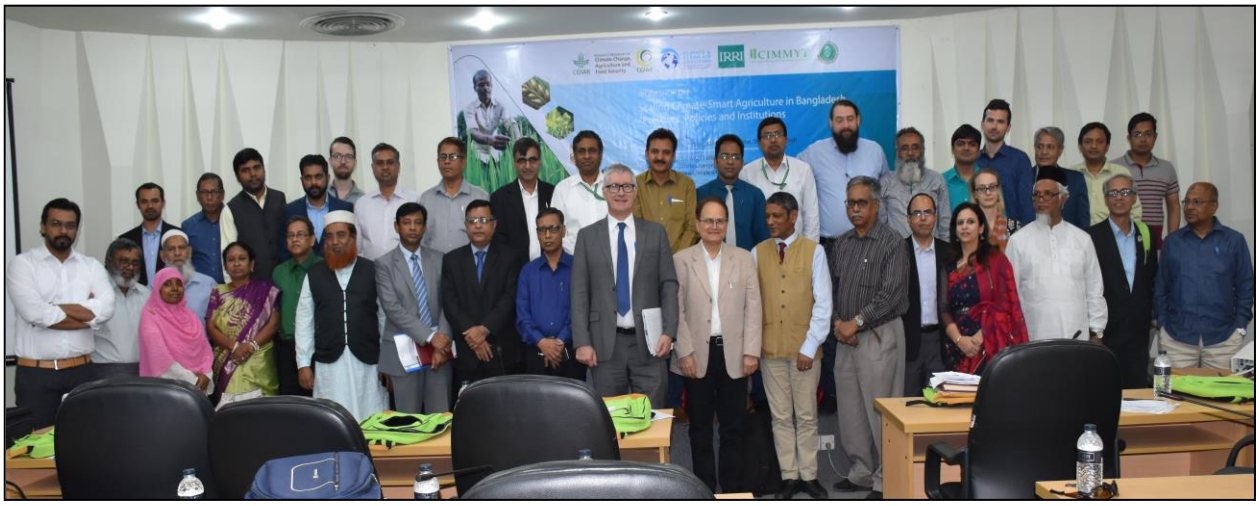
Scaling Climate-Smart Agriculture in Bangladesh:

Practices, Policies and Institutions

Workshop Report

20 March 2019
CIRDAP, Dhaka, Bangladesh



Acknowledgement
This report and workshop would not have been possible without the support and assistance of the Bangladesh Rice Research Institute (BRRI) partnership. Considerable logistical and planning was provided by Department of Agriculture (DAE), Govt. of Bangladesh. The workshop also would not have been possible without assistance from the International Maize and Wheat Improvement Center (CIMMYT) and the IRRI-Bangladesh Office (IBO) team, namely Timothy Krupnik, Humnath Bhandari, Md. Mursedul Alam, Muhammad Ashraful Habib and Md. Farrukh Ahmed.

"This report was implemented as part of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), which is carried out with support from the CGIAR Trust Fund and through bilateral funding agreements. For details please visit https://ccafs.cgiar.org/donors. The views expressed in this document cannot be taken to reflect the official opinions of these organizations."

Authors and correct citation
Rana, D.S., *Sharma, S., *Alam, M.M. and **Krupnik, Tim.J. 2019. Scaling Climate-Smart Agriculture in Bangladesh: Practices, Policies and Institutions, Dhaka, Bangladesh. *International Rice Research Institute (IRRI),International Maize and Wheat Improvement Center (CIMMYT).*

CONTENTS

Participated Organizations

- Climate change, agriculture and food security (CCAFS)
- Climate & Clean Air Coalition (CCAC)
- International Rice Research Institute (IRRI)
- International Maize and Wheat Improvement Center (CIMMYT)
- Ministry of Agriculture (MoA), Bangladesh
- Bangladesh Rice Research Institute (BRRI), Bangladesh
- Department of Agricultural Extension (DAE), Bangladesh
- Bangladesh Water Development Board (BWDB)
- Krishi Gobeshona Foundation (KGF), Bangladesh
- Blue Gold Projects (BGP), Bangladesh
- Rangpur Dinajpur Rural Service (RDRS), Bangladesh
- Palli Karma-Sahayak Foundation (PKSF), Bangladesh
- mPower, Bangladesh
- BRAC University (BRACU), Bangladesh
- Precession Agriculture for Development (PAD)
- International Food Policy Research Institute (IFPRI)
- International Fertilizer Development Center (IFDC)
- International Council for Research in Agroforestry (ICRAF)

Abbreviations

ACI	Advanced Chemical Industries
ADB	Asian Development Bank
AIRN	Agro-Input Retailers Network
AWD	Alternate Wetting Drying
BADC	Bangladesh Agricultural Development Corporation
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BAU	Bangladesh Agricultural University
BD	Bangladesh
BDT	Bangladesh Taka
BG	Blue Gold
BGP	Blue Gold Programme
BINA	Bangladesh Institute of Nuclear Agriculture
BISA	Borlaug Institute for South Asia
BMGF	Bill and Melinda Gates Foundation
BRAC	Bangladesh Rural Advancement Committee
BRRI	Bangladesh Rice Research Institute
BSMRAU	Bangabandhu Sheikh Mujibur Rahman Agricultural University
BWDB	Bangladesh Water Development Board
CCAFS	Climate change, agriculture and food security
CCDB	Christian Commission for Development in Bangladesh
CEO	Chief Executive Officer
CG	Consortium Group
CGIAR	Consortium Group of International Agricultural Research
CH4	Methane
CIMMYT	International Maize and Wheat Improvement Center
CIRDAP	Centre on Integrated Rural Development for Asia and the Pacific
CO2	Carbon dioxide
CPs	Cropping patterns
CRPs	Community resource persons
CSA	Climate-smart agriculture
CSAPs	Climate Smart Agricultural Practices
CSI	Climate-smart irrigation
CSISA	Cereal System Initiative in South Asia
CSVs	Climate smart villages
DAE	Department of Agricultural Extension
DOA	Department of Agriculture
DSR	Direct seeded rice
DR	Directorate of Research
EIT	Economies in transition
FAO	Food and Agriculture Organization of the United Nations
FP	Farmer practice

