

International Conference on

Financialisation and false solutions

Climate smart agriculture and its alternatives

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Conference Report

Climate Smart

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Financialization and false solutions: Climate smart agriculture and its alternatives

Conference proceedings report

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Abbreviations and acronyms

AWD	Alternate wetting and drying
BADC	Bangladesh Agricultural Development Corporation
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BAU	Business as Usual
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BINA	Bangladesh Institute of Nuclear Agriculture
BRRI	Bangladesh Rice Research Institute
BWDB	Bangladesh Water Development Board
CCRF	Bangladesh Climate Change Resilient Fund
CCTF	Bangladesh Climate Change Trust Fund
CDM	Clean Development Management
CFC	Chlorofluorocarbons
CRWs	Crop wild relatives
CSA	Climate smart agriculture
EAP	Ecological Agriculture Program
GCF	Green Climate Fund
GHG	Greenhouse gas
GoB	Government of Bangladesh
HVCs	High-value crops
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual Property Rights
IRRI	International Rice Research Institute
MACH	Management of Aquatic Ecosystems through Community Husbandry
MDTF	Multi Donor Trust Fund
MoA	Ministry of Agriculture
MoLF	Ministry of Fisheries and Livestock
NAMAs	Nationally Appropriate Mitigation Actions
NAPA	National Adaptation Programme for Action
NGO	Non-government Organizations
NPK	Nitrogen–phosphorus–potassium
OA	Organic farming
PA	Paris Agreement
PPCR	Pilot Program for Climate Resilience
REDD	Reducing Emissions from Deforestation and Forest Degradation
RLS	Rosa Luxemburg Stiftung
UDP	Urea deep placement
USG	Urea Super Granule
WARPO	Water Resources Planning Organization
UNFCCC	United Nations Framework Convention on Climate Change

Foreword

We know it's the farmers who have laboured in their fields and forests, discovering edibles, observing closely, experimenting, adopting and adapting to not just bring to us a robust agriculture, but also enrich the world with extremely rich and diverse crop species and their seeds. The farmers invest in our future, in our survival and yet they live a life of most uncertainty themselves. They are the only people who work seven days a week through rain, sunshine, through good and bad - and don't get paid at the end of the day, week or month. Farmers' crops made way to a multitude of food habits, practices and social customs that led societal growth and progress. However, they are often not sure whether they will get a full harvest at the end of it or not; and even if they get a good harvest, not certain if they will get adequate remuneration for that or not. Their minute understanding and knowledge of their soil, hydrology, flora and fauna appropriately marks them as the worthy and original scientists of the world.

We need not go into the details of the problems and consequences of chemically intensive agriculture promoted by the Green Revolution, which was essentially presented as the solution to a problem. Several decades back, while the problem was hunger, the solution offered by Green Revolution was production. Was the target shifted from being humanitarian to providing a platform for business? Green Revolution, ultimately as has been proved, was not a humanitarian nor a sociological, nor even an agricultural plan, but was a market phenomenon. Now, we have more and adequate production, and yet we continue to have the one of worst states of hunger and malnutrition in the world. More production did not deliver us from hunger, but offered plenty of riches to the corporations engaging in the business of agriculture. As regards HYVs (high yielding varieties), we did not realise or even if we did, we did not call out their bluff that the seeds were not high yielding but actually high responsive varieties - responding only to a high usage of external chemical inputs of fertilizers and pesticides at the cost of soil and nature. We did not question when these were branded as miracle seeds.



Dr. Shamsul Bari

Climate Smart Agriculture (CSA) is being promoted around the globe, but we need to critically observe whether it is being promoted as a solution or has itself become the problem. We also need to examine whether we are getting the same old package of business idea with a new or different terminology, and whether the same market forces continue to have control over us. We also need to question whether we are following an agenda set by someone else without questioning or suspecting their hidden objectives.

Now, financialization process has penetrated all aspects of life. Small and marginal farmers of Bangladesh are facing challenges of resource depletion, input scarcity, market mechanism, technological interventions, financialization of resources, and consumerism. They have in fact lost sovereignty of production systems, production inputs, and products as well. Therefore, we need to dig deep into the society, particularly the farming communities, to analyze and explain its effects.

We need to work to help the farmer communities take back the control of the reins of agriculture, help them be the masters of their own agriculture, which they once were. It is important to preserve traditional seeds and practices, and advocate the agricultural principles that protect our ecology and biodiversity, i.e., keep our future in our own hand.

Dr. Shamsul Bari

Chairman

Research Initiatives, Bangladesh (RIB)

Introduction

Climate change is undeniably affecting the life and natural resources around the world, mostly in the developing countries. Since the effect of climate change on the rain-fed agriculture is enormous, there emerged various solutions to adapt to changing climate and mitigate the effects. However, the solutions to deal with the climate crisis are mostly based on the market mechanisms where the industrialized states by funding carbon reducing projects in developing countries get the license to do business as usual. These mechanisms are based on financialisation of nature, which presupposes a process whereby forests, woodlands, meadows, mountainsides etc. turn to be merely a collection of ecosystem services including biodiversity, regulation and filtration of water, carbon storage and sequestration, the economic value of which can be calculated and expressed in monetary terms. However, the solutions for climate change in farmer's fields must be the climate resilient practices of ecologically based agricultural systems. We all agree that the methods promoted in the name of solutions should be holistic in nature and they should address the root cause of the problem and not its symptoms. Isn't it the crisis

emerging out of the climate change has its roots very deep in the capitalist mode of production which has a predatory approach towards nature. Is it possible to find out a solution without touching the issues of dominance and exploitation? Is it really necessary to find solutions within the framework of productivity only? These fundamental questions are necessary to identify the true nature of the problem and then it will be easy to differentiate the false solutions with those which would be really needed to overcome the civilizational crisis we are heading towards.

In this broader context, RIB with support from Rosa Luxemburg Stiftung (RLS) organized an international conference during 9-11 August 2017 in Dhaka to deconstruct the notion of climate solutions based on financialisation as well as to share and explore the experiences around CSA from the perspective of those who are most vulnerable to the climate crisis. Agriculture scientists, practitioners, experts, researchers, academicians, activists as well as government and non-government actors from countries like Nepal, India and Bangladesh participated in this conference.



Session 1

Opening

So, it is needed to keep in mind that climate change has direct connection with agriculture and unfortunately the solutions are being avoided due to this trading. So, politics need to be incorporated.

- Soumitra Ghosh



Dr. Meghna Guhathakurta, Executive Director of RIB, and member of National Human Rights Commission (NHRC), Dhaka introduced RIB and explained the organization's association with RLS. RIB is an organization that does not merely engage in traditional research, rather engages in action research. The focal groups of RIB's engagement are marginalized communities – marginalized in the sense of ethnicity, gender, occupation, etc. The marginalized communities participate in a process of searching means to solve their existing crises, in which RIB provides technical and research assistance. RIB's experience with Rosa Luxemburg in working for the marginalized farming communities has given the prerogative to organize this conference.

The Opening Session was chaired by Dr. Shamsul Bari, Chairperson of RIB who set the tone of the conference as saying that financialization process has penetrated all aspects of life. Small and marginal farmers of Bangladesh are facing challenges of resource depletion, input scarcity, market mechanism, technological interventions, financialization of resources, and consumerism. They have in fact lost sovereignty of production systems, production inputs, and products as well. Therefore, we need to dig deep into the society, particularly the farming communities, to analyze and explain its effects.



Soumitra Ghosh

Keynote:

“Capitalizing nature: Chimeras, Values and Politics in Climate-Smart Agriculture”

- Soumitra Ghosh, an independent researcher, a social activist, and a maker of documentary films

Key points

The phenomenon of climate change shows that certain limits have already been crossed and nature can no longer be exploited ad infinitum. According to IPCC, there is a medium level of confidence that if temperatures rise by 2°C or more above latest twentieth century levels, without adaptation, production of the world's major staple crops will be negatively affected in both tropical and temperate regions. There is evidence that climate change has already negatively affected wheat and maize yields in many regions. In such case, crop wild relatives (CRWs) will be a key resource in meeting this challenge, as their genes can promote resistance to many of the environmental stressors associated with climate change. International movement of germplasm will be essential in adapting agriculture to these novel climates. Breeding programmes will need to develop strategies for specific crops and regions, targeting the development of varieties that will be relevant to the challenges facing farmers 10 to 15 years into the future.

It has been observed that the discourses of climate change and food insecurity now include conservation and utilization of CWR genes: while re-commodification of current crops, infused with climate-hardy traits, is one dimension of the enclosure frontier, the potential for enclosure is larger and variegated. In situ conservation efforts might mean setting up of new genetic reserves, probably controlled by state and corporations and hence inaccessible to communities, whose traditional knowledge includes the CWRs. That industry can own this knowledge through Intellectual Property Rights (IPR) thus constitutes an epistemic enclosure.

FAO study argues that CSA can provide effective

tive options to manage a range of climate risks in agriculture. Risk mitigation includes mostly market-based solutions such as various kinds of insurance as well as new resistant seeds: i) irrigation, use of resistant seeds, improved early warning systems, and adoption of better agronomic practices); risk transfer -the transfer of risk to a willing party, for a fee or premium. To contain the growing risks from weather, private insurers working with microfinance institutions and with the backing of the World Bank increasingly promote weather insurance among small-scale farmers in Africa, Asia, Latin America, and the Caribbean. Diversification into high-risk cash crops might mean greater losses under climate change. The FAO is paying serious attention to the carbon market as a potential source for financing of CSA. Despite all the difficulties with its implementation, the concept of putting a price on GHG emissions and installing a market-based price-setting mechanism through certificate trading provides a powerful instrument of climate finance.

Uncertainties about carbon storage in the soil and its measurement as well as a market which is at best shaky do not however prevent the supporters of carbon trading from eulogizing new projects such as the much-hyped The Kenya Agricultural Carbon Project, that is breaking new ground in designing and implementing climate finance projects in the agricultural sector.

REDD or such incentivizing projects hoodwink the communities and disrupt their everyday life: ...in one tree planting project in Ecuador run by the Dutch company FACE, the carbon contract between the company and the participating communities included an obligation for the community to replant trees that might be destroyed, for example in wild fires. The trees planted were pine trees, in monoculture plantations and in a region that is not suitable for pine and has a high risk of fires....when the carbon trees burned down - not once but three times...the community paid to have the trees replanted because the company insisted on fulfillment of the contract obligations.

As in a bevy of so-called climate change solutions (such as various forms of carbon trading, sink-making, bio-fuel and fracking), CSA is

more of a chimera than substance, whose clinically depoliticized periphery banishes all hints of potential subversion, including the simple truth that you cannot have climate-change solutions without reining in big business and reducing emissions at source. Because admission of such truth would preclude solutions like CSA, international institutions such as FAO, The World Bank and the UNFCCC steadfastly maintain an informed silence about it, in other words, keep mum. Meanwhile we learn how private finance is essential for CSA and similar climate fixes: Voluntary carbon markets, which are small but expanding, provide a channel for private CSA financing, but current volumes are still minimal. While it is necessary to situate CSA in a political terrain and debunk the myths that come with institutional climate-change solution packages, is there a future for it as a field-level practice? In other words, will CSA be practiced on a large scale? If the initiative has to rest on private players, it is doubtful whether much headway would be made.

CSA is not going to yield concrete/substantive actions on the ground that could help the climate vulnerable communities in continuing with their life and reduce emissions. So, it is needed to keep in mind that climate change has direct connection with agriculture and unfortunately the solutions are being avoided due to this trading. So, politics need to be incorporated. He emphasized resilience, risk management of seed, livelihood diversity and agroecology conservation with the following recommendations:

- | Finding out the main sources of climate change to get proper solutions.
- | Formulating strategies in controlling enteric fermentation and its corresponding methane emissions along with reducing usage of synthetic fertilizer.
- | Crop production method needs to be climate resilient.
- | Productivity needs to be increased
- | There should be a mitigation policy.
- | New crops with high adaptivity in any climate change need to be generated.
- | The whole agricultural process needs to be incorporated with national and international politics.

Discussion on the keynote

As designated discussant on the keynote paper, Professor MM Akash, Dept. of Economics, University of Dhaka, suggested to have a position on middle ground rather taking any side of solution or impact. He suggested finding out the source of environmental crises at first and sharing responsibilities in resolution. He specifically made the capitalist developed countries responsible for the climate change issues and advised to give up past consumptions along with making an end-line which should not be crossed at any cost. He added that carbon emission can take place in a slower rate rather fully emitted because this is impossible. So he recommended making a farmer friendly market using technological and institutionalized mechanisms along with ownership. Similarly, he advised not to use genetically modified seeds, but using new varieties of seeds based on flood, drought and salinity tolerance.

Professor Dr. Sekender Ali, Pro Vice-Chancellor of Sher-E-Bangla Agricultural University, Dhaka, also as designated discussant, supported the recommendations made by the keynote presenter mentioning, *“No compromise with chemicals should be the motto of tackling the situation. Here, integrating bureaucrats are needed to get rid of biased and pre-occupied concept or cultivation.* He added that climate smart agriculture is a constant process so agriculture needs a holistic approach towards farmers. Dr. Abu Wali

Raghib Hasan, Project Director, IFMC, Department of Agricultural Extension, Dhaka, emphasized area and context based dissemination for better food production. He thinks carbon trading is not the main issue here rather working with production and natural conservation strategy is more important to get a fruitful result in saving environment. He suggested cultivating leguminous crops, Alternate Wetting and Drying (AWD) to reduce water usage and making floating garden before working on mitigation. He focused on increasing production and research on seed varieties because issue of climate change is alarming on what we are heading towards.

Dr. Debel Deb, Chair, Centre for Interdisciplinary Studies, Kolkata, as a designated discussant, stated a collective suggestion from all the previous discussions. He said, *“We have faced three problems namely biodiversity balance loss, climate change and nitrogen cycle disruption which have never been predicted before. As we have no technology to make a solution of this, we need to be adaptive with this situation positively and modify our agricultural methods for food production respectively”.* He advised to undertake screening programs along with proper promotion of seeds for capitalizing climate adaptive mechanisms.

Ansar Ali, a farmer from Bogra, made his urge and suggestions based on his experiences about climate change impact on agriculture as:



Prof. MM Akash



Prof. Dr. Sekender Ali



Dr. Abu Wali Raghib Hasan



Ansar Ali



Dr. Debel Deb



Dr. Md. Khurshid Alam



Ferdous Rahman



Dr. Md. Saifullah



Burhanuddin Khan
Jahangir



Biju Negi



Advocate Shamsul Haque
Reza



Qazi Sazzad Zahid
Chandan



Vinod Koshti



Dr. Manoranjan Mondal

- | Government should take responsibilities of crop destruction because of climate change.
- | Farmer's knowledge and option need to be valued and incorporated in policy making.
- | Soil needs to be given importance along with other agricultural resources.

During the open house discussion, Dr. Md. Khurshid Alam, TCRC, BARI, added his view in the discussion saying, *“Only adaptation will not curb the problems regarding climate change impacts on agriculture. We need proper ways of mitigation along with adaption because the rate of carbon emission is increasing which is cautious”* Ferdous Rahman, Chief Planning Officer, BADC, gave importance on Greenhouse effect and pointed to global policy making to control CFC emission. He suggested making drought and salinity adaptive seeds using lesser pesticides for further improvement from the negative climate change impact on agriculture. Dr. Md. Saifullah, Chief Scientific Officer, BARC, suggested incorporating politicians while making policies. Biju Negi from Beej Bachao Andolan, India, suggested cattle usage in cultivation for methane production. He also added, *“We need to define the contribution of climate change in agriculture at first to go for further actions”*.

Advocate Shamsul Haque Reza, General Secretary, Bangladesh Krishok League, as a special guest, expressed his apprehension regarding the lack of opportunity in incorporating the suggestions given by the experts

with the national policy. He recommended building better communication realistically with the government. He mentioned collaborative action plan for better implementation and result. Qazi Sazzad Zahid Chandan, General Secretary, Bangladesh Krishak Samity, as a special guest, blamed the developed capitalist countries being responsible for climate change and argues that the capitalist system will never create an option to make solution for climate change. He added that government needs to monitor the activities of multinational companies who sell cocktailed pesticides for profit. He emphasized remaking strong government structure along with appropriate policy making. Moreover, he stated that the research result should be incorporated with production and bridged with the farmers for betterment. Vinod Koshti, Program Manager, RLS-South Asia, made some remarkable proposals mentioning the current situation as ‘worst global inequality’ situation. He believes climate change is increasing inequality results in cultivation loss and reduces opportunities for income generation directly affecting the farmers. He also argued that climate is not only posing the threat of inequality but it is also promoting injustice - those who are responsible for the climate change are being further benefitted by it and those who are trying to protect the planet are the victims of climate change.

Profession Burhanuddin Khan Jahangir, Social scientist and Director, Centre for Social Studies, Dhaka, as the Chief Guest of the inaugural session, upheld the importance of politics in making climate change solutions and incorporating farmers in every level of policy making. He also stated to look into the government acceptance regarding the suggestions since state can implement these at its best.

Session 2

Agriculture in Bangladesh in the context of biodiversity, climate change, and CSA



Rivers in Bangladesh are of great value especially, to the people whose livelihoods are directly linked with its resources. Persistent and documented movements can mitigate relevant issues by bringing all stakeholders and conflicts on the table.

- Sharif Jamil



“A Critical Review of Bangladesh Policies on Climate Change”

- Mohammad Reazuddin, Former Director, Department of Environment and National Environment Consultant, Asian Development Bank (ADB)



Mohammad Reazuddin

Key points

Bangladesh is a highly climate vulnerable country whose emissions are less than 0.35% of global emissions. The country is adopting a two-fold strategy against climate change. The main focus of Bangladesh's activities is on increasing resilience to the impacts of climate change – which are already affecting the livelihoods of much of the population and will continue to do so in the future. For example, extreme temperatures, erratic rainfall, floods, drought, tropical cyclones, rising sea levels, tidal surges, salinity intrusion and ocean acidification are causing serious negative impacts on the lives and livelihoods of millions of people in Bangladesh, and are gradually offsetting the remarkable socio-economic development gained over the past 30 years, as well as jeopardizing future economic growth. However at the same time, Bangladesh is also working to achieve lower carbon as well as more resilient development. The measures taken to tackle the climate change effects focus on both adaptation and mitigation.

Major plans formulated under adaptation include National Adaptation Programme for Action (NAPA) 2005 updated in 2009 that identified 38 adaptation measures covering 8 thematic areas: (i) research and knowledge management, (ii) agriculture, fisheries and livestock, (iii) health, (iv) building Climate resilient infrastructure, (v) disaster management, (vi) livelihood, (vii) biodiversity, (viii) policy and institutional capacity building. From 38 identified adaptation measures, 16 projects have been further developed for implementation by different ministries and departments. The government has prepared Bangladesh Climate Change Strategy and Action Plan (BCCSAP) emphasizing greatest importance on strengthening the adaptive capacity of the local communities and innovation and extension of climate change related technologies with the vision to eradicate poverty and achieve economic and social wellbeing through a pro-poor climate change resilience strategy. The vision of the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009 is to eradicate poverty, increase employment opportunities, ensure food security, provide access to energy & power, and achieve economic and social well being of all citizens of the country which will be achieved through a strategy of pro-poor, climate resilient and low carbon development, based on the four building blocks of Bali Action Plan - adaptation to climate change, mitigation, technology transfer and adequate and timely flow of funds for investment, within an inviolate framework of food, energy, water, livelihoods and health security. In order to implement the 44 programmatic ideas identified under BCCSAP on the ground, Bangladesh has established two innovative funds: Bangladesh Climate Change Trust Fund (CCTF) from the Government's own budget, and Bangladesh Climate Change Resilient Fund (CCRF) with the support of Development Partners.

