladesh. BARC has been established with the vision of effective management of agricultural research and development (R&D) activities with an aim to improve the lives and livelihoods of the people of Bangladesh. BARC is mandated to manage the overall agricultural R&D activities in partnership with a wide range of stakeholders and collaborating organizations that includes public (NARS, Universities), private and non-government organizations.

Through the pioneering contributions of BARC and BARC affiliated/ associated institutions and agencies, the country has now become self-sufficient in cereal food grain production and moreover with surplus production of potato. In terms of global ranking in food production, we are now 3rd in vegetable growth, 2nd in jute, 3rd in rice, 4th in tea, 7th in mango, 7th in potato production and 4th in aquaculture. Our success in fisheries and livestock is also quite impressing. When we remember our successful past joyfully, we need to commit ourselves to meet the future challenges to Bangladeshi agriculture, which is far more challenging than the past. Therefore, I urge my team of scientists, technical and support staffs to look forward and contribute to further intensify our efforts to meet the new challenges.

I hope that this Brochure will be helpful to the NARS and other related personnel, with its updated and informative contents. My thanks are due to the Committee Members who worked hard with their utmost devotion, endeavour, enthusiasm and sincerity to bring out this publication within the shortest possible time.


ফার্মিং সিস্টেম রিসার্চ প্রজেক্ট
উচ্চ ফলনশীল বি.আর ৩৪ ধান চাষ
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বাংলাদেশ মৎস্য গবেষণা ইনস্টিটিউট


"Towards
Building Advanced
Intelligent Systems for
Sustainable Agriculture"

Bangladesh Agriculture

Agriculture sector plays a pivotal role in achieving food and nutrition security and improving the livelihood of the people of Bangladesh. It is the lifeline of the economy of the country. The agriculture sector that includes crops, livestock, fisheries and forest sub-sectors contributes a significant share to the Gross Domestic Product. Agriculture is the largest income and employment generaing sector. On one hand, it contributes towards alleviating poverty and on the other hand, it plays a remarkable role in meeting the challenge of achieving self-sufficiency in food production and fostering sustainable economic growth.

Bangladesh has become a lesson learning model for growth even during global economic crisis. In this growth story, agriculture is an important vibrant sector for Bangladesh. The Government of Bangldesh supports developing agricultural technologies, diversifying crops, livestock and fisheries, providing subsidy and agricultural credit, ensuring uninterrupted power supply and most importantly agricultural mechanization for transforming subsistence to commercial agriculture. Moreover, the government has formulated its agriculture and food security policies and action plans in aligninment with the Sustainable Development Goals (SDGs) of the United Nations. Through implementing National Agricultural Policy, adopting 7th Five-Year Plan, attaining the goals of SDGs and sketching the Delta Plan 2100, the agricultural sector is materializing the dreams of Father of the Nation, Bangabandhu Sheikh Mujibur Rahman.

1. ◆ Bangladesh Agricultural Research Council

Bangladesh Agricultural Research Council (BARC) is the Apex Body of the National Agricultural Research System (NARS) under the Ministry of Agriculture. It was estalished in 1973 to provide a systematic approach to priority setting, planning, monitoring, evaluating, coordinating and conducting national agricultural research program in order to accelerate food production including fish and livestock and labour productivity. It has the responsibility to strengthen the national agricultural research capacity and capability through planning and integration of resources. It also provides advisory services to the government and gives strategic guidance to NARS for the development of research programs. The country has achieved 3rd in vegetable growth, 2nd in jute, 3rd in rice, 4th in tea, 7th in mango, 7th in potato production and 4th in aquaculture in the world performance grading through the adoption of modern technologies developed by NARS. The country is now self-sufficient in rice and fish production.

1.1 ◆ Vision

- An efficient, effective and sustainable agricultural research system.

1.2 ◆ Mission

- Enhancement of research capacity for agricultural development through agricultural innovations including development of improved variety and sustainable technology based on the partnership with NARS institutes, agricultural universities, private organizations and other collaborating agencies.

1.3 ◆ Mandate

- Prioritize the areas of agricultural research in line with the framework of the National Agricultural Policy;
- Formulate essential and appropriate agricultural research plans for NARS institutes and coordinate the same;
- Review and monitor the progress, and evaluation of research activities of the institutes as per the schedule set in the approved research programs and proposals;
- Monitor the transfer of agricultural technology at the field level and advise the concerned organizations to remove the bottlenecks in the dissemination of technology;
- Undertake necessary steps for human resource and capacity development of the NARS institutes;
- Advise the government in respect of problems and prospects of agricultural research and appropriate external assistance in the agriculture sector.

1.4 ◆ Milestones

- Bangladesh Agricultural Research Council (BARC) was established in 1973 by the Presidential Order No. 32 to coordinate agricultural research conducted by various organizations.
- BARC was restructured in 1976 under the Ordinance, BARC Amendment No. LI 1976.
- The Ordinance was replaced by the BARC Amendment Act. No. 28 in 1988.
- This Act was again amended by the Parliament in August 1996 to give BARC wider responsibility of human resource development, planning, priority setting, coordinating, monitoring, reviewing and evaluating of research programs of the National Agricultural Research Institutes.
- Wider responsibility is entrusted on the council through enacting BARC Act 2012 by expanding areas, integrate and strengthen to make the country's agricultural research more vibrant, tailored and effective. The Act empowers BARC to allocate research resource in order to co-ordinate the agricultural research program.

1.5 ◆ Organizational Structure

BARC has involved collaborative activities in several ministries of government like Agriculture, Environment, Forest and Climate Change, Fisheries and Livestock, Local Governnment, Rural Development and Cooperatives, Education, Industries, Commerce, Science and Technology, etc. BARC is organized into three main constituents: The Governing Body (GB), the Executive Council (EC) and the Secretariat.

1.5.1 ◆ Governing Body

The Governing Body (GB) is the supreme authority of the Council. It controls, directs and oversees the matters pertaining to research, planning, coordination and administrative policy formulation of the Council. The Honorable Minister for Agriculture chairs the Governing Body and Minister for Fisheries and Livestock and Minister for Environment, Forest and Climate Change are the Co-chairs. There are 30 members that include two members of the National Parliament, representatives from Extension Departments (Agricultural Extension, Livestock, Fisheries and Forestry), Agricultural Universities, Agricultural Research Institutes, NGOs, Private sector, Farmers and Executive Chairman of BARC. Member Director (Administration and Finance) of BARC acts as Member Secretary of the Governing Body.

Governing Body Meeting

1.5.2 ◆ Executive Council

The Executive Council consists of the Executive Chairman and Member Directors of BARC, and the Heads of different Agricultural Research Institutes (ARIs). The Executive Council is responsible to the GB. It assists in various policy issues in NARS and approves the research program of ARIs. The Executive Chairman of BARC chairs the Executive Council.