GHG	Greenhouse gas
GIS	Geographic information system
GJUS	Grameen Jano Unnayan Sangstha
GSDP	Gross State Domestic Product
GWP	Global Warming Potential
HYVs	Hi-Yielding Varieties
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICAR	Indian Council of Agricultural Research
ICT	Information and Communication Technology
IFDC	International Fertilizer Development Center
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IMD	India Meteorological Department
INM	Integrated nutrient management
IPCC	Intergovernmental Panel on Climate Change
IS	Irrigation scheme
ISAT	Intelligent Systems Advisory Tool
IWM	Integrating weed management
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
IRRI	International Rice Research Institute
KGF	Krishi Gobeshona Foundation
KVK	Krishi vigyan Kendra
MSL	Mean Sea Level
MFS	Market oriented Farmer Field School
MT	Million ton
N2O	Nitrous oxide
NAPCC	National Action Plan on Climate Change
NARS	National agriculture research system
NASC	National Agriculture Science Centre
NCA	Net cultivated area
NEC	Net Eco-system Carbon
NFSM	National food security mission
NGO	Non-governmental organization
PACS	Primary Agriculture Cooperative Society
PAD	Precision Agriculture for Development
PKSF	Palli Karma-Sahayak Foundation
R4D	Research for Development
RCM	Rice Crop Manager
RD	Regional Director
RDA	Rural Development Academy
RDRS	Rangpur Dinajpur Rural Service
REY	Rice equivalent yield
R&D	Research & development
RU	University of Rajshahi
SA	South Asia

SAAOs	Sub-Assistant Agricultural Officers
SAU	Sher-e-Bangla Agricultural University
SAU	Sylhet Agricultural University
SBSA	South Bengal Seed Association
SDA	Services delivery approach
SDG	Sustainable Development Goal
SHG	Self Help Groups
SI	Sustainable intensification
SIDS	Small Island Developing States
SMSPA	Small and Medium Seed Producers Association
SRI	System rice intensification
SSNM	Site specific nutrient management
STRASA	Stress Tolerant Rice for Africa and South Asia
STRVs	Stress-tolerant rice varieties
SWSPAB	South West Seed Producer Association of Bangladesh
WMG	Water Management Groups
WP	Water productivity

Scaling Climate-Smart Agriculture in Bangladesh: Practices, Policies and Institutions
Workshop Organised by IRRI-CIMMYT-BRRI

20 March 2019 CIRDAP, Dhaka, Bangladesh

Background

Climate change is likely to impact negatively on many aspects of agriculture including irrigation water availability, soil heath, pests, crop and livestock production. Bangladesh is one of the most vulnerable countries to climate change. The country is experiencing contrasting extreme weather conditions claiming many lives: from heat waves to cyclone, from droughts to floods. During the past decade, the country has faced one or more forms of disasters like floods, cyclone, tornado or drought every year. The poor and marginal farmers are mainly affected by these natural calamities. Increases in air temperature and associated crop yield losses have been reported in Bangladesh. According to some estimates, production of wheat may drop 32% by the year 2050 (IPCC, 2007). Increases in temperature would also shorten the winter season in Bangladesh. A short winter would adversely affect the vegetative as well as reproductive growth of most of the winter crops and consequently reduction in yield. High temperature reduces yields of HYVs of Aus, Aman and Boro rice. Climate-smart agriculture (CSA) involves sustainably increasing agricultural productivity and incomes, adapting and building resilience to climate change, and where possible, reducing and/or removing greenhouse gas (GHG) emissions. There are many paths to achieve these goals depending on the environmental and social context in which an agricultural system operates. Hence CSA practices may include all aspects of crop, soil, and water management—from tactical considerations involving time of sowing and crop maturity, to nutrient, water, and pest management and conservation tillage options, as well as strategic decisions about crop selection, rotations, and multiple cropping, or investment in irrigation infrastructure. Significant efforts have been made by various stakeholders and programs in Bangladesh to develop interventions for adoption or mitigation to climate change. Many climate resilience schemes are going-on in some vulnerable areas identified based on their exposure to recurrent climatic vulnerability under by various stakeholders such as DAE, NARS, Universities, CGIAR, NGO and Pvt Sectors. Despite all these, the adoption of CSA practices has been slow and in isolated pockets. In order to bring in the full benefit of CSA and to scale CSA to the vulnerable ecologies for impact to scale various stakeholder need to come together and develop a collaborative approach of consortium of projects/programs/ institutions involved in CSA research for development in Bangladesh.

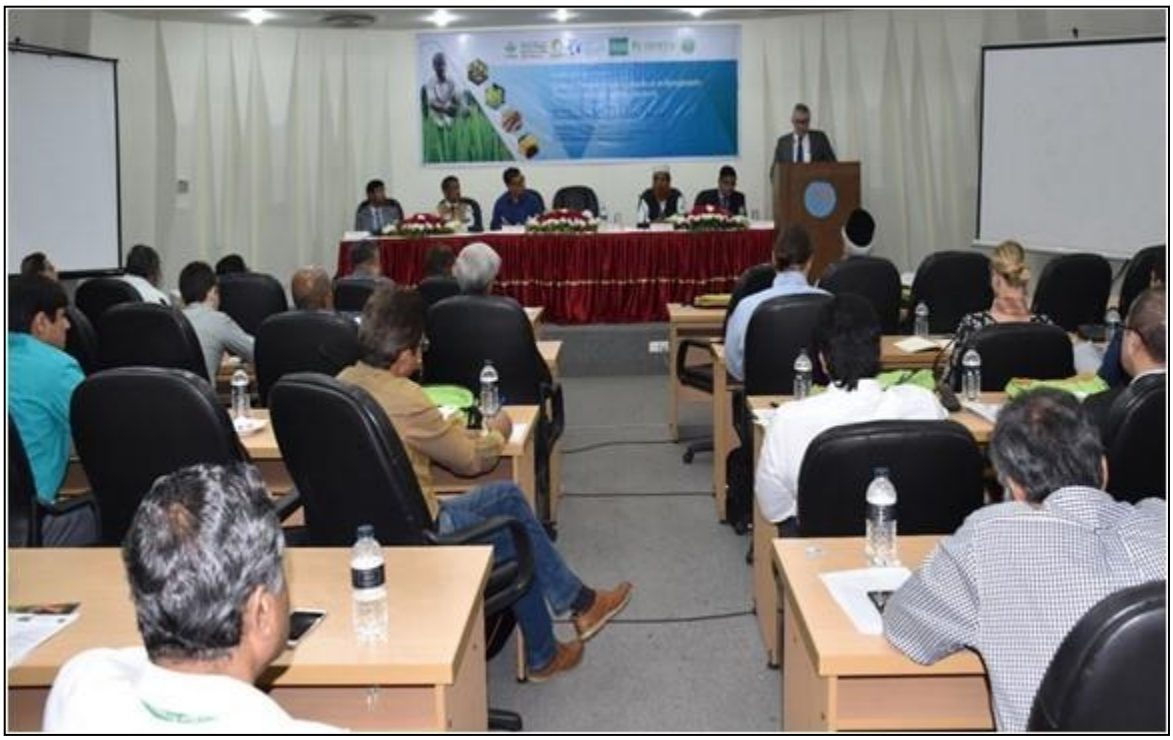
Keeping this in view, the present workshop is aimed to provide a common platform to discuss common issues related to slow adoption of CSA and research gaps, develop synergies and complementarities of the on-going CSA activities in Bangladesh, and formulate a collaborative roadmap for scaling CSA and bringing highest benefit to investments on climate resilient agriculture with focus on:

