TSUKUBA DECLARATION AND CLIMATE SMART AGRICULTURE

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Agriculture is defined as crop production by using natural resources e.g. soil, water, air, and sunshine through application of scientific knowledge. Climate Smart Agriculture (CSA) is a transformation of agriculture in a sustainable manner to increase production and reduce emission. Agricultural system is greatly dependent on climatic condition of a region while success of agricultural production largely depend on weather condition. Timely delivery of weather information service is key to success of agricultural productivity. Global Climate Change (GCC) is now reality and many countries including Bangladesh are the worst victim of GCC. Overall, such GCCs are affecting agriculture through their direct and indirect effects on crops, soil, livestock, pests and diseases, and hence global food security. This challenge is more pertinent to Asia which is the home for more than one half of the world population. Alleviating poverty and attaining food security are the major concerns to most countries in Asia-Pacific region. Reorientation of agricultural research is thus considered imminent and is global priority in the context of Climate Change (CC).

Against this backdrop an International Symposium on "Global Climate Change- Imperatives for Agricultural Research and Development" was held at Tsukuba, Japan in 2008, organized jointly by Asia-Pacific Association of Agricultural Research Institutions (APPARI) and Japan International Research Centre for Agricultural Sciences (JIRCAS). In all, 158 participants from 30 countries representing national agricultural research systems, regional and sub-regional organizations, universities, advanced research institutions, non-governmental organizations, the private sector, farmer's organizations, young professionals, multilateral and donor agencies, and international agricultural research centres of the Asia-Pacific region attended. The 'Tsukuba Declaration on Adapting Agriculture to CC' was unanimously adopted. Highlights of Tsukuba Declaration are as follows:

* The Asia-Pacific region sustains almost half of the global people, with high rate of population growth and poverty and has the largest concentration of hungry and malnourished people in the world. Agriculture continues to play a critical role in terms of employment and livelihood security in all countries of the region. Droughts, floods, heat waves and cyclones occur regularly. Climate Change (CC) is likely to raise regional temperatures and lead to decline in fresh water availability, sea level rise, and glacial melting in the Himalayas. It has recognized the IPCC's consideration that the developing countries of the Asia-Pacific region, especially the megadeltas as very vulnerable to CC.

* Attainment of Millennium Development Goals (MDGs), particularly alleviating poverty, assuring food security and environmental sustainability against the background of declining natural resources, together with changing climate scenario, presents a major challenge to most of the countries in the Asia-Pacific region during the 21st century.

* Water is a key constraint in the region for attaining food production targets and will remain so in future as well. So, steps are needed by all the stakeholders to prioritize enhancing

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water use efficiency. In addition, measures for water storage using proven approaches such as small on-farm ponds, large reservoirs, ground water recharge and storage, and watershed approach managed by the farming communities require attention.

* Increasing food production locally will be the best option to reduce poor people's vulnerability to CC. Available agricultural technologies can help increasing yield potential of crops that has not yet been tapped in many countries of the Asia-Pacific region. Hence, a concerted effort, backed by policy makers at the national level would be the key to enhance food security as well as ensuring agricultural sustainability.

* New genotypes tolerant to multiple stresses: drought, floods, heat, salinity, pests and diseases will help further increase food production. This would require substantial breeding and biotechnology (including genetically modified varieties) related efforts based on collection, characterization, conservation and utilization of new genetic resources that have not been studied and used. This needs substantial support in terms of institutional infrastructure, human resource capacity and required political will to take up associated agricultural reforms.

* A reliable and timely early warning system of impending climatic risks could help determination of the potential food insecure areas and communities. Such a system could be based on using modern tools of information and space technologies and is especially critical for monitoring cyclones, floods, drought and the movement of insects and pathogens.

* The increasing probability of floods and droughts and other climatic uncertainties may seriously increase the vulnerability of resource-poor farmer of the Asia-Pacific region to global CC. Policies and institutions are needed that assist in spreading the risk and to provide protection against natural calamities, especially for the small farmers.

* Governments of the Asia Pacific region should collaborate on priorities to secure effective adaptation and mitigation strategies and their effective implementation through creation of regional fund for improving climatic services and for effective implementation of weather related risk management programs.

* There are several possible approaches to enhance carbon sequestration in the soils of the Asia-Pacific region, such as greater adoption of scientific soil and crop management practices, improving degraded lands, enhanced fertilizer use efficiency, and large scale adoption oconservation agriculture. This soil carbon sequestration has the added potential advantage of advancing food security at the national/regional level. Need to ensure appropriate pricing of soil carbon and related ecosystem/environmental services in order to motivate the small farmers to adopt new management practice that are linked to proper incentives and rewards.