Executive Council Meeting

1.5.3 ◆ BARC Secretariat

The Executive Chairman is the Chief Executive Officer of BARC, who is responsible for the execution of decisions of GB and overall administration and implementation of programs of BARC. The Member Directors of the Council assist the Executive Chairman in carrying out the activities.

1.5.4 ◆ Divisions and Units

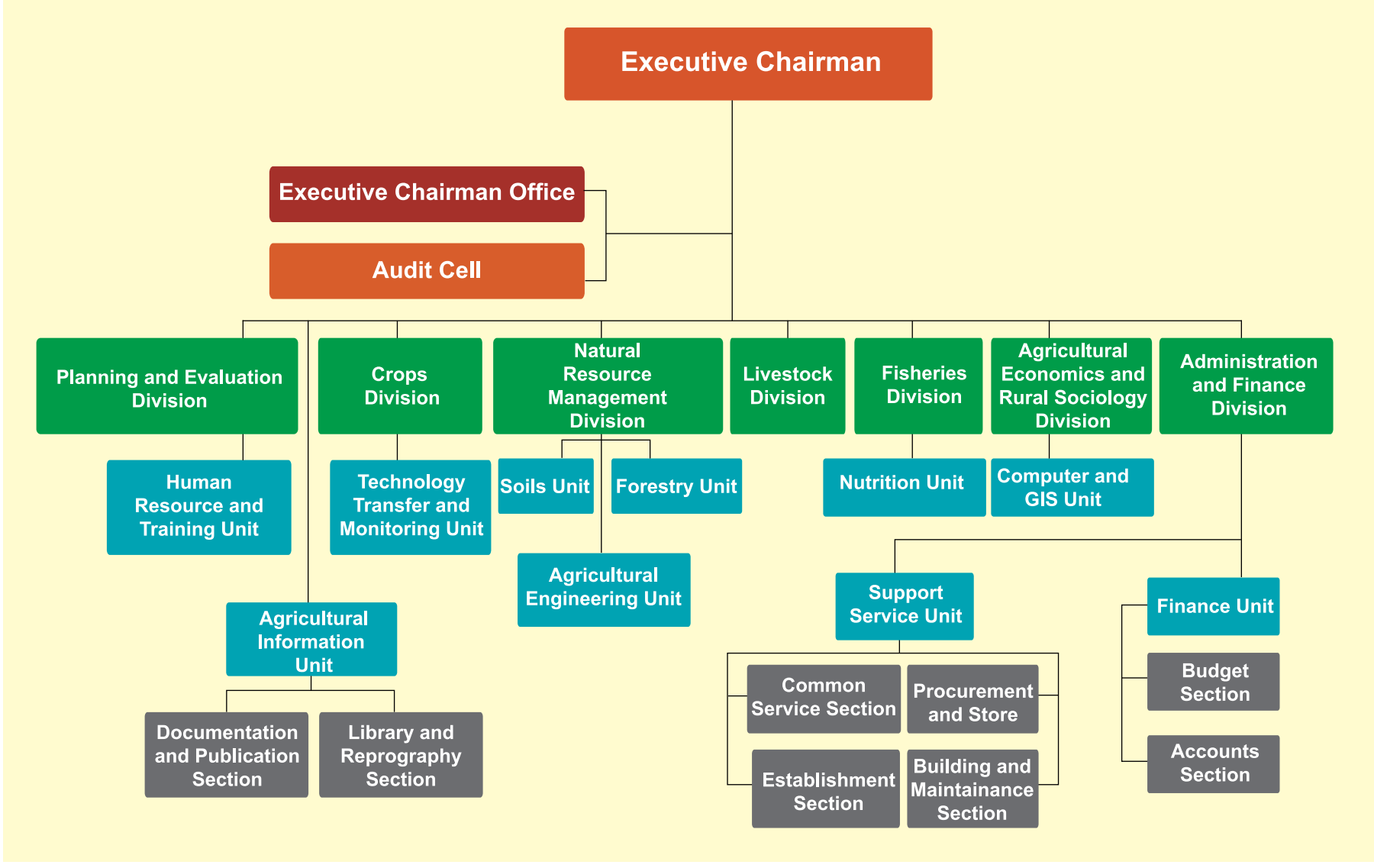
BARC has seven Divisions headed by the Member Directors. The Divisions are- (a) Administration and Finance, (b) Planning and Evaluation, (c) Crops, (d) Natural Resource Management, (e) Agricultural Economics and Rural Sociology, (f) Livestock, and (g) Fisheries. These Divisions are responsible for coordinating the activities in specific fields or program areas.

The BARC Secretariat, consisting of technical and general staffs implements the policies and guidelines formulated by the Governing Body. The Secretariat has a number of units, which include Soils, Forestry, Agricultural Engineering, Human Resource and Training, Technology Transfer and Monitoring, Computer and G1S, Agricultural Information Centre, Nutrition, Support Service and Finance.

Each Division and Unit of BARC is responsible for identifying problem areas and setting priorities for research, reviewing project proposals and reports, improving research extension linkages, developing the capacity building for emerging research issues, and keeping abreast of the progress of research. Responsibilities also include monitoring and evaluating research programs, identifying deficiencies in research coverage, and suggesting means of improvement; developing inter-institutional projects and fostering cooperation among the scientists and research institutes. The organizational structure of BARC is shown in page 17. Considering the current global food security and environmental issues and to address future challenges, the organizational structure needs to be reviewed and improved.

Under the provision of BARC Act 2012, National Agricultural Research System (NARS) has been formed with BARC as the apex body and twelve agricultural research organizations are the constituent units. The agricultural universities, NGOs and private sector though not integrated but linked with NARS in terms of research collaboration. Among the 13 research organizations including BARC, six organizations (BARC, Bangladesh Agricultural Research Institute, Bangladesh Rice Research Institute, Bangladesh Jute Research Institute, Bangladesh Institute of Nuclear Agriculture, Bangladesh Sugarcrop Research Institute) are autonomous bodies(Schedule A) under Ministry of Agriculture. While, three government departments (Bangladesh Forest Research Institute, Soil Resource Development Institute and Cotton Development Board) under Ministry of Agriculture and four other autonomous bodies under different Ministries (Bangladesh Livestock Research Institute, Bangladesh Fisheries Research Institute, Bangladesh Tea Research Institute and Bangladesh Sericulture Research and Training Institute) are grouped in Schedule B. The newly established Bangladesh Wheat and Maize Research Institute is also in the process of inclusion under NARS.

Organogram of BARC



2. ◆ Highlights of Activities of Bangladesh Agricultural Research Council

2.1 ◆ Research Priority Setting

Considering the different policies of the government, national demand and climate change, research issues are prioritized and compiled as "Agricultural Research Vision 2030 and Beyond". The vision document has been prepared for 12 sub-sectors of agriculture as an effective visionary future agricultural research guideline.