Major strategies, plans and action of mitigation include Nationally Appropriate Mitigation Actions (NAMAs) to mitigate greenhouse gas emissions in a manner commensurate with the capacity and in line with the national development goals of Bangladesh. Intended Nationally Determined

Contribution (INDC) of Bangladesh contains as mitigation component an unconditional contribution to reduce greenhouse gas (GHG) emissions by 5% from Business as Usual (BAU) levels by 2030 in the power, transport and industry sectors, based on existing resources; a conditional 15% reduction in GHG emissions from BAU levels by 2030 in the power, transport, and industry sectors, subject to appropriate international support in the form of finance, investment, technology development and transfer, and capacity building; and a number of further mitigation actions in other sectors which it intends to achieve subject to the provision of additional international resources.

Bangladesh has been champion in the world by installing around 3 million solar home systems across the country meaning that around 14-15 million populations are getting electricity entirely from the renewable sources. The country has taken initiative to build new energy efficient Combined Cycle Power Plants (CCPP) as opposed to inefficient Single Cycle Power Plants (SCPP) and replace existing SCCP with CCPP. On energy conservation, the Government is implementing a project styled 'Efficient Lighting Initiatives of Bangladesh' to replace around 30 million household incandescent bulbs with energy efficient CFLs/LEDs. Initiatives have also been taken to improve energy efficiency in Brick making through the replacement of Fixed Chimney kiln with Hybrid Hoffman Kiln (improved technology) which will also substantially improve the health benefits through reduced air pollution in the country. The government has already taken initiative to improve the transport sector by exploring key modal shifts (BRT, Metro, circular water ways, etc.) which require significant amount of investments from both public and private sector.

Government has taken initiatives to manage the forest resources for carbon trading in the context of global climate change and has already assessed the carbon stock at Sunderban forest. For the approval and promotion of Clean Development Management (CDM) projects in the country under Kyoto Protocol, the government has established a

Two-tier Designated National Authority (DNA) for CDM – (i) National CDM Board, and (ii) National CDM Committee to approve CDM projects in Bangladesh with a view to reducing the emission of GHG along with facilitating adaptation mechanism. Currently, UNDP and FAO are assisting the Government of Bangladesh to implement two targeted support activities funded by the UN-REDD Programme on corruption risk assessment, social impact assessment and monitoring, reporting and verification, bringing Bangladesh closer towards a comprehensive plan to realize the role of forests in tackling climate change.

Particularly in tiers below the central Government level, GoB officials have been lacking in terms of understanding and knowledge. GOB Officials and elected office bearers of local government institutions (LGI, e.g., Union Parishads, *Pourasava* Councils, Municipal Corporations, etc.) have lacking in management skills to deal with needs emanated from impacts of climate change, which in turn has been making institutional efforts not adequately effective. The BCCSAP has given a list of programmes under its six pillars, however no effort has since been made to elaborate financial requirements for each of the identified programmes and prioritize projects based on current and projected financial capabilities and arrangements. The prevailing system has difficulties in designing and implementing projects in a participatory manner. A simple analysis of BCCSAP clearly highlights the lack of financial resources towards meeting the objectives of both adaptation and low carbon development. As a consequence of lack of technical knowledge and understanding regarding advanced efficient technologies, there is a clear lacking in terms of analysis of current efficiency as against technologies that are already available. Dearth of analyses has been depriving the country to seize opportunities brought forward by the advancement of science and technologies. Energy saving industries/sectors have limited capacity to coordinate with National Board of Revenue to periodically review and reset conducive tax and tariff structures towards better management of demand side.

“Climate Smart Agriculture Technology: Theory and practices of BRRI for Coastal Region”

- Dr. Md. Mostafa Kamal, Chief Scientific Officer, BRRI, Gazipur., and Dr. MA Ali, Director (Research), BRRI



Dr. Md. Mostafa Kamal

Key points

The FAO estimate that feeding the world population will require a 60% increase in total agricultural production by 2050? With increasing population and decreasing natural resources and elevated climate change vulnerabilities in the future will have a big threat for sustaining food and nutritional security of many of the Asian and African countries?

In the recent past years the climate change vulnerabilities become highly visible that threaten the whole agricultural productivity. Drought, flash flood, salinity, heat, cold, tidal surge, torrential rain, land slide etc. are the key climate change elements that impacted negatively on agricultural productivity including livestock and fisheries. However, research and develop-

ment innovations and indigenous knowledge and their adaptation through different service providers aided to bring resilience to some extent. Development partners, government policy supports and farmers' awareness along with introduction and adaption of climate resilient technologies and integration with alternative options have improved the system productivity and livelihood of the climate victim people. BRRI is working to develop different technologies for favorable as well as unfavorable ecosystem. In this text different technologies for unfavorable/stressed environment; drought, salinity and submergence have been focused.

The northwest part of Bangladesh is known as the most drought prone area. Geophysical features, water resources, mismanagement, rainfall variability, temperature increase, absent of insufficient irrigation system are identified as a reason of drought. About 2.5 million hectares of land of Northwestern and central region is affected by drought. Drought can be mitigated by addition of organic matter, mulching, sprinkler irrigation, levee management. Digging of mini-pond (water reservoir) where rain water can be conserved and can be used as irrigation source during dry season that decrease pressure on underground water. It is projected that 15-20 million hectares of irrigated rice may experience some degree of water scarcity by 2025 in the world. Drought tolerance and drought escaping are two scenarios of drought mitigation. BRRI has developed rice varieties; BRRI dhan56, BRRI dhan66 and BRRI dhan71 that can tolerate drought and BRRI dhan57 is a drought escaping variety.

Salinity mitigation

The coastal zone of Bangladesh, covering 32% of the land area and home to 30% of the population, is one of the regions that is most vulnerable to climate change and sea-level rise. Salinity develops in soil through upward capillary movement of salt through the cracks. Early seeding in first week of November and transplanting within December of irrigated rice can escape salt affection in April and May. To harvest a good winter crop seeding/transplanting should be done within November. Winter and wet season crop; tomato, potato, sweet gourd, water melon, onion, garlic,

turmeric, chili can be produced using mulching. Crop cultivation in Pit and cover crop; dhaincha and khesari cultivation can mitigate salinity. Partially irrigated, Aus rice can be established by dibbling to prevent salinity at water scarcity period.

BRRI has developed climate resilient rice varieties; BR10, BR23, BRRI dhan40, BRRI dhan41, BRRI dhan53, BRRI dhan54, BRRI dhan73 and BRRI dhan78 for wet season in saline ecosystem. Most of these varieties have an aerobic tillering ability with yield potential 5.0-6.5 t/ha, suitable for mixed rice+fish cultivation in monsoon and popular in southwest region. On the other hand, BRRI dhan73 is a potential variety for high land ecosystem where winter crops can easily be established in optimum time with yield potential 4.5-5.0 t/ha with shorter growth duration and slender grain. BRRI dhan78 is a climate resilient submergence and salinity tolerant variety suitable for tidal saline water inundated ecosystem.

BRRI dhan47, BRRI dhan61 and BRRI dhan67 are suitable for dry season. BRRI dhan47 adapted across the saline ecosystem that can tolerate salinity, 8.0 dS/m (whole life cycle). BRRI dhan67 is a salt tolerant, 8.0 dS/m (whole life cycle) slender grain variety with 6.5 t/ha grain yield. The seedling height and tidal inundation tolerance of BRRI dhan76 and BRRI dhan77 are better or similar with local varieties but yield is at least 1.5 t/ha higher. Under this ecosystem 0.8 mha lands are available for replacement which would undoubtedly improve the productivity of the ecosystem.

Flood and Submergence

BRRI and BINA have developed submergence tolerance rice varieties; BR22, 23, BRRI dhan46, BRRI dhan51, BRRI dhan52, BRRI dhan79 and BINA dhan17, respectively. Flash flood in late September to October at reproductive stage of wet season rice also cause huge damage and none of the varieties can produce any yield. In such instances farmer should go for direct seeding of black gram with water receding or wait for winter crop, maize, wheat etc. BRRI dhan55 is a long slender grain multi-stress tolerant variety with lodging tolerance. BRRI dhan65 is 95 days direct seeded moderate drought tolerant partially irrigated Aus variety and it has high

weed competitiveness. BRRI has also developed some rice varieties those have medicinal value; BRRI dhan31 a wet season rice variety that has the capacity to prevent neurological disorders, BR5 is antioxidant rice that prevents life style diseases, BR16, BRRI dhan46 and BRRI dhan69 are low Glycemic index varieties that prevent diabetics.

Modified Sorjan, a potential and climate resilient technology, was developed by BRRI for south central region of coastal zone. Native catfish cultivation inside the canals and vegetables on the ridge with fence can produce high gross margin of 10 to 11.5 thousand USD/ha. Salinity tolerant rice varieties; BR10 and BR23 (Low land), BRRI dhan53, BRRI dhan54, BRRI dhan73 (Medium-Medium High Land), King Prawn+ Carps in wet season and Tiger Prawn in dry season is also climate resilient technology. Cucurbits on the fence; eggplant, Okra, bitter gourds on the levee of dyke can produce gross margin about 10 thousand USD/ha. After receding flood water sandbar cropping can be introduced where pumpkin/sweet gourd produced in sandy barren soil is profitable climate resilient technology for flood affected malnutrition people.

Unlocking the productivity of stressed areas requires multiple interventions, integration of natural resources, policy support, smart technological innovations and dissemination, efforts of service providers, farmers' capacity building and their holistic approach of implementation will undoubtedly help in sustaining food security of Bangladesh.

“River Degradation and Social Movement”

- Sharif Jamil, Coordinator, Waterkeepers Bangladesh and Joint Secretary, Bangladesh Poribesh Andolon (BAPA)

Key points

Rivers are one of the primary water resources for agriculture in Bangladesh. Bangladesh drains about 1.72 million square kilometer area of which 93% lies outside its territory in India, Nepal, Bhutan and China. The annual average runoff of the cross boundary rivers is around 1200 cubic kilometers. Bangladesh



Sharif Jamil

uses more than 70% of its land for agricultural purposes, often with multiple cropping seasons, and nearly all of the remainder is covered by forests, settlements, roads and waterways. Water withdrawals and diversions in the upstream countries generate serious disadvantages on socioeconomic sustainability and growth, the environment, and the ecology of Bangladesh. The alteration of river flow regimes associated with dam operations has been identified as one of three leading causes, along with nonpoint source pollution and invasive species, of the imperilment of aquatic animals. A river's flow regime is now recognized as a "master variable" that drives variation in many other components of a river ecosystem, e.g., fish populations, floodplain forest composition, and nutrient cycling, in both direct and indirect ways.

Obstructive or diversionary structures have serious negative impact on the hydrology and morphology of the rivers. Less flow of water during lean period enhances sedimentation and changes in the structure of the river that influences flash flood to be more distractive in monsoon. Changes in the structures and lack of enforcement of legal frameworks also encourage encroachments in multiple ways. The massive inter-basin water transfer project of India highlights as a serious threat to the river ecology of the region and survival of Bangladesh as an environmentally sustainable nation on top of internal river degradation. Additionally, the entire economic system of

Bangladesh could be paralyzed from lack of water adversely affecting agricultural production, fishery, forestry, navigation, and fresh water needs. Unilateral transboundary activities also cause salinization of coastal belt and degradation of ecosystems in the southern region of Bangladesh.

Unplanned mining and commercial activities at the upstream have been causing serious transboundary pollution to the rivers of Bangladesh while it further aggravates inside the country by the reckless industrial pollution to the rivers and wetlands. Many rivers in Bangladesh are struggling for their existence these days in many parts of the country. The scarcity of water during lean period and sudden flash flood in rainy season, both impact directly the life and livelihood of the farmers initially. Many social movements have been developed by last decade here in Bangladesh to protect the rivers. Among those, river Boral and Save Boral Movement have been discussed here briefly to understand the magnitude of the crisis and movement along with complex realities around poor governance in the implementation process of the government decisions and instructions of court.

The 220 km-long Boral River is the main branch of the Padma River passes through Chalan Beel before falling into the Jamuna River at Sirajganj. Boral was the lifeline of Chalanbeel as it would connect the Padma and Jamuna directly. The river is on the brink of death as it has lost its flow and width due to the degradation to the Ganges-Padma river-system and establishment of several unplanned embankments along its length. Several portions of the river, which provides livelihood to around five million people, have also been encroached by local influential groups. The river has played an essential role in irrigation for the agricultural sector of its region in and around the Chalanbeel. However, sluice gates and earthen cross dams constructed by government agencies have turned the river into several logged water bodies which are being used as a fish hatchery.

Save Boral Movement was initiated in 2008 by BAPA and Chalan Beel Uddog Society. After many public gatherings and multiple rallies,

meetings, human chains, press conferences in 14 Upazilas in 2008 and 2009, construction of another dam near Chatmohar Pilot School was stopped. A signed appeal was made by hundred thousand riverbank people and the civil society to protect the Boral River. In 2009, the Parliamentary Standing Committee for the Ministry of Land decided to cancel the lease of Boral and recommended the sluice gates and cross-dams removal. Instructions also came from the Honorable Prime Minister's office to release the Boral River.

In 2012, the Chairman of the Parliamentary Standing Committee for the Ministry of Land, sent a letter to the DC for identification of the Boral River boundary. Later in March 2013, a 220 kilometer human chain was organized. Thousands of people took part in this human chain for saving Boral River. A report was submitted on behalf of the Save Boral Movement to the national task force for the rivers of Bangladesh in the same year which demanded six points to free Boral. Bangladesh Environmental Lawyers Association (BELA) was requested for filing a case, which led the Honorable High Court to order the removal of all the barriers in the Boral River.

In 2015, Honorable Shipping Minister and State Minister for Water Resources visited Boral, held a meeting with the officials of the Rajshahi Divisional Commissioner's office, and announced that all barriers in Boral River be removed. But Water Development Board again came up with different ideas of cordon approaches to the task force. Though the task-force sounded determined to free the river, Institute of Water Modeling has been contracted to conduct an assessment study. People's movement was going on simultaneously to ensure Boral a free flowing river. In April 2017, in the presence of the Chairman of National River Conservation Commission, the decision to free the Boral River from all establishments was again announced. At present, the Dahpara dam, the New Market dam of Chatmohar, Bodh dam have been removed. Bridges are under construction. The Ramnagar dam will be removed soon as well. Boral has also been excavated to 1600 meter in Charghat. People are now hoping the sluice-gates and other obstacles will be removed

soon, Boral will be dredged entirely and Chalanbeel will be rejuvenated again.

Transboundary cooperation is essential for the survival of the rivers and water bodies in Bangladesh. Strong ecological approach under good governance is essential as well. Rivers in Bangladesh are of great value especially, to the people whose livelihoods are directly linked with its resources. Persistent and documented movements can mitigate relevant issues by bringing all stakeholders and conflicts on the table.

Discussion on papers

Rezaul Karim Chowdhury, Executive Director, Coast, Dhaka, as a designated discussant, pointed out the necessity of making solutions based on issues of South Asia. He stated that as Bangladesh is a society of merchant riders, several NGOs work for agricultural and environmental aspects alongside the government which is remarkable. He suggested, "*As the people of Bangladesh uses technology a lot, using technology in agriculture in a proper and planned way can make a revolutionary change for betterment*". He added that the demand of crops and fishes cultivated without using pesticides is increasing rapidly which is very constructive. As the civil society organizations and the government makes almost same policies, there needs to have a change if implementation process for better result. Moreover, he provided three key recommendations as:

- a) Proper land protection is needed in the coastal areas along with suitable waste management system.
- b) Integrated water management is required to be started soon as proper management of water will assist in fish cultivation.
- c) New technology needs to be incorporated in water crises e.g. establishing more deep tube wells, increasing surface water by proper preservation, rain water harvesting etc.

Suraiya Begum, Deputy Director, RIB, as a designated discussant, made several critical notes regarding the papers. She suggested focusing the challenges more than findings because challenges need to be overcome first



Rezaul Karim Chowdhury Suraiya Begum

and farmers need to know about the negative effects of pesticides. She also stated that women contribution is not visible in policy implementation though women are working in this sector for so long. She suggested making climate change policy gender-balanced. Information of local varieties of rice, price, production and demand needs to be noted in research institutes for further activities. Climate adaptation is a prime concern here. She added, *“If we can make the farmers understand the effect of climate change in a transparent way and let them involve in policy level, the climate adaptive solutions will be easier to make now than before”*.

During open discussion, Md. Mujibul Haque Munir added that the quality and quantity of land should be kept in mind alongside the quality and quantity of seeds. And for all these, vocational training and education is a must now. Dr. Md. Atikur Rahman argued about the holistic approach of agriculture and stressed incorporating farmers in policy and research level. He added that rivers are also very important to think about along with land and seeds. He stated, *“Debates on climate smart agriculture will be continuing but we need to focus on the alternative appropriate solutions for sustainable impact”*. Dr. Mahfuzul Haque made his words on climate friendly approaches mentioning, *“Policies need to be made as climate friendly not only solution centric. Agricultural, fertilizer and water policies need to be reviewed along with climate smart agriculture that promotes indigenous knowledge and practice”*. Dr. Nilufer Hye Karim observed that *“the varieties of rice should be drought and flood tolerant along and proper information of these varieties is needed to be preserved”*,

The overall recommendations of the session could be noted as follow:



Md. Mujibul Haque Munir



Dr. Mahfuzul Haque



Dr. Nilufer Hye Karim



Dr. Meghna Guhathakurta

- a. Institutions: Using technology must be location specific by proper institutionalized methods for achieving nutrition security.
- b. Movement: A change in mindset is required for planning a long termed sustainable and development oriented- policy rather making year-based plan. For this, resource protection in a scientific way should be the first thing to move forward. Similarly, investigation needs to precede adaptation and mitigation processes because development needs to take place as a whole for policy sustainability.
- c. Policies: As Bangladesh do not have any climate change policy, issues regarding energy, water, and land should be incorporated with the agro-climate policy which will further create pathways for adaption and mitigation process. The policy needs to be based on thematic areas e.g. human rights, environment etc. Cost benefit analysis is also compulsory since technology is suggested to be used. Most importantly, policy should integrate woman's participation.

Dr. Meghna Guhathakurta, as Chair of this session, put a light on farmers' perspective and incorporating them in national level policy making process focusing regional context along with different perspectives. She also suggested recording inputs of stakeholders as well. Following the inaugural session she agreed to make politicization of climate change issues.

Session # 3

“Climate smart agriculture in Bangladesh: Practice and Prospects”

- Dr. Sohela Akhter, Principal Scientific Officer, Soil Science Division, BARI, Gazipur



Dr. Sohela Akhter

Key points

Climate changes can be characterized by increase in mean temperature, changes in rainfall patterns, increased variability both in temperature and rainfall patterns, low water table and drying up of water bodies, frequency and intensity of extreme events such as droughts and floods, and disturbances of ecosystems. CSA is an integrative approach to address the interlinked challenges of climate change and food security. There are various climate smart technologies being adopted in Bangladesh, which are discussed in brief below:

Soil management practices

Conservation tillage practices can minimize the rapid breakdown of plant residues. Reduced tillage is helpful in reducing organic carbon loss from soils, which may result in improved physical, chemical and biological properties of soil as well as improved crop

productivity. BARI developed *zero tillage* planter operated by a power tiller. It simultaneously sows seed and applies fertilizer without tilling the soil. It conserves the residual soil moisture. Zero tillage planter is used to cultivate wheat, maize pulses in light textured soil of Rajshahi, Dinajpur, Jessore etc. It reduces 30% of crop establishment cost. Yield of these crops is satisfactory. *Strip-tillage* is a conservation system that uses a minimum tillage. It combines the soil drying and warming benefits of conventional tillage with the soil-protecting advantages of no-till by disturbing only the portion of the soil that is to contain the seed row. *Contour plowing* or *contour farming* or *Contour bunding* is the farming practice of plowing and/or planting across a slope following its elevation *contour* lines. Crops are grown across or perpendicular to a slope rather than up and down the slope.

