

GREEN REVOLUTION OR THIRD AGRICULTURAL REVOLUTION: POSITIVE AND NEGATIVE IMPACTS ON AGRICULTURE

Article Id: AL202135

Mousumi Malo

Assistant Director of Agriculture, Model Farm, Jayrambati, Bankura, West Bengal, India

Email: moubckv15@gmail.com

The Green revolution is defined as the transfer of modern research technologies occurring between the year 1950 and late 1960s, which enhanced agricultural production markedly throughout the entire world, more specifically in the late 1960s. It emphasized the cultivation of high yielding varieties of particularly wheat and rice, to increase food production, especially in India. The new seed varieties or ‘miracle’ seeds of wheat were developed in Mexico and of rice in the Philippines, but the dwarf wheat varieties provided the bigger growth in yield per hectare. The ‘Green Revolution’ term was first used by William S. Gaud who was the administrator of the U.S. Agency for International Development or USAID in 1968, for introducing new technologies and policies implemented in the developing nations with assistance from the industrialized nations between the 1940s and 1960s to increase production and productivity of food crops (Conway, 1997 and Dalrymple, 1979). During this revolutionary period, the productivity of agriculture throughout the globe was accelerated gigantically due to application of new technical advances. Norman Borlaug was considered as the ‘Father of the Green Revolution’ and received Nobel Peace Prize in the year 1970 because he successfully helped in saving more than billion people from acute starvation through the implementation of basic approaches like the development of HYVs of cereals mainly, expansion of efficient irrigation infrastructures, administration of modern management methodologies, the wide distribution of hybrid seeds, use of synthetic or chemical fertilizers, herbicides as well as pesticides to the cultivators.

History and overview of the Green Revolution

Green Revolution refers to the renovation of farming methodologies which were started in Mexico in the 1940s. Due to its success stories in producing more agricultural commodities in Mexico, the technologies had spread throughout the world in the 1950s and 1960s, remarkably improving the calories produced per acre of cultivated area. The Green

Revolution is more frequently attributed to Norman Borlaug, an American scientist who had received a Nobel Prize in the year 1970 for his pioneering work on the wheat crop with the objective was to enhance crop productivity by means of technical progress deprived of any type of meaningful economic or social reforms of the agrarian sector. Norman Borlaug developed new disease tolerant HYVs of wheat by conducting research in Mexico in the 1940s. Through the combination of these modern and improved wheat varieties along with the mechanization of agriculture, the country soon turned into a huge exporter of wheat by the year of 1960s because of higher wheat production than the requirement of its citizens. In order to use the newest technologies continue to produce more food for a growing population throughout the globe, the Rockefeller Foundation and the Ford Foundation, as well as many government agencies funded research possibilities. Afterwards, Mexico constituted an international research institution, namely ‘The International Maize and Wheat Improvement Center’ in 1963. Majority of the countries were benefited from the works carried out by Borlaug and CIMMYT. This revolution also helped India positively as our country was in the extremity of severe famine in the early 1960s due to the huge explosion in population pressure. Borlaug along with the Ford Foundation, implemented research in our country and developed a new variety of rice, namely IR 8, which produced more grain per plant cultivated with irrigation and synthetic fertilizers. In recent times, India is one of the world’s leading rice producers, and the cultivation of IR 8 rice spread throughout Asia in the decades following the rice development in India. The research and development of new HYVs of wheat were carried out at Centro Internacional de Mejoramiento de Maiz y Trigo or the International Center for the Improvement of Maize and Wheat (CIMMYT) in Mexico, and the research of HYVs of rice was carried out at the International Rice Research Institute (IRRI) in the Philippines. Both these centres were members of the Consultative Group for International Agricultural Research (CGIAR), a network of 15 research centres across the world, each with its own major research responsibilities and priorities in the field of agricultural growth and development.