Consultation Meeting on Improvement of Research Planning, Monitoring and Evaluation of the NARS

2.2 ◆ Research Planning and Coordination

As the national coordinating body for research, BARC provides essential directives for NARS and associated institutes on the basis of national policies such as Agricultural Research Vision 2030 and Beyond, Bangladesh 2nd Country Investment Plan, 7th Five-Year Plan, National Agriculture Policy 2018, Master Plan for Agricultural Development in the Southern Region, Biotechnology Policy 2012 etc. The technical divisions organize annual review workshops for reviewing the progress and the activity planning for next year's research agenda avoiding duplication of research in the presence of specialized expert members. BARC organizes workshops on Crop Improvement, Biotechnology, Crop Production, Insect Pest Management, Disease Management, Technology Transfer, Agricultural Mechanization, Soil, Forest, Agricultural Economics, Fisheries and Livestock. BARC has a great role in variety release, fertilizer and pesticide recommendation process. Different technical divisions of BARC are engaged in project development, research and product management.

Annual Review Workshop on Crop Production

Variety Release: BARC along with the technical committee of National Seed Board (NSB), Ministry of Agriculture review the institutional proposal and recommends release of new variety considering yield and quality of 6 notified crops (rice, wheat, sugarcane, jute, kenaf and mesta) to the NSB. During the last ten years, more than 170 varieties of different crops were recommended to NSB for release.

Fertilizer Recommendation Guide: BARC publishes Fertilizer Recommendation Guide (FRG) for major crops and cropping patterns periodically at five years interval. The first FRG was published in 1979 in the name of "Fertilizer Guide for Major Crops of Bangladesh". The subsequent six FRGs were updated and published. The Fertilizer Recommendation Guide- 2018 is a revised and seventh version of FRG published both in Bangla and English. This guide is available at BARC website (www.barc.gov.bd).

Under the research planning and coordination activities, BARC has been organizing significant number of programs, sub-projects under National Agricultural Technology Program, special projects funded by the Ministry of Agriculture and projects in collaboration with regional and international organizations. Some of the salient projects are highlighted below.

Annual Review Workshop on Crop Improvement


Launching Ceremony
Fertilizer Recommendation Guide 2018
Chief Guest : Dr. Md. Abdur Razzaque MP
Hon'ble Minister, Ministry of Agriculture
Special Guest : Kbd. Al Mannan MP
ARC

National Agricultural Technology Program (NATP): To improve national agricultural productivity, market linkages and farm income, focussing small, marginal and female farmers, the government has signed a contract of agreement with World Bank to initiate a project named National Agricultural Technology Program (NATP) for a period of 15 years (in three phases), co-founded by IFAD. Accordingly, NATP-Phase 1 was initiated in July 2007 which was completed in December 2014. After the significant achievements made in Phase 1 of the project that had a long history of World Bank engagement, the project was declared as a Flagship project in Asia. The notable achievements of NATP-1 were: increased efficiency and effectiveness of the agricultural research systems (i.e. delivered 42 transferable technologies of crops, livestock and fisheries, engaged 10 post-doctorates, 79 PhDs awarded in-country and 29 PhDs awarded in different foreign universities. ICT linkages were made with institutions like BARI, BRRI, BJRI, BSRI, BLRI, BFRI-Fisheries, SRDI and improved lab facilities of BARI, BRRI, BINA, BTRI, BJRI, SRDI, BLRI and BSRI). Efforts are being continued to add greater value to the output of the agricultural sector by giving importance to commercialization.

Some of the key lessons learned during the implementation of NATP-1 were to increase productivity and focus on facilitating value addition through better market linkages for improved value chain and supply chain management. This is to ensure the sustainability of farmer groups and in particular of Producer Organizations (POs). After accomplishing significant achieviements in Phase I, the Government of Bangladesh approved the second phase with a total cost of BDT 1,878 crore for additional six years with duration from 1st October 2015 to 30 September 2021. The project is sponsored by the ministry of Agriculture and ministry of Livestock and Fisheries. The components of the project are: i) Enhance agricultural technology generation- Project Implementation Unit, PIU-BARC; ii) Support crop development, PIU-DAE; iii) Support fisheries development, PIU-DoF; iv) Support Livestock Development, PIU-DLS; v) Project Management Unit-PMU. The project is funded by GoB, World Bank, IFAD and USAID. The project started on 5 September 2016 effectively.

PIU-BARC component of NATP-2 project under BARC aims to achieve generation of innovative agricultural technologies and improve the performance of the NARS by strengthening agricultural research institutions. This included technology generation through Competitive Research Grant (CRG), Program-Based Research Grant (PBRG), human resource development (higher studies, capacity building training and study visit), research and training infrastructure facilities, development and strengthening the ICT facilities in NARS. The component started functioning in September 2016 and completed field implementation of 190 CRG research sub-projects. Another 51 PBRG research sub-projects were also awarded to the scientists of NARS institutions, universities and other relevant organizations. The major activities of PIU-BARC are:

Undertaking 190 (one hundred ninety) Competitive Research Grant (CRG) sub-projects: Competitive Research Grant (CRG) program targeted to promot demand-driven basic, strategic, applied and adaptive research with better research extension-farmer linkages. CRG critically targets to mobilize research capacity, stimulate creativity and promote efficiencies in the research system. CRGs are open to all research providers-National Agricultural Researc Institutes (NARIs) and non-NARI research providers (Public Universities, Private Sector, NGOs and other Organizations). Competitive Research Grant program is funded by GoB and USAID.

Research on Flower under CRG Sub-Project, BARI

PhD Scholarship Awardee under NATP-2

PhD Scholarship Awardee under NATP-2

Undertaking 51 Program-Based Research Grant (PBRG) sub-projects:

The coordinated PBRG program planned to be operated by NARIs is expected to make wider scope in integrating multiple organizations to jointly address national agricultural problems and strengthen research management capacity, utilizing proper resources in national perspective. The duration of the PBRG sub-project is maximum 4 (Four) years i.e. up to June 2021. Program-Based Research Grant is funded by the World Bank and IFAD.

Inception Workshop of a PBRG sub-project

Half yearly Progress Review Workshop of a PBRG sub-project

Monitoring of Project Activities

Agricultural Biotechnology Support Project (ABSP-II): BARC coordinated the ABSP-II project since 2005. Under the project, BARI released four Bt-brinjal varieties following government approval. Three more projects are under consideration and in the pipeline for necessary approvals. Besides, research efforts on the development of late blight resistant potato varieties are continuing.

Asian Food and Agriculture Cooperation Initiative (AFACI): BARC functions as a national focal point for AFACI Project which is funded by the Government of Korea since 2010. Some of the salient activities of the project are, germplasm collection and conservation of various crops, development of stress-tolerant varieties, good agricultural practices (GAP), integrated pest management (IPM) technology and good postharvest (GPHT) technology.