Water management practices

AWD is a water-saving technology capable of reducing irrigation water requirement of rice. The savings of irrigation water will have an impact on the environment because of reduced withdrawal of ground water, reduction in burning diesel. This may also reduce arsenic contamination in rice grain and straw. *Fertigation* is the injection of fertilizers, and other water-soluble products into an irrigation system. Fertigation is used to add additional nutrients or to correct nutrient deficiencies detected in plant tissue analysis. It is usually practiced on high-value crops such as vegetables, fruit trees, and ornamentals. *Rain water harvesting* plays an important role in crop production in drought and saline-prone areas where water is scarce or saline in nature. Digging a mini pond in the crop field ensures sweet water irrigation for the crop. Kuni/Mini pond is important for small-scale irrigation in southern saline areas.

Fertilizer management

Organic manures are environmentally friendly. Cowdung, poultry manure, traditional compost are popular organic manures in Bangladesh. Bioslurry, vermicompost are new organic manures recently used in Bangladesh. *Bioslurry* is a bi-product of a biogas plant. When organic substances (cowdung, poultry litter, kitchen waste etc) decompose in an air-tight digester (biogas plant), biogas generated from the biogas plant. Mainly cowdung and poultry manure are used as raw material for biogas

plant. Hence bioslurry is also of two types: cowdung based bioslurry and poultry litter based bioslurry. *Vermicompost* refers to organic manure produced by earthworms. It is a mixture of worm castings (faecal excretions), organic material including humus, live earthworms, their cocoons and other organisms. We can use special types of earthworms which are specialized surface dwellers (not burrowers), typically live in very rich organic matter such as manure, compost heaps or leaf litter. By feeding these earthworms with cowdung or decomposable organic wastes, we can produce required quantities of vermicompost. *Biochar* is a high-carbon, fine-grained residue that is produced through modern pyrolysis processes; it is the direct thermal decomposition of biomass in the absence of oxygen (preventing combustion), which produces a mixture of solids (biochar), liquid (bio-oil), and gas (syngas) products.

Crop management practices

Shifting planting time is an important approach to overcome the deleterious effect of climate. Early planting or late planting escaping the drought, flood, heat stress, cold injury is a vital weapon to cope with adverse climatic condition. *Mulch* is a layer of material (rice straw, wheat straw etc.) applied to the surface of soil. Reasons for applying mulch include conservation of soil moisture, improving fertility and health of the soil, reducing weed growth and enhancing the visual appeal of the area. Mulch can be applied in drought prone or saline soil. Mulch reduces the evaporation and thereby retaining soil moisture in drought prone soil. In saline soil it restricts the capillary rise of saline water by restricting evaporation from surface soil. *Sorjan cropping system* is an intensive method of growing crops on alternately raised beds and deep sinks.

Pyramid/ridge cropping practice enables farmers to grow rabi and kharif-I vegetables in relatively lowlands that remain under few cm of flood water at the time of harvest of the transplanted aman rice. Soils are heaped up like pyramid just after harvest of the aman rice at a spacing required for the next desired crop. *Floating agriculture* (locally known as *vasoman/dhapchash*) has been practicing since at least two centuries in the low-lying areas of the southern region particularly in Pirojpur, Gopalganj and Barisal districts of Bangladesh

to cope with the flooded/submerged conditions. According to local tradition, this indigenous system of 'soilless cultivation (*vasoman/dhapchash*)' has been used for growing different types of vegetable and spice crops and/or its seedlings. The floating bed is built up with various types of local materials such as water hyacinth, topapana, *dulalilata*, *shaola*, dissected coconut fibres and so on. Farmers generally cultivate vegetables and spices crop.

Climate resilient crop variety in Bangladesh

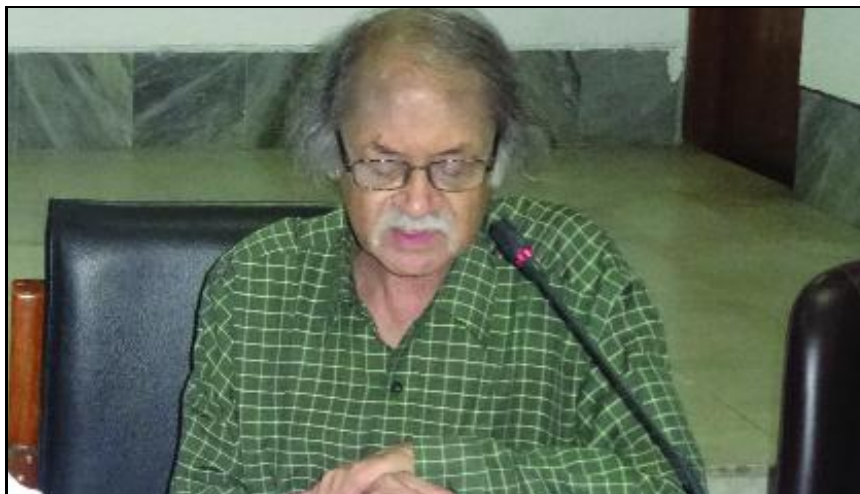
Scientists of BARI, BRRI and other NARS Institutes developed climate resilient crop varieties that are capable to cope with stress environment. Some of the varieties of the crops are described in the following table.

“Climate resilient, ecologically and socially sustainable Agriculture in India: Policy, Science and Technology, and Institutional challenges”

- D. Raghunandan, Director, Centre for technology & Development, India

Key points

Paris Agreement pledges leave high probability of crossing the 2°C goal: 3-3.5°C temperature rise (IPCC, UNFCCC). Therefore, substantial impacts are foreseen in India/South Asia. However, PA's forward-looking architecture is deeply flawed and inequitable. India's NDC is moderately ambitious but disjointed and mitigation focused. Temperature is expected to rise 1.5-2.0°C higher by 2030, 3.5-4.3°C by 2100 with rise in number and frequency of heat waves and hot days, onset and withdrawal of monsoons delayed, variable rainfall, decrease in number of rainy days, increase in heavy rainfall days, reduction in river discharge, degeneration of glacier mass, declining NW to NE, evapo-transpiration of main rivers up by 40%, so low recharge of aquifers, poor recharge of groundwater, sea-level rise, coastal erosion, and saline water ingress. Changes in climate will lead to 40 mha (12% area) flood prone, 51 mha (16% area) drought-prone, dry season flows lower, wet season flows higher, severe droughts and floods, per capita availability of water decreased, prevail-



D. Raghunandan

ing near-crisis situation likely to worsen, groundwater availability affected; and sea-water ingress in Cauvery and Sabarmati r. systems. Climate changes will make 65% of rain-fed crop area and small holdings highly vulnerable to climate variability, rice productivity to decline, wheat, maize, sorghum, soyabean yields to decline, 4-10% drop in food production by 2030, 20-40% by 2050 (more drop in rain-fed than in irrigated areas), protein content of grain to also drop, increase in pests; spread to new areas by 2050, 10-25% drop in farm incomes, 5% drop in GDP, food security, and livelihoods clearly threatened.

The crises can be observed in neo-liberal policy paradigm, high input costs, decline in public investment, low crop prices, variability in global markets, middle-men, lack of institutional credit, declining soil health and productivity due to chemicalization; declining water availability; soil erosion and water-logging; pest mutation; poor infra (eg. storage), decline in rural economy: shrinking non-farm sector, animal husbandry; lack of value-addition, changing crop patterns (most farmers now grow only a few, mostly cash crops, poor food security, loss of bio-diversity, higher vulnerability, poor policy response.

National Mission on Sustainable Agriculture (NMSA) running since 2010-11 takes a sustainable development approach with climate co-benefits with focus on rain-fed area development (location-specific multi-cropping, integrated farming etc, for diversified produc-

tion/livelihoods and risk management), soil health (GIS-based practices, choices/inputs), water conservation, agronomic practices, adaptation and mitigation measures. National Initiative on Climate Resilient Agriculture (NICRA) supports NMSA-allied programme enhancing climate resilience of crops, livestock, fisheries through strategic research, such as, vulnerability assessment in different zones, evolving climate stress tolerant varieties in major crops, adaptation and mitigation strategies (input use efficiency, conservation agriculture), studies in pest dynamics, new pests, field demonstrations, and capacity-building of researchers/other stakeholders.

Already vulnerable populations will be more vulnerable to climate change i.e., climate vulnerability adds on to pre-existing vulnerabilities. Bio-physical vulnerability will include ecological processes, exposure to physical changes eg for small/marginal farmers, fisherfolk, forest/near-forest dwellers, hill peoples, coastal inhabitants and all those dependent on natural resources for livelihoods/habitats.

Analysis of climate-agricultural policies

NMSA clearly takes a top-down approach ignoring systemic agrarian crisis, structural vulnerabilities, and locale-specific needs esp. of small farmers. It is prescriptive not need-based, co-evolutionary, where degraded extension support system not addressed. NICRA largely takes a techno-fix approach which reiterates problematic lab to land model, having shortage of meso-level climate, vulnerability data, lack of interactive information/knowledge flows, where capacity-building inadequately addressed

Science and technology approach and capabilities

These approaches are top down, over-centralized lab to land approach with known weaknesses, where problem identification, local adaptation flawed and S&T State/Dist-level Institutions largely ignored. There is no sign yet of replicable models on the ground (eg. quick-chilling varieties in famous Kullu apple case). There is a focus on RF crops, and there are chances of “major” irrigated crops (rice, wheat, oil-seeds) getting prioritized, “minor” crops ignored. The dangers remain in R&D thrust on GM rather than improved native varieties, and on mono-crops leading to loss of

bio-diversity. There is insufficient differentiation between climate-specific problems and sustainability issues.

Agrarian crisis

Farmers are likely to face climate impacts through own ad hoc coping measures in short term. Capacity-building for adaptation/climate resilience among farmers is crucial but not addressed. Policy responses cannot be implemented with degraded public extension capability. Ag-related issues are State subjects where States' capacity is weak; SAPCCs are miscast. Cross-sectoral issues are missing eg coastal salinity ingress. Several adaptation options with mitigation and developmental benefits not adequately pursued

Suggestions going forward

Adaptation suggests taking ex-post measures to cope with climate impacts – to build resilience, including progressive adaptation. Measures with multiple objectives or co-benefits (Dubash, Raghunandan: EPW) e.g. resilience, livelihoods, food security, resource conservation (soil, water), mitigation be taken. Decentralized participatory action research and multi-stakeholder rural innovation ecosystem be taken. Structural vulnerabilities incl. agrarian crisis: towards alternative developmental pathway must be tackled.

“Ethno botanical study on traditional rice diversity in Bangladesh”

- Pavel Partha, Coordinator, Food Security Program, Bangladesh Resource Center for Indigenous Knowledge (BARCIK)

Key points

Bangladesh is divided by mainly 30 agro-ecological regions, 17 hydro-ecological zones and different geographical characters. Bangladesh has a historical landscape agriculture and riparian food-life. Agriculture in Bangladesh has experienced effects of climate change and intrusion of corporate control. Local variety food grains are widely ignored, whereas those are more resilient and nutritional. Characteristics of local rice varieties:



Pavel Partha

- | Suited to local ecological system
- | More resistant to diseases
- | Related to local culture
- | Less production costs
- | More environment stress tolerant
- | More weather stress tolerant
- | More palatable, and top the demand list of foods
- | Farmers can preserve seeds
- | Seeds are exchanged and genes transferred

Deep water rice varieties (cultivated in Sunamganj, Moulvibazar, Habiganj, Sylhet, Kishoreganj, Mymensing, Gopalganj, Netrakona and Kushtia districts)

- | Kumri, Boiakhawri, Joldigha, Hijoldigha, Holudjakhon, Lathishail. Lakhai, Jolbhanga. Digha, Hijoldigha, Kalamani, Gochi, Rata, Boiakhawri, Topa, Churak

Saline zone rice varieties (cultivated in Khulna, Satkhira, Bagerhat, Pirojpur and Barguna districts)

- | Tekshoil, Kutepatnai, Tikepatnai, Birpala, Nuneshwer, Nonakhochhi, Raenda, Burimonteshwer, Sadamota

Drought tolerant rice varieties (cultivated in Chapainwabganj, Naogaon, and Rajshahi districts)

- | Sonashail, Batraj, Jhingashail, Malshara, Subondari, Hansraj, Biyanophul, Magurshahil, Randhunipagol, Chiniatab

Hill rice varieties (cultivated in Tangail, Rangamati, Khagrachari, Bandarban, Moulvibazar districts)

- | Gallong, Khobrok, Guria, My-riung, Aduma-Kiting, My-borukchika, Malang-mi-Middim,

Mikhocu-Wakhocu, Champli-my, Mami-mochoi, Churii, Nee-pidi, Jamma, Rai-rik, Rai-sa

Discussion on papers

Mohammad Reazuddin, Former Director, Department of Environment, Bangladesh thinks that the definition of climate change needs to be well defined more for better understanding in the paper named, 'Climate smart agriculture in Bangladesh : Practice and Prospects'. He also stated his constructive opinion regarding the second paper, 'Climate resilient, ecologically and socially sustainable agriculture in India: Policy, S&T and Institutional challenges' as *"We should increase sustainable production by keeping in mind that green house reduction is the main target for mitigation. For this we can use technology"*. He also added, *"If there remains inconsistency cultivating shrimp and crops together, using rain water can be good solution considering climate smart agriculture"*. Mr. Rezauddin believes that small farmers have direct connection with mitigating all these problems mentioned in the second paper and here, top down policy making can never be effective. Lastly, in the third paper namely ethno-botanical study on traditional rice diversity in Bangladesh, he supported the key features saying, *"Research is mandatory because if climate tolerance affects agriculture most, a proper research is needed to tackle this"*.

Dr. Md. Mostafa Kamal, CSO, BRRI, said, *'All we need to do is surviving the negative impact of climate change on agriculture. For that, it is necessary to cope up with the upcoming problems from different locations from farmers' perspective'*. He also added that for greenhouse gas mitigation, reduction of carbon is mandatory

and local germ plasm needs to be preserved. Also, different places have different names of same crops which need to handle carefully.

Professor Anu Mohammad, Dept. of Economics, Jahangir Nagar University, Dhaka firmly believes that climate change took place because of human activities and this problem is now the prime concern of policy making, development, funding and research. He added that Bangladesh, being in the most vulnerable position, should focus on mitigation and adaptation in terms of policy making. He stated, *"Though global organizations like the UN or multinational companies are working to tackle climate change, this mitigation and adaptation will not be of work unless there remains development"*. He made an urge to look into the fact of water salinity, reduction of river water and drought which are definitely the results of climate change and suggested to have a negotiation with India regarding this matter immediately.

Furthermore, Professor Mohammad emphasized protection of river and forest. He acknowledged that after the green revolution, excessive use of irrigation system might increase food production but it ruined sustainability by making the rivers dead, increasing salinity and escalating river possession illegally. He recommended thinking about the preservation of coastal forests and rivers. He said, *"In Bangladesh, we need both academic and action research. Also, we need to lessen our dependency on external funding since it plays active role in reverse direction for research due to its attention in profit making than making development"*. Dr. Mahfuzul Haque suggested relooking into the darker side of CSA issues specifically the politicization.



Mohammad Reazuddin



Dr. Md. Mostafa Kamal

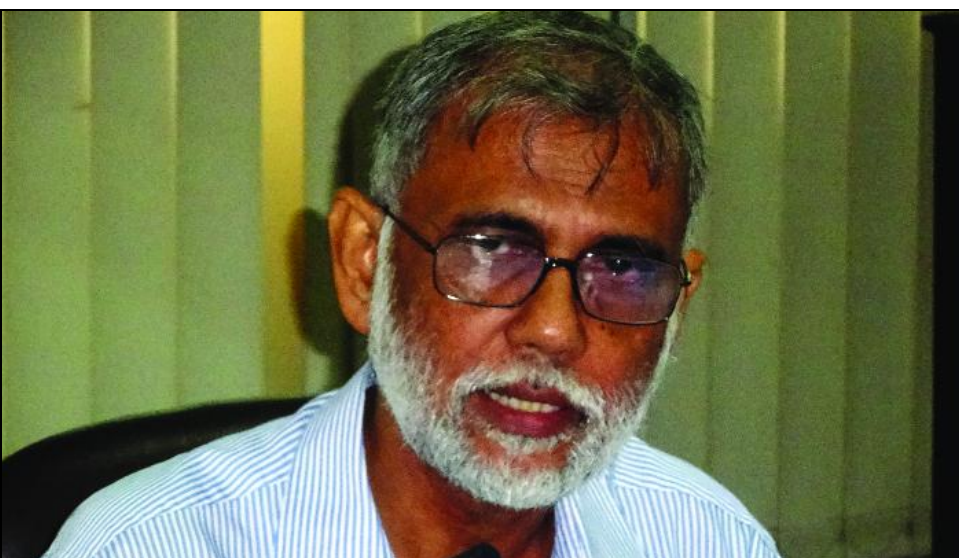


Professor Anu Mohammad

Session 4: Climate smart agriculture (impact) and the alternatives

“The Jhumiya Women Farmers of the Chittagong Hill Tracts, Bangladesh and their Agro-Ecological Practices”

- Dr. Mahfuzul Haque, Former Secretary, GOB and Adjunct faculty of University of Dhaka, and Brac University



Dr. Mahfuzul Haque

Key points

Jhum is a dominant form of agricultural land-use in the hilly region of the Chittagong Hill Tracts (CHT) of Bangladesh. Eleven minority ethnic groups of the hills of Chittagong practice this form of slash and burn method. Approximately, 41,000 ha of land of this region (14% of total cropped area) is used for shifting cultivation every year and about 73,000 families are engaged in this traditional form of agriculture. Women play an important role in the family as they take active part in clearing and burning of bushes, selection of plots and seeds, opportune moment for sowing after the first rain, guarding the *jhum* fields from marauding animals and organize harvest.

Jhum is almost a self-reliant production system, as they produce everything they need in their day to day life. They cultivate crops, grow fruits and trees, raise livestock and catch

fish. In addition, they build their own houses, make their own looms, weave their own clothes, make baskets to carry and conserve goods. Although, there is no privately owned land, there is however, a kind of unwritten law related to land claims for *Jhum*. It is *de facto* rights of the *Jhumiyas*, who have been cultivating the hilly lands for generations. On the other hand, the government exercises its *de jure* rights claiming all lands belong to the state.

There are some common allegations against *jhum* cultivation that due to application of “slash and burn” method, it causes loss of top soil, loss of soil fertility, killing of friendly insects, land erosion, deforestation and a telling effect on the environment. Although, some of these allegations are partly true, did anybody question the reasons behind such a sorry state of this cultivation practice, which was once a self-sustaining one? If shifting cultivation is that bad, how an estimated 10 million hectares of land in South Asia and more in Latin America and Africa continue to be under this form of agriculture? How could majority of more than 400 million people survive on shifting cultivation across Asia these days?

Jhum has become the victim of a concerted policy campaign for last two centuries. It was initiated by British colonial administration and followed by subsequent governments having tremendous impacts on the land use pattern of the Chittagong hills. Moreover, the very negative attitude of the government and some development partners concerning *jhum* cultivation were reflected in the development projects and policies implemented in the hills. Some of development projects are as follows: commissioning of Kaptai hydro project in 1962 inundating 40% of the total cultivable land; establishment of forest product-based Karnaphuli Paper Mill; resettlement of landless Bengali farmers from the plains causing shortening of *Jhum* cycle; setting up of “*Jhum* Control Board” by the Forest Department; rubber plantation project; and expansion of tobacco cultivation in Bandarbands.

