

International Conference

Eliminating Hunger and Poverty: Priorities in Global Agricultural Research and Development Agenda in an Era of Climate Change and Rising Food Prices

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Theme Address

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In September this year, a Summit will be held in New York under the auspices of the United Nations to review the progress made during the last ten years in achieving the targets set under the UN Millennium Development Goals adopted by Member Nations of the United Nations in 2000. The UN MDGs represent a global common minimum programme for sustainable human security and wellbeing. In spite of the modesty of the goals set, progress in achieving them is inadequate in many developing countries, including India. In fact the FAO points out that the number of children, women and men going to bed hungry now is over a billion, although this number was only eight hundred million in the year 2000. There is obviously a need to review our strategies and redouble our efforts in achieving all the UN MDGs and particularly the very first one relating to hunger and poverty by the year 2015.

The Economic Survey of India (2008) contained the following observations :

- “While poverty rates have declined significantly, malnutrition has remained stubbornly high. Malnutrition, as measured by underweight children below 3 years, constitutes 45.9 per cent as per the National Family Health Survey 2005-06 (NFHS 3). It has also not significantly declined from its level of 47 per cent in 1998-99 (NFHS 2).
- **It is evident that existing policies and programmes are not making a significant dent on malnutrition and need to be modified.** While per capita consumption of cereals has declined, the share of non-cereals in food consumption has not grown to compensate for the decline in cereal availability”.

For achieving sustainable food security, concurrent attention will be necessary to ensure food availability, access and absorption. Access depends upon opportunities for employment, while absorption will be conditioned by clean drinking water, sanitation and health care. Thus, both food and non-food factors condition food security.

This conference particularly deals with the role of science in achieving freedom from hunger and poverty. In the case of the economically underprivileged sections of our population, over seventy percent of their income goes to the purchase of food. This is why there is a strong interconnection between hunger and poverty. India used to witness serious famines during the colonial rule. The last big famine was the Bengal Famine of 1942-43. Although famines of this order have not occurred in independent India, chronic hunger arising from inadequate purchasing power, and hidden hunger caused by micronutrient deficiencies in the diet like iron, iodine, zinc, vitamin A, vitamin B12 etc, are widespread. What is the role of science in dealing with such issues?

A major development in Indian agricultural science was the setting up of the Indian Agricultural Research Institute, the Indian Veterinary Research Institute, and the National Dairy Research Institute during the later part of the nineteenth century and the beginning of the twentieth century. Later, the Indian Council of Agricultural Research was established on the recommendations of the Royal Commission on Agriculture headed by Lord Linthgow. The Commission said :

“However efficient the organisation which is built up for demonstration and propaganda be, unless that organisation is based on the solid foundation provided by research, it will be merely a house built on sand”

We now have a fairly impressive infrastructure in respect of agricultural research and education. In addition to ICAR institutions, there are a large number of agricultural, animal sciences, fisheries and horticulture universities. Still poverty and hunger persists at inexcusable levels. It is under these conditions that the M S Swaminathan Research Foundation was born twenty one years ago. I would like to take the work being done under six major interdisciplinary areas to illustrate the kind of reorientation we need in our research and educational strategies.

First, I would like to emphasise the need for **Coastal Systems Research (CSR)**. Globally nearly 97 percent of water is sea water. Unlike farming systems research (FSR) which deals with crop – livestock production systems, the coastal system which needs integrated attention to the landward and seaward sides of the coast is yet to receive similar attention. This is why MSSRF chose CSR as a priority area. India has nearly 7500 kilometers of coastal area in addition to the Andaman and Nicobar and Lakshadweep group of islands. There is hence enormous potential for integrated agri–aqua systems of farming. This will involve the cultivation of halophytes including mangroves and the culture of salt water tolerant fishes. The mangroves and other halophytes also serve as bioshields, performing the role of speed breakers during cyclonic storms and tsunamis. 2010 represents the 80th Anniversary of the Dandi March led by Mahatma Gandhi. The aim of the salt march was to emphasise that sea water is a social resource and should not be taxed by Government. Unfortunately, seawater farming based on coastal agro-forestry and capture and culture fisheries has not yet become widespread. Also in areas like Kuttanad in

Kerala, farmers had developed nearly 150 years ago, techniques for below sea level farming. This knowledge will be very useful in the context of a potential rise in sea level.