Land Suitability Assessment and Crop Zoning (LSACZ): BARC has compiled crop zoning map for 17 crops to increase crop production based on soil, climate and region-specific suitable crops in cooperation with NARS institutes and DAE. Preparation of crop zoning map for 300 Upazilas is in progress.

Pubication on Land Suitability Assessment and Crop Zoning

Seaweed Production Capacity Building: BARC attempted to integrate and boost up the blue economy through implementation of artificial culture of seaweed under the project 'Capacity Building for Conducting Adaptive Trials on Seaweed Cultivation in Coastal Areas' with the cooperation of BARI. Three species, namely, *Gracilaria tenuistipitata, Hypnea boergesenii and Ulva lactuca* were found suitable in open sea cultivation and *Hypnea boergesenii* was found suitable for commercial production in the open sea. Through training and technical support, farmers are now cultivating seaweed in the open sea and in wider areas.

Cultivation and Harvest of Seaweed, Nunia Chara, Cox's Bazar

2.3 ◆ Monitoring and Evaluation of Research Programs

The successful implementation of agricultural research programs and maintenance of high research standards depend on periodic monitoring and evaluation of the programs. BARC undertakes a periodic review of the programs and projects implemented by the NARS institutes in various areas of agricultural research and development. The professionals of BARC are monitoring both at the desk and field level. Desk monitoring included reviews of financial, physical and technical progress considering field monitoring activities with an interval of 5-6 months using format to collect first-hand information/data. PIU–BARC has established central M&E Cell at BARC, Divisional M&E Cell of BARC, Institutional M&E Cell at respective organizations and formed an internal monitoring team at PIU-BARC to exercise field monitoring of on-going sub-projects.

Monitoring PBRG Sub - Project on Farming System Research

2.4 ◆ Technology Transfer

Execution of Program on Increasing Rice and Pulses Production: This program was executed during 2009-2011 across the country by DAE, BADC and NARS Institutes coordinated by BARC to increase rice and pulses production. Under this program Breeders Seed, Foundation and Certified Seed of high yielding varieties were produced and distributed to the farmers. Subsequently, the production of rice and pulses had increased by 17.5 % and 15%, respectively.

Agriculture Technology Transfer Project: The BARC implemented 'Agriculture Technology Transfer Project' funded by Japan Debt Cancellation Fund (JDCF) during 2005-2010 to improve the livelihoods of small and marginal farmers through transferring agricultural technologies and marketing their products. A total of 55 technologies of crops, livestock, fisheries and agroforestry were validated and transferred in 43 Upazilas through this project. Subsequently, 16744 farmers were trained, 11840 field days and 767 demonstrations were organized on selected technologies.

Awareness on Safe Food and a Balanced Diet: A well pictured "Food Plate" has been developed by BARC for healthy daily life and knowledge on proper nutrition and its popularization among mass people about safe food intake. An ample number of "food plate" has already been distributed through training and workshop among stakeholders like extension workers, academicians, print and electronic media and other available platforms for disseminating nutrition information and knowledge.

Seminar/Workshop/Training/Fair/Meeting: BARC uses multiple media for disseminating matured technologies to the end-users. With the integrated effort of technical divisions of BARC organized seminars in National Vegetables Fair, Fruit Fair, Honey Fair, Seed Fair, World Food Day and other occasions. It also arranges workshops to share matured technologies to the stakeholders. Moreover, BARC arranges training of trainers (ToT).

Agricultural Technical Extension Coordination Committee Meeting (ATECC)

Field Day on Field Performance of Newly Released Wheat Varieties

at a glance

Seminar at the National Vegetables Fair 2019

National Honey Fair 2020

Seminar at the National Vegetables Fair 2020

National Vegetables Fair 2020

2.5 ◆ Human Resource Development

In 2010, a comprehensive 'Human Resource Development Plan 2025" for short, medium and long term higher education has been formulated by BARC. BARC has been arranging higher studies for NARS scientists both at home and abroad. Moreover, short term trainings were conducted under the human resource development plan. A total of 466 PhDs, 10 Post Doctoral and 1209 Short term training were conducted under the human resource development plan. In addition, 1800 scientists/officers had opportunities to train for skill development. Besides, 16744 farmers were trained and 11480 field days were organized. BARC also arranged the foundation training for 1040 NARS scientists/officers in 26 batches.

PIU-BARC, NATP-2 has a provision for local (80) and foreign (60) PhD programs under capacity building of NARS scientists to coordinate national research activities and to implement basic and adaptive researches at laboratory and field level that are on-going. Efforts are being made to develop the quality of scientific manpower who were directly involved in technology generation to ensure food security of the nation by inducing stress tolerance gene in locally adopted crop genotypes and by mitigating the challenges of low yield potentials of local crop varieties through organizing short term training and study visit mostly for senior officials of NARS Institutes.

at a glance

Inaugural Session and Certificate Awarding Ceremony of some Training Courses

2.6 ◆ Strengthening of Research Facilities

The PIU-BARC, NATP 2 has provision for improving the existing research and training facilities of BARC and NARS Institutions as well as to ensure advance research in the context of climate change and environmental pollution. So far, the project supported to establish an electrical connection in two newly constructed floors of training building of BARC complex. The project also supported to install sub-station to facilitate the smooth (uninterrupted) supply of power throughout the BARC complex. A comprehensive plan is made to equip the laboratories of NARS Institutes and outreach stations to carry out advance research programs.

2.7 ◆ Policy Formulation and Action Plan

Preparation of Acts and Rules: The scientists of BARC actively participated in the preparation of different acts and rules related to agriculture. Some of those are- Fertilizer (Management) Act 2018, Plant Quarantine Rules 2018, BJRI Act 2017, BWMRI Act 2017, BARI Act 2017, BRRI Act 2017, BINA Act 2017, Seed Act 2018, Pesticide Act 2018, Pesticide Rules 2019 (Draft), Underground Water Management Law 2018, Bangladesh Dairy Development Act 2017, BLRI Act 2017, Bangladesh Water Rules 2018, NPGRI Act 2018 (Draft), BIAG Act 2019(Draft).

Formulation of National Agricultural Policy: BARC assisted in developing 'National Agricultural Policy 2018' under the supervision of Ministry of Agriculture in continuation of 'National Agricultural Policy 2013' considering the context of global climate change, current issues and national demand identified by different stakeholders.

Policy Formulation: The scientists of BARC actively participated in different policy formulation related to agriculture. Some of those are- Underground water management in Agriculture Rules 2019, Agriculture Policy 2018, Draft National Seed Policy 2018, Integrated Minor Irrigation Policy 2017, Crop Variety and Technology Development Policy 2010, National Organic Agriculture Policy 2016, National Milk Development Policy 2016, Evaluation and Release Procedure of Rice, Evaluation and Release Procedure of Wheat, Multi-Sectoral Action Plan for the Non-communicable Disease Control and Prevention 2016-21, Guidelines for Establishing and Managing Tissue Culture Laboratory for potato seed production 2018, Procedure for Organic Agriculture Standard (Accreditation).