Due to decrease in fallow period, *jhum* cycle shortened and as a result, production decreased. As a result, they collect bamboo bushes and trees from the hills and sell them in the market. As rice yields decreased steadily

due to declining soil fertility and shortening of *Jhum* cycle, the *Jhumiyas* started looking for alternative crops for their sustenance. Sad thing is that in order to increase food production, *Jhumiyas* have resorted to using agrochemicals, insecticides and pesticides taking tolls on the environment. Earlier days, burned ash of *Jhum* fields was used as insect repellent. Following shortening of *Jhum* cycle, the farmers are now applying more chemical fertilizer (mainly urea and potash) and insecticide (dynochlor, basudin) to get increased production of mainly ginger and turmeric. Moreover, climate change induced disasters like cyclones, excessive rain, climate variability are also visiting the Chittagong hills coupled with invasion of rats and famine, which were never known in the hills before.

International Centre for Integrated Mountain Development, Kathmandu, conducted a number of case studies, which showed that shifting cultivation as a farming system provided benefits both for its practitioners and for the society. The findings demonstrated that shifting cultivation contributed to forest cover, wildlife conservation, agro-biodiversity, soil and water conservation, organic farming as well as cultural integrity and social security. Some of the major findings are elaborated below:

Along with anti-*Jhum* campaign, the century-old cultivation practices faced challenges from climate smart agriculture, which aggressively promoted saline-tolerant, drought-tolerant HYV of crops in order to offset food insecurity caused by climate change-induced natural disaster. Agrochemicals and HYV seeds made inroad in subsistence agriculture like slash and burn methods as well as affected livelihoods of the *Jhumiya* women farmers. Failing to meet annual food demand, the family members face starvation and famine. It is interesting to note that against all odds, surprisingly around 73,000 *Jhumiya* farmers in Bangladesh and around 400 million around the globe continue practicing *Jhum*, which demonstrate that there must be some merits in *Jhum*. Now, the greatest challenge would be how to change the anti-*Jhum* mindset created among the policy makers, development workers, foresters, agricultural scientists, extension workers and the academia?

“Fighting Climate Change Impact with Farmers and Fishers for Sustainable Food Security and Livelihood: COAST Experience and Efforts in Bhola Island”

- Md. Mujibul Haque Munir, Assistant Director, COAST, Dhaka



Md. Mujibul Haque Munir

Key points

Agriculture of Bangladesh is severely vulnerable due to climate change. Countries mainly responsible for climate change must compensate the countries affected due to climate change. Bangladesh must be prepared within itself. Farmers' capacity should be enhanced in this regard. Adapting new and sustainable technologies and adaptation alternative livelihoods can be an option to face the challenges of climate change impact. Farmers of Bhola Island are creating example of fighting strongly against climate change impact. They are contributing to the environment and as well as they are also adapting alternative income generative options.

Eco-friendly sustainable Agriculture technologies

- | Vermi Compost (An organic, eco-friendly low cost alternative to chemical fertilizer)
- | Sex Pheromone (Killing Enemies, Saving Friends, Saving Environment)

- | Leaf Color Chart (Increasing Production and Reducing Demerits)
- | The Maria Model (Way of Finding and Preserving Quality Seeds)
- | Porous Pipe (Saving Cost, increasing production and Saving the World)
- | Gutti (Granular) Urea (Ensuring Higher Yield with low Urea!)

COAST Efforts of Promoting Alternative Livelihood Options to Face the Climate Change

- | Mini Hatchery (Produce Chicks, Produce Dreams): Mini hatchery is a local technique where heated rice husk is used as a means of artificial incubation for hatching chicken/duck eggs.
- | Goat Rearing: Goat rearing does not require much land and also does not need high cost to run.
- | Model Breeding (Producing Eggs): COAST is promoting Model Breeding. It is a local technology of rearing chicken, hens or ducks-drake and hens for reproduction.
- | Beef Fattening (Little Effort: Sure profit): Beef fattening is a profitable business, and it can be made by the rural people.
- | Vaccinator (Saving Livestock: Creating Income): COAST is providing training to some rural women and then providing technical supports.
- | Cow Rearing (Source of Empowerment)
- | Duck Rearing
- | Chick Rearing in Rural Areas (Household Effort: National Effect)
- | Household level Buck Station

“Real Climate Smart Agriculture must Delink from Carbon Markets, Lower Emphasis on Centralized Industrial solutions and be Open to Local Responses and Control”

- Soumya Dutta, Bharat Jaan Bhigyan Jatha-BJVJ/ India-Climate-Justice (ICJ)

Key points

The climate change crisis in agriculture is very real. The two kinds of impacts, catastrophic



Soumya Dutta

and slow-onset, are already taking a huge toll. The 2015 drought in India is estimated to have cost the Indian economy around USD 100 billion, or nearly 5% of the GDP at that point, thus undercutting almost the entire economic growth. Over 50% of Indian farmers suffered badly. Industrial agriculture is one of the major contributors to greenhouse gas emissions, and thus to the climate change crisis. The signature problems of massive industrial operations – standardize, uniformize, concentrate resources and production processes, large scale magic bullet solutions for all are all replicated in the mainstream ‘solutions’ offered in the shape of climate-smart agriculture.

One of the most prominent features of the climate crisis is the increased unpredictability – of both the climate systems and the scale of change over any time and space. Any “smart” response to a situation of unpredictable change has to be built on developing capability to learn and keep responding differently to these situations, which might vary even within a small geography. This essentially means developing local watch, monitor and respond capacities. Any uniform, centralized solution will essentially take much more time and resources to develop and deploy in large swathes, and will be inherently less resilient. On top of that, this centralized magic bullet solutions take the initiative and capacity away from local farming communities, making them hapless passive implementers of large centralized “solutions”. In the face of increased local variations and unpredictability, that’s not smart.

The other danger of mainstream climate smart agriculture is its emphasis on emission measurement based mitigation, with an eye on the

carbon market. It seems that the FAO, World bank and the UN have not learned anything positive from the abject failure of the first carbon market experiments like CDM. Large interconnected markets operate on their own rules, with rapid economic responses to a host of factors not directly connected with agriculture.

Agriculture is inherently slow and patient, with many natural processes being synchronized during the cycle(s). There is an inherent mismatch, and thus a grave danger that agriculture will be forced to respond to the rapid changes of the carbon market situations. Though even this condition holds a dichotomy, under the mainstream “climate smart agriculture” model, the large peasant farming sector in India and south-Asia will be held hostage to these markets. That will be an additional blow, over and above the change and unpredictability of climate, and the already increased pressures of non-supportive economic policies of our countries.

Discussion on papers

Dr. Sohela Akhter suggested testing jhum cultivation if that creates soil erosion and reduces nutrient. But it is a concerning issues that these methods create methane which is harmful. However, she said, *“Integrated planning system is dependent on organic fertile system. But this increases carbon sequestration as it is organic. So, using vermin compost can be an option of waste management which has also resells value as fertilizer in the production of vermiform. Additionally, this will lessen environment pollution”*.

Mohammad Reazuddin emphasized the proper examination of CSA methods to bring the bests to the farmers for better results. Furthermore he added that people associated with agriculture needs to be more careful about greenhouse gas since it does not contain

carbon only also it contains methane. So, any steps taken by the authority needs to be contextualized.

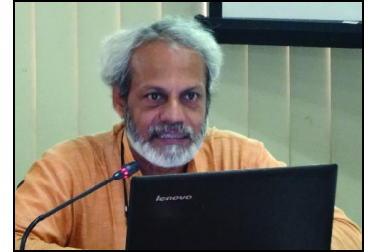
Dr. Debel Deb criticized all three papers. For paper one, Dr. Deb stated that it is a wrong perception that Jhumya is a destructive cultivation whereas it actually is the most productive and sustainable cultivation where soil erosion is minimal. For this, shifting is needed which means cultivating in different areas in a cycle rather cultivating in the same area. This is a sustainable method which makes the cycle full in every 30 years. He added, *“State and the forest department need to take responsibility of this Jhumya cultivation to work properly along with proper land policy”*. He further included, *“Fire control mechanism is another vital thing to maintain in proper Jhumya cultivation which needs to be looked after as well”*. For paper two, he suggested to conserve genetic resources with production in traditional agriculture. Alongside, he said, *“Fisheries need to be incorporated in climate adaptively approaches focusing on proper method of fishing and food security for resource conservation”*. Dr. Deb pointed some scientific explanations regarding the third paper. He explained, *“Biochar creates carbon especially from wood which ensures presence of micro organs who fixes PSM bacteria which are beneficial for cultivation. It enhances nutrient and do not get washed away by flood. This needs to be incorporated in sustainable agricultural mechanisms but the prime concern is wood whose supply leads towards deforestation. As scientifically, small bushes and shrubs can be an alternate option here, deforestation will not take place. But it needs to keep in mind that all should take place in a contextualized way”*. Additionally, he advised that no-till method of cultivation is absolutely inapplicable for rice cultivation because it refers to herbicide.



Dr. Sohela Akhter



Mohammad Reazuddin



Dr. Debal Deb

Session 5:

Climate smart agriculture (impact) and the alternatives



The unending tragedy of farmers' suicides in India, the problem of drugs and cancer in Punjab et. al. are a direct or indirect consequence of chemically intensive agriculture promoted by the Green Revolution.

- Biju Negi



“Exploring Traditional Wisdom and Practices as Response to Current Questions”

- Biju Negi, Beej Bachao Andolan, Dehradun, Uttarkhand, India



Biju Negi

Key points

Agriculture right through its existence has never been free of problems. The invention of agriculture did not happen in a day, but was a very slow process of discovery, adoption and adaptation. In this entire process, in particular, farmers have always had to face broadly two kinds of problems – natural or physical, political or administrative problems. Climate crises have always been there, and have possibly caused the extinction of societies through human history; and which are now a major cause of the rapid annihilation of existing flora and fauna. Political or administrative problems relate to or emerge from policy and administrative decisions and response programmes which are inappropriate, inadequate or poorly implemented. Indeed, there are growing evidences that political or administrative prob-

lems are enhancing the natural or physical problems and exacerbating their impacts.

In traditional community understanding and practice, floods were not seen as a problem or an enemy but, on the contrary, considered a friend, which always brought mineral-rich silt to the cropping fields and ensured a wholesome and healthy agriculture through the rest of the year. The people saw floods as a normal behaviour pattern of a river and a temporary minor irritant during one certain season in the year. In India, in the regions of eastern Uttar Pradesh and Bihar, the women even sang ‘welcome’ songs for the floods. It is possible that there were similar practices elsewhere too. What was the government administrative response to floods? It saw the annual floods as a problem, and created embankments to prevent them from entering the villages. In eastern Uttar Pradesh in India, the flow of rivers is generally west to east or north-west to south east, while the embankments were built along the north-south axis. These embankments were built to block the natural flow of the rivers. The result of this government response is that today embankments have become the problem, almost wiped out the benefits of floods and exacerbated the damages and after-effects of floods.

Understanding the conceptual problem

Green Revolution was presented as the “solution” to a problem. The unending tragedy of farmers’ suicides in India, the problem of drugs and cancer in Punjab *et. al.* are a direct or indirect consequence of chemically intensive agriculture promoted by the Green Revolution. In 1943, the country saw a devastating famine in Bengal. The government did not forgo or relax tax burden on the farmer even in the face of the famine, and in fact, specific orders were passed to that effect. Not only that! To meet the famine situation, a ship with grains sailed from Australia and was bound for India. However, even or reaching the shores and anchored at one of the harbours, on the orders of Winston Churchill, the ship was not unloaded and ordered to proceed to Europe where World War II was happening. Point to note – the problem of hunger and malnutrition was essentially not due to inadequate grain production, but was an issue of inequitable and unfair distribution. The main concern, and one which has been entirely overlooked, is that while the problem was

“hunger”, the solution offered by Green Revolution was “production”.

We remained blissfully ignorant of this ‘trick’ was because there was an extremely smart play on words. Consider the term “Green Revolution”. Who would protest the terms “Green” and “Revolution”? The result – we have more and adequate production and yet we continue to have the one of worst states of hunger and malnutrition in the world. The ‘more production’ did not deliver us from hunger, but offered plenty of riches to the corporations engaging in the ‘business’ of agriculture. Or take the terms – HYV or ‘miracle seeds’, which were integral parts of the Green Revolution lexicon. We did not realize or even if we did, we did not call out their bluff that the seeds were not ‘high yielding’ but actually ‘high responsive’ varieties – responding only to a high usage of external chemical inputs of fertilizers and pesticides.

The use of these terms was to pre-empt any enquiry or suspicion – because the truth was not what was being stated, because the proponents had something to hide. Going a step further, we can now understand that the motive was certainly not to abolish hunger and nor, in fact, to even ‘produce more’ but as has since become immensely clear – the motive was to marginalize the farmers, to disenfranchise them from the ownership of seeds and local solutions – to capture the resources and thereby the market. The objective was to break the self-reliance of the farmers and turn them into consumers from producers. Seeds which were part of the peoples’ or community’s collective ownership, now became a trading product owned and marketed by companies.

Why we continue to call it the “Green Revolution”? Or why do we continue to call the seeds HYVs? Green Revolution should be more appropriately called the ‘Greed Revolution’, because it generated a practice which farmers earlier could never have even thought of. Farmers practicing and profiting from doing agriculture with the methods propagated under this method, invariably had a separate smaller plot, where they produced not for the market but for themselves and did not use any chemical fertilizers or pesticides. This meant that such farmers knew the dangers of the ‘new’ agriculture! This is the greed that this revolution engineered, and forever broke

the sacred trust that one had for and by the farmers.

Climate Smart Agriculture

It the same with ‘climate smart agriculture’. A clever play on words, to numb our conscience. CSA is being promoted as a ‘solution’ but has itself become the ‘problem’, which is only worsening the situation of climate change. Who would want to protest a ‘smart’ project and plan? Because, to protest would mean that you are opposite of being ‘smart’, that you are a ‘fool’! So, now we are busy spending our energies on discussing, protesting climate smart agriculture or CSA, instead of spending our energies and precious resources on meeting the challenges of climate change itself.

It is important that we become ‘proactive’ rather than being merely ‘reactive’. Let us begin to set our own agendas. Help the farmer communities take back the control of the reins of agriculture, help them be the masters of their own agriculture, which they once were; to re-establish their knowledge system, which they once had. Traditional agriculture has a history of about 10,000 years. The wisdom and practices from such a rich and long experience should have been at the forefront of fighting the challenge of climate change. The rich traditional knowledge bank and diverse resources of local farmer owned seeds offer us a way by which the farming communities can set their own agendas.

In all humility, *Beej Bachao Andolan* has been instrumental in reviving and seeking to re-establish this lost multi cropping practice of *Baranaja*. In *Baranaja*, the farmers did not simply grow a diversity of crops at the same time, but collectively followed a genuinely ‘scientific’ plan of growing this through crop rotation and field rotation. Farmers planned and devised a wonderfully creative and ‘scientific’ method. Could or would the scientists educated and trained at universities have done better? Then, what prevents us from acknowledging that farmers are scientists? We often have a complaint that in case of ‘new’ agriculture and hybrid seeds, the farmers need to replace the seeds every few years, which adds greatly to the input costs for the farmers. It is an established phenomenon that all seeds lose their virility after continuous use. This the farmers are also aware of. And they also know

that growing the same crops in the same fields allows the pests to establish in the fields. But they had devised a way to circumvent these problems – through the above mentioned method of crop and field rotation. And additionally, after a couple of years the farmers would exchange seeds, first within the village and then with neighbouring or distant villages. So, on seeds, on this issue of seeds losing their virility, the farmers and the scientists and the corporate seed sellers are on the same page.

What has, however, craftily changed is that while originally the farmers were the owners of the seeds, freely exchanging seeds, today the seed owners are companies making huge money through seed sale, and the farmers having to pay periodically for seeds, heavily escalating their input costs. The principle is the same, but the ownership has changed. What was once a free resource is a market product for the companies. And the farmers are the heaviest losers.

“Organic Agriculture in Bangladesh: Status, Issues and Prospects”

- Dr. Md. Khurshid Alam, TCRC, BARI

Key points

Organic farming (OA) is an alternative agricultural system which evolved in the first half of the twentieth century as a response to chem-

ical agricultural practices. It is a sustainable way of farming; and considers some important aspects like sustainable natural resources and environment. In general, organic agriculture is a production system which avoids or excludes the use of synthetically compounded fertilizers, pesticides, growth regulators and livestock additives. Many organizations around the world are involved with organic farming and is defined in differently. Among them, the definition developed by Codex Alimentarius (FAO) is regarded as a typical one which is as follows: OA is a ‘holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems.

OA has the benefits over conventional agriculture in terms of enhancing soil carbon sequestration and reducing greenhouse gas emissions. It contributes to mitigate the greenhouse effect and global warming through its ability to sequester carbon in the soil. Many management practices used by organic agriculture (e.g. minimum tillage, returning crop residues to the soil, the use of cover crops and rotations, and the greater integration of nitrogen-fixing legumes), increase the return of carbon to the soil, raising productivity and favouring carbon storage. A number of studies revealed that soil organic carbon contents under organic farming are considerably higher. The more organic carbon is retained in the soil, the more the mitigation potential of agriculture against climate change is higher.

Status of organic agriculture in Bangladesh

Bangladesh is an agro-based country, and its agriculture system was based on organic practices before introducing Green Revolution in 1960's. In the early 1990s, an attempt for organic farming has been started in Bangladesh in a minor scale. A number of NGOs played the pioneering role in the beginning stage. At least 75 NGO's and some progressive farmers are working towards an organic farming basis in Bangladesh. In the year 1978, an initiation was taken for spreading ecological practices with its “Ecological Agriculture Program” (EAP), and later some other NGOs have started work in this field.



Dr. Md. Khurshid Alam

CARE (Bangladesh), 'UBINIG' BARCIK, USC-Canada are the name of some NGO's working with OA. Not only NGO's but a small number of progressive farmers and private entrepreneurs have come forward to cultivate organic crops.

Since, a considerable number of farmers in the form of cooperatives, some progressive farmers, and private entrepreneurs have been practicing organic production and their products are being sold under a contract farming system in different super shops like Agora, Meenabazar, Nandan, Shapna etc. targeting higher income elite persons in different city. Different NGO's involve with organic farming sell their produced organic products through their own outlets. Recently, online marketing system based on organic products has been introduced by some young entrepreneurs also to following Community Supported Agriculture (CSA) system in urban areas. However, most of the organic products except tea for domestic markets are not certified by any accredited certifying agency.

Bangladesh's agriculture was basically organic before introducing chemical intensive Green revolution in 1960's. However, consumers' attitude started to change in favor of organic farming due to raising awareness as well consciousness about health, environment, ethical and social issues in the early 1990's and raised their voice against chemical farming. Government intervention was found nearly two decades later. There were two clauses 4(3) and 11.4 in National Agricultural Policy in 2013 regarding OA without giving any pathways. The National Technical Committee on Organic Farming (NTCOF) under MoA drafted the Organic Agricultural Policy which was approval as policy by Cabinet Meeting on November 07, 2016.

Problems associated with organic farming

- | Most of the farmers and producers in Bangladesh lack in awareness about organic farming technologies.
- | A second important problem is the population's low ecological consciousness (first of all, among the rural population) and poor technological culture of agricultural production at all levels.
- | Lack of consumer trust is another social problem exists in Bangladesh. Because

organic products cannot be distinguished from conventional products, consumers have still depend entirely on producers' or sellers' statements in favor of organic since there is no any recognized certifiers in country.

