Chennai Science Festival 2011
Science City – Popular Lecture

Climate and Food Security

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The principle of common but differentiated responsibilities is the core of the many climate agreements arrived at so far, including the Kyoto Protocol (1997) and Bali Plan of Action (2007). The differentiated responsibilities aim to meet the special needs of developing countries for accelerated and equitable economic development. Both at Copenhagen and Cancun, the industrialized countries proposed limiting the rise in mean temperature to 2 deg. C above normal. Even this seems to be unattainable in the context of the present rate of emission of green house gases (GHG). Hence, **the principle of common but differentiated impact of 2 deg. change in mean temperature is essential for prioritizing climate victims.** For example, small islands like Tuvalu in the Pacific Ocean, Maldives, Lakshadweep and Andaman and Nicobar, as well as Sunderbans in West Bengal, Kuttanad in Kerala and many locations along the coast will all face the prospect of submergence. Floods will become more serious and frequent in the Indo-gangetic plains. Drought induced food and water scarcity will become more acute. South Asia, Sub-saharan Africa and the small islands will be the worst victims. In contrast, countries in the northern latitudes will benefit due to longer growing seasons and higher yields.

Addressing the World Climate Conference held in Geneva in 1989 on the theme, "Climate Change and Agriculture", I pointed out the serious implications of a rise of 1 to 2 deg C in mean temperature on crop productivity in South Asia and Sub-saharan Africa. An Expert Team constituted by FAO in its report submitted in September 2009, also concluded that for each 1 deg. C rise in mean temperature, wheat yield losses in India are likely to be around 6 million tonnes per year, or around $ 1.5 billion at current prices. There will be similar losses in other crops and our impoverished farmers could lose the equivalent of over US $ 20 billion in income each year. Rural women will suffer more since they look after animals, fodder, feed and water.

We are now in the midst of a steep rise in the price of essential food items like pulses, vegetables and milk. The gap between demand and supply is high in pulses, oilseeds, sugar and several vegetable crops including onion, tomato and potato. Production and market intelligence as well as a demand – supply balance based an integrated import and export policy are lacking. The absence of a farmer-centric market system aggravates both food inflation and rural poverty. FAO estimates that a primary cause for the increase in the number of hungry persons, now exceeding over a billion, is the high cost of basic staples. **India has unfortunately the unenviable reputation of being the home for the largest number of undernourished children, women and men in the world**. The task of ensuring food security will be quite formidable in an era of increasing climate risks and diminishing farm productivity.

China has already built strong defences against the adverse impact of climate change. During 2010, China produced over 500 million tonnes of food grains in a cultivated area similar to that of India. Chinese farm land is however mostly irrigated unlike us where 60% of the area still remains rainfed. Food and drinking water are the first among our hierarchical needs. Hence while assessing the common and differentiated impact of a 2 deg. rise in temperature, priority should go to agriculture and rural livelihoods. What are the steps we should take in the field of both mitigation and adaptation?

The largest opportunity in the area of mitigation lies in increasing soil carbon sequestration and for building up soil carbon banks. Increase in the soil carbon pool in

the root zone by 1 ton C/ha/yr will help to increase food production substantially, since one of the major deficiencies in soil health is low soil organic matter content. There should be a movement for planting a billion "fertilizer trees" which can simultaneously sequester carbon and enhance soil nutrient status. We can also contribute to the reduction in methane emission in the atmosphere from animal husbandry by spreading biogas plants. A biogas plant and a farm pond in every farm will make a substantial contribution to both reducing GHG emission and ensuring energy and water security. Similarly neem coated urea will help to reduce ammonia volatilization and thereby the release of nitrous oxide into the atmosphere.

2010 was the International Year of Biodiversity. We can classify our crops into those which are climate resilient and those which are climate sensitive. For example, wheat is a climate sensitive crop, while rice shows a wide range of adaptation in terms of growing conditions. We will have problems with reference to crops like potato since a higher temperature will render raising disease free seed potatoes in the plains of North-west India difficult. We will have to shift to cultivating potato from true sexual seed. The relative importance of different diseases and pests will get altered. The wheat crop may suffer more from stem rust which normally remains important only in Peninsular India. A search for new genes conferring climate resilience is therefore urgent. We have to build gene banks for a warming India.