Farm Mechanization: BARC provides directives, suggestions and technical assistance to different universities and NARS Institutes on different aspects of farm mechanization including irrigation, water management and post-harvest technologies. In the context of labour shortage in agricultural production and minimizing postharvest losses, necessary Farm Mechanization Road Maps for 2021, 2031 and 2041 were developed.

Appropriate Agricultural Technology for the South: A book titled 'Appropriate Agricultural Technology for the South' was prepared by BARC comprising suitable technologies for 14 southern coastal districts for the implementation of 'Southern Master Plan' in the line of overall agricultural development to achieve food sufficiency and poverty reduction.

Action Plan Based on Biotechnology Policy 2012: Under the guidance of the Plant Biotechnology Technical Committee, the crop-related NARS Institutes, Agricultural Universities and private sector prepared a short (2017-19), mid (2017-22) and long term (2017-2027) plan on biotechnology research under the Biotechnology Policy 2012. The research areas of the timebound plan are- i) Developing standards for tissue culture/ micro-propagation methods for the prompt production of high quality and disease-free seed/ sapling of important plants/ crops, bamboo and timber, ii) Selection/ reproduction of major crops (paddy, wheat, pulse, oilseed, etc.) using the marker for a specific use, iii) Developing nutritional value of crops; producing transgenic plants which are resistant to insects and diseases, abiotic stress-tolerant and harmonious to climate change, iv) Identification, differentiation and determination of characteristics of necessary genes in order to develop a variety of plants by transferring genes, v) Determination and conservation of molecular characteristics of the plant (including medicinal plants) genetic resources and necessary microorganisms in the agriculture sector, vi) Revealing genome of important crops and forest plants for a specific use, vii) Introduction, evaluation and testing of transgenic crops and viii) Identifying plant diseases at the molecular level. The progress of the plan has been reviewed two to three times in a year and the compiled reports are being submitted to the Ministry of Agriculture.

Action Plan Preparation on UN SDG Goal 2: Under the supervision of MoA, BARC has coordinated outlining an action plan for achieving SDG Goal-2, '7th Five-year plan (2016-2020)' and 'Vision Document 2021'.

Progress Review Workshop held at BARC

Workshop on SDGs Roadmap Related to Agriculture

Action Plan for Digital Bangladesh: BARC renders services through database setup using research results/technologies, financial management, procurement, human resources and publications of NARS Institutes. A data hub has been established at BARC for data management activities efficiently. In addition, weather-related data are being retained to continue GIS activities to mitigate future risk in agriculture and help to increase production.

2.8 ◆ Organize need based Workshops, Seminars, Consultation Meetings, Press Briefings, Fairs and Rallies

BARC regularly organizes demand-driven workshops, seminars, consultation meetings etc. following both top-down and bottom-up approach. BARC has been organizing these events with the fund from government and donor organizations. PIU-BARC, NATP-2 has funding support for assisting outstanding scientists to attend workshops/seminars abroad. The project also supports workshops/seminar as per need on current issues and dissemnate scientific information among the NARS scientists.

Press Briefing on Tracing Antibiotic, Heavy Metals in Milk

National Task Force Meeting on Fall Armyworm Management

National Conference on Safe & Nutritious Food Value Chain

Country Consultation for 35th APRC Regional Conference

Discussion on National Victory Day 2016

Asia Open Access Data Sharing Workshop

National Workshop on Research, Development & Production of Quality Seed

Use of Power Tiller and Soil Fertility Workshop

Field Visit of Fall Armyworm National Task Force Team

Awareness Workshop on Locust Management

National Nutrition Week 2019

Workshop on Lumpy Skin Disease of Cattle

2. 9 ◆ Publications

BARC publishes its annual report, a reputed journal, "Bangladesh Journal of Agriculture"and a newsletter. The technical divisions also publish a good number of books, proceedings, manuals, leaflets, brochures etc. It also publishes fact sheets on-demand basis in collaboration with NARIs.

2.10 ◆ National Agricultural Display Centre (NADC)

At BARC premises the NADC was set up to create interest and inspire the students, teachers, scientists, extension personnel, farmers including visitors from home and abroad on agricultural history-heritage, success stories, agricultural inputs, crop varieties, production techniques etc. of Bangladesh.

2.11 ◆ Strengthening ICT facilities of NARS

ICT facilities had been developed at BARC and seven NARS institutes i.e. BARI, BRRI, BJRI, BLRI, BFRI, BSRI, SRDI under NATP-1 project. Similar facilities were planned to be developed for the remaining 5 NARS (CDB, BFRI, BTRI, BINA& BSRTI) and few more sub-stations (RARS/ARS) of NARS under NATP-2 project.

Table:1 Important Online Application of BARC

SL. No.	Description	Website
1	Fertilizer Recommendation Guide	frg.barcapps.gov.bd
2	Crop Zoning System	cropzoning.barcapps.gov.bd
3	ARMIS Database	armis.barcapps.gov.bd
4	Maps and Shape Files Database	maps.barcapps.gov.bd
5	Land Resources Information	lri.barcapps.gov.bd
6	Climate Information Database	climate.barcapps.gov.bd
7	Crop Calendar Repository	cropcalendar.barcapps.gov.bd

2.12 ◆ Linkages : National, Regional and International

Memorandum of Understanding (MoU): BARC has signed MoUs' and bilateral agreements with different countries, national, regional and international institutions for exchanging and upgrading technological advancement. With the MoUs' signed, research, skill development and sharing technical know-how are being exchanged, benefiting the signing countries and institutes. Some of these are: BARC & Dept. of Agriculture, Bhutan, 2019; BARC & KWPA, Iran, 2018; BARC & Michigan State University, USA, 2017; Bangladesh & CGIAR-IRRI, 2017; BARC & ICIMOD, Nepal, 2017; BARC & ICRAF (World Agroforestry Centre) 2016; BARC & SLCARP, 2016; BARC & YAAS, (Yunnan Academy of Agricultural Sciences), China, 2014 and BARC & CAAS, China.