- | Most of the rural people use cow dung and crop residue as fuel which consequently result in insufficiency of organic inputs for the given local land.
- | There is no basic law on organic farming and certification of organic produce, which would comply with the international legislative requirements.
- | Lack of associations or centers for organic produce growers. Other facilities like cold storage, vacuum packing units, processing unit etc. are not well developed.
- | Marketing of organic products is a major problem for farmers. There is a serious shortage of information on organic management strategies and market opportunities.
- | Institutional support structure (research, education, extension) is relatively weak in Bangladesh.
- | There is hardly any recognized training institution to provide training in organic agriculture.
- | Temporary decrease of overall production may cause financial losses
- | Extra financial expenditures are needed for purchase of special-purpose machinery and equipment
- | There is no operational mechanism for risk insurance in agricultural production. Lack of support from the Government agencies and other relevant departments in the form of subsidy and financial assistance

Prospects of organic farming in Bangladesh

In Bangladesh, most of the farmers are poor with traditional agriculture systems. Conventional methods are less relevant for many poor farmers due to lack of access to inputs like fertilizers and pesticides. Poor farmers who cannot afford these chemicals at the cost of higher price simply depend on locally available raw materials as the substitute of fertilizers. There is a wide range of raw materials in our country for manufacturing organic fertilizers. Pest management is one of the principal components of crop production. A number of small farmers still follow the local practices (e.g neem, ash etc.) for pest management. For example, a wide range of

pests and diseases are controlled by using the product (leaf, wood etc.) of the neem (*Azadirachta indica*) which is easily grown in our local climate even in drought condition. Neem is regarded as the panacea for organic farming and suitable for Bangladesh because the useful chemicals can be easily removed from the neem without the use of expensive and complicated equipments. Again, organic farming is a labour-intensive production method. Bangladesh is a densely populated country, where labors are available at a cheaper wages.

There is a great scope for organic farming in Bangladesh and she could exploit the opportunities through developing organic farming. Although government adopted organic policy, the success entirely depends on how effectively the policy is implemented across the country.

Discussion on papers

Dr. Nilufer Hye Karim, Former Director, BRRI, emphasized acknowledging farmers in policy making process. She said, “*We need to be aware of the practical aspects of climate smart agriculture in order to face climate change tactically.*” She stated that international organizations like UN have to find some certain set of rules to be followed in term of climate change.

Dr. Md. Morshed Alom, Senior Research Officer, BPATC, Savar, Dhaka, as a discussant, made some significant points. Regarding paper one, Dr. Alom mentioned that government’s response in conceptualization of farmers’ need is necessary in agriculture. And these activities require target oriented approaches specifically for hunger and nutrition. For paper two, Dr. Alom said that there a big limitation for proper understanding of climate smart agriculture in Bangladesh. No clarification is there on the demand of organic agriculture. He added, “*Human health needs to be prioritized more along with climate change*”.

Soumitra Ghosh said, “*As climate change is not created by us, so solution cannot be also created by us. So, we cannot be active of climate change and reactive or proactive of its solutions*”. Mr. Ghosh made a reminder that in this case, we have very limited choice options



Dr. Sohela Akhter



Dr. Md. Morshed Alom



Soumitra Ghosh



Dr. Debal Deb

to work on. No matter how much organic practice or protection of varieties take place, he believes that is not adequate and sufficient to handle climate change and eventually it will create climate change conflict. Mr. Gosh emphasized making alternative pathways along with certain decisions because he is concerned of its transformation into political conflict.

Dr. Debal Deb, chair of this session made some firm point of views after the panel discussion which are:

1. Climate Change is not that problem created only by us. We have crossed threshold where nothing can undo of what we have done to the climate. As per scientific prediction, fossil fuels will be extinguished by 30 years followed by the extinction of human and other species. This is a real degradation.
2. We need to have political thinking on this matter since all are taught by the west countries and it’s them who need to give us the solution.
3. Changing pattern in the way of thinking, linking with nature and changed livelihood is needed for betterment.
4. We should depend on traditional and biodiversity based cultivation of agriculture along with traditional production and prepares ourselves for the challenges.
5. We need more production for more people rather more production for less people.

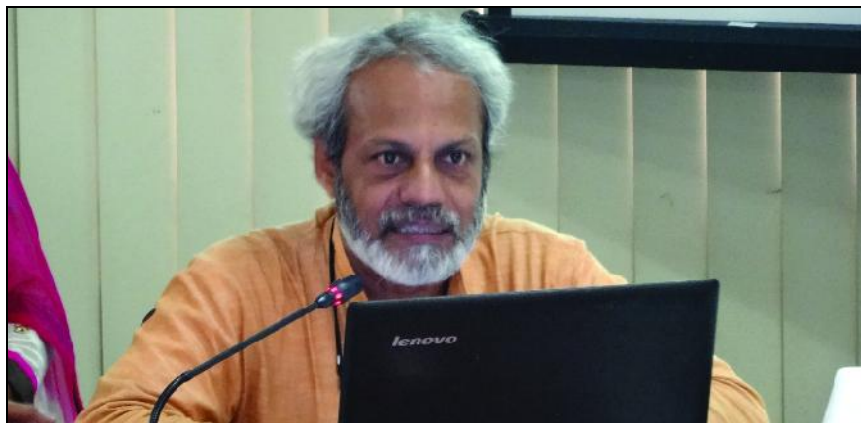
An open discussion took place right after the panel discussion and the address by the chair. The open house discussion demonstrated some recommendations as follows:

1. More people need to be incorporated in farming. Also, farmers need to be given capacity in being proactive to find solution.
2. Finding out the conspiracy behind the profit oriented privatization is essential.
3. Salt gene and submerged gene need to be initiated with a target of nutrition security.
4. Proper delivering system from government, stakeholders and organizations to the farmers is needed.

As monitoring is not entirely possible in organic foods, we should look into the sovereignty of farmers by controlling certifying agencies properly.

“The functional alternative to CSA”

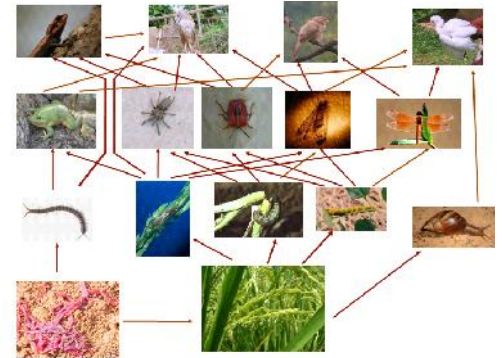
- Dr. Debal Deb, Chair, CIS, Kolkata



Dr. Debal Deb

Key points

Dr. Deb argued that any ecosystem with many species with interaction can increase resilience power. In this paper, he accentuated on sustainable agriculture mentioning the importance of diversity along with organic agriculture. He prioritized farmers' participation for proper food production. He stated, “*Real smart agriculture needs to be fully organic*”. Additionally, he said that farmers should grow crops with genetic, ecological and species diversity.



In a broader sense, Dr. Deb mentioned that rice farmers are being consumers in the process of reintegration so diversity in all forms is mandatory now.

Resilience: Defining and Measurement

- Resilience is the ability of a system to return to its original equilibrium state following a perturbation.
- The measure of Resilience is Return Time, calculated as $RT = -1/Re(1_{max})$

Complexity Begets Resilience

1. Certain Species with specific interaction

Ecological Meanings of Food Web Architectural Complexity

System Property	Real Life Consequence
Systems with more species	are more resilient
more links	more persistent
more trophic levels	more resistant to perturbation
more omnivory	

(Hilman et al. [2009]; Naiman et al. [2006]; Konecny [2007]; Mulzer et al. [2013])

links (Keystone, Top Predator) have significant effect on Community Function

2. Species Diversity including Keystone species is important in increasing system resilience.

“The real solutions to the crises of the climate, malnutrition, etc., will not come from conforming to the industrial model. We must transform it and build our own local food systems that create new rural-urban links, based on truly agroecological food production by peasants, fishers, pastoralists, indigenous peoples, urban farmers, etc. We cannot allow agroecology to be a tool of the industrial food production model: we see it as the essential alternative to that model, and as

Multi-Tier Agro-Forestry System

Landrace	Land Type	Duration
Gadaba	Upland	62 d
Aash	Upland	80 d
Kinari	Upland	125 d
Chinna Ponni	Medium land	88 d
Kabiraj-sal	Medium land	151 d
Lakkhi dighal	Deepwater	204 d
Jabrah	Deepwater	158 d
Matla	Saline Lowland	190 d

ure
con

ity and our Mother Earth.” (Nyeiem Declara Bon 2015)

The Real Smart Agriculture

- | Agroecology: Zero External Input
- | Locally Adapted Crop Genetic Diversity
- | Re-Localization of Production
- | Freedom from Global Market Operators
- | Farmers' and Fishers' Markets
- | Re-integration of Farmers, Fishers, Craftsmen and Consumers in Village Communities

Valuable Rice Landraces for Growing on Marginal Farms Salinity tolerance:

Getu, Matla, Talmugur, Soorakuruvai, Kundali, Kuzhivadichai, Kalhagoonvale, Vellakudavazha, Kallurundai, Kagga

Drought tolerance:

Sornavali, KaLu Samba, Noichi, N22, Erava Pandi, KaLa modan, Pisni, Dehula, Rangi HaiLa, Kaya, Kelas, Mahadi, Pitchavari, Dabra, Nanisal, Pathara, Velchi

Flood tolerance: Jabra, Jal-kamini, Dhusara, Kudaivazhai, Khajara, Kumragorh, Pantara.

Landrace	Land Type	Duration
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Lakkhi dighal	Deepwater	204 d
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Matla	Saline Lowland	190 d

Micronutrients in Rice

Rice Variety	Fe (mg/kg)	Zn (mg/Kg)
Lal Getu	85	22.3
Nara Hasoi	66.5	24
Jal Kamini	39	41.9
Dudhe Bolta	130.9	25.8
Bagh Jhapta	64.8	23.5
Kelas	34.6	44.9
IET 7029	1.9	31.6
IR68144-2B2-2-3	8.9	3.7

Ref: Deb et al. Curr. Sci. 109: 407-409 (2015)

Submergence tolerance: Baish-bish, Chakia, Paniduba, Vaidehi, Kurkaruppan, Thavalu

Shifting Cultivation is the Most Sustainable Food Production System Traditional Shifting Cultivation Practices with:

- | Long (> 20 yr) Fallow Cycles
- | Maintenance of “mother trees”
- | Fire Control technology
- | Prolonged Use of Biochar
- | Enrichment Plantation

Agroecology: Essential Components

- | ZERO External Input (Seeds, Agrochemicals, Fuels, Exotic organisms)
- | Enhancement of Biological Diversity - Species, Varieties, Ecosystem
- | Maintenance of All Function Groups
- | Localised Need Based Production and Consumption
- | Integration of Local Cultures (incl. Food Cultures)
- | Incorporation of Folk Wisdom and Experimental Science
- | Strengthening of the Communitarian Ethos

Micronutrients in Rice

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Session 6:

Alternative agricultural practices and movements

RIB can make a network of resource farmers and like-minded groups/organisations and collaborate with them in order to promote resilience towards climate change.

- Vinod Koshti



“Are farmers willing to shift to agro-ecology? Experiences of RIB from the special initiatives”

- Dr. Nilufer Hye Karim, RIB, and Former Director, BIRRI



Dr. Nilufer Hye Karim

Key points

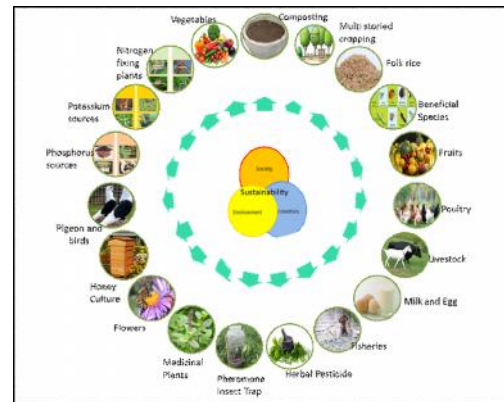
By the year 2050, 37.3 mt of cereals will be required to feed 202 million people.

Present Agriculture system is alarming!

- | Indiscriminate use of chemical fertilizer, pesticide and herbicide
- | Farmers are dependent on big corporates for input supply
- | No protection to health and environment

Causes and effect of chemical farming

- | Loss of soil texture and fertility
- | Poor soil health and environment
- | Vanishing the beneficial insects and organisms
- | Creating an unstable ecosystem
- | Pollution
- | Unknown Sickness
- | Increase of deaths due to non-communicable diseases



Effect.....

- | Plenty of Food is Available!
- | But, is it Safe?

The Future is horrifying!!!

- | Chemical use is growing at a rate of 3.5%/yr.

Practice of organic farming

Increased consumption of Nutrient rich prod-



ucts

Marketing of Products

- | Most organic products are consumed at home
- | Remaining are sold at nearby market or to neighbours

YES, Farmers are willing to shift to agroecology as an alternative farming practice, with the following challenges:

- | Scaling up is a challenge, is possible with follow up and monitoring
- | Sustainability- need for more technical knowledge and practices on use of the natural resources that ensures low cost, gives profitable income and assures health and environmental benefit.
- | More ventures emphasizing the fact that “food security also means nutritional security” aimed at reducing ‘hunger and poverty’.

“Climate change in agriculture of Nepal: peasants’ agriculture cools the planet: from the perspective of peasants of Nepal”

- Pramesh Pokharel, Central Committee Member, All Nepal Peasants Federation (ANPF)



Pramesh Pokharel

Key points

Climate change in Nepal

- | Twelve warmest years since 1975 to 2007 (eg. 2006 was the warmest year)
- | OECD (2003), shows that there will be 1.2 degree Celsius temperature rise by 2030
- | Fifteen Glacial Lake Outburst Floods (GLOF) events have been documented in Nepal
- | The monitoring result of Shorong Himal since 1978 shows that the retreat until 1989 was 30 m, which is equivalent to 12 m thinning of the glacier surface. Glacier surface has further retreated by 14 m after 1998.
- | Late or pre-monsoon, unusual precipitation, decreased rainy days and intense rainfall events caused more runoff and low ground-water recharge.
- | Extreme fog conditions have recently been

observed in the terai regions.

- | Receding snowfall and retreating of the glaciers (AX010 small glacier mountain shrinking at alarming rate) due to increase in atmospheric temperature in mountain environment.

Impact on agriculture

- | Traditional rainfalls of Jestha and Ashar (mid July) have been shifted in Shrawan and Bhadra.
- | Small peasants are most affected due to impact in agriculture and Decline in rainfall from November to April adversely affecting the winter and spring crops.
- | Shifts in agro-ecological zones, prolonged dry spells, and higher incidence of pests and diseases are recorded.
- | Increased incidence of fire in recent years affected more than 50,000 people and loss of large areas of productive forest land.

Government policies and strategies:

- | Climate Change Policy, 2011 was proclaimed by the GoN to promote climate adaptation and mitigation in response to the international climate regime to which Nepal is also a signatory party (MOE 2012).
- | Positive outlooks are Bottom-up, participatory planning and Integrated approach, Ensuring the participation of poor people, Dalits, marginalized indigenous communities, women, children and youth in the implementation of climate adaptation and CC-related programs
- | 80 % fund allocated to the local level and Poverty reduction and livelihood focus
- | Mainstreaming CC adaptation to the national development agenda

Responses from grounds/Adaptation

- Adaptation/coping practices in agriculture
- | Techniques of Ecological Agriculture
- | Inbuilt Adaptation (Use of Community wisdom, local and indigenous Varieties)
- | Safeguarding water resources: Water basin management
- | Disaster management
- | Protecting and enhancing agriculture and forestry
- | Protecting natural resources and ecosystems

Effective farmers’ strategies

- | Community forest management to manage the forest resource

- | System of Rice Intensification (SRI) and other techniques
- | Introducing crop diversification
- | Undertaking poultry, livestock activities which facilitate the farming.
- | Introducing local varieties of rice that grows in drought and flooded area too.
- | Using organic manure to maintain soil moisture and soil fertility.
- | Shifting of cultivation period
- | Plantation and shading

Way forward

- | Returning agriculture to its central role
- | Reject and fight against false solutions like GMOs, Synthetic Biology, Agrofuels, and financialization of nature through green economy, carbon markets, Climate smart agriculture,
- | Build alternatives to capitalism at various level
- | Agro-ecology, a system of farming that peasants and small farmers has been using and developing, has even been proven by scientists to not only feed people better, healthier food but it also has the ability to cool down the planet.
- | Advocacy and interventions
- | Climate Justice Now!

Panel discussion on way forward

Dr. Meghna Guhathakurta, Dr. Mohammad Rezaul Karim, Deputy Director of Bangladesh Public Administration Training Center (BPATC), Savar, Dhaka, Dr. Debal Deb, and Dr. Raghunandan participated in the panel discussion. The discussion session was chaired by Vinod Koshti, Program Manager, Rosa Luxemburg Stiftung- South Asia. The panelists sorted out few crucial problems and provided recommendations as follow:

Problems:

- a) Traditional and indigenous methods of cultivation have been lost.
- b) Absence of knowledge about climate change and agriculture in tertiary movement is visible.
- c) We have environment policy but we don't have any climate change policy.

- d) Use of Chemicals in agriculture in the name of development or food security is predominant.
- e) Exotic species are perishing.
- f) Use of genetically modified organism (GMO) is alarming.
- g) Western pressure on agricultural mitigation is alarming in the name of climate change or climate smart agriculture.
- h) All new technological choices need to be



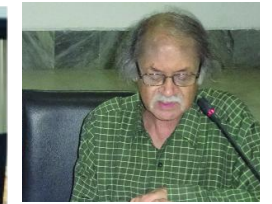
Dr. Meghna Guhathakurta



Vinod Koshti



Dr. Debal Deb



D. Raghunandan



Dr. Mohammad Rezaul Karim

utilized only to critical appraisal preferably before any agricultural adoption along with farmers in order to keep pace with their multi-dimension-

al needs.

- i) People or farmers know more than the experts think of them and experts know less than what they believe- a comprehensible imbalance and narrowed viewpoint exist in South Asia which might create difficulty in near future. .

Recommendations:

- a) Awareness program along with alternative practices needs to be started for farmers.
- b) Knowledge based advocacy program needs to be merged with climate change and agriculture.
- c) A well-structured climate change agenda should be considered necessarily.

- d) Ecological agriculture related awareness needs to be spread in broader way.
- e) Proper collection and distribution of climate adaptive seeds and their genetic diversities is desirable.
- f) Extensive training on agro-ecological aspects and seed conservation practices is required along with the actual methods of maintaining genetic diversity.
- g) Promoting and advocating multi stakeholders in participatory action research to make them adaptive in climate resilient agricultural practices and technologies.
- h) Locate climate resilient agricultural solutions within farmers' socio-economic reality and such as to combat the scope of negative political economy.
- i) Aim for multiple objective interventions addressing climate resilience, food security, farmers' livelihood and income, environmental footprint and quality-quantity of yield.

Discussants suggested to look into the process of reducing western dominance on agricultural mitigation and to keep contact with the knowledgeable farmers who can make potential change in policy making rather generalizing all. They also added that experts need to be very open in accepting any sort of valuable suggestion from grass root farmers since they are expert in practical action. Additionally, global north-south countries should call for knowledge sharing to reduce dominance on each other.

An open discussion was held right after the panel discussion on ways forward since the participant's proposition were also fundamental to be addressed for further action. The open house discussion demonstrated some feedbacks, proposals and recommendations as follows:

- 1. Proverbs, poetries, songs, stories and other cultural objects with agricultural influence need to be preserved for sustainability.
- 2. Religious tales on sustainable nature can be followed.
- 3. A document is required on terminologies like green revolution or climate smart agriculture with their patterns, meaning and ways of responding for effectively.

- 4. Mobile or satellite technology can be a great use for agricultural advancement.
- 5. Improved condition of soil should be in the priority.
- 6. Framers, beneficiaries and associated populace should be included in research for creating participatory and resilient climate change impact.