- Identify research & development gaps in the government intervention plans.
- Formulate roadmap for action plan under participatory amalgamation of roles and responsibilities to ensure climate resilient agriculture in Bangladesh.
- Develop framework to strengthen capacity enhancement mechanism with linkages among research, education and extension

PROGRAMME

20 March 2019 (Wednesday)		
Time (hrs)	**Activity**	**In-charge**
08.30 - 09.30	Registration	IRRI
09.30 – 09.35	Welcome note	Humnath Bhandari, IRRI
09.35 – 09.45	Introduction to the Workshop	Sheetal Sharma, IRRI
09.45 – 10.05	Key note presentation	Sheetal Sharma, IRRI
10.05- 10.15	Special Guest 1	Mir Nurul Alam, DG, DAE
10.15 – 10.25	Special Guest 2	Nafees Meah, IRRI-RD, SA
10.25 – 10.35	Guest of Honor	Matthew Morell, DG, IRRI
10.35 – 10.50	Inaugural address- Chief Guest	Md. Nasiruzzaman, Sec, MoA
10.50 – 11.00	Remarks from Chairperson	Md. Ansar Ali, Director, Admin & CS, BRRI
11.00 – 11.20	Tea	
11.20 – 13.20	**Climate change research for development programs in Bangladesh. What are key learnings?**	**Chair: Tamal Lata Aditya, DR, BRRI Rep: Md. A. Habib**
11.20 – 11.35	Bangladesh Climate Change Scenario	Ainun Nishat, BRAC University
11.35 – 11.50	BRRI	Md. Rafiqul Islam, BRRI
11.50 – 12.05	Krishi Gobesona Foundation (KGF)	Jatish C Biswas, KGF
12.05 – 12.20	Blue Gold Project (BGP)	Amirul Hossain, Director, BG
12.20 – 12.35	mPower	Mridul Chowdhary, mPower
12.35 – 12.50	PAD	Abhilekh Paul, Director, PAD, SA
12.50 – 13.05	IFPRI	Barun Paul/Himanshu Pathak
13.05 – 13.20	CIMMYT	Timothy J. Krupnik
13.20 – 14.20	Lunch & Prayer	
14.20 – 14.35	IRRI	Manoranjan Mondal, IRRI
14.35 – 14.50	Discussion	All
14.50 – 15.05	Remarks of Chair/Co-chair	Tamal Lata Aditya
15.05- 15.25	Tea	
15.25 – 16.15	**Facilitated group discussions** • **Group 1: Technology Evaluation and Partnerships** • **Group 2: Capacity Strengthening and Scaling Up**	**Facilitator: Timothy Krupnik**
16.15 – 16.35	Reports Group 1 Group 2	 Manoranjan Mondal Salahuddin Ahmad
16.25 – 16.35	Facilitators' Remarks and discussion	Timothy J. Krupnik
16.35 - 16.45	Closing remarks	Timothy J. Krupnik
16.45 – 16.50	Vote of Thanks	Timothy J. Krupnik

WORKSHOP HIGHLIGHTS



Inaugural Session

Welcome address

Dr. Humnath Bhandari, IRRI-Bangladesh Representative, Dhaka, Bangladesh

Dr Bhandari welcomed all on behalf of organizers (IRRI, CIMMYT, BRRI, CCAFS), extended a very warm welcome to the chief guest, the guest of honour, special guests, and all distinguished participants of the workshop on “Scaling climate-smart agriculture in Bangladesh: practices, policies, and institutions”

He expressed very deep satisfaction and gratefulness to have a wide range of participants including researchers, academicians, development workers, and policy makers representing diverse organizations such as government, public sector, private sector, universities, NGOs, CGIAR centres, International org., development partners, and others.

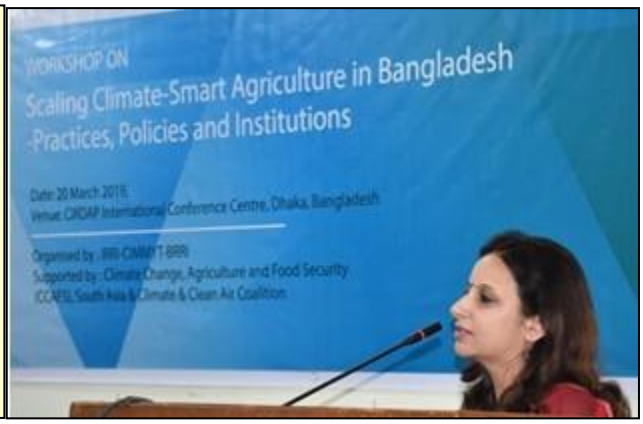
He described as climate change is one of the biggest threats facing our world today which affects all dimensions of our life and its impact on agriculture is overwhelming. Climate change affects agriculture in different ways such as changes in temperature/rainfall/climate extremes; changes in insects/diseases infestation; changes in atmospheric carbon dioxide; changes in nutritional quality of some foods; changes in sea level; and so on, he said.

He emphasized the need of CSA services in Bangladesh, because of its topography and geographic situation, it is one of the top 7 climate change hotspot countries, faces multiple climatic stresses such as floods, droughts, salinity, cold, heat, cyclones, storms, and river erosion, which have been affecting agriculture, food system, and livelihood of millions of people. On the other hand, he highlighted how the Bangladesh is also a global leader in using innovative climate change mitigation and adaptation technologies and practices through various organizations who have been developing and promoting different CSA technologies and practices like BRRI, who has released 16 climate smart rice varieties.

He commented that the development and adoption of CSA is important to build climate resilient agriculture, food system and livelihood by researchers and climate change

professionals in this room through sharing them in depth knowledge and experience on CSA technologies, practices, policies and institutions. He expected that the workshop will come out with effective programs, roadmaps, and policy suggestions to build climate resilient agri-food systems.