Effects/negative impacts/issues of Green Revolution

Although the Green Revolution had several benefits, it had a gloomy side too that affected both the environment and society. Some of the negative effects of the Green Revolution are stated below:

- a) The excessive utilization or application of fertilizers, herbicides and pesticides adversely hampered the environmental equilibrium due to increased pollution.
- b) The new toxic materials added to the soil and plants polluted the soil and water around the fields.
- c) The soil pollution led to declined or impaired soil health and quality that accelerated the hazard of topsoil erosion by the action of wind or water.
- d) Indiscriminate killing of useful insects, microorganisms and predators that naturally check excess crop damage by insect pests
- e) Considerable loss of biodiversity occurred.
- f) The cultivation of a small number of crop cultivars with an aim to produce higher yield levels declined genetic diversity among different species.
- g) High yielding varieties can increase irrigation requirements thus placing stresses on India's water budget leading to lowering of the water table or creating water shortages or depleting the groundwater reserves
- h) Increased salinization
- i) Reduction in natural soil fertility; soil degradation or contamination; destruction of soil structure; impaired aeration and reduced water holding capacity of soil
- j) Susceptibility of soil to water and wind erosion as well as silting of reservoirs
- k) Greater vulnerability to pests and breeding of more virulent and resistant species of pests
- l) Development of resistance to one species of pest due to **genetic modification** might invite other species of pests to attack the crop; for example, bollworm being replaced by other pest species in case of Bt cotton
- m) Reduced availability of nutritious food crops for the local population
- n) Diminishing return on inputs
- o) Rural impoverishment
- p) Displacement of small and marginal farmers and increased social conflict due to the focus on large farms and wealthy farmers who could acclimatize with the more resource-intensive agricultural methods introduced in the early period of the green revolution in India
- q) Increased use of pesticides is leaving residuals in the environment
- r) Retardation of agricultural growth due to inadequate irrigation coverage, shrinking farm size, failure to evolve modern technologies, inadequate use of technology, declining plan outlay, unbalanced use of inputs, and weaknesses in credit delivery system

- s) The benefits of the green revolution remained concentrated in the areas only where the new technology was used.
- t) Its benefits were mostly accrued only to wheat-growing regions.
- u) Increased rural inequalities and evolution of regional inequalities due to regional dispersal in terms of socio-economic disparities and landholding concentration
- v) Interpersonal inequalities between large and small scale farmers were observed as the new technologies demanded substantial investments which were beyond the capability of a majority of small farmers but farmers having large farmlands continued to make greater absolute benefits in terms of monetary income through reinvestment of their earnings in the fields of farm and non-farm assets, purchasing land from small peasants, etc.
- w) Endangering the health of the farmers and workers who produce them; poisoning the food with highly toxic pesticide residues; chemical changing the natural taste of the food and increasing the farmers' work burden and tension
- x) Increased agricultural expenses due to high inputs costs, depletion of the fossil fuel resources, increased irrigation needs of the land for cultivation of HYVs
- y) Lowering of the drought tolerance of crops and the appearance of problematic weeds

Advantages or benefits of the Green Revolution

The benefits of Green Revolution are described below:

- a) Firstly, larger quantities of food could be produced due to the introduction of chemical fertilizers, synthetic herbicides and pesticides, HYVs as well as hybrids, and multiple cropping.
- b) Productivity enhancement was very much successful in feeding the burgeoning population.
- c) A strain of short stature wheat was developed in Mexico by Norman Borlaug in 1940s which imparted tolerance against pests and diseases, the abrasive action of wind and would produce larger seed heads and higher productivity.
- d) Within a span of only twenty years, wheat production was tripled.
- e) Mexico became self-sufficient and started to export their wheat and sell it in other countries.
- f) Norman Borlaug developed the HYVs of rice and wheat particularly and won a Nobel Peace Prize for preventing hunger, malnutrition or starvation in many developing countries.