As the Chair of Panel Discussion session Vinod Koshti brought up the crucial points of these three days conference stating,

- 1. Options and suggestions given by the discussants are highly influential and motivating. Bangladesh needs to be concerned about climate change issues since it is moving in the same direction which leads to disasters.
- 2. Formulation of contextualized policies with proper implementation and monitoring is required along with addressing the beneficiaries.
- 3. Democratic institutions would play a significant role in formulating and implementing these people oriented policies to deal with climate change.
- 4. Knowledge based capacity development is the key.
- 5. RIB can make a network of resource farmers and like-minded groups/organisations and collaborate with them in order to promote resilience towards climate change.
- 6. Finally, focusing on creating appropriate model, resource pool, regular update on knowledge and monitoring is mandatory along with engagement of policy makers.

Session 7

Concluding



This conference has brought the scientific terms into light which is appreciating.

- Dr. Maz Ahmed Khan



Summing up

Md. Saidur Rahman, Project Coordinator, RIB, made his summing up speech on these recommendations, which are as follow:

1. Incorporate both policy and law to avoid more destruction in agricultural sector. Critical review of agriculture, land, water and fertilizer policy is essential. Framers, beneficiaries and associated populace should be included in research for creating participatory and resilient climate change impact. A transparent monitoring is needed in seed research, production, selling and overall usage. Categorize high efficient seeds with varieties for more productivity and resiliency.
2. Joint action programs by the government, decision makers, CSOs, farmers and respective people are desirable in policy making. Promoting and advocating multi stakeholders in participatory action research to make them adaptive in climate resilient agricultural practices and technologies. Farmers' participation needs to be integrated focusing regionalism, institutionalization and politics. Woman participation is mandatory. Research results are necessary to be sent to the farming communities.
3. Condition of soil needs to be improved. Proper preservation of soil, water and seed is mandatory. Soil of coastal areas should be protected with necessary meas-



Md. Saidur Rahman

ures along with waste management.

4. South Asian contextualized solutions require to be taken to tackle the climate change issues in agriculture. SAARC needs to be more effective in agricultural issues.
5. A well-structured climate change agenda should be considered necessarily. Climate justice requires collaboration with government agencies.
6. Integrated water management and preservation method is considered necessary for more fish cultivation.
7. Finding out the alternatives to tackle climate change impacts in agriculture along with its appropriateness in the local context.
8. Perception on agricultural variety is needed to be changed for sustainability.
9. Location and geography specified technology is necessary to be incorporated.
10. Nutritional as well as food security needs to be achieved.
11. Thematic action plans (e.g. environment, human rights) are be addressed.
12. Proper collection and distribution of climate adaptive seeds and their genetic diversities is desirable.
13. Extensive training on agro-ecological aspects and seed conservation practices is required along with the actual methods of maintaining genetic diversity. Climate resilient agricultural solutions need to be located within farmers' socio-economic reality.
14. Aim for multiple objective interventions addressing climate resilience, food security, farmers' livelihood and income, environmental footprint and quality-quantity of yield.
15. Crop sustainability should be maintained while working on carbon emission and absorption. In this case, dependency on serial crop needs to be reduced.

Points made by the Special Guests:

The prime statements that have been made by the special guests are:

Professor Dr. Niaz Ahmed Khan, Department of Development Studies, and Former Country Representative-Bangladesh, IUCN made the following points:

- In terms of climate change, our country is going backward mostly since it's not being



Dr. Niaz Ahmed Khan

concerned on the methodological scientific aspects that have been changing day by day and not being generalized to all.

- | Objectivity of scientific based knowledge is absent which is disappointing.
- | This conference has brought the scientific terms into light which is appreciating.
- | We need more evidence based policy making approaches with more man power and progressive financialisation.
- | National agricultural policy should look into profitable agricultural approaches along with tracking who is being profitable and how.
- | Participatory and representative policy needs to be made.

Professor Dr. Zakia Parveen, Department of Soil, Water and Environment, University of Dhaka made the following points:

- | Agricultural improvement with climate adaption is a crying need now along with redesigned and restructured policies for diversified system.
- | Production of new varieties of seed as well as pesticide management is required.
- | Cost effective biochar seed needs to be developed.
- | Investment in agricultural research is necessary.
- | Policy needs to address regional requirements for further implementation.

Points made by the Chief guest:

As the conference was coming into the end, the chief guest of the ceremony, Mr. Md. Nazrul Islam Babu, Member of Parliament, member of the parliamentary standing committee on Ministry of Agriculture highlighted a few key issues and his further actions on behalf of the government on resolving those. As climate



Dr. Zakia Parveen

change is now one of the burning issues globally and Bangladesh is also being affected by this, he believes the government officials need to present in such kind of conferences to get an apparent view on what's going on and what should we do to tackle this properly with necessary steps suggested by experts. He added that the honorable Prime Minister of Bangladesh, Sheikh Hasina, is also very much concerned about the government is eager to work on this issue. The government has their budget on climate research and he invited all the discussants to work with the standing committee of the Ministry of Agriculture along with their research, suggestions and solutions.

However, the chief guest also addressed that proper accountability and transparency is required from all officials to tackle this issue appropriately. He added, assisting farmers is also necessary since realistic knowledge is a must to handle climate change impact on agriculture. As the government is concerned, everyone needs to come forward to assist the government for sustainable implementation of the solutions given by the experts.



Md. Nazrul Islam Babu

Conclusion

We are not going to meet our future food targets when farmers are leaving agriculture as a whole. We need to understand that we don't need more production. What we need is more production by more people – and not more production by less people. The charade being enacted under the name of Green Revolution and CSA needs to be exposed. Ultimately, we need to realize that climate change, by its very nature of unpredictability and the fact that it is going to continue unpredictably, cannot be addressed through mere technological solutions. These solutions can, at best, be only temporary, before newer and further concerns in climate change emerge.

Traditional wisdom and mixed cropping practices offer hope for solutions to our problems of food insecurity and climate change as traditional seeds and local crops have a tremendous capacity to withstand drought as well as floods. The truly long-term solution would be to empower the farmers to work and find their own solutions to problems on the field. This can only happen if farmers hold the reins of their agriculture, if they have the controls. The farmers need to recapture the sense or fact of ownership of their agriculture; and the civil society groups or those working on agriculture issues need to help the farmers achieve this. This can happen largely through regaining, re-establishing the farmers' or the people's food sovereignty.

Ultimately, this means we need to place agriculture at the centre of our being. Not treat agriculture simply as a livelihood issue. Ultimately, this would also mean reviving the original role of the farmers as a practicing scientist of the earth – of the farmer being the provider rather than simply being the receiver. We need to make their farming profitable – socially, culturally, and economically.

We need to listen to the farmers. They have a heritage we all can learn and enrich from. We need to help them revive their repositories of traditional resources and knowledge, and let them find the solutions – on the ground.

Both policy and law are required to stop destruction in agricultural sector. Critical review of agriculture, land, water and fertilizer policy is essential. Farmers, beneficiaries and associated populace should be included in research for creating participatory and resilient climate change impact. A transparent monitoring is needed in seed research, production, selling and overall usage.

Condition of soil needs to be improved. Proper preservation of soil, water and seed is mandatory. Soil of coastal areas should be protected with necessary measures along with waste management.

A well-structured climate change agenda should be considered necessarily. Climate justice requires collaboration with government agencies. Finding out the alternatives to tackle climate change impacts in agriculture along with its appropriateness in the local context.

Extensive training on agro-ecological aspects and seed conservation practices is required along with the actual methods of maintaining genetic diversity. Climate resilient agricultural solutions need to be located within farmers' socio-economic reality.

Annex 1: Review of government policies and strategies related to climate change

Action plans and strategies to address climatic changes:

National Adaptation Programme of Action (NAPA) was prepared by the Ministry of Environment and Forest (MOEF) in response to the decision of the Seventh Session of the Conference of the Parties (COP7) of the UNFCCC. The preparation process has followed the generic guiding principles outlined in the annotated guideline prepared by LDC Expert Group (LEG). The basic approach to NAPA preparation was along with the sustainable development goals and objectives of the country where it has recognized necessity of addressing environmental issue and natural resource management. The suggested future adaptation strategies are:

- | Reduction of climate change hazards through coastal afforestation with community participation.
- | Providing drinking water to coastal communities to combat enhanced salinity due to sea level rise.
- | Capacity building for integrating climate change in planning, designing of infrastructure, conflict management and land-water zoning for water management institutions.
- | Climate change and adaptation information dissemination to vulnerable community for emergency preparedness measures and awareness raising on enhanced climatic disasters.
- | Construction of flood shelter, and information and assistance centre to cope with enhanced recurrent floods in major flood-plains.
- | Mainstreaming adaptation to climate change

into policies and programmes in different sectors (focusing on disaster management, water, agriculture, health and industry).

- | Inclusion of climate change issues in curriculum at secondary and tertiary educational institution.
- | Enhancing resilience of urban infrastructure and industries to impacts of climate change.
- | Development of eco-specific adaptive knowledge (including indigenous knowledge) on adaptation to climate variability to enhance adaptive capacity for future climate change.
- | Promotion of research on drought, flood and saline tolerant varieties of crops to facilitate adaptation in future.
- | Promoting adaptation to coastal crop agriculture to combat increased salinity.
- | Adaptation to agriculture systems in areas prone to enhanced flash flooding in North East and Central Region.
- | Adaptation to fisheries in areas prone to enhanced flooding in North East and Central Region through adaptive and diversified fish culture practices.
- | Promoting adaptation to coastal fisheries through culture of salt tolerant fish special in coastal areas of Bangladesh.
- | Exploring options for insurance and other emergency preparedness measures to cope with enhanced climatic disasters.

The main strategic direction on climate change policy in Bangladesh is set by the BCCSAP, which was published in 2009 and is built on six pillars:

- | Food security, social protection and health

- | Comprehensive disaster management
- | Infrastructure
- | Research and knowledge management
- | Mitigation and low carbon development
- | Capacity building and institutional strengthening

The BCCSAP is currently being reviewed and updated, and the new version is due to be published in 2018.

Intended nationally determined contributions (INDC)

Bangladesh's contribution to global GHG emissions is small, at less than one-fifth of one percent of the world total. GHG emissions in the country are primarily methane from flooded rice fields and waste, the latter particularly in urban areas. The country's low emissions are due to its extremely low energy production and consumption. However, expansion of the energy sector is a government priority, reflecting a desire for economic development and reflecting the importance of electrification, increased and improved transportation systems, and industrial development. Climate change mitigation efforts are not to jeopardise the legitimate demand for and supply of energy (GPRB, 2008).

NDC implementation is a vital component of delivering sustainable and low carbon growth in Bangladesh and meeting a wider raft of objectives and priorities, including energy access, economic growth, productivity, poverty reduction and improved quality of life. In this sense they link closely to the UN's Sustainable Development Goals.

The INDC of Bangladesh consists of the following elements:

- | Mitigation contribution:

- m An unconditional contribution to reduce GHG emissions by 5% from Business as Usual (BAU) levels by 2030 in the power, transport and industry sectors, based on existing resources.
- m A conditional 15% reduction in GHG emissions from BAU levels by 2030 in the power, transport, and industry sectors, subject to appropriate international support in the form of finance, investment, technology development and transfer, and capacity building.
- | Adaptation component:
 - m An outline of what Bangladesh has already done on adaptation and what the next steps are, including the long-term vision for adaptation in Bangladesh and synergies with mitigation measures.
- | INDC implementation:
 - m Proposals for governance and coordination of INDC implementation and an outline of key next steps.
- | Support for INDC implementation:
 - m A qualitative description of Bangladesh's support needs and an outline of plans to further quantify this, along with some examples of indicative costs of taking action on mitigation and adaptation.

The NDC therefore aligns closely with the Seventh Five Year Plan (7FYP), which proposes a number of key activities to facilitate climate change mitigation and adaptation, including enhancing understanding on low carbon development, promoting a whole-government approach to climate readiness, improving capacity, improving coordination and communication amongst key institutions and encouraging innovation and research. All of these will aid and support NDC implementation. As part of the implementation of the

7FYP, the Government is developing sectoral action plans for the thirteen sectors set out in the 7FYP.

Bangladesh government priorities

Agriculture is the dominant economic activity in Bangladesh and regarded as the lifeline of the Bangladesh economy. Because it has major ramifications for issues like food and nutritional security, income generation and poverty reduction, it is a high priority in government planning efforts (Ministry of Agriculture, 2010). It is estimated that agricultural land is declining by 1 per cent per year and the land quality is deteriorating due to degradation of soil fertility (e.g., nutrient imbalance), soil erosion and soil salinity. Water resources are also shrinking. In order to produce more food for an increasing population, and raw materials for agro-industries, there is a need for increasing agricultural growth through higher productivity, including increased yield, agricultural intensification and diversification, and value addition. Addressing these issues in a sustainable fashion will be a major challenge for the country going forward (Ministry of Agriculture, 2010).

In addition to BCCSAP, NAPA, and National Communications, the Bangladesh Climate Trust Fund has been created with domestic resources and the multi-donor funds allowing the government to implement the BCCSAP. Bangladesh has shown leadership at UNFCCC negotiations and has been a driver of positions of the least developed country negotiating bloc. While Bangladesh tends to focus on adaptation, given the country's vulnerability to climate change, mitigation also requires serious attention to ensure the country pursues a low-carbon development path. In June

2011 Bangladesh presented to the UNFCCC on its Low Carbon Path of Development and Nationally Appropriate Mitigation Actions (NAMAs). The presentation indicated that Bangladesh plans to reduce emissions from business-as-usual projections by at least one third by 2030. Bangladesh stresses that economic growth and poverty alleviation should not be compromised by mitigation efforts. Energy consumption will increase, but there is scope to reduce emissions with appropriate international capacity building, financing and technology support.

Climate funds and projects

Bangladesh Climate Change Resilience Fund (BCCRF) is an innovative partnership between the Government of Bangladesh, Development Partners and the World Bank to address the impacts of climate change. This fund, one of the first of its kind in the area of climate change, was established in May 2010, with financial support from Denmark, European Union, Sweden and the United Kingdom. Switzerland subsequently joined the Fund in December 2010. The objective of BCCRF is to support the implementation of Bangladesh's Climate Change Strategy and Action Plan for 2009-2018.

Bangladesh Climate Change Trust Fund (BCCTF) set up under an Act of Parliament and the Government of Bangladesh funding it from its own resources over a number of years was a groundbreaking and laudable initiative. Over the last six years or so, it has disbursed for several hundred projects in different ministries of the government as well as to NGOs. However, unfortunately over time, a number of instances of misallocation were brought to light by journalists and NGOs such as Transparency International

Bangladesh (TIB).

Palli Karma Shahayak Foundation (PKSF) is chosen for allocation of 10 per cent of BCCRF and BCCTF funds to the civil society to support grassroots and community level adaptation to climate change. At the time, PKSf did not have any experience on climate change but had disbursed funds to several NGOs for micro- credit and it had a very robust monitoring system. PKSf set up a new climate change cell to handle the climate funds it received from both BCRF as well as BCCTF and has, over the years, funded many NGOs who are working at community level.

Pilot Project on Climate Resilience (PPCR) was a separate fund from the World Bank in Washington, as it was managed by the Asian Development Bank (ADB) in Bangladesh, and involved the International Finance Corporation (IFC) to bring in the private sector to tackle climate change. The task of involving private sector in mitigation is relatively easy but bringing them into adaptation is not. So it has not been easy to find private sector interest here.

Green Climate Fund (GCF) is the new fund set up under the UNFCCC to channel funds from the developed countries to the developing countries to help tackle climate change. Bangladesh will have to compete with other countries in order to get funds from the GCF. Fortunately, Bangladesh was among the first eight countries to be allocated funding by the GCF.

CGIAR focuses CSA interventions drawing on traditional practices like the Sorjan system (tall beds for vegetable and crop produc-

tion alternating with furrows suitable for submergence tolerant crops and fish production) as well as new practices like vertical gardens. Floating bed cultivation of vegetables in the low lying southern districts, homestead production and roof top gardening of fruits and vegetables are also spreading rapidly.

Critical analysis of climate change strategy and action

Dichotomy in national goals

Sustainable development and climate resilience co-benefits– Recognizing that NAMAs are expected to contribute to sustainable development, and that development is a priority, all short-listed NAMAs are expected to have at least one clear economic, social, environmental or climate resilience benefit.

- | Economic benefits – economic growth, improved livelihoods, increased household income, improved energy security; negative impacts can be increases in energy prices
- | Social benefits – enhanced food security, decreased time for fuelwood collection, improved indoor air quality; negative impacts can be displaced populations, lack of access to forest and grazing lands
- | Environmental benefits – improved local air quality, improved water quality, enhanced biodiversity; negative impacts can be flooding of land, monoculture in tree plantations
- | Climate resilience – improved water availability, reduced soil erosion, reduced deforestation and forest degradation; maladaptation can result from land degradation

Urea deep placement

The usual technique to apply urea, the main nitrogen fertilizer for rice, is broadcast application. It is very inefficient: 60 to 70% of the nitrogen applied is lost, leading to GHG emissions and water pollution. IRRI the international rice institute, and IFDC, the international fertilizer organization have developed the urea deep placement technique. Urea is conditioned in briquettes of 1 to 3 grams, which are placed at 7 to 10 cm soil depth after the paddy is transplanted. This technique decreases losses by 40% and increases urea efficiency to 50%. It increases yield by 25% with an average decrease of urea use by 25%. It has been actively promoted by the Bangladesh Department of Agricultural Extension, with IFDC assistance, and was used in 2009 on half a million hectares, by a million farmers; with planned expansion to 2.9 million more families, on 1.5 million hectares. The widespread adoption of the technique in Bangladesh had an important impact:

- | Farmers' income has increased, thanks to both increased yields and reduced fertilizers' costs
- | Local jobs have been created upstream in small enterprises to make the briquettes, often owned by women. There are now 2500 machines in Bangladesh.
- | Jobs are also created on the field as briquettes are being hand placed: the increased yields more than pays the extra 6 to 8 days of manpower needed per hectare

Issues:

In Bangladesh, climate change related plans and policies are based on productivity, efficiency and high yield influenced by green revolution of the sixties. Environmental considerations and farmers' rights protection are always neglected. Bangladesh is seriously pursuing implementation of the SDGs and finalizing the Bangladesh Delta Plan 2100 in line with Dutch prescription. Climate change negotiators in the international forums are not properly briefed on the newly introduced CSA related issues. Aggression of green revolution, climate smart agriculture, and commercialization of natural resources are yet to attract wider public attention. We need to regard climate change adaptation, build understanding, knowledge and capacity at all levels. Action plans surrounding agriculture and water bodies have to be inclusive and pro-people. GHG emissions and environmental protection issues need to be analyzed and disseminated. Preservation of traditional crop varieties through on-farm practices is required for the food sovereignty and ecological protection. By trusting farmers' wisdom, and letting them find the solutions on the ground, we need to be critical of the interventions in agriculture in the face of climate change. Further academic discussion and orientation on nature, agriculture and the farmers are need of the day. We need to be critical of the benefits accruing from crisis in agriculture and environment, look beyond solutions, and challenge them.

Annex 2: Review of government policies and strategies related to agriculture

Agricultural policies and strategies in Bangladesh can be classified in three sub-categories: crops, non-crops and cross-cutting policies. The policy documents deal mainly with cereal crops, especially rice. Non-crop sub-sector, covering fishery, livestock and forestry, appear less prominently both in terms of coverage and focus. The cross-cutting policies include those related to land, water, food and rural development.