Keynote address



Dr. Sheetal Sharma, Scientist-Nutrient management, IRRI, New Delhi, India

Climate-smart agriculture & CCAFS Emerging Opportunities

Sheetal Sharma, IRRI and Pramod Aggarwal, BISA-CIMMYT

Dr. Sheetal Sharma gave an overview about programs and overall objectives of CSA & CCAFS, which is a collaboration among all 15 centers of the CGIAR and works with an extensive partner network that aims to ensure a food secure future in the face of a changing climate. She described the catalysing positive change towards climate-smart agriculture, climate-smart food systems and climate-smart landscapes in order to reduce poverty, improve food and nutrition security for health and improve natural resource systems and ecosystem services. CCAFS works across the globe and a major vision of CCAFS is that 'Farmers across Asia Africa and Latin America are supported by effective climate services and are protected by well-targeted safety nets, enabling transition toward climate smart agricultural systems and resilient livelihoods'. Dr. Sheetal then discussed the lessons in developing and implementing participatory and institutional approaches to agricultural climate services development in various CCAFS related initiatives in South Asia:

- **Agricultural insurance schemes with satellite data:** Innovative approaches are developed to improve insurance schemes using remote sensing and crop models throughout South Asia
- **Future scenarios work inform policies:** The 7th five year plan of Bangladesh was informed by the future socio-economic and climate scenarios developed for the region
- **Scaling up Climate-Smart Villages:** The Indian state government of Bihar implements Climate-Smart Agriculture and Climate-Smart Villages in all of its 38 districts

Dr Sheetal further described that CCAFS has been very active in creating science-based evidence for various CSA interventions, suitable for different conditions in Southeast and South Asia. This includes climate-smart technologies and practices, climate information services and insurance, mitigation of greenhouse gases, and innovative institutions and policies. The challenges in developing and delivering improved CSA services and to harness farmer participation in Bangladesh are:

- Make full use of untapped potential currently available technologies for crop yield, potential yield, attainable yield, measured yield and investment in management of land and water resources, and input delivery and market linkage mechanisms.
- Precision agronomy
- Improved management of water resources
- Local level participatory strategic planning including contingency plans
- ICT and Big data enabler for farmers and other stakeholders
- Farms of the future: Farmer-to-farmer learning
- Climate-Smart Village R4D Approach: A holistic strategy for scaling-up adaptation options
- Building evidence, systematic learning and scaling of CSA
- Partnerships: research and development, science and policy, public and private
- Knowledge generation: CSA practices/technologies, services; CSVs
- Incentive mechanisms: business models, private sector
- Address generic vulnerability issues simultaneously –poverty, literacy, governance, etc., which limit adaptation even today and will do so in future as well

Special remarks

1. Mr. Mir Nurul Alam, DG, DAE

Mr. Nurul Alam extended his support in adapting new technologies and new climate smart varieties and providing advice to the farmers about CSA He mentioned that CSA have been emerging since 2010, and the CSA concept has been adopted by the Food and Agriculture Organization (FAO) and the World Bank. FAO emphasizes 'adopting an ecosystem approach, working at landscape scale and ensuring intersectional coordination and cooperation' while the World Bank stresses 'integrated planning of land, agriculture, fisheries, and water at multiple scales (local, watershed, regional)'. Mr Alam described the effects of climate change on water, agriculture and infrastructure

lead to increased migration to the cities that are already at the limit of their infrastructural and social capacity. In response to the water related threats, migration to urban areas is increasing as people search for new economic opportunities. However, they often end up in urban slums and will be among those most affected by climate change. Urban slums in Bangladesh are already overcrowded, poorly managed by municipal governments, and face severe he mentioned.

He indicated that as per government instruction and support we are trying to disseminate climate smart newly released varieties within 2-3 years and we are successful. He also pointed that we are also concern about smart adaptability and smart accommodation of safe food and nutritious food. Nutrition is a key developmental goal on the national agenda and is pertinent Nutrition Sensitive Agriculture provides a new mechanism for us to develop food technology that is most beneficial to the people of Bangladesh.

Overall he emphasised to do holistic approach and more collaboration at the regional level to bolster efforts in CSA application. He concluded with his gratitude and pray for the success of the workshop.

2. Dr. Nafees Meah, IRRI Regional Director, South Asia, New Delhi, India

Dr Nafees Meah described the necessity of Climate Smart Agriculture with global perspective as:

- The world passes 400 ppm carbon dioxide threshold
- Atmospheric CO_2 concentrations since the beginning of the Industrial Revolution
- Large spatial and temporal variability in temperature and precipitation (IPCC AR5)
- Extreme events will increase: length, frequency, and/or intensity of warm spells; heavy precipitation events to increase
- Perfect storm, Flooding in Haor region 2017
- An increasing share of GHG emissions will be from Agriculture, Forestry and other Land Use
- Need for Climate-smart agriculture: Asia a hotspot GHG emissions from agriculture and food intensity
- Food security and climate change; Present case, worst case and best case scenario
- Socolow's wedge approach applied to the global food challenge
- Many CSA practices or programs or policies can be somewhere but none are likely everywhere

Remarks from Guest of Honour

Dr. Matthew Morell, Director General, IRRI, Philippines

Dr. Matthew Morell mentioned that IRRI has realized the seriousness of the threats by climate change to South Asia and he urged the workshop participants to use their best knowledge, experience, and effort to chalk out opportunities and options for practicing CSA in Bangladesh. He pointed out the relevance of CSA activities to the IRRI commitment to support smallholder farmers to build their resilience and ensure increased production, and to bolster country climate resilience and adaptation capacity. It is important that climate be translated into user-friendly information for farmers and the national systems. This workshop is a good platform on how to develop participatory climate services and institutional relationships to ensure that climate data are effectively translated into useful climate services. He expressed his best wishes to the success of the workshop.

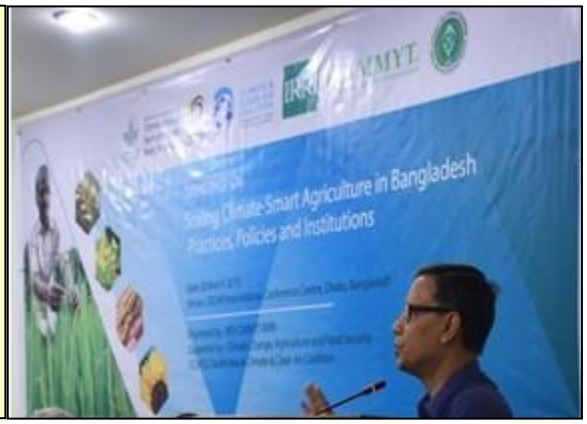
Remarks from Chairperson

Dr. Md. Ansar Ali, Director, Admin. & CS, BRRI

Dr. Ali emphasized the need for Joint practices of all stakeholders together for CSA technologies and services to avoid duplicity and getting maximum benefits for the development of farmers in Bangladesh. He also highlighted how the BRRI plays a key role in this direction. He commented that the delivery of climate services depends on the

quality of climate data collected and how it is analysed, which needs to be prioritised to ensure effective climate services. He pointed out that there are many models used to analyse and predict weather and climate, and therefore care should be taken in the selection of models to assure relevant and accurate results. Given the current state of global hunger and climate change (along with conflict and socio-economic slow-down), the need for climate services is crucial in order to plan for increased food production. He commented that with the diverse range of experts from different sectors and countries, this workshop would provide an opportunity for knowledge sharing, dialogue and collaboration among the professional community which will inform, design and develop climate services in Bangladesh. He finished his speech with expectations that the exchange of knowledge in this workshop will bring great benefit for the country.