Nearly 25 percent of our populations live within fifty kilometers of the shoreline. Global warming is likely to result in a rise in sea level within the next few decades. Therefore, we should launch an Integrated Coastal Zone Management Strategy linking the ecological security of coastal areas and the livelihood security of coastal communities in a mutually reinforcing manner. Such a strategy should include both sea water farming through agri-aqua farms, and below sea level farming based on the Kuttanad experience.

Biodiversity : 2010 is being observed as the International Year of Biodiversity in order to highlight the critical role biodiversity plays in the areas of food, health, livelihood and environmental security. Agrobiodiversity rich areas are also rich in cultural diversity. MSSRF's work in Kolli Hills in Tamil Nadu, Wayanad in Kerala and Koraput in Orissa has shown that tribal families, who observe a strict conservation ethic, also tend to remain poor. **We must break the nexus between the poverty of the people and the prosperity of nature if we are to safeguard biodiversity for future generations.** MSSRF's approach has been to link commercialization and conservation in a mutually reinforcing manner so that there is an economic stake in conservation. On 11 June 2010, delegates from 90 countries, meeting in Busan, Republic of Korea approved the establishment of an Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) on the model of the Inter-governmental Panel on Climate Change (IPCC). **It will be prudent to set up a National Platform on Biodiversity and Ecosystem Services in order to generate synergy among ongoing programmes.**

Biotechnology : Recombinant DNA technology has provided powerful tools for moving genes across sexual barriers and for developing novel genetic combinations. It is important to use this tool for solving present and potential problems arising from unfavourable temperature, rainfall and sea level. Therefore, during the last twenty years, MSSRF scientists have concentrated on identifying genes for salt water and drought tolerance. A US Patent has been granted for the **dehydrin gene** from *Avicennia marina* responsible for salt tolerance in plants. Similarly **Glutathione S Transferase (GST)** gene from *Prosopis juliflora* conferring resistant to drought has also been granted a US Patent. These are very valuable genes and have to be combined with crop varieties having desirable agronomic and culinary characteristics. This has already been done by MSSRF scientists. Another area where recombinant DNA technology can be useful is in biofortification. Iron (Ferritin) rich rice varieties have been developed using genes from *Avicennia marina*. Thus there are uncommon opportunities for developing climate resilient strains of crop plants, farm animals and fishes. Genes like Sub-1 in rice provide opportunities for breeding varieties for flood tolerance. There is need for setting up Gene Banks for a Warming India.

Ecotechnology : Knowledge is a continuum. We cannot place traditional and modern knowledge into two different pigeonholes. Modern knowledge has its roots in ancient wisdom. Ecotechnology helps to blend traditional ecological prudence and techniques with frontier science and technology. Ecotechnology gives concurrent attention to ecology, economics, ethics, equity, energy and employment generation. A method of converting ecotechnology into jobs and income is through **Biovillages**. A biovillage is one where concurrent attention is given to natural resources conservation and enhancement, improvement of small farm productivity and profitability, and generation of non-farm employment. A Rural Systems Research (RSR) methodology helps to improve rural professions – farm and non-farm – in an integrated manner. The aim of the Biovillage is to provide every individual in the village with an opportunity for a productive and healthy life. The National Policy for Farmers placed in Parliament in November 2007 calls for as much emphasis on farmers' income as on production. Such an income orientation to farming can be achieved only through RSR. Unfortunately, Agricultural Universities and research institutions are yet to adopt such an integrated approach to improving agrarian and rural prosperity.

