



## Second green revolution for sustainable agriculture

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The first green revolution was made possible with the availability of miracle wheat and rice varieties, electricity at the farms and land reforms. In the 70's, India was successful in creating a green revolution which gave a boost to the agriculture sector across the country. Green revolution in India created a huge impact in terms of crop production but it had several negative impacts like gradual loss of soil fertility, increasing alkalinity and salinity, water logging, depletion of ground-water resources, decreasing biodiversity, chemical poisoning of soils, surface water and food. India has failed to extend the concept of high-yield value seeds to all crops or all regions. In terms of crops, it remains largely confined to food grains only, not to all kinds of agricultural produce. In regional terms, only Punjab and Haryana states showed the best

results of the green revolution. But it had several positive impacts which improved the overall quality and life of the farmers in India. We need to create a similar revolution in the near future as we have already started experiencing stagnation in growth in the agricultural sector. Once again, we need to re-orient ourselves to create another green revolution.

While the first green revolution was to ensure food security as there was severe scarcity of food in the country, the second green revolution should aim at creating sustainable livelihood security for the poor and eradication of poverty by generating gainful self-employment. While the first green revolution was aimed at undertaking mass production, the second green revolution should be to promote production by the masses.

Use of all eco-friendly means in cultivation is the second green revolution. The second green revolution in India is a concept as well as the name of programme. It consists of crop management, cost reduction, value addition as well as green farming. In January 2004, the Government of India announced a major agricultural programme named as the second green revolution with an initial fund allocation of Rs. 50,000 crore. It has three broad categories.

### Increasing agricultural production:

– Unlike the green revolution, it involves the all

agricultural products, *viz.*, cereals, cash crops, animal husbandry, fisheries, sericulture etc.

- Involvement of suitable type of cropping pattern, crop diversification, crop management, plant protection, less post harvest loss, soil conservation etc.
- Use of biotechnology in agriculture: Genetically modified (GM) seeds to double the per acreage production.

The second green revolution should focus on generation of employment for the small and marginal farmers and the landless, while enhancing agricultural production. As these families mostly own degraded and low fertile lands, deprived of irrigation, the focus should be on efficient use of such lands. As such lands are



not suitable for intensive cropping of high yielding food and cash crops, priority should be given to dry land horticulture and agro-forestry. Tree crops have the ability to withstand the vagaries of nature without causing heavy losses. Tree farming can also provide year-round employment while protecting the soil from erosion and run-off of rain water.

Promotion of tree farming will also enrich soil fertility and increase the water table. Therefore, such programmes can improve the quality of life and protect the environment.

An equally important sector is livestock, which needs good support. A majority of the small farmers in India, who do not have good land for agriculture, depend on livestock for supplementary income. Therefore, livestock is well distributed among various sections of the community unlike land holdings. Therefore, promotion of mixed farming with various species of livestock can generate employment for small farmers throughout the year. Fortunately, in India we have the largest population of livestock in the world and the demand for livestock produce is increasing steeply. This will provide greater opportunity to small farmers to expand their dairy husbandry programme. Livestock being the major source of organic manure, animal husbandry should be an integral part of agriculture. With the introduction of modern

efficient agricultural implements, preferably operated by a single animal, the bullock power can become an ideal farm power for small farmers.

**Value addition:** In Indian agriculture sector, right from farmers to traders there has been tendency of disposing agricultural goods in its primary form. There will be an increased emphasis upon agro-processing, beverages and drink industries.

**Strengthening the infrastructural assets:**

*Storage facilities, transport connectivity, marketing network:* Private sector to develop and market the usage of GM foods *i.e.* efficient marketing of the ideas.

*Irrigation facilities:* Promotion of water shed technology, Linking of rivers as much as economically possible to bring surplus water of one area to others *i.e.* linking of the rivers.

Water is a crucial input required to enhance agricultural production. As most of the small farmers are living in arid and semi arid regions and deprived of irrigation facilities, promotion of watershed development schemes and sustainable use of all the available water resources should be ensured to improve the crop yields. Fortunately, adequate financial support is available from various sources to accelerate this programme. In the absence of adequate water conservation measures, water scarcity is likely to be a serious bottleneck in the future. Water crisis can be a serious problem with the anticipated global warming and climate change. With increasing exploitation of natural resources and environmental pollution, the atmospheric temperature is expected to rise

by 3-50C in the next 75-100 years. If it happens, most of the rivers originating from the Himalayas may dry up and cause severe shortage of water for irrigation, suppressing agricultural production by 40-50 per cent. Rainfall is expected to be erratic and the water requirement for crops is likely to increase due to a significant increase in evaporation and transpiration losses. Therefore, greater awareness needs to be created to make efficient use of water resources and to prevent global warming through environmental protection as an integral part of green revolution.