Remarks from Chief Guest



Md. Nasiruzzaman, Secretary, Ministry of Agriculture, Govt. of Bangladesh, Dhaka

Md. Nasiruzzaman gave an overview that agriculture is the primary base of livelihood and the heart of Bangladesh economy and made significant progress since our independence in 1971. It is the main source of food, economy labor force utilization and intellectual power which are indivisible and interrelated. He indicated that the cultivable land has been found shrinking with an alarming rate due to housing, industries, infrastructures development and river erosion. There are more challenges which concern with the threat of climate change on food security.

With best hope through this Workshop for convened good message and come-out really good solutions, he highlighted few more points like a good number of rice varieties developed by BRRI in collaboration with IRRI having saline, submergence and drought tolerance and also short duration with around 100-110 days maturity but there is no good variety for the hill. We need to find the possible ways to reduce GHG emissions, increase the productivity and income growth. We need to develop climate smart variety as well as technology, management where we can get 10 ton per hector instead of 5 ton per hector. Farmers are always looser in this country, sell price of their produces are very less. But when they are buying for their consumption purpose by themselves then the buying price is too high. Value chain and post-harvest issues remain concerns for consumers and farmers, particularly smallholder farmers. Another issue is irrigation water as affected by climate change, where underground water depleting and amount

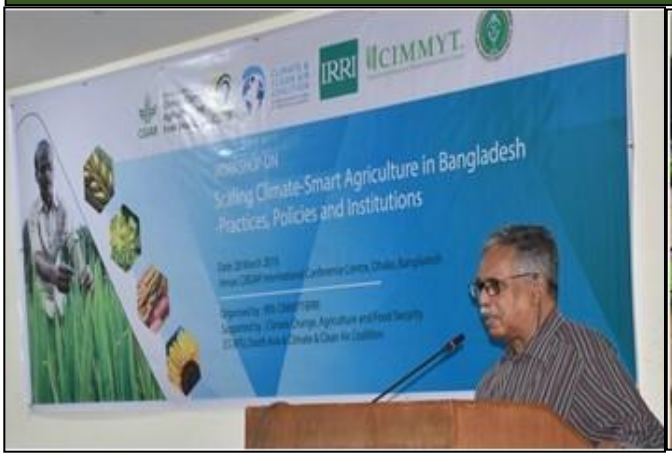
and quality of surface water degrading day by day. He also mentioned the issue of salt water, which affecting rice field in coastal areas.

He indicated heavy loss due to blast disease infestation in wheat last year where its production was 38 lac metric ton against demand of 55 lac metric ton and emphasized to address this blast issue by CIMMYT in collaboration with our NARS partner to develop blast resistant high yielding variety. He mentioned that our country dominantly a floodplain with some terraces and hills. And every 10-12 years there is big storm/ disaster like sidar, aiyla, Nargis etc. He opined the need to focus on polders and cropping patterns of those areas. At the interface of two different environments- Bay of Bengal to the south and the Himalayas to the north about 10% of the country is hardly 1 meter above the Mean Sea Level (MSL), and one third is under tidal excursions having too much water in monsoon and little water in winter. Such geographic location and geo-morphological conditions made Bangladesh one of the most vulnerable countries due to Climate Change. Bangladesh should adopt climate-smart agriculture to help the country to overcome the increasing risk of food insecurity that may result from climate change.

Technical session

The technical session of the workshop started with different countries and organizations sharing their experiences and ideas on participatory climate services. The presentations included the following:

Climate change research for development programs in Bangladesh. What are key learnings? Chaired by Dr.Tamal Lata Aditya

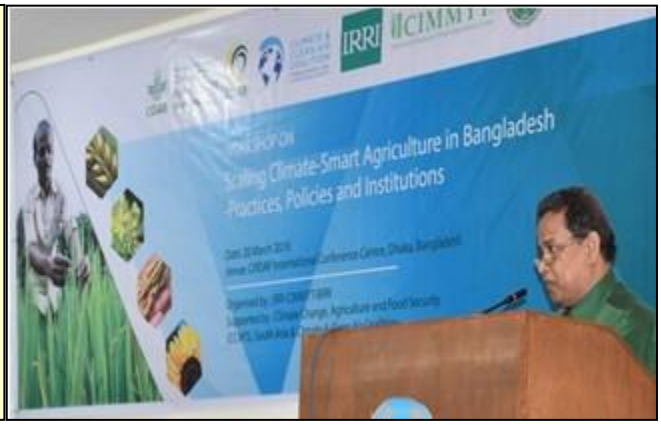


CLIMATE CHANGE AND AGRICULTURE: BANGLADESH COUNTRY CONTEXT
Dr Ainun Nishat, Adviser, C3ER, BRAC University

Dr Nishat expressed his overviews about impact and solutions from climate change globally as:

- Is there any doubt the climate change real?
- Climate change and climate variability are now real.
- A stable situation is not likely to be achieved, even with maximum efforts
- Climate change has risen to the top of international policy agenda and major decisions are expected by December, 2019.
- Major Global concerns
- Threat of food shortage
- Threat of migration; Livelihood security
- Increase in intensity and frequency of natural disasters will be on increase,
- Loss of biodiversity and ecosystem; many species will disappear
- Health security threatened
- Process of sustainable development affected
- Coping capacity of LDCs, SIDS and countries in Africa is not adequate
- Agriculture in climate change negotiations through politically and scientifically process

Climate change research for development programs in Bangladesh: What are key learnings?



Dr. JC Biswas, MH Ali & W Kabir, Krishi Gobeshona Foundation (KGF), Dhaka, Bangladesh

Dr. Biswas described about CSA in Bangladesh and role of KGF in this regards:

- •KGF Coordinated with NARS & universities since 2013
- •Started with Crops, Livestock, Fisheries & Natural Resouces to assess Climate Change impact
- •Trained about 120 scientific professionals

He talked about strategy to address Climate Change:

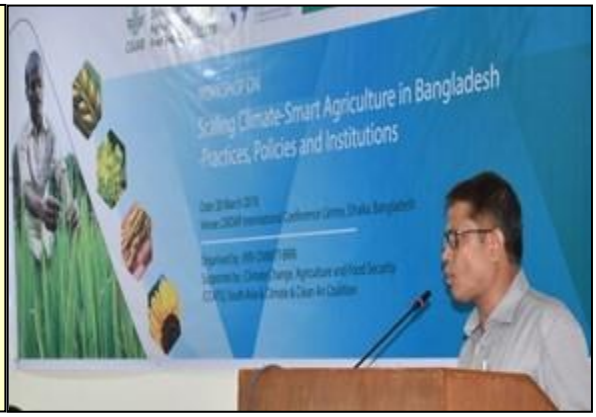
- •Development & dissemination of CSA: submergence, heat, insect pest & disease, cold, salinity resistant/tolerant varieties–success in rice, wheat, pulses, oilseed, etc.
- •Energy efficient machineries, CA: A long way to go
- •Use of renewable energy: solar energy for irrigation, lighting
- •Input use efficiency–fertilizer, water, pesticide,
- •Floating agriculture
- •Weather forecasting at localized level
- •Crop suitability zoning