Information, Communication Technology (ICT) : Bridging the urban – rural digital divide helps to bridge economic, skill and gender divides. **Biotechnology, Space technology and ICT are transformational technologies**. We should make every village a knowledge centre in order to take the benefits of modern scientific knowledge and techniques to rural professions. **Mahatma Gandhi urged that there should be a marriage between brain and brawn if Indian agriculture is to progress**. This can be achieved through the effective use of ICT based on location specific needs and language. The Grameen Gyan Abhiyan provides a great opportunity for taking the benefits of ICT to the rural poor based on a last mile and last person connectivity. Synergy between the internet and cell phone, or FM radio and cell phone helps to take the benefits of right information to the right place at the right time. Rural Knowledge Revolution is vital for ending all forms of divides and substituting them with the technological and skill upgradation of rural professions.

Food Security : In recent years there has been a **paradigm shift from a patronage to a rights approach** in relation to information, education, employment and in the case of tribal families, ownership of land. The Government of India has committed to bring food security also under the category of legal right. A sustainable food security system will depend on adequate production, procurement on the basis of a minimum support price preservation in modern silos or other forms of storage, and above all an efficient and corruption free public distribution system. The National Food Security Act provides a great opportunity for stimulating the conservation of natural resources, cultivation using new technologies, consumption of a wide range of grains, and farmer centric marketing. **While Right to Information can be enforced through files, the right to food has to come from the farmer and the field**. The right to food can be maintained only if there is

increase in productivity in perpetuity without ecological harm, i.e. the evergreen revolution, spearheaded by families with small holdings.

Our agriculture is at the cross roads. Farm ecology and economics are getting adverse to sustained productivity. Inadequate public good research further compounds the problem of technology choice and access. We should ensure that the Food Security Act covers a wide range of staples and not just wheat and rice. At the same time, there is need to strengthen the ecological foundations of sustainable agriculture, particularly with reference to land, water, biodiversity and climate.

Way Forward

- To achieve the paradigm shift from assessing progress only in terms of millions of tonnes of grains, to measuring it in terms of the growth in the real income of farm families as envisaged in the National Policy for Farmers presented to Parliament in November 2007, there is need to revamp and refocus agricultural research and education.
- A decentralized food security system involving the setting up of village level grain banks will be very effective
- Coastal System Research (CSR), Rural System Research (RSR) and farmer participatory research and knowledge management are important for increasing the income and employment potential of coastal and rural professions on an environmentally sustainable basis.
- Strategic research involving marker assisted selection or genetic engineering techniques will be necessary for developing farming practices which can minimize the adverse impact of climate change.
- Lab to Land can be facilitated through information and communication technologies based on an appropriate mix of the print media, cable TV, internet, FM Radio and the mobile phone.
- To help rural families to adapt to climate change, 127 Research and Training Centres should be established one in each of the 127 agro-climatic sub zones. These Climate Risk Research and Training Centres should develop computer simulation models of alternative cropping strategies to suit different weather models. Seed Banks should be established at these centres to provide seeds of the alternative crops. Safe grain storage structures should also be established in each of the 127 agro-climatic zones.
- The Climate Risk Research and Training centre should help to train one woman and one man from every local body as **Climate Risk Managers**. They should be well versed with the science and art of managing adverse changes in temperature, precipitation and sea level. Each R&T Centre should operate a satellite connected Village Resource Centre, established with the help of the Indian Space Research Organisation (ISRO).
- Our whole aim should be to maximize the benefits of a good monsoon and minimize the adverse impact of unfavourable weather.

- Gene Banks for a Warming India and climate resilient crop varieties and animal breeds should be developed. **For example, in wheat we will have to change the focus from per crop yield to per-day productivity.** In potato, we should develop True Potato Seed (TPS) technology, in case seed tubers are affected by virus diseases due to vector activity. In rice, we should develop strains containing Sub-1 gene for imparting flood tolerance. **A National Agricultural Research Agenda for meeting the challenge of climate change is an urgent need.**
- The future of our food security system will depend upon the scientific and policy support we extend to our farming community, who constitute one fourth of the global farming community. The green revolution was the result of a small Government programme getting converted into a mass movement led by farm men and women. **Today, our educational and research institutions are more obsessed with bricks rather than with brains.** We must reverse the paradigm and nurture brains which can help to promote knowledge-intensive agriculture.