Following are some of the technologies useful while developing degraded lands and improving agricultural

production in the country.

**Water quality, conservation and utilization:**

- Ground water survey, water current and storages.
- Soil water content and techniques for easy measurement in the field.
- Water requirements of crops to determine irrigation schedule
- Measuring salt and mineral contents in water and soils
- Technology for improving the quality of irrigation water
- Efficient harvesting and storage of rain water
- Reducing loss of water by evaporation in reservoirs and tanks
- Reducing ground water pollution
- Cost effective filtration of water for drinking
- Development of alternate and renewable sources of energy for rural uses
- Technologies for low water consumption by crops and trees



**Soil quality improvement :**

- Technology for chelating / precipitating harmful salts and minerals in soil.
- Eco-friendly techniques for faster decomposition of stones and rocks.
- Technology for cracking / breaking sub-surface hard / clay pans.
- Improvement in soil texture enhance soil productivity and water holding capacity

**Nutrition management:**

- Identification of microbes for accelerating bio-composting, facilitating efficient uptake, fixation and production of nutrients
- Acceleration and production of plant growth hormones, growth promoters, flower inducers, fruit setters, fruit ripeners

**Crop protection:**

- Genetic manipulation for improving crop yields and quality
- Bio-fungicide, bio-pesticides, disinfectants,
- Eco-friendly techniques for sterilisation, control of pests and diseases
- Techniques for drying and storage of seeds and food grains
- Foodgrain storage using techniques like low humidity, oxygen free chambers
- Techniques for long shelf life of fruits, vegetables and

other food products

**Post- harvest management:**

- Safe techniques (chemical free) of food preservation
- Low cost dehydration of fruits and vegetables
- Protection of natural colours and flavours in processed food
- Quick field tests to assess the pollutant levels in food products
- Technology for killing pathogens present in fresh and processed food

**Livestock industry:**

- Genetic improvement for enhancing production and quality
- Sexing of semen and embryos
- Diagnostic kit detecting heat, pregnancy and diseases
- Induction of disease resistance
- Development of low cost, thermo-resistant vaccines
- New technologies for increasing hygiene and sanitation
- Preventing aflotoxins in cattle food and methods for treating such feeds
- Low cost animal health care using nuclear and light therapies
- Improving the digestibility of inferior quality feed and fodder
- Development of protein rich animal feeds through microbial digestion of wastes
- Production of spirulina, single cell protein, *Azolla*, etc. for feeding livestock
- Diagnosis of infertility problems and development of hormonal treatments
- Techniques for clean milk production
- Low cost cooling and processing of milk, meat and other food products
- Value addition for milk, meat and other products

- Efficient production of biogas from dung and animal wastes
- Management and recycling of animal wastes and dead animals
- Reduction in release of methane and carbon dioxide.

**Summing up the second green revolution:** Just like the green revolution, too address the climate change effects especially on the agriculture, there is a need for a second green revolution which could potentially address the negative impacts of the climate change may be through some of the kinds of farming like:

*Organic agriculture:* cultivation without any use of chemical inputs like mineral fertilizers and chemical pesticides.

*Green agriculture:* cultivation with the help of integrated pest management, integrated nutrient supply and integrated natural resource management systems.

*Eco-agriculture:* Based on conservation of soil, water and biodiversity and the application of traditional knowledge and ecological prudence.

*EM agriculture:* system of farming using effective micro-organisms (EM).

*White agriculture:* system of agriculture based on substantial use of micro-organisms, particularly fungi.

*One-straw Revolution:* system of natural farming without ploughing, chemical fertilizers, weeding and chemical pesticides and herbicides.

The second green revolution of boosting food grain output in India to 400 million tonnes in next 15 years is need of the day. Its achieving is not very difficult. Rather it is achievable if mind set on introducing newer technology is changed. India has to whole-heartedly, embrace the new technology.

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