•Delineation of socio-ecological vulnerability
•Hard & soft engineering
•Proper utilization of marine economy
•Human capacity development
•Eco-parks—industrial parks: businesses cooperate to reduce waste & turn by products into energy

He concluded that:

•Climate change impacts are visible in Bangladesh
•Some adaptive measures such as fertilizer, water & OM management are emerging from KGF initiatives, need further evaluation
•Some policies have been formulated by the Govt. for adaptation & mitigation
•Comprehensive & coordinated studies needed among sectors and sub-sectors
•Understanding Climate Change phenomenon in all subsectors of agriculture
•Regional & International collaboration required
•More investment for hard & soft engineering, human capacity development through advanced trainings

Climate Smart Agricultural Practices for Crop Production and Greenhouse Gas Emission in Bangladesh



Dr Rafikul Islam, CSO & Head, Soil Science Division, BRRI, Gazipur, Bangladesh

Dr. Islam presented in details about on-going research trials of CSA practices under CCAFS programme in Bangladesh as:

Objectives:

- To evaluate impact of Rice Crop Manager (RCM) based fertilizer management on yield and GWP over farmers' practice (FP) of selected Cropping patterns (CPs) comprising only rice and rice-non-rice crops
- To disseminate recently released but climate resilient short duration rice cultivars among farmers as a tool of adaptation in climate change

Cropping Pattern:

- Boro-Fallow-T.Aman (26.92% of NCA)
- Mustard-Boro-T.Aman (2.16% of NCA)
- Potato-Boro-T.Aman (2.11% of NCA)
- Fallow-Jute-T.Aman (0.16% of NCA)

Treatments:

- T1: Rice crop manager (RCM)
- T2: Farmer's practice (FP)

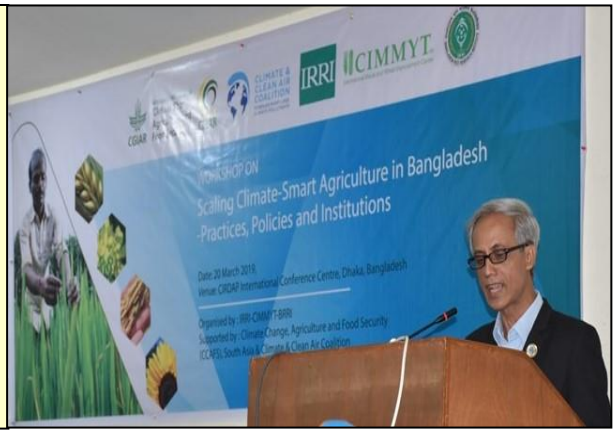
Observations:

- Cool Farm Tool Beta-3 used to estimate CH4, CO2, N2O emission
- Net Eco-system Carbon (NEC) budget
- Impacts of N and water management on cumulative N2O-N emissions in T.Aman at BRRI farm Gazipur.
- Effects of AWD and farmers practice (FP) on cumulative CH4 emissions from the rice field (Boro season 2018) at Bhaluka, Mymensingh.

Key finding:

- REY increase if non rice crops introduce in double rice CP
- Short duration rice varieties are one of the important techniques to reduce GWP than long duration rice varieties
- Non-rice based CPs had lower GWP than rice-rice based cropping patterns
- NEC budget showed positive under Mustard-Boro-T. Aman and Fallow-Jute-T. Aman cropping pattern
- On an average, AWD condition reduce GWP by 39% over conventional practices in Boro season
- BRRI released 17 climate resilient varieties, of them 10, 3 and 4 varieties were cultivated in saline, submergence and drought prone ecosystems, respectively.

BLUE GOLD PROGRAM (BGP) (BWDB Component)



Md. Amirul Hossain, Program Coordinator, BGP, Dhaka, Bangladesh

Md. Hossain highlighted the achievement of BGP towards reduce poverty in the project area by enhancing the livelihood of the rural population through efficient water resources management and increase productivity of Crops, Fisheries, Poultry and Livestock and by empowering the communities to be the driving force. He also described other development programmes of Blue Gold:

Community Development:

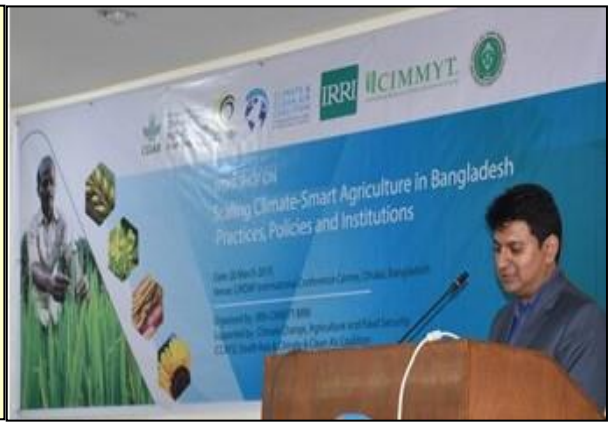
- Formed 511 Water Management Groups (WMG)
- House hold enrolled under WMG 118,208 nos.
- Members enrolled 136,533 nos. (Male 77621, Female 58912)

- WMG Collected Fund about 75.2 million Taka out of that about 42% invested in income generating activities by the WMG
- WMG contributed in O&M 4.4 million Taka from 22 Polders, 4 Districts, 14 Upazilas and 119,124 ha

Business Development:

- 186 Market oriented Farmer Field School (MFS) conducted covering 4,576 farmers
- Additional 730 MT rice produced covered by the FFS
- In the Polders, about 75% area protected from Tidal Flooding, Salinity, Drainage improvement.
- Agricultural Production increased by 25% and income increased by 15 –20%.
- Mungbean collected from WMGs of Patuakhali and exporting to Japan since 2016 which gradually increasing quantity
- Taken collective actions by the WMG like Land preparation, harvesting, input purchase, product sale etc. enhanced the income of the WMG members

Climate Smart Agriculture Key Learnings from mPower's weather based agro advisories



Mr. Mridul Chowdhury, Founder & CEO, mPower Dhaka, Bangladesh

Mr. Chowdhury described about his Climate Smart Agro Innovation through mPower in Bangladesh:

Programme

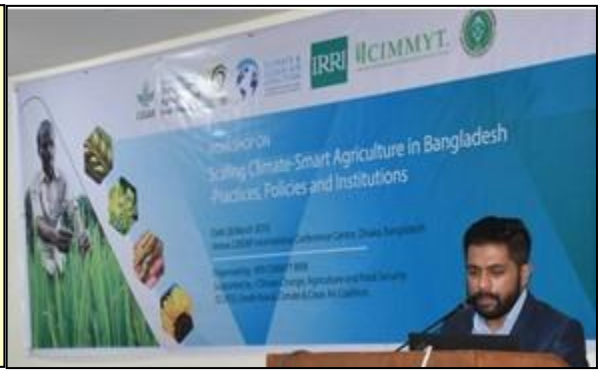
- Weather based localized agro advisory
- Geo data based disease warning system
- Crop Model Based Stress Alert
- Climate Vulnerability Mapping