Anticipatory analysis and action hold the key to climate risk management. The major components of an Action Plan for achieving a Climate Resilient National Food Security System will be the following:

- Establish in each of the 127 Agro-climatic Sub-zones, identified by the Indian Council of Agricultural Research based on cropping systems and weather patterns of the country, a **Climate Risk Management Research and Extension Centre**.

- Organise a Content Consortium for each centre consisting of experts in different fields to provide guidance on alternative cropping patterns, contingency plans and compensatory production programmes, when the area witnesses natural calamities

like drought, flood, higher temperature and in case of coastal areas, a rise in sea-level.

- Establish with the help of the Indian Space Research Organisation (ISRO) a Village Resource Centre (VRC) with satellite connection at each of the 127 locations.

- Link the 127 Agro-climate Centres with the National Monsoon Mission, in order to ensure better climate, crop and market intelligence.

- Establish with the help of the Ministry of Earth Sciences and the India Meteorological Department an Agro-Meteorological Station at each Research and Extension Centre to initiate a "Weather Information for All" programme.

- Organise Seed and Grain Banks based on Computer Simulation Models of different weather probabilities and their impact on the normal crops and crop seasons of the area.

- Develop Drought and Flood Codes indicating the anticipatory steps necessary to adapt to the impact of global warming.

- Strengthen the coastal defences against rise in sea level as well as the more frequent occurrence of storms and tsunamis through the establishment of bio-shields of mangroves and non-mangrove species. Also, develop sea water farming and below sea level farming techniques. Establish major Research Centres for Sea- Water Farming and Below Sea-Level Farming. Kuttanad in Kerala will be a suitable place for the Below Sea-Level Farming Research and Extension Centre. A major centre should also be established in the Sunderbans area of West Bengal.

- Train one woman and one male member of every Panchayat to become **Climate Risk Managers**. They should become well versed in the art and science of Climate Risk Management and should help to blend traditional wisdom with modern science. The Climate Risk Managers should be supported with an internet connected Village Knowledge Centre.

A Climate Literacy Movement as well as anticipatory action to safeguard the lives and livelihoods of all living in coastal areas and islands will have to be initiated. Integrated coastal zone management procedures involving concurrent attention to both the landward and seaward site of the ocean and to coastal forestry and agro-forestry as well as capture and culture fisheries are urgently needed. A Genetic Garden for Halophytes is being established at Vedaranyam in Tamil Nadu. Biodiversity is the feedstock for a climate resilient agriculture and food security system. The Honourable Chief Minister of Tamil Nadu has therefore taken a very visionary decision to establish five Genetic Heritage Gardens based on Sangam Tamil Literature, which described two thousand years ago five major agro-ecological zones in the State, namely, Kurinji, Mullai, Marudham, Neithal, Palai. He announced this initiative at the World Classic Tamil Conference held at Coimbatore last year. These Genetic Heritage Gardens are being established at the following locations.

Kurinji (Malai) – Yercaud, Salem District
Mullai (Kadu) – Sirumalai, Dindigul District
Marudham (Vayal) – Maruthanallur, Kumbakonam, Thanjavur District
Neithal (Kadarkarai) – Thirukadaiyur, Nagapattinam District
Palai (Varanda Nilam) – Achadipirambu, Ramanathapuram District

With the help of Tata Trusts, the M S Swaminathan Research Foundation has established a "Fish for All Research and Training Centre" at Kaveripoompattinam (Poompuhar) for the purpose of imparting training to fisher families from fish capture to consumption. A College for coastal communities has been established with the help of the Indira Gandhi National Open University. Artesenal fishermen going to the sea in small boats are being provided with cellphones which can give them information on wave heights and the location of fish shoals. This helps not only to save time, but also to allay fears concerning a sudden rise in sea level. **Hereafter, climate care and resilience must be mainstreamed in all development programmes.** We can then ensure food, water, fodder and food security for a human population of 1.2 billion and 1 billion farm animals.