MoU signed between BARC, Bangladesh and GIFS, University of Saskatchewan, Canada 2020

MoU signed between BARC, Bangladesh and YAAS, China 2014

MoU signed between BARC, Bangladesh and KWPA, Iran 2018

BARC maintains strong linkages with national, regional and international organizations. Some of those are mentioned below:

- International Rice Research Institute (IRRI)
- International Maize and Wheat Improvement Centre (CIMMYT)
- International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
- International Plant Genetic Resources Institute (IPGRI)
- International Potato Centre (CIP)
- International Food Policy Research Institute (IFPRI)
- International Water Management Institute (IWMI)
- International Centre for Agricultural Research in the Dry Areas (ICARDA)
- International Livestock Research Institute (ILRI)
- World Fish Centre (WorldFish)
- World Agroforestry Center (WFC)
- Food and Agriculture Organization (FAO) of the United Nations
- Indian Council of Agricultural Research (ICAR)
- Sri Lankan Council for Agricultural Research Policy (SLCARP)
- Nepal Agricultural Research Council (NARC)
- Malaysian Agricultural Research and Development Institute (MARDI)
- Australian Centre for International Agricultural Research (ACIAR)
- Philippines Council for Agricultural and Resources Research & Development (PCARRD)
- The World Vegetable Centre (WVC)
- SAARC Agriculture Centre (SAC), South Asian Association for Regional Cooperation (SAARC)
- Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)
- International Centre for Integrated Mountain Development (ICIMOD)
- Japan International Cooperation Agency (JICA)
- International Fund for Agricultural Development (IFAD)
- Asia Pacific Association of Agricultural Research Institute (APAARI)
- Centre for Agriculture and Bioscience International (CABI)
- Asian Food and Agriculture Cooperation Initiative (AFACI)
- Yunnan Academy of Agricultural Sciences (YAAS)
- Global Institute for Food Security (GIFS), University of Saskatchewan

35th SAARC Charter Day 2019

Project Completion Workshop of a ACIAR-Funded Project

Book Launching Ceremony & Celebrating International Year of Soils 2015

Seventh BIMSTEC Meeting

3. ◆ Brief Profile of NARS Institutes

3.1 ◆ Bangladesh Agricultural Research Institute (BARI) (www.bari.gov.bd)

BARI is the largest multi-crop research Institute mandated to carry out research on a wide variety of crops such as cereals (except rice, wheat and maize), tubers, pulses, oilseeds, spices, horticultural crops, etc. Besides crop variety development, the major areas of research are: soil and water management, development of farm machinery and equipment, cultural management, disease and insect management, vertebrate pest management etc. BARI is organized with four wings, namely, Research, Support Service, Training and Communications, and Planning and Evaluation Wing. It has eight Regional Stations, 28 sub-stations, eight specialized crop centres, nine Farming Systems Research and Development sites and 83 Multi-Location Trial sites spread all over the country. Since inception, BARI has been successfully contributing agricultural production by evolving technologies that are suitable for the country's climate and appropriate for the farmer's condition. BARI has so far developed a total of 1087 technologies of which 558 are improved and hybrid varieties of 131 crops and 529 technologies on different areas. BARI has also developed a self-contained Genebank where more than 10000 germplasm accessions of pulses, oilseed, vegetables have been preserved.

BARI hybrid Tomato-8 (summer)

BARI Sarisha-16

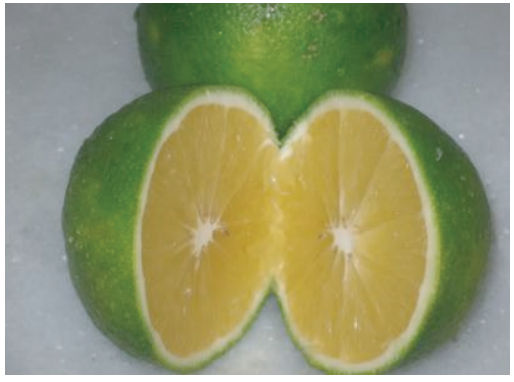
BARI Sarisha-14

BARI Alu-53

BARI Misti Alu-11

BARI Misti Alu-13





BARI Malta-1


BARI Aam-4

Banana Bagging for Controling Insect pests

3.2 ◆ Bangladesh Rice Research Institute (BRRI) (www.brri.gov.bd)

BRRI was established to work on rice research and development activities. The Institute has outstanding contributions to the food security of Bangladesh. So far 100 high yielding rice varieties have been developed including six hybrids. The varieties include salt, drought, cold and submergence tolerant varieties along with zinc, iron, antioxidant-enriched and diabetic-patient friendly rice. These varieties are cultivated in about 80 per cent of the total rice areas and contribute almost 91 per cent of total rice production of the country. During the last 50 years, rice production increased three fold, matching with the increase in population that was almost doubled. It is estimated that the rate of return per taka investment in rice research and development is Tk 46. Nineteen BRRI developed rice varieties are cultivated in 14 countries around the world. BRRI also developed 51 profitable rice-based cropping patterns for different agro-ecological zones (AEZ), 32 improved agricultural types of machinery. It has achieved the ability to produce about 100 tons of breeder seed per year and developed producer and consumer preference model for BRRI varieties. It preserved about 8,000 rice germplasm in the BRRI Genebank collected from home and abroad.

BRRI dhan50

BRRI dhan71

BRRI dhan81

BRRI dhan89

3.3 ◆ Bangladesh Jute Research Institute (BJRI) (www.bjri.gov.bd)

BJRI conducts research to develop short duration, high yielding varieties of jute, kenaf and mesta and develop crop production and crop protection technologies; research on jute industry i.e. development of value-added and diversified jute products and improvement of traditional jute products; jute textile particularly jute-based textile product development combining of jute, cotton and other natural and artificial fibres. BJRI has a central agriculture experimental station, four regional stations and one Jute seed production farm. It has a Genebank which conserves about 6000 germplasm of jute and fibre related crops. A total of 50 varieties of jute, mesta and kenaf, 75 agriculture technologies and 40 industrial technologies so far have been developed by BJRI. Among those, BJRI Tosha pat-4, salt-tolerant BJRI Deshi pat-4, Auto-Jute Power Ribboner, Natural additive treated jute geotextile, low-cost easy preparation of charcoal from jute stick and blanket from jute, cotton and sheep wool are notable.

BJRI Deshi pat-8

BJRI Mesta-2

goods

BJRI Kenaf-4

BJRI developed Jute Products

3.4 ◆ Bangladesh Institute of Nuclear Agriculture (BINA) (www.bina.gov.bd)

Binadhan-22

Bangladesh Institute of Nuclear Agriculture (BINA) conducts research to dvelop high yielding varieties of several important crops and biological nitrogen fixation inocula for different pulse and oil seed crops, along with non-commodity technologies through the peaceful use of nuclear and advanced technologies. It has 11 research divisions and 13 sub-stations. BINA has so far succeeded in developing and releasing 108 modern varieties of 18 important crops by using nuclear techniques. Among those, short duration, submergence and drought tolerant and aromatic varieties of rice, drought-tolerant sesame varieties are notable.