- g) On the other hand, it became possible to grow more crops on roughly the same amount of land with a similar amount of effort resulting in reduced production costs and cheaper prices for food in the market.
- h) The capability of achieving higher production level on a similar amount of land was advantageous to the environment because less forest or natural land was needed to be converted to farmland to produce more food.
- i) The natural land that is currently not needed for agricultural land is safe for animals and plants for their natural habitat.

Characteristics features of the Green Revolution

Followings are treated as a ‘package of practices’ to supersede ‘traditional’ technology and to be adopted as a whole.

- a) Adoption of new technologies
- b) Cultivation of high yielding varieties (HYVs) of cereal crops, especially dwarf rice and wheat
- c) Excessive utilization of chemical fertilizers, synthetic herbicides, pesticides and other agrochemicals
- d) Chemical fertilizers made it possible to supply crops with extra nutrients thereby increasing yield level
- e) The synthetic herbicides and pesticides managed harmful weeds, deterred or killed insect pests and prevented diseases ultimately leading to higher productivity
- f) Controlled water supply usually involving improved irrigation systems
- g) Promotion of agricultural mechanization
- h) Implementation of multiple cropping
- i) Double cropping in the existing farmland
- j) The continuing expansion of farming areas
- k) Commercial crops and cash crops such as cotton, jute, oilseeds, etc. were not a part of the plan
- l) The first wave of Green revolution in India mainly emphasized food grains such as wheat and rice which helped the country to attain self-sufficiency level in production by the year 1970 and it was mainly restricted to the HYVs of wheat in certain north Indian states like Punjab.

- m) The second wave in our country emerged with significant agricultural growth in 1980, which included not only different regions across India beyond northern states but also involved many other crops, including rice and wheat.
- n) It possessed the capacity to enhance income sources remarkably in some regions in rural India, though many other areas remained considerably poor.

Green Revolution in Indian context

Green revolution in the Indian context is referred to a period when agriculture was transformed or converted into an industrial system owing to the wide adoption of modern methods and technologies such as high yielding varieties, tractors and other machineries, irrigation facilities, pesticides, and fertilizers. The concept was mainly found by M. S. Swaminathan, ‘Father of the Green revolution in India’ and this initiative was an important part of the Green revolution carried out by Norman Borlaug, through research and technologies to enhance agricultural productivity in the developing countries. Under the leadership of Lal Bahadur Shastri, Green Revolution in our country was commenced in the year 1965 with the development of high yielding and rust disease tolerant varieties of wheat that ultimately led to enhanced food grain production especially in Punjab, Haryana, as well as Uttar Pradesh. Nevertheless, this revolution was proved to be a useful measure and was a pioneer in helping the government to independently produce essential crops in India without relying on foreign exports.

Conclusion

Green revolution protected our nation in another way whose policies were often misused by the foreign nations for blackmailing our country with the aim of serving their own political purposes and are dominated by those nations. The successful progress of these revolutionary changes transformed the status of the country from a food deficient economy to one of the world’s leading agricultural nations which started in 1967 and lasted till 1978. India reached its road to self-sufficiency in terms of production to fulfil the requirements of escalating population pressure, stock for emergencies and was less dependent on imports from foreign countries; besides started export of different agricultural produces. The anxiety among people inhabiting in India about commercial farming that it would certainly result in severe unemployment and leave a majority of labour force jobless was prohibited by Green Revolution; instead, the outcome was completely different, and it was observed that there

was an enhancement in rural employment opportunities due to the tertiary industries such as transportation, irrigation, food processing, marketing, etc. Farmers were highly benefitted as they not only survived but also prospered during the revolution period, and their income saw a significant rise which enabled them to shift from sustenance or subsistence farming to commercial farming.

References

Conway, G. (1997). *The doubly green revolution: food for all in the 21st century*. London: Penguin Books.

Dalrymple, D. G. (1979). The adoption of high yielding varieties in developing countries. *Agric Hist.*, 53, 704–726.