A. Crop sub-sector

1. National Agriculture Policy (NAP), 1999 under Ministry of Agriculture (MoA) with goal of food security, profitable and sustainable production, land productivity and income gains, IPM, smooth input supplies, fair output prices, improving credit, marketing and agro-based industries, protecting small farmers interest
2. New Agricultural Extension Policy (NAEP), 1996 under MoA with goal of provision of efficient decentralized and demand led extension services to all types of farmers, training extension workers, strengthening research-extension linkage, and helping environmental protection
3. DAE-Strategic Plan, 1999-2002, under MoA with goal of adoption of Revised Extension Approach, assessment of farmers' information needs, supervision, use of low or no cost extension methods, promotion of food and non-food crops, and mainstream gender and social development issues into extension service delivery.
4. Agricultural Extension Manual, 1999 under MoA with goal of annual crop planning, seasonal extension monitoring, participatory technology development and rural approval partnership, technical audit, attitude and practice surveys.
5. Seed policy, 1993 under MoA with goal of breeding of crop varieties suitable for high-input and high output agriculture, multiplication of quality seeds, balanced development of public and private sector seed enterprises, simplification of seed important for research and commercial purposes, provision of training and technical supports in seed production, processing and storage monitor, control and regulate quality and quantity of seeds.
6. Seed Rules 1997 under MoA with goal of delineation of rules and regulations regarding changing functions and of national seed board, registration of seed dealers, seed certification, marking truthful labels, and modalities of seed inspection.
7. Plan of Action on NAP, 2003 under MoA with goal of reviewing NAP and its implementation, setting out strategies and actions, and identifying institution and programme framework.
8. Actionable Policy Brief, 2004 under MoA with goal to prioritize immediate medium-term and long-term policy measures with respect to seed, fertilizer, land, irrigation, mechanization, marketing, agricultural research and extension with a view to increasing labour and water productivity, investment in agriculture and improve risk management.
9. National Jute Policy, 2002 under Ministry of Jute with goal of keeping jute production at a desirable level, stabilizing supply and prices of jute, developing commercially viable jute industries, accelerating privatization of jute industries, and developing multiple uses of jute and jute goods.
10. National Jute Policy, 2011 under Ministry of Textiles and Jute with goal of producing jute and jute goods in keeping with domestic and international markets, land use planning for jute cultivation, producing quality jute seeds and distribution among farmers, preserving and extending market of jute and jute goods, diversifying jute goods.
11. National Integrated Pest Management Policy, 2002, under MoA with goal of enabling farmers to grow healthy crops in an increased manner and thereby increase their income on a sustainable basis while improving the environment and community health.
12. National Agricultural Policy, 2013, under MoA with goal of ensuring sustainable and profitable agricultural production; conducting

research and training in order to sustainably develop and expand high improved crop varieties as well as cultivation systems; increasing productivity, employment and income through appropriate technology expansion and inputs management; introducing and sustaining competitive agriculture through financialization; taking effective steps to achieve self-sustained agricultural systems adaptable to climate change and farmer's needs; ensuring fair price of agricultural products and improving sales systems; encouraging to produce quality agricultural products in keeping with international market demands, and promoting export of agricultural products.

13. National Organic Agricultural Policy, 2016 under MoA with goal of managing agricultural activities in line with physical, chemical and organic values of soil; inventing and expanding crop specific organic production methods; making organic seeds handy; identifying traditional and indigenous knowledge and practice associated with organic farming; developing skilled human resources through education and training; determining criteria for organic agriculture; facilitating production and supply of quality organic inputs; supporting the farmers with their organic farm produces through certification of products; creating national and international market for organic crops; and contributing to increased income of the farmers through quality organic agricultural products
14. National Agricultural Policy 2017 (draft) under MoA with goal of increasing production of cereal crops, increasing access, rights and purchasing capacity of common people; promoting agro-industries and export oriented crop and vegetable production; sustaining productivity and income for farmers, and rejuvenate rural economy; sustainable and efficient management of natural resources; making production system profitable; increasing knowledge and skills of those engaged in farming; mechanization of agriculture in order to reduce physical labor; developing technology suitable for adverse environment.

B. Non-crop sub-sector

15. Livestock Policy and Action Plan, 2005 under Ministry of Fisheries and Livestock (MoLF) with goal of improvement of small scale poultry and dairy farming replicating CLDDP, reform of DLS, enforcement of low and regulations towards animal feeds, vaccines and privatization of veterinary services adoption of breeding policy, and establishment of livestock insurance development fund and livestock credit food.
16. National Fishery Policy, 1998, under MoLF with goal of development of fishery resources, increasing fish production and self employment, meeting demand for animal proteins accelerating fish exports, and improvement of public health.
17. National Forest Policy 1994 under Ministry of Environment and Forest with goal of bringing 20% area under afforestation, enriching biodiversity, extending assistance to forestry sector development through development of land and water resources, implementation of national and international efforts and agreements relating to global warming, desertification control of wild bird and animal trade, and prevention of illegal occupation of forest lands, felling of trees, encroachment and haunting of wild animals.
18. National Land Use Policy, 1994 under Ministry of Land with goal of minimizing loss of cropland, stopping indiscriminate use of land, preparing guidelines for land use for different regions, rationalizing land acquisition, and synchronization of land use with natural environment.
19. National Water Policy, 1998 under Ministry of Water Resources, with goal of development and management of surface and groundwater in an efficient manner ensuring access of the poor, women and children to water, accelerating development of sustainable public and private water delivery systems, development of a legal and regulatory framework for private sector investment in water development, and capacity building for designing future water resource management plans.
20. Environment Policy 1992 under Ministry of Forests and Environment, with goal of protection of environment, identification and control of pollution, sustainable use of natural resources and participation in all international initiatives to protect environment.
21. National Food Policy, 2004, under Ministry of Food, with goal of ensuring dependable food security system, adequate and stable supply of safe and nutritious food at affordable prices,

increasing access and food purchasing power of people.

22. National Rural Development Policy, 2001 under Ministry of Rural Development and Cooperatives, with goal of income and employment of rural people, ensuring participation of rural people in development process, improvement of rural infrastructure and marketing facilities, local level planning, training of youths and women, and development of disadvantaged, small minority communities and hill tract regions.
23. Agriculture and Rural Development section, PRSP, 2005, under Planning commission, Ministry of Planning, with goal of creation of enabling environment and playing supportive roles for intensification of major crops i.e. (cereals) diversification to high value non-cereal crops, (i.e. fruits and vegetable) development of non-crop enterprises (i.e. livestock, fishery, poultry), and promotion of rural non-farm economy, and outlining a policy matrix on future actions.
24. Public Jalmohal (water bodies) Management Policy, 2009, under Ministry of Land, with goal of identification of real fisher folks, the registered fisher folk organization to be prioritized for leasing, preservation of fishery and bio-diversity, and increase production.
25. Domestic Food Grains Collection Policy, 2010, under Ministry of Food and Disaster Management, with goal of providing financial assistance to the producing farmers, stabilizing market price of the food grains, building food security, sustaining supply to the public food distribution systems.
26. National Biotechnology Policy, 2012 under Ministry of Science and Technology with goal of using biotechnology for food security, poverty reduction, improvement of health and lifestyle, listing organisms, inspiring research and development of biotechnology, improving human resources, financing biotechnology institutions.
27. Micro Irrigation Policy, 2017 under MoA, with goal of ensuring effective use of water and increasing water productivity, applying sustainable technology for irrigation purpose, encouraging poor, disadvantaged and youth in using irrigation, expanding group and cooperative irrigation system, introducing sprinkler irrigation, drip irrigation, dugwell et. to

increase efficiency, introducing renewable energy in irrigation.

28. Perspective Plan of Bangladesh, 2010-2021, Planning Commission, Ministry of Planning, with goal of diversification and intensification of agricultural crops, motivating farmers to use recommended/ balanced doses of chemical fertilizers, extensive production and use of organic fertilizer, and proper utilization of soil guide and soil testing facilities to enhance soil fertility, productivity increase yielding up to 20 percent higher production of hybrid rice through technological progress, stress tolerant varieties, increasing fish production, increasing dairy, meat and poultry production, increasing tree coverage, developing agricultural product marketing, increasing rural credit, improving irrigation facilities, preserving environment for agriculture.

Issues in the policies and strategies

The prominent constraints in agriculture now include depletion of soil nutrient, lack of awareness program, risk of crop failure, unbalanced use of fertilizer, deficiency in micro nutrient and organic matter. The policies and strategies in the field underline facilitating market entry for the private commercial firms, leveling the playing field to ensure competitive fairness in both input and produce markets, promoting new areas and mechanisms for R&D for accelerating agricultural growth, improving the supply of agricultural credit to farmers, monitoring and enforcing laws and regulations devised for agricultural development. Government's overriding policy is to create enabling environment and support the transformation of subsistence agriculture to a more diversified commercial agribusiness with significantly increased participation of private sector. For crop and non-crop sector growth, there is emphasis on achieving productivity and profitability gains, diversification and commercialization of agricultural enterprises in the face of trade liberalization under globalization. Cross-cutting issues include agricultural research and technology generation, and energizing agricultural marketing and agro-processing.

Annex 3: Review of government policies and strategies related to environment

Context of environmental policy formulation

The idea of environmental protection through national efforts was first recognized and declared with the adoption of the Environmental Policy 1992. In the formation of Environmental Policy, different actors and factors played some direct and indirect roles. The actors were basically of two types, external and internal. Among external actors, United Nations General Assembly, international forum, international organizations, donor agencies (IDA, USAID, UNDP, ADB) were major players. Internal actors include, environmental NGOs (CARDMA, BCAS, IUCN, FEJB, ADAB) government agencies i.e. Ministry of Environment and Forest (MOEF), DOE, Planning Commission, concerned ministries, consultants, bureaucrats, civil society, and so on.

Environmental Policy and Legislation

Legislation for the control, prevention and abatement of water pollution in Bangladesh dates back to the East Pakistan Water Pollution Control Ordinance, 1970, East Pakistan Ord. No. V of 1970, which established the East Pakistan Water Pollution Control Board, defined their remit, outlined responsibilities for implementation of policies formulated by the Board and laid out penalty procedures. The 1970 Ordinance requires that any persons or commercial or industrial undertaking: adopt measures for the prevention, control and abatement of existing or potential pollution of any waters, including construction, modification, extension or alteration of disposal systems; provide information to the Board regarding wastes, sewerage or treatment works; and permit any officer to inspect and search land and buildings.

The Environmental Pollution Control Ordinance, 1977 superseded the Water Pollution Control Ordinance, 1970 and extended the control, prevention and abatement of pollution to the entire environment of Bangladesh and expanded the definition of pollution from that specifically relating to waters to air, water or soil. The 1977 Ordinance also reconstituted the Environmental Pollution Control Board with a similar mandate to that detailed in the 1970 Ordinance but extending to pollution of air and soil and giving the Board the power to appoint expert committees as they deem necessary.

In 1992 the National Environmental Policy (NEP) was drawn up with the aim of providing protection and sustainable management of the environment. The objectives of the Policy include:

- | Maintaining the ecological balance and overall development through protection and improvement of the environment;
- | Identifying and regulate polluting and environmentally degrading activities;
- | Ensuring environmentally sound development;
- | Ensuring sustainable and environmentally sound use of all natural resources; and
- | Actively remain associated with all international environmental initiatives.

The National Environmental Management Plan (NEMAP) was developed as the framework of programmes and interventions aimed at implementing NEP. Its activities attempt to lead to better management of scarce resources, reducing the rate of environmental degradation, improving the natural and manmade environment, conserving habitats and biodiversity, promoting sustainable development and improving quality indicators of human life (MoEF, 1994). NEMAP proposed actions and interventions are for government agencies, NGOs and wider civil society and include activities relating to fisheries and agriculture.

The National Fisheries Strategy and Inland Capture Fisheries Strategy set out a framework for community management of inland fisheries based on leasing at nominal rates, widespread conservation measures, and precautionary development of aquaculture in floodplains. However, implementation of policies set by the Ministry of Fisheries and Livestock (MoFL) is largely dependent on the policies and practice of the land administration, which controls most water bodies (*jalmohals*). The Jalmohal Management Policy (2009) allows for fisher organizations to lease water bodies without competitive bidding, and mentions sanctuaries and swamp forest, but does not ensure secure tenure, requires current levels of lease payment, and leaves considerable space for elite capture.

Environmental Conservation Act and Rules

The Bangladesh Environmental Conservation Act passed in 1995, and the accompanying 1997 Rules, are arguably the most important legislative documents for industrial water pollution. The Act is dedicated to the conservation, improvement of quality standards, and control through mitigation of pollution of the environment (Environmental Conservation Act, 1995). The 1997 Environment Conservation Rules made in accordance with the 1995 Act provide additional guidance for specific components of the Act.

The 2000 Environmental Court Act supports the Environmental Conservation Act (1995) and the Environmental Conservation Rules (1997) by providing for the establishment of environmental courts for the trial of offences relating to environmental pollution. It includes protocols for the establishment of the court, and defines the court's jurisdiction, appropriate penalties, powers of search and entry, and procedures for investigation, trial and appeal. The Environmental Conservation Act, 1995 and the Environmental Court Act 2000 were amended in 2002 and the Environmental Conservation Rules, 1997 were extended to incorporate ambient air quality and exhaust fan vehicles.

The Bangladesh Environmental Conservation Act (1995) established the Department of Environment (DoE) and signaled a move towards ecosystem approaches and regulation of developments harmful to those ecosystems, particularly pollution control and mitigation and requirements for Environmental Impact Assessments. Under it, the Environmental Protection Regulations (1998) cover regulations, compliance and enforcement. The Act includes provisions for declaring Ecologically Critical Areas (ECAs) to restrict potentially harmful activities in these areas. Ten such areas have since been declared.

The Forest Act of 1927 sets the frame for forest management and vests considerable power in the hands of the Chief Conservator of Forests to determine the use of forest lands and to penalize illegal users. While allowing for designating use rights in forest for villages, the act does not give a role to neighboring communities in any decision making, including minority communities that often had use and settlement rights in forest areas or for civil society in general. The Bangladesh Wildlife (Preservation) Order of 1973 (later

amended and gazetted as the Bangladesh Wildlife (Preservation) (Amendment) Act of 1974) is mainly concerned with regulating hunting but also sets out the scope for declaring protected areas as wildlife sanctuaries or national parks; notably, these are not limited to forests, nor is the Order limited to Forest Department implementation. New rules for management of Protected Areas (PAs) and for social forestry now under discussion should go a long way to institutionalizing the concept of co-management (see below).

The National Water Policy (NWPo) has some 50 clauses of relevance to the environment and it is intended that compliance with the Policy will ensure protection, restoration and preservation of natural habitats, particularly wetlands, mangroves, other forests and endangered species that depend on them. Specific provisions made under the Policy include: protection, restoration and enhancement of water resources; protection of water quality, including strengthening regulations concerning agro-chemicals and industrial effluent; sanitation and potable water; fish and fisheries; and participation of local communities in all water sector development.

International Conventions

Bangladesh has acceded to 27 international conventions and protocols related to environment and development. However, there is still considerable scope to mainstream their provisions. For global environmental concerns, the UNFCCC or Agenda 21, 1992 and the Kyoto Protocol (1997) are the most significant, along with the Montreal Protocol on Substances that Deplete the Ozone Layer (1985). In terms of biodiversity, the most relevant are the Convention on Biological Diversity, which has increased attention to biodiversity issues in various sector policy and strategy documents. Bangladesh has ratified the 1971 Ramsar Convention (Convention on Wetlands of International Importance, especially as Waterfowl Habitat) and designated two wetlands (Sundarbans and Tanguar Haor), which has strengthened conservation efforts there (and led to Tanguar being taken out of commercial leasing). However, a wider commitment to promoting wise use (sustainable management) of all wetlands has not been strongly followed up, since the convention is seen as an environment/DoE responsibility rather than a land and fisheries issue.

Donor programs and their roles in response to

environmental issues are as follow:

The WB is currently identifying assistance to the Sundarbans, focusing on community level infrastructure and AIG in the landscape zone to complement USAID's IPAC and the European Union's Sundarbans Environment and Livelihood Security (SEALS) projects. The WB has been active in the provision of water and sewerage to Dhaka and Chittagong since the 1960s and is planning to add industrial effluent control under the Dhaka Environment and Water Program Project, which will also build regulatory capacity. An Arsenic Mitigation Water Supply Project was rated Moderately Satisfactory on completion. Lessons learned from an Embankments Rehabilitation Project were incorporated into the ongoing Emergency 2007 Cyclone Recovery and Restoration Project, which is seen as the first phase of a 15 year program of disaster risk reduction. It includes rebuilding of embankments and shelters, restoration of the agriculture sector, and disaster risk management. A project for Rivers Information and Conservation will emphasize hydrology and strengthening the Bangladesh Water Development Board (BWDB). A Livestock and Fisheries Project is under preparation that reportedly will include floodplain fisheries, through scaling up of the MACH co-management approach. A major preoccupation for the WB in the near future will be the MDTF, for which it is the implementing agency. The MDTF is a vehicle for implementing the BCCSAP's six pillars: food security, social safety and health, comprehensive disaster management, infrastructure; research and knowledge management; mitigation and a low carbon development and capacity building. The MDTF will apply the "Paris principles" of ownership, harmonization, rationalization, predictability and mutual accountability; and the GoB has also set a Climate Change Fund to support the implementation of the BCCSAP. In addition, Bangladesh is expecting benefit from a global Pilot Program for Climate Resilience (PPCR) being managed by the bank's headquarters. The PPCR will have two phases: technical assistance and investment. The WB and ADB are making a joint effort to identify suitable projects.

Asian Development Bank (ADB) has also had a long association with provision of water supply and sewerage services in major cities – Dhaka, Chittagong and Khulna. An earlier project in small-scale water resources development, which

incorporates community-based management was rated Successful and a new project is planned. A flood damage rehabilitation project, following the floods of 1998, was rated Successful but Less likely on sustainability, with concerns about corruption. On that front, the ADB has funded the strengthening of the Anti-Corruption Commission but remains dissatisfied with its powers. A Disaster Risk Management operation is planned for 2011. ADB is planning a Clean Fuel Sector Development Program to expand the distribution of natural gas. ADB prepared a Climate Change Implementation Plan and is participating, with the WB, in the PPCR, with an emphasis on energy, agriculture and urban issues. The ADB has completed a first project for all three districts of the Chittagong Hill Tracts and is planning a second phase. The approach includes rural infrastructure, livelihood support and institutional strengthening but not – it appears – NRM interventions, like reforestation, erosion control or water management. Following a successful project with the FD on social forestry, the ADB, in 1998, planned a large, ambitious and complex project to safeguard biodiversity, develop FD capacity and support livelihoods in and around the Sundarbans.

United Nations Development Programme (UNDP) has been a major supporter of GCC capacity building in Bangladesh and has funded several strategy papers and action plans and expects to have substantial funding for adaptation. On mitigation it has supported conversion of baby taxis to CNG and improved technology at brickfields. Its flagship environmental project has been the Coast and Wetlands Biodiversity Management Project (CWBMP), which targeted the coastline between Sonadia and St. Martin's Islands in the south-east and Hakaluki Haor in the north-east, both ECAs.

The European Union (EU) has allocated 10 per cent of its 2007-13 program for environment and disaster management and intends to mainstream environmental considerations into all its assistance. It has recently pledged fund for the Sundarbans Environment and Living Security (SEALS) Project, to be implemented in close coordination with IPAC and to start in July 2010. This will include support to the FD to improve its management of the forest resources and also AIG funding (through NGOs) for the landscape zone. Other projects include municipal waste management and solar energy.

UK Department of International Development (DfID) are cooperating with UNDP and Sweden regarding development of community risk reduction measures, with UNDP/UN Habitat regarding urban slum issues (with the main focus being on environmental risk reduction), with NGOs regarding sustainable livelihoods development, including a *char* livelihoods program (for vulnerable populations on recently accreted islands) and with the government regarding the development of climate change indicators. Government capacity to respond to climate change is currently very limited, but discussions are ongoing as to how to improve this situation. Government is setting up new structures and DfID's approach will be to support these structures (the entry point being disaster management) rather than providing fragmented support to individual projects. Climate change and related programs in Bangladesh are expected to attract several hundred million dollars in donor funding over the next 5 to 6 years.