Binadhan-10

Binasarisha-9

Binachinabadam-10

3.5 ◆ Bangladesh Sugarcrop Research Institute (BSRI) (www.bsri.gov.bd)

Bangladesh Sugarcrop Research Institute (BSRI) (formerly known as Bangladesh Sugarcane Research Institute) is one of the pioneers and oldest research institutes of Bangladesh. BSRI has extended its mandate through the Act no. XVII of 2019. BSRI conducts research on the development of varieties, production technologies and multipurpose uses of sugarcrops. Based on sugarcane, major sweetener sources i.e. sugar and gur industries have developed in the country. Along with sugarcane BSRI is presently conducting research on other sweetener crops such as sugarbeet, palmyra palm, date palm, stevia, golpata, honey bee and liquorice as well. Since its establishment in 1951 at Ishurdi, Pabna, it has developed and released 46 varieties of sugarcane including 2 chewing type varieties. The varieties are cultivated in 99% of mill zone areas and 65% of non-mill zone areas. It has registered 2 varieties of sugarbeet, 1 year-round palmyra palm variety and 1 stevia variety also. Moreover, it has developed 221 technologies on sugarcrop production, gur processing, preservation and marketing.

BSRI Akh-42

Lentil Intercropped with Sugarcane

Tomato Intercropped with Sugarcane

Gur Processing From Sugarcane

3.6 ◆ Soil Resource Development Institute (SRDI) (www.srdi.gov.bd)

Soil Resource Development Institute (SRDI) is a government organization under the administrative control of the Ministry of Agriculture. The institute has four divisions, 9 sections, 6 regional offices, 15 Regional Laboratories, 21 district offices and 2 research centres. Besides these, 10 Mobile Soil Testing Laboratories (MSTL) are also providing on-farm soil testing facilities including balanced fertilizer recommendations to the farmers. The objectives of SRDI are to make inventory of soil and land resources and to investigate soil-related problems for agricultural research and development. The functions of SRDI include reconnaissance soil survey of the country on the basis of aerial photo interpretation and field and laboratory investigation of soils; detailed and semi-detailed soil surveys of development project areas and research farms for various beneficiary agencies; soil surveys for locating areas of problem soils; soil moisture, characterization of soil tracts of the country; and preparation of various maps and reports based on the surveys, and soil conservation by managing hilly and saline soils.

Bench Terrace Technology

Mobile Soil Testing Laboratory

3.7 ◆ Bangladesh Fisheries Research Institute (BFRI) (www.fri.gov.bd)

Bangladesh Fisheries Research Institute (BFRI) was established in 1984 with a view to developing appropriate technologies to harness the vast potentials of the fisheries sector for food, nutrition and economic development through increased production from fish and fisheries. The Institute has five Research Stations namely, the Freshwater Station at Mymensingh, Riverine Station at Chandpur, Brackishwater Station at Paikgacha, Khulna, Marine Fisheries Technology Station at Cox's Bazar and Shrimp Research Station at Bagerhat. It has five sub-stations. In accordance with the government priority for the development of the fisheries sector, the Institute has been playing a significant role in developing the country's fisheries resources. BFRI so far developed 62 improved aquaculture and management technologies aimed at increasing aquaculture production. The country has accomplished silver revolution through the use of improved aquaculture technologies and implementation of management guidelines.

BFRI developed fish species

BFRI developed fish species

Kholisa fish

Mud crab

3.8 ◆ Bangladesh Livestock Research Institute (BLRI) (www.blri.gov.bd)

Bangladesh Livestock Research Institute (BLRI) is a research institute on livestock under the Ministry of Fisheries and Livestock. It has eight research and a Support Service Divisions and five Regional Stations. It was entrusted to identify problem and prospect of livestock production, development of breeds and technologies, their on-farm testing, socioeconomic evaluation and first-hand extension. Food safety, diversification of inputs and products and their value addition, and counselling of farmers and entrepreneurs are the activities of the Institute being emerged with the on-going process of transformation of subsistence livestock keeping into input supported systems. Since its inception, the Institute has so far developed 87 technologies/packages of poultry and livestock production. Avian Influenza H5NI antigen, BLRI developed layer strain "Shorna", preservation of green forage by dool method, FMD control model, TMR technology, buffalo fattening technology, commercial Bangla lamb production from local sheep, sheep rearing techniques in hilly areas and bio-security model for commercial poultry farm are some innovations from BLRI.

Indigenous Chicken

BLRI Cattle Breed

Black Bengal Goat

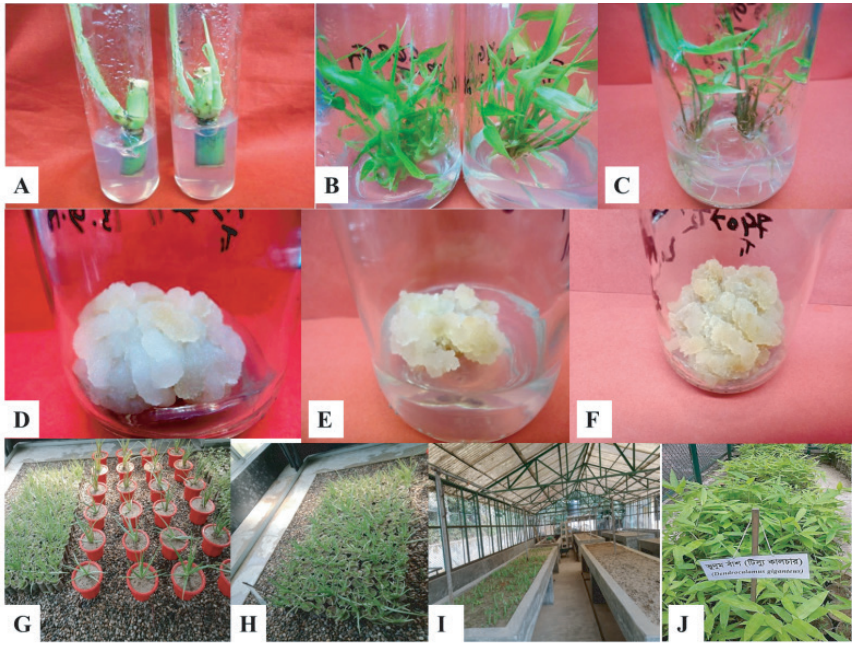
Indigenous Buffalo

3.9 ◆ Bangladesh Forest Research Institute (BFRI) (www.brfi.gov.bd)

BFRI under the Ministry of Environment, Forest and Climate Change conducts research to develop management practices to increase the productivity of national forests and village groves and to convert wastelands and marginal lands to forestry and agroforestry uses; develop technologies for rational utilization of forest products; generate technologies to conserve or restore environment balances through increases stocking densities of both rural and urban forests; transfer technology through extension services and other agencies to end-users. BFRI has 17 Research Divisions, 2 Common Service Divisions and 21 Field Stations. The Forest Products Branch is designing of a low-cost solar-kiln for seasoning timbers, devising preservative treatment techniques for rural housing materials, development of composite products from wood and bamboo, generation of technology for good quality pulp from inferior quality jute and lesser-used wood, classification of end-uses of the lesser-used and village wood species, etc. The research in the Forest Management Branch is aimed at increasing the productivity of forest land through improved management, conservation of soil and water, protection of trees from pests and diseases, tree improvement through biotechnology and genetic engineering, etc. BFRI developed tissue culture protocol for 13 bamboos, 7 medicinal and 6 tree species. It has conserved 33 species of bamboo and 221 species of medicinal species.