Contents

- AWS is expensive (BDT6–25lac)
- Accuracy is always a concern
- Weather forecast is very generic
- Locally assemble AWS (Below BDT 1 lac)
- Continuous improvement requires: Ground trothing and Bias-correction
- Downscaled highly localized forecast (4X4 km grid from 25X25 km grid)

- Unavailability of weather smart/weather specific content
- Lack of localized content
- Cannot be detected beforehand
- Content development and validation by Farmers, Extension officers and Researchers
- Contents are developed based on specific ecological conditions
- Farmer behaviour Farmers' way of acquiring knowledge doesn't suit supply-driven training
- Difficulty in changing farmers' farming practice and mind set
- Low access to tech at smallholder farmer level Messages are only to send farmers when needed.
- Recommendations are coupled with farmer engagement activates e.g. Video show, demo plots
- Self-learning inter-active tools via intermediary lead farmers
- SMS and voice message for farmers with basic phones
- Use of voice messages in local dialect

Precision Agriculture for Development (PAD)



Mr. Abhilekh Paul, Director, Precision Agriculture for Development, South Asia

Mr. Paul gave an overview of the work and objectives of PAD to meet issues of million poor, unproductive, small holder farmers around the world as food demand continues to grow, but production is constrained. He described challenges and developments towards CSA:

- Climate change, soil erosion, etc. are presenting new, unfamiliar challenges
- Precision agriculture holds promise in developed countries but what about farmers in developing countries?
- Vision Transforming agricultural extension using the latest available technologies and research methods to improve the productivity and income of farmers in developing countries

Mission:

- Support smallholder farmers in developing countries by providing customized information and services via mobile phones that increase productivity, profitability, and environmental sustainability.

Goal:

- Reach and impact >100 million smallholder farmers in ten years
- High quality advice
- Farmer profile information such as: Location, Socio-demographics, Crop variety, Water management, Agricultural data, Soil type, Rainfall, Market prices, Pest/disease outbreaks, Customized content, Input recommendations, Management advice

Key elements of PAD model:

- Behavioural economics
- Human cantered design
- Social learning
- A/B tests
- Big data and machine learning
- Impact measurement and monitoring

PAD in Bangladesh:

- 32 PAD supports mPower's programs through research tools to introduce new features, and evaluate the impact of existing services. We have worked with mPower on two projects:
- 1) Agriculture 360-Crop management recommendations and weather alerts via sms to farmers to improve the efficiency of their crop cultivation and promote practices that mitigate the impact of climate change on their crops.
- Experiment A: Test if sending voice messages with text messages could improve farmers' understanding, adoption of the recommendations and their satisfaction.
- Experiment B: Test if sending voice messages in specific dialect increases the listening duration to the voice message, their understanding, the likelihood of adoption of recommendations and their satisfaction.
- 2) Geo Potato- Alert farmers of potential out breaks to encourage timely application of fungicides. mPower has partnered with Bayer, to explore the impact of product branding in advisory messages, with the goal of developing a commercial version of the Geo Potato service.
- Experiment: i) Assess the impact of alerts recommending Bayer branded fungicide on farmers' trust in the service, and how this translates into the adoption of Geo Potato recommendations, and ii) understand the effect of promoting Bayer fungicides on branding recognition and on purchases of fungicides.

Scaling Climate-Smart Agriculture in Bangladesh: Challenges & Opportunities

Dr. Himanshu Pathak and Dr. Barun Paul, IFPRI, South Asia, New Delhi, India

Dr. Pathak and Dr Paul jointly presented the model existing farming systems to prioritize them through the lenses of Income Risk minimization:

- To estimate land use pattern across region of the study location –Khulna Division in South West Coastal Region
- To identify areas of investment to scale up indigenous but efficient practices

Expected Utility Theory (Neuman & Morgenstern, 1944)

- Given any two farm plans (X1) and (X2), X1 will be preferred to X2 if E[U(X1)]>E[U(X2)]
- Quadratic Utility Function is best fit for this theory (Anderson, Dillion and Hardaker, 1977)
- Pratt, 1964, rejects the consideration of quadratic function –Marginal Utility of Income Fall beyond certain point

Mean-Variance (E,V) Analysis (Freund, 1956)

- Based on expected income E[Y] and associated income variance V[Y]
- Utility function is considered as exponential form (Freund, 1956)

MOTAD Model (Hazell, 1971)

- Minimize Total Absolute Deviation from Mean
- Linear Programming Alternative for E,V analysis
- Most relevant for time series and cross section data

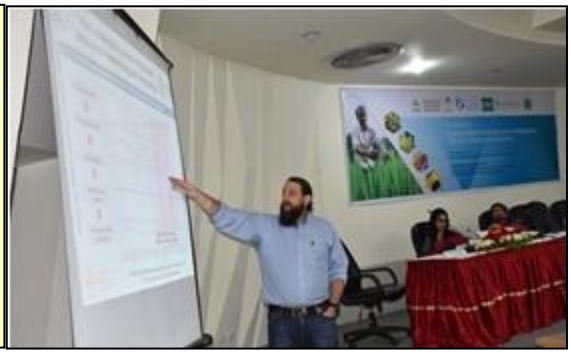
Key Findings

- Given the available resources autonomous Risk Minimization by changing cropping pattern may lead to fall income
- Area rejuvenation by improving drainage system will reduce risk & increase income provided farmers have adequate labour and credit supply
- Labour availability impose a larger constraint than salinity
- Labour demand for Government activities coincides with crop harvesting & sowing season –proper planning can increase seasonal supply of labour
- Mechanization Strategy

Way Forward (Investment Prioritization)

- Government of Bangladesh allocated only 3% of its total Budget (FY2018-19) for agriculture.
- Public investment is both an enabler of innovation in agriculture as well as facilitator of private investment.
- IFPRI-CCAFS are collaborating to develop a multi-country investment prioritization modelling tool to facilitate investment policy in the agricultural sector.
- The tool aims to bring forward the advantages of CSA in tackling climate change and means to upscale it, particularly in vulnerable regions.