* Global CC and its implications for agriculture underline the need for regional collaboration for agricultural research in the Asia-Pacific.

As a follow-up action of Tsukuba declaration a two-days workshop on "Climate Smart Agriculture (CSA) in Asia: Research and Development Priorities" was held in Bangkok,

Thailand during 11-12 April 2012. The workshop was aimed at selection research priorities to devise adaptation and mitigation means for sustaining agriculture.

The following issues Possible actions and recommendations were discussed throughout the workshop:

1. Research investment/effort should be doubled or tripled.
2. Building capacity of research institutes.
3. Water for agriculture is a crucial issue and rain fed farming remains a risky business.
4. Water conservation and management. Explore nutritional potential of wastewaters.
5. Small/marginal farmers should be compensated for climate change impacts. Adaptation & Mitigation funding is necessary. Regional cooperation is important in this regard.
6. Categories for Adaptation e.g. SILOCAs (simple, Low-cost adaptation strategies), MMCOAS (Moderate, Medium-cost adaptation strategies), PASIDs (Potential adaptation strategies in development).
7. Management of livestock diet as they are the major source of carbon emission.
8. Rise in temperature increase sterility of rice. Development of heat tolerant or early morning flowering variety. may help avoiding sterility of spikelet.
9. Explore microbial world for genes for adaptation to high temperature.
10. Characterization of germplasm for CC, drought, salinity, heat tolerance.
11. Financial incentives for resource conservation and development of conservation technologies.
12. Greater pest surveillance in the context of CC, and tropical diseases spreading to temperate regions.
13. Development of multiple stress tolerant (drought, submergence, saline, disease resistance) crop varieties.
14. Resource management- water management at regional/farm/field level, soil conservation.
15. Information technology-weather information, development of crop-climate model.
16. Livelihood diversification, crop diversification.
17. Reduce wasting food and post harvest loss of crops.
18. Organic farming and sustainable intensification of agriculture.
19. Soil Moisture Network is necessary which has been ignored since long.
20. Nitrogen Use Efficiency (NUE) should be increased.
21. Farmers, fishermen and livestock herders have different need for weather information. The time gap between generation of weather information and weather service delivery to the farmers should be the minimum.

Relevance to Bangladesh: Uncertainty of weather condition e.g. erratic rainfall and natural calamities like cyclones cause huge damage to human lives and loss of properties and put huge pressure on national economy. Shortage of water supply for irrigation, drought, shifting of cultivation season, increasing soil salinity, rise in temperature already appeared as great

hurdle for sustaining agriculture in Bangladesh. Tsukuba declaration and the issue discussed in Bankok were entirely relevant to sustainable agriculture in Bangladesh. To attain food security through ensuring farmer's welfare emphasis should be reoriented to the following aspects:

* Reorient agricultural research encircling temperature rise and CC impacts; development of research priorities. Encourage climate resilient innovations.
* Strengthening agricultural research institutions.
* Development of multi-stress tolerant varieties. Crop biotechnology could be the prime tool in this regard. Research on microorganism for genes for adaptation to high temperature
* Information technology-weather information, crop-climate model. Timely delivery of reliable weather information services to the farmers.
* Financial incentives for small and marginal farmers to cope with CC impacts.
* Land zoning, conservation and protection of agricultural land from conversion to other uses. This is necessary for ensuring food security.
* Intensification of agriculture through organic and vertical farming.
* Halt land degradation; recover degraded land and conservation through Sustainable Land Management (SLM) practices. SLM practices could be incentivized.
* Ensure soil health diagnosis and related information service delivery in a timely manner to the farmers.
* Assessment of policies in support of CSA and synchronization of National Policies of Agriculture, Land and Environment.
* Increase research on how huge atmospheric Nitrogen can be used by cereal crops through symbiosis.
* Recover degraded wetland and water bodies to use as water reservoir and ground water recharge.
* Increase water use efficiency. Research on nutritional potential of wastewaters as part of water resource conservation
* Increase livelihood diversification and agro-biodiversity.
* Increase surveillance and monitoring of pests and diseases in the context of CC to devise pest control/avoidance mechanism.
* Strengthening extension services (with respect to CC & CSA, climate school, training of trainers, private-public partnership).