

## Towards an Ever-Green Revolution

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The term Green Revolution was coined by Dr. William Gadd of USA in 1968, when our farmers brought about a quantum jump in wheat production by taking to semi-dwarf, non-lodging varieties with great enthusiasm and when similar progress appeared feasible in rice. Punjab took the lead because of the scientific and educational backstopping given by the Punjab Agricultural University on the one hand and on the other, by the presence of the essential pre-requisites for progress such as land consolidation and levelling, rural communication, rural electrification and above all, owner cultivation. Shri. C. Subramaniam in his recent memoirs (Vol.II, Green Revolution, published by the Bharatiya Vidya Bhavan, 1995) has chronicled the events and policies which led to the green revolution. His book is a wonderful record of an exciting period in our scientific and social history. Our country is in deep debt to him for spreading at a critical time a climate of confidence in our agricultural destiny.

Twenty seven years after the term "Green Revolution" was coined, we are in a position to draw a balance sheet and chalk out a strategy for the future. Apart from erasing the "begging bowl" image of our country, the most important gain has been the saving of forests and land, thanks to the productivity improvement associated with high yielding varieties. This year, our farmers have harvested over 60 million tonnes of wheat, as compared to 6 million tonnes at the time of our independence in 1947. Punjab farmers have raised the average yield of wheat to over 40 quintals per hectare. Likewise, Tamil Nadu farmers have raised the average yield of rice to over 50 quintals per hectare. If the yield improvement associated with the Green Revolution in wheat and rice had not taken place, we will need another 70 million hectares to produce the wheat and rice we now harvest. Thus, the productivity improvement associated with the Green Revolution is best described as *forest or land saving agriculture*.

Our population is growing. The average Total Fertility Rate of our country in 1992-93 was 3.39. Only Kerala, Tamil Nadu, Goa and Mizoram have so far achieved a demographic transition to low birth and death rates. Besides population increase, improved purchasing power among the poor will enhance the demand for food, since under-nutrition and poverty go together. In contrast, per capita availability of arable land is shrinking. Water use efficiency is still on the whole low and water disputes are growing. In addition to the gradual decline in per capita availability of land and water,

various forms of biotic and abiotic stresses are spreading. There is still a widespread mismatch between production and post-harvest technologies. In perishable commodities like fruits, vegetables, flowers, meat and other animal products, this mismatch is often severe, affecting the interests of both producers and consumers. This is why foreign experts frequently refer to the setting in of a *fatigue of the Green Revolution*. Lester Brown and Hal Kane in their book "Full House" released last year predict that at the current rate of population growth and environmental degradation coupled with an improvement in the consumption capacity of the poor, India will have to import annually over 40 million tonnes of foodgrains by the year 2030. This is four times the quantity we imported in 1966, i.e., before the onset of the Green Revolution. We should examine this issue seriously and should not allow complacency overtake the farm sector, just because we now have over 30 million tonnes of foodgrains available with Government.

Industrial countries are responsible for much of the global environmental problems such as potential changes in temperature, precipitation, sea level and incidence of ultraviolet-B radiation. While further agricultural intensification in industrialised countries will be ecologically disastrous, the failure to achieve agricultural intensification and diversification in our country will be socially disastrous. This is because, agriculture including crop and animal husbandry, forestry and agro-forestry, fisheries and agro-industries provide livelihood to over 70 percent of our population. The smaller the farm, the greater is the need for higher marketable surplus for increasing income. Eleven million new livelihoods will have to be created every year in our country and these have to come largely from the farm and rural industries sectors. Importing food and other agricultural commodities will hence have the same impact as importing unemployment. Thus, what we need now is an environmentally sustainable and socially equitable green revolution or what may be termed an ever-green revolution.

Those who advocate going back to the old methods of farming ignore the fact that just a century ago when the population of undivided India was 281 million, famines claimed 30 million lives between 1870 and 1900. The famine eradication strategy of India comprising the following steps is perhaps the most important achievement of independent India;

- a. enhanced production and productivity
- b. better distribution through the public distribution system
- c. adequate grain reserves,
- d. purchasing power enhancement through various employment generation and guarantee schemes, and

- e. special intervention programmes for children, pregnant and nursing mothers and old and infirm persons.

While famines have been prevented, widespread undernutrition prevails among the economically underprivileged. We should redefine food security as follows :

Food security implies livelihood security at the level of each household and all members within and involves ensuring both physical and economic access to balanced diet., safe drinking water, environmental sanitation, primary education and basic health care.