Projects MACH, Nishorgo and IPAC are few of the examples of USAID projects. USAID was also instrumental in setting up the Arannayk Foundation (AF) for tropical forest conservation, which is funded through a debt for nature swap. USAID has numerous other programs which directly or indirectly contribute to environmental conservation and climate change mitigation and adaptation.

Canadian International Development Agency (CIDA) has funded two projects since 2000 to build the capacity of DoE, focusing on training, IT and other equipment, and demonstration projects. It worked actively on the CNG conversion and plastic bag issues. CIDA agrees that further work is needed to make DoE fully effective but does not expect to have any further funding for such a program, or in environment and GCC generally.

Gesellschaft für Technische Zusammenarbeit (GTZ) focuses on governance, health and energy, with some innovative projects for solar, efficient lighting, solid waste with methane collection, and improvement of rice mill boilers. A project on wetland protection has just started and another project for reforestation in the Chunati PA is about to do so. This will be implemented through the FD and other bodies.

Denmark has made a modest contribution to the Multi Donor Trust Fund (MDTF) but expects to contribute more once the fund is operational. It is also co-financing UNDP's CHT and agriculture projects and has a fisheries project with DoF. The Swiss Development Corporation (SDC) is supporting the Tanguar Haor wetland project. The Organization of the Islamic Council has agreed to finance a marine fisheries research vessel. The International Fund for Agricultural Development is funding a major floodplain fisheries project (Sunamganj Community Based Resource Management Project) through the Local Government Engineering Department.

Policy and Legislation Concerns

The Environmental Conservation Act and Environmental Conservation Rules, and National Water Policy have adequate clauses relating to industrial pollution. This includes water quality protection, effluent discharge monitoring, zoning regulations for new industries and strengthening of the regulatory system for agrochemical pollution control. There are few action programmes and a lack of skills and expertise to take appropriate actions to ensure that both government and private sector developments properly address environmental concerns. With few exceptions there is still a lack of institutional awareness let alone capabilities to address policy goals and objectives. The issues that remained attention include:

- | Coordinating with other authorities or agencies that have relevance to the objectives of the Act.
- | Adopting safety measures and determining abatement measures to prevent accidents that may cause environmental degradation.
- | Advising persons on environmentally sound use, storage, transportation, import and export of hazardous material or its components.
- | Conducting research and assisting other authorities and agencies in conservation and improvement of the environment.
- | Investigating locations, equipment, manufacture or other processes, ingredients, or materials, to ensure improvement of the environment, and control and mitigation of pollution.
- | Collecting, publishing and disseminating information regarding environmental pollution.
- | Advising the Government on manufacturing processes and materials that may cause pollution.
- | Ensuring potable water quality.

Annex 4: Mapping of climate smart agriculture projects in Bangladesh

Documents of Annual Development Programme (ADP) of 2013-2014, 2014-2015, 2015-2016, and 2016-2017 of the Planning Commission, Ministry of Planning, Bangladesh, and sources like World Bank, IFC, ADB, USAID, etc. have been reviewed to map climate smart agriculture components in the projects. A few projects have been critically named hereunder to trace the trends of CSA interventions in agriculture and its sub-sectors in Bangladesh.

Pilot Project on Weather Index-Based Crop Insurance (WIBCI)

The project, funded by ADB, continued during 2013-2016. The project pilot-tested viable WIBCI products aiming to design and pilot WIBCI products for farmers, especially small and marginal ones, to address some inherent deficiencies in traditional crop insurance. The project facilitated collaboration between a public insurer, Sadharan Bima Corporation (SBC) and one or two private insurers, in partnership with distribution partners (nongovernment organizations [NGOs], microfinance institutions [MFIs], farmer cooperatives, or agricultural banks) to provide affordable and sustainable weather index-based solutions to small and marginal farmers. To encourage uptake of WIBCI, the option of having the Government of Bangladesh provide subsidies to the farmers in line with its existing credit support was explored, if need be. The project dealt with strengthening policy and regulatory framework facilitate an environment in which WIBCI to be piloted in accordance with insurance and related laws and the potential to scale the business can be sustainably explored. Under this component, assistance was provided to Insurance Development and Regulatory Authority (IDRA) in drafting the regulatory framework for implementing an untraditional insurance scheme such as WIBCI. However, regulations may not be operational during the project except for

those related to piloting WIBCI. Insurance regulation is subject to the approval of IDRA and Bank and Financial Institutions Division (BFID) with involvement from the Ministry of Law and Parliament Affairs. Consultative exercises between IDRA and implementing agencies and other key stakeholders were undertaken to facilitate deeper understanding about the concept of WIBCI markets, drawing upon experience from project implementation. This encouraged IDRA to draft regulations in a realistic context and ensure pro-poor business piloting and experimentation. Dialogue was held with noninsurance regulators from banking, MFIs, and telecommunications to explore an innovative, client-friendly insurance distribution. The project also targeted improving technical and institutional capacity among providers of crop loss and weather data, insurers, distributors, regulators, and other concerned agencies, with a special focus on rural farmer clients.

Bangladesh Climate-Resilient Ecosystems and Livelihoods (CREL) Project

USAID's Climate-Resilient Ecosystems and Livelihoods (CREL) Project, 2013-2018, aims at sustainability, resiliency to climate change, natural resource management, and scaled-up impacts. CREL activities would bring together women and men from resource-dependent households in targeted landscapes, civil society groups, and the Government of Bangladesh (GOB) to collectively conserve, protect, and manage forests, wetlands, and critical ecosystems. This engagement at multiple levels – from people at the grassroots to key decision-makers at the policy level – is underpinned by targeted initiatives that support policy reforms, institutional strengthening, and alternative livelihoods and incomes for the poorest and most vulnerable. The objective was to create an enabling environment for sustainable communities and ecosystems, by improving capacity to co-manage natural resources, adapt to climate variability and change, and

diversify livelihoods. CREL has scaled-up and adapted successful Co-Management models, improving the ability of resource management institutions to foster environmental stewardship and biodiversity conservation. Key areas of work included: the conservation and expansion of Protected Areas (Pas) and Ecologically Critical Areas (ECAs); advocacy and research for policy reforms; and increased resilience to climate change through community-based planning, preparedness, and income generation. The project is currently expanding activities to new areas and additional beneficiaries. GOB Partners of CREL include Ministry of Environment and Forest, Ministry of Fisheries and Livestock, Ministry of Land Department of Fisheries, Department of Environment, and Bangladesh Forest Department. The expected outcomes are: more than 700,000 beneficiaries are better able to respond to the effects of climate change and variability; 350,000 stakeholders with increased capacity to adapt to impacts of climate variability and change; 500,000 people with increased economic benefits; 90,000 metric tons of CO₂e reduced or sequestered as a result of USG assistance; 2,000 ha of natural resources showing improved biophysical conditions; 475,000 ha under improved management; and 4,800 stakeholders using climate information in decision-making.

National Agricultural Technology Programme – Phase II (NATP-II)

Funded by the World Bank, 2015-2021, and implemented by the Ministry of Fisheries and Livestocks, the National Agricultural Technology programme aimed to increase income and reduce extreme poverty and hunger by improving agricultural technology development and support the development of the agriculture, fisheries and livestock sector. In its second phase, it incorporated climate-smart technologies and improved market linkages through: demand-driven agricultural research; integration of technology generation, technology transfer, practical application at farm and market level; agriculture extension for crop, livestock and fisheries farmers; farm-to-farm extension; agro-busi-

ness and agro-processing development; and collaboration with private-sector service providers

NATP-II covered 57 of the country's 64 districts and spanned a broad range of agro ecological zones across Bangladesh. It is estimated that over 1 million farming households directly benefited from project activities.

Strengthening National Forest Inventory and Satellite Land Monitoring System in support of REDD+ in Bangladesh

The project of FAO-UN and GoB, funded by USAID, for the period 2015-2016, aimed at implementing a robust forest monitoring system for the Forest Department - supporting forest policy and critical decision making processes, and supporting actions for climate change adaptation and mitigation in forestry. FAO and SilvaCarbon provided technical support in assisting institutional capacity development process. The project is expected to contribute to reinforce the general conditions for the national forest inventory, reinforce the national forest monitoring strategy, the implementation of the National Forest Monitoring and Assessment, and estimate the value of forest ecosystem goods and services.

Promotion of the Climate Change Unit in coordinating the Bangladesh Climate Change Strategy and Action Plan (Climate Finance Governance Project)

Together with the Government of Bangladesh (GoB), the Climate Finance Governance (CFG) Project, 2013-2018, aims to build a climate resilient nation. It supports the government to implement the national climate change strategy and action plan with national and international climate funds, in a transparent manner. It helps improve Ministry of Environment and Forests and its line agencies' results-based implementation of the National Climate Change Strategy according to fiduciary principles. The Ministry of Environment and Forests is responsible for the effective coordination of the implementation of the BCCSAP into its own processes and across government. Through a critical review of the current BCCSAP and its implementation, the MoEF and its line agencies

coordinated climate change policy in the future. Lessons learnt were applied to an updated version of the strategy. The Department of Environment (DoE) is developing a Climate Change Vulnerability Assessment (CCVA) to provide the Government of Bangladesh with a tool to assess climate change vulnerability across the country. This assessment will serve as a base line for measuring climate change adaptation activities and identify districts of high vulnerability. It will also inform policy makers and improve the allocation of funds, due to better targeting.

Integrated Agricultural Productivity Project (IAPP)

The project, funded by the World Bank, 2011-2016, was implemented by the Ministry of Agriculture with the agencies, such as, BRRI, BARI, Fisheries Research Institute, DAE, BADC, SCA, Department of Livestock, and Department of Fisheries. The Technology Generation and Adaptation Component was to adapt and make available for project farmers the technologies and management practices that increase yields and production intensities of crops and fish. The focus of the BRRI work was on saline tolerant varieties of rice for the South and flash flood or drought tolerant varieties for the North. BARI worked with wheat, maize, oilseeds and pulses for both the South (Agro-ecologically constrained) and the North (economically depressed). The major focus of both was on location specific field trials to meet the needs of these two regions, and the development and introduction of new varieties that is particularly beneficial in these regions. The Technology Adoption component was to enable farmers in the project area to sustainably adopt improved agricultural (crops, livestock and fisheries) production technologies and management practices. The Crops sub-Component handled paddy, wheat, lentils, oilseeds, and vegetables. It was also conducting demonstrations for farm yard manure, green manuring, the use of alternate wetting and drying of soil for paddy production, soil improvement through liming, and others.

Bangladesh: Second Crop Diversification Project

The project funded by ADB, 2010-2017, aims at fostering commercialization of agriculture through interventions to promote diversification into high-value crops (HVCs) and value addition, gender mainstreaming, and climate change adaptation. The project is market oriented and demand driven, and is expected to increase farmers' incomes and enhance food security in Bangladesh. The Asian Development Bank (ADB) is supporting inclusive economic growth and poverty reduction in Bangladesh through its strategic priorities as identified in the country strategy and program for 2006-2010. The project is a follow-on to the successful ADB-assisted Northwest Crop Diversification Project (NCDP) completed in June 2009. The NCDP substantially raised the incomes of small and marginal farmers in the northwest region. The proposed project builds on the successful NCDP activities and expand into new areas, especially the southwest of Bangladesh. The project will complement the NCDP and other ADB support, such as the Agribusiness Development Project, particularly by promoting value addition to HVCs, strengthening value-chain integration by developing backward and forward linkages between farmers and consumers, and including service provision by private sector agribusinesses and technically and financially qualified microfinance institutions (MFIs) and wholesale banks. The project is consistent with the ADB country strategy and in conformity with recommendations made in the recent country assistance program evaluation in Bangladesh. The evaluation found that lack of agricultural diversification is one of the country's binding constraints to growth, and confirmed that agricultural and rural development is one of the government's top priorities and key to reducing rural poverty. The partners NGO (BRAC) was engaged to form, validate groups and to extend credit support for the interested group farmers. Targeted farmer's group formation on-going through validation and new selection. DAE in close collaboration with BRAC (NGO) is arranging techni-

cal training for the selected farmers on high value crops production and value addition, and making them eligible for credit support. DAE field staff in collaboration with the NGO (BRAC) are organizing field demonstration trials in the potential farmers field for the selected small farmers groups to show potential production technologies.

WB's Climate Smart Agricultural Water Management Project

The project to be implemented by Bangladesh Water Development Board, Department of Agricultural Extension, and Department of Fisheries and Livestock from 2018 onward will have the following components:

- 1 A: Rehabilitation of Irrigation Infrastructure and Management: A.1: Rehabilitation of FCD and FCDI Schemes; A.2: Management Transfer and Capacity Building of WMOs; A.3: Institutional Development of Chief Water Management Cell
- 1 B: Climate Smart Agriculture for Crop and Aquaculture Productivity: B.1: Crop Production Improvement; B.2: Aquaculture Production Improvement; B.3: Improved Market Access
- 1 C: Project Management Support
- 1 D: Contingency Emergency Response

World Fish Center's Climate Smart Farm Project in Bangladesh

The Climate Smart Farm Project tested a range of possible adaptations to climate variability and change in southwest Bangladesh. One such adaptation is a cyclone and flooding resistant home designed to reduce the loss of food and income in a storm's aftermath - stopping a natural hazard from becoming a natural disaster. The project was funded by the CGIAR Research Program on Climate Change, Agriculture and Food Security and the International Water Management Institute.

IFC's Approach

IFC is actively promoting climate-smart agricultural practices in Bangladesh, working with both the private and the public sectors to

build greater efficiencies in the use of their resources. More specifically, IFC works with Bangladesh's some of the largest private seed companies (e.g., Supreme Seed Ltd., ACI Ltd., and Lal Teer Ltd.) to demonstrate the business case for stress-tolerant and high yielding seed varieties, provide extension services to farmers on seed production and on-farm management practices, and encourage more investment in the business. They want farmers to increase awareness of climate-smart agricultural practices that can improve their yield and revenue; women farmers to formalize their role in post-harvest activities in specific communities and train them on seed production, micro-entrepreneurship and market linkages; dealers and retailers to expose them to new seed varieties, understand their applications in specific cropping seasons and environmental conditions; and the government to bring together public and private sector representatives to a constructive dialogue and collaboration in promoting stress tolerant seeds and other adaptive inputs.

CCAFS engagement

Climate Change, Agriculture, and Food Security (CCAFS)'s major activities in Bangladesh also include prioritization of adaptation/mitigation strategies in agriculture sector, promotion of CSA through the Climate-Smart Village (CSV) approach, crop yield forecasting for weather risk management, and gender and social inclusion in climate-smart agriculture. For example, CCAFS and CGIAR centers together were engaged with national and sub-national stakeholders including policymakers, NGOs and civil society groups, research organizations, farmers groups and private sector for promotion of climate-smart agriculture in India. Priority areas include Indo-Gangetic Plan of Northern India and dryland agriculture systems in southern and western parts of India. Priority areas include coastal agriculture systems in the country.

Internal mechanism to finance CSA

- 1 The Krishi Gobeshona Foundation—an agricultural research foundation—operates

as an endowment trust fund with World Bank seed money for funding adaptive research projects. Most of the funds supporting agriculture research and any CSA practices comes from bilateral or multilateral funding sources.

- 1 While the micro-finance institutions provide microfinancing for agriculture, few offer macro-credit to facilitate larger-scale investments that can help the sector transition from subsistence farming to sustainable commercialized agriculture or help establish CSA practices.
- 1 The private sector actors like ACI, PRAN, Lal Teer, and others are increasingly participating in agricultural technology diffusion, promotion of scale-appropriate mechanization and seed development. They are being recognized and facilitated with continuing favorable public policies. This has also implications for wider scale out of CSA practices and technologies, some of which may require higher, long-term costs.
- 1 Advanced Chemical Industries Limited (ACI) of Bangladesh has developed a variety of improved, specially adapted stress tolerant seeds for field crops (rice, wheat, maize, rapeseed etc) and homestead gardening that can be cropped all year around.
- 1 Continuation of funding and alignment of interventions with the major policy documents in Bangladesh i.e. Seventh Five Year Plan (2016-2020), Sustainable Development Goal implementation plan, and various sectoral plans, is also crucial for CSA advancement.

Issues requiring attention:

CSA is fairly a new terminology promoted by FAO and World Bank and a policy maker is likely to be beguiled by its apparently innocuous statement. In disguise of CSA, the multinationals would come in with prescriptions on adaptation and Bangladesh being one of the most vulnerable countries of the world to climate change would easily fall prey. The whole issue of science on climate change and agriculture needs to be clarified and discussed. Literature available in internet is mostly biased. Serious efforts are needed to unearth the follies of CSA scientifically and change

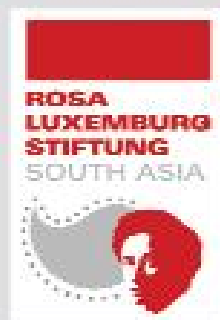
our mindset, especially that of the scientists. Since the scientists (mainly the agricultural scientists) are divided on this issue, policy makers and civil servants could be easily beguiled. Universities and research organizations (focusing on agriculture and environment) are lagging behind. Undertaking research and publication in earnest is required. Traditional knowledge and practices of the local and indigenous communities on agroecology, seed conservation etc are always neglected not only by the policy makers but also by the scientists. Convincing them could be a tall order. Definitely mainstreaming CSA-alternatives in national plans and policies in Bangladesh is a tall order. All our plans and policies are based on productivity and high yield influenced by green revolution of the sixties. Environmental considerations and protecting rights of the farmers are always neglected. Existing policies and plans, in particular, Environment Policy 1992, Water Policy 1998, Agricultural Policy, Seed Policy and Pesticide Policy including the Seventh Five Year Plan (2016-2020) are all targeted towards increased crop production for ensuring food security. They are to be reviewed in proper perspective. Hence, looking at these policies and plans from a different perspective is not an easy job.

Bangladesh is seriously pursuing implementation of the SDGs and finalizing the Bangladesh Delta Plan 2100 in line with Dutch prescription. All our climate change documents (BCCSAP, NAPA, NDC etc) prepared by the Ministry of Environment and Forests are based on productivity and increased food production. While finalizing these documents, CSA-alternatives is to be looked into. Critical review of these documents is necessary. Climate change negotiators (from the public and private sectors) in the COP are not properly briefed on the newly introduced CSA related issues. They are to be sensitized and trained for the upcoming negotiations. Both print and electronic media could be geared up in sensitizing the general mass in understanding CSA in proper perspectives. Correct scientific writings on CSA are required in this regard.



Research Initiatives, Bangladesh (RIB)

Research Initiatives, Bangladesh (RIB) was founded to promote knowledge on poverty alleviation that is relevant, innovative, participatory and action oriented, with a special focus on marginalized and socially excluded communities. RIB views poverty as a multidimensional process and recognizes that the needs of poverty groups go beyond simple income generation, food and shelter, to areas such as equality, dignity, justice, human rights and good governance. RIB supports marginalized and minority groups who are unable to access basic services due to social discrimination and conduct people's research ("Gonogobeshona") on the development schemes that affect them most, in order to develop ownership and generate community mobilization.



Rosa Luxemburg Stiftung

Rosa-Luxemburg-Stiftung (RLS) is a political foundation from Germany that works within the tradition of workers' and women's struggles. Bearing the name of Democratic Socialist Rosa Luxemburg (1871-1919), the foundation serves as a forum for debate and critical thinking about political alternatives, as well as a research centre for progressive social development. RLS promotes the discourse among activists, scientists and intellectuals from South Asia and Germany as well as from other regions of the world. A special focus lies on creating networks among countries of the Global South. The foundation also provides space for critical discourse and publishes educational material.

For more information please visit our website www.rosalux.in