



Green Revolution and Beyond

This editorial is based on the Article [Man of Science & Humanity](#) which was published in The Indian Express on 29/09/2023. It talks about MS Swaminathan, the father of the Green Revolution in India, and his contributions towards transforming Indian Agriculture.

For Prelims: [Green Revolution](#), [P.L.480 scheme](#), Green revolution 2.0, [Genetically modified \(GM\) crops](#), [Millets](#)

For Mains: Green revolution: Objectives, Features, Impacts, Challenges and Solution (Green Revolution 2.0)

M S Swaminathan is no more. But his legacy remains with every student and scientist of agriculture. He is most widely known for working with Norman Borlaug to usher in the [Green Revolution](#) in India in the mid-1960s when India was facing back-to-back droughts. Millions would have died of starvation if the country had not experienced the Green Revolution. **India was already termed as a “ship to mouth” economy**, as the country was importing 10 million tonnes from the US under [P.L.480 scheme](#). And India had no foreign exchange to pay for it. The situation was so grave that the then Prime Minister [Lal Bahadur Shastri](#) had given a call to the nation to “skip a meal in a week”, and wheat products, including wheat chapatis, would not be served at wedding parties.

Why did India need the Green Revolution?

- India was facing a **severe food crisis in the 1960s** due to rapid population growth, low agricultural productivity, frequent droughts, and dependence on food imports.
- India was **vulnerable to external pressures and political interference** from the food exporting countries, especially the United States, which used food aid as a tool of diplomacy and leverage.
- India wanted to **achieve self-reliance and food security** for its people, and reduce poverty and malnutrition.
- India wanted to **modernize its agriculture and make it more efficient**, profitable, and competitive in the global market.

What was the Green Revolution?

- **The Revolution:**
 - The Green Revolution was a major initiative that aimed to increase the production and quality of food crops, especially wheat and rice, in India, by introducing new technologies, such as high-yielding varieties of seeds, fertilizers, pesticides, irrigation, and mechanization.
- **Objectives:**
 - To **achieve self-reliance and food security** for the population and reduce dependence

on food imports.

- To **improve the income and living standards** of millions of farmers and rural people, and reduce poverty and hunger
- To **modernize the agriculture sector** and make it more efficient, profitable, and competitive in the global market.

▪ **Key features:**

- **Using High-Yield Variety (HYV) seeds to increase food production.** These seeds were developed by agricultural scientists like M. S. Swaminathan, who is widely regarded as the Father of the Green Revolution in India.