Building agricultural resilience to climate stress requires a multi-faceted, multi-disciplinary approach



Dr.Timothy J. Krupnik-Senior Scientist and Systems Agronomist, CIMMYT, Bangladesh

Dr Tim emphasized on doubling crop production in Bangladesh with the challenges in developing and delivering improved climate smart services and to harness farmer participation in country are:

Opportunities for stress mitigation:

- Shorter duration rice
- Early rice establishment
- Reapers
- Revised sowing recommendations
- Mechanized sowing
- Heat tolerance

CSA requires interdisciplinary efforts

- Systems agronomy and CSA
- Managing uncertainty: Agricultural climate services and risk reduction
- New directions for CSA: Big data analytics

Conclusions

- Agricultural climate service systems: Applied science partnerships-Bringing together research institutes, and public and private sector to translate climate science into practical action.
- Beating back wheat blast with climate services
- Sudden appearance in 2016 in Bangladesh, infecting 15,000 ha.

- Fears of regional spread.
- The Ministry of Agriculture wanted practical solutions (quickly!)
- Resistant varieties (!)
- Monitoring, warning systems, advisories
- Harnessing the power of climate data and meteorological forecasting
- Time- and location-specific customized blast mgt. advice delivered by voice message and DAE
- Mitigating mungbean climate risks using weather forecasts and interactive voice response
- Heavy rainfall can significantly damage mungbean at picking. Can rainfall forecasts reduce risk of crop loss?
- Smart data – not just big data – for CSA
- New directions for research on CSA: Most agronomic research, The big data 'revolution'
- CSA – Advantage is that it is not necessarily something very new
- Climate variability and extremes: Key considerations
- Requires interdisciplinary and strong partnerships
- Value emerging in climate services sector and strong potential of 'big data' approaches
- We will unpack these issues this afternoon

Research and Development Activities on CSA: IRRI's Experiences in Bangladesh

Dr. Manoranjan Mondal, Scientist, IRRI, Bangladesh

Dr Mandal described all Climate-smart projects and practices having IRRI's involvement in Bangladesh, which are:

- Stress Tolerant Rice for Africa and South Asia (STRASA)
- CSISA Phase III
- Impact evaluation of AWD technology
- Reducing emissions from paddy field
- Climate-smart practices and varieties for intensive rice-based cropping systems
- Unlocking the production potential of polder communities in coastal Bangladesh (SIIL-Polder)

Goal:

- Reduce poverty and hunger
- Increase food and income security of resource-poor farm families and rice consumers in SA & sub-Saharan Africa

Major objectives:

- Develop submergence, drought and salt tolerant rice variety.
- Seed multiplication, dissemination, varietal tracking and impact assessment.
- Capacity enhancement.
- Communication & information management.
- Funding source: Bill and Melinda Gates Foundation (BMGF)

Partners:

- Universities: BAU, BSMRAU, SAU, RU, SAU.
- Research Institutes: BRRI, BINA.
- Government organizations: DAE, BADC, RDA.
- Seed companies: ACI Ltd., BRAC, Lal Teer Seed Ltd., Energy Pac.
- Seed Producer Associations: SMSPA, SWSPAB, SBSA.
- NGOs: RDRS, AVADS, CCDB, GJUS & IDEAL.
- Seed Net Partners: More than 500 seed net partners

Major Achievements:

- STRVs released in Bangladesh with the collaboration of BRRI & BINA
- STRVs cultivated areas has covered by 396911 ha.(13.9%)
- Distribution of Fact sheets on wheat blast through LSPs, SAAOs, AIRN, NGO Staffs, Partner Staffs

Impact evaluation of AWD technology

- Mobilizing concerted action for AWD out-scaling in Bangladesh: “Zekhane boro, shekhanei AWD”
- Climate-smart practices and varieties for intensive rice-based cropping systems
- 231 farmers and 22 SAAOs trained on AWD use Lessons learnt:
- AWD saved water, fuel and energy without yield loss
- Insects and disease infestation reduced in AWD plots
- No crop lodging observed in AWD plots
- Community based irrigation systems facilitates AWD adoption
- AWD needs intensive monitoring and management
- AWD reduced 40% GHG emission

SIIL-Polder Project:

Key Findings

- Coastal zone is rich with water resources, offers huge potential for Bangladesh to make a quantum leap in meeting future food security requirements and in achieving SDG 1 & SDG 2
- Water logging is the main constraint and drainage in aman is the key intervention and entry point for cropping system intensification in polders of the CZ
- Because of hydrology, individual alone cannot successfully adopt improved agricultural technologies in the coastal zone, community coordination within a hydrological area is necessary for adoption of improved technologies in the coastal polder ecosystem.

Chairs' remark

After a lively presentation and discussion, the Chair Dr.Tamal Lata Aditya, DR, BRRI gave her remarks with thanking to all presenter and participants, logistical coordinators and others who have helped and contributed to the success of the session. She also stressed the magnitude of the challenge before success of CSA and the need to work closely to meet the goals for Bangladesh agriculture.

Group Discussion then divided into two groups and worked around the theme assigned to each group to achieve the objectives of the theme. Groups were also encouraged to think beyond

Based on a pre-determined group, experts where but related to the assigned theme.

Group 1:

Technology Evaluation & Partnerships

The group 1 discussed the impact and do-ability of the CSA Technologies which have potential to improve agriculture productivity, increase resilience and reduces emissions in Bangladesh and to identify effective strategic partnership. Discussed about the value of this participatory approach in different contexts, and this has already started delivering concrete policy impacts in Bangladesh. The government of Bangladesh has already recognized this approach of climate change adaptation and started to implement as a part of efforts to adapt to climate change in country. Identified as the high impact and high do-able combination of CG and NRS institutions for CSA options in different agricultural production systems and socio-economic conditions.

Group 2:

Capacity Strengthening and Scaling Up

The group more focussed on policy interventions as farmers still remain largely dissatisfied with CSA in Bangladesh. Discussed with in group about CSA which are to enhance awareness of climate smart management of seed, water and mechanization tool through demonstration and communication tools with collaboration of all stakeholders.

Each group was faced to develop a prioritization matrix for the technologies, capacity development and partnership etc. For the purpose of effective scaling out, there is need for a common platform for work together. All interventions planned to this effect must be community based. Innovative and engaging business models should be developed and curated to deliver social development goals. There should be a two-way approach towards this: piloting and out upscaling. Further, food research must be given enhanced visibility which will finally lead to a win-win situation for all.

Closing Remarks and Vote of Thanks

Timothy J. Krupnik - Senior Scientist and Systems Agronomist, CIMMYT, Bangladesh

In closing remarks, Dr. Tim thanked all participants and partners for a productive workshop. It is clear there are many common issues across the region including the need for greater data sharing and collection to help planning and build a business case for investment. Greater collaboration and trust will be required between the private and public sectors to move forward to achieve the CCAFS goals.

Workshop Images

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Way forward

We hope that all participants found the workshop informative and worthwhile. Our primary goal is to increase the understanding of climate smart agriculture from different perspectives and to provide a common platform for various stakeholders converge the efforts for greater impact.

As a way forward, and as agreed upon during the workshop, we aim to jointly develop a compendium of climate smart agricultural interventions for Bangladesh very soon.