To give operational content to such a concept of food security, we should initiate a Hunger-Free Area Programme (HFAP) consisting of the following components :

- a. Ensuring sustainable availability of food by maintaining the growth in food production over population growth through the development and dissemination of ecotechnologies, supported by appropriate packages of services and public policies. Ecotechnology involves the blending of the ecological prudence and technologies of the past, with the best in frontier technologies, particularly biotechnology, information technology, space technology, renewable energy technology and management technology, *Without ecotechnological empowerment*, farm men and women will not be able to produce more food and other agricultural commodities on an environmentally sustainable basis from less land, water and energy resources.
- b. Sustain the productivity of the natural resource base, by conserving and improving the ecological foundations essential for continuous advances in crop and animal productivity.
- c. Ensure adequacy of household incomes through *promotional social security*, such as accessing assets, employment and organisational and marketing empowerment. Agricultural programmes should concurrently aim at more food, more jobs and more income. Integrated attention to farm and non-farm employment and value-addition to primary agricultural commodities will be necessary to enhance income and rural livelihood security.

- d. Provide entitlement to food through *protective social security* measures to the vulnerable groups, such as employment guarantee and food for nutrition programmes.
- e. Introduce a *National Food Security Act* with the concurrence of the National Development Council for the purpose of paying integrated attention to:
  - i. conservation of land, water, forests, biodiversity and the protection of the atmosphere.
  - ii. Enhancing productivity through ecotechnologies,
  - iii. Improving distribution in order to eliminate endemic hunger,
  - iv. Maintenance of adequate food security reserves,
  - v. Strengthening the techno-infrastructure for better post-harvest technology and expanding the coverage of sanitary and phytosanitary measures, and
  - vi. Efficient research, education, extension, marketing systems both to take full advantage of emerging opportunities in international trade and to ensure that research and extension designed to promote public good receive adequate support.

1995 marks the beginning of a new era in global agricultural research due to the onset of Trade-related Intellectual Property Rights (TRIPS). How do we promote research for public good under a fast spreading Intellectual Property Rights Environment (IPR)? In order to ensure that our national effort for achieving the ecotechnological empowerment of resource poor farm and rural families does not suffer under an economic environment where profit gets precedence over public good, I suggest that the Government of India may set up a National Trust Fund for Ecotechnology with an initial outlay of at least Rs.1000 crores to foster research designed to promote sustainable public good in the farm sector. At the same time, we must promote meaningful social contracts between the corporate sector and resource poor rural families so that there is value-addition to the time of the poor.

Many of the environmental problems associated with the recent phase of agriculture and coastal aquaculture arise from the excessive and unscientific use of chemical pesticides and mineral fertilisers as well as the abuse of land and groundwater. In my lecture at the Indian Science Congress held in Varanasi in January, 1968, I had warned about potential environmental harm from exploitative agriculture, and I quote, from what I said then :

"Exploitive agriculture offers great possibilities if carried out in a scientific way, but poses great dangers if carried out with only an immediate profit or production motive. The emerging exploitive farming community in India should become aware of this. Intensive cultivation of land without conservation of soil fertility and soil structure would lead, ultimately, to the springing up of deserts. Irrigation without arrangements for drainage would result in soils getting alkaline or saline. Indiscriminate use of pesticides, fungicides and herbicides could cause adverse changes in biological balance as well as lead to an increase in the incidence of cancer and other diseases, through the toxic residues present in the grains or other edible parts. Unscientific tapping of underground water will lead to the rapid exhaustion of this wonderful capital resource. The rapid replacement of numerous locally adapted varieties with one or two high-yielding strains in large contiguous areas would result in the spread of serious diseases capable of wiping out entire crops. Therefore the initiation of exploitive agriculture without a proper understanding of the various consequences of every one of the changes introduced into traditional agriculture, and without first building up a proper scientific and training base to sustain it, may only lead us, in the long run, into an era of agricultural disaster rather than one of agricultural prosperity."

Such an action-reaction analysis led to the intensification of efforts in the areas of varietal diversification, development of integrated pest and nutrient management systems and improved soil health care. Consequently we now have several hundred high yielding varieties in major crop plants and effective methods of pest and soil fertility management. There is every opportunity for pushing ahead with yield improvement without associated ecological harm.

Sustainable green revolution is an ecological and economic necessity in our country of small holdings and 100 million farm families. Therefore it would be better to coin another term to denote the unsustainable use of yield enhancing technologies. I would like to refer to it as the Greed Revolution. What we should strive for in both agriculture and aquaculture is the promotion of sustainable green revolution (i.e. improving production through productivity improvement) and the curbing of the greed revolution. Failure to make a distinction between green and greed revolutions often causes confusion in public mind and will do harm to public good.