Conservation of Threatened Mangrove Species in the Sundarban

Germplasm Conservation of Medicinal Plants at BFRI



Biotechnology Research at Bangladesh Forest Research Institute

(A, B & C denote Micro-propagation of different bamboos. D, E & F denote Embrogenic callus culture of fruit tree latkon *(Baccaurea sapida)*.G, H, I & J denote hardening of tissue culture plantlets in green house and nursery)

Bamboo Composite Furniture

3.10 ◆ Bangladesh Tea Research Institute (BTRI) (www.btri.gov.bd)

Bangladesh Tea Research Institute (BTRI) is a scientific organization of the Bangladesh Tea Board (BTB) under the Ministry of Commerce. BTRI conducts research to increase yield and improve the quality of Bangladesh Tea by developing improved high yielding tea clones, production technologies and render advisory services to the tea industry. The Institute has four sub-stations and a regional station. There are three major research departments, which encompass six research disciplines and eight research divisions. BTRI renders services to transfer proven and adaptive newly innovated technologies in the tea industry. BTRI have released 21 clones, 4 hybrid biclonal and 1 polyclonal seed stocks with high yield and quality. It has a Genebank where 519 germplasms are being conserved. A soft drink "Cha-Cola" from tea has been developed and patented. It is manufacturing of different Green tea, value-added tea like White tea, Masala tea, Satkora tea, Zinger tea, Tulsi tea, Zira tea and Earl Grey tea.

Tea Bush Pruning for Maximizing Yield

Tea Processing Research

Tea Manufacturing at BTRI Black Tea Factory

Tea Agrotypes and BTRI Clones

3.11 ◆ Bangladesh Sericulture Research and Training Institute (BSRTI) (www.bsrti.gov.bd)

Bangladesh Sericulture Research and Training Institute (BSRTI) has been established for the development and transfer of appropriate technologies for sericulture, provide technical support and generate skilled manpower through training for development and extension of sericulture in the country. BSRTI conducts research on collection and conservation of germplasm materials both for mulberry and silkworm for the enrichment of genetic stock with the aim of developing mulberry varieties and silkworm races, development of high yielding mulberry varieties and silkworm races, appropriate technologies for mulberry cultivation, silkworm rearing and silkworm egg production, reeling and re-reeling appliances to ensure the quality raw silk production and increase the raw silk productivity. It imparts training to the extension staff to systematize the silk production processes. BSTRI has developed more than one hundred sericulture technologies. A total of 82 Mulberry germplasms and 112 Silkworm races are being maintained in the Germplasm Bank.

Variety: BM-11

Bivoltine Hybrid Silkworm

3.12 ◆ Cotton Development Board (CDB) (www.cdb.gov.bd)

Cotton Development Board (CDB) is a government organization responsible for increasing cotton production and research in Bangladesh. The main focus of cotton research in Bangladesh include the development of hybrid and short duration high yielding cotton varieties with desirable fibre characteristics, generation of agronomic management technologies to increase productivity, improving soil fertility by integrated management of organic and inorganic fertilizers, identification of bio-pesticide in controlling cotton insect-pests and cotton diseases management. In addition, research on stress management has been prioritized to expand cotton cultivation in the hill, char, saline and drought areas combining the traditional knowledge and skill with biotechnology tools. Recently, the research program has been taken by CDB on Bt cotton. CDB has 5 research farms/stations and three research sub-stations. A total of 19 upland cotton and 3 hill cotton varieties, packages on technologies and crop management practices for hybrid and modern cotton has been developed by CDB.

CB hybrid-1

Rice-Cotton Cropping System

Cotton Production in Mango Orchard

Cotton Production in Hilly Areas

3.13 ◆ Bangladesh Wheat and Maize Research Institute (BWMRI) (www.bwmri.gov.bd)

Bangladesh Wheat and Maize Research Institute (BWMRI) is established in 2017 aiming to increase the production of wheat and maize and conducting basic and applied research and training activities in the country. It has the mandate to develop climate-smart variety and crop management technologies and supply of breeder seeds. It has regional and substations at Debigonj, Thakurgaon, Rajshahi, Jashore, Jamalpur, Joydebpur and Hathazari. BWMRI has developed 7 high yieldings, heat tolerant and disease-resistant wheat varieties. Among those, BARI Gom-33 is a Zn riched (50-55 ppm) and blast resistant and BARI Gom-32 is early maturing (100-105 days) Variety. BWMRI also developed 6 hybrid maize. It also developed wheat blast management techniques and identify devastating Fall Armyworm and made the recommendation for its management. Increasing production using reduced tillage and soil management in Wheat-Maize-T. Aman cropping pattern. BWMRI has released a wheat variety, WMRI Gom 1 which is a short duration and heat tolerant variety.

WMRI Gom 1

4.0 Way Forward

NARS comprises thirteen Agricultural Research Institutes (ARIs) including the Apex Body, BARC. The coordination of research of these institutes is constrained by firstly, the institutes within the system that are scattered functionally under different ministries and are being operated under individual Acts and Service Rules. Secondly, the resource allocations of the institutes are channeled through line ministries without functional linkage with the program review at the council level. Thirdly, the management of the scientific human resource is undertaken by the individual institutes. Fourthly, research facilities/infrastructure including outreach stations are independently managed and used by the institutes limiting common use of the facilities by NARS.

The role of BARC as an effective coordinating council is expected to further strengthen the governance of NARS for addressing future challenges of food and nutrition security and climate change. More importantly, the research system should have a competitive edge in the generation, refinement and adoption of technologies so that they may become locally relevant and globally competitive. To achieve a competitive edge, the NARS must make massive investments in frontier areas of agricultural science and technology. Research and development focus should also be directed towards unfavorable environments and tomorrow's farmers. Value addition of agricultural products and strategic policies should aim at protecting the interest of the farmers. Emphasis should be placed on collecting and characterizing of the valuable germplasms from the area still unexplored. A cross-cutting function includes institutional capacity building and tools for information management and decision support.

Our future efforts must aim to ensure that agricultural research is more relevant and responsive to existing as well as emerging needs in the local, national and global scenario. The task ahead is large and difficult, but given an ambitious but realistic vision and support from dedicated and innovative scientists, the NARS community will be able to translate this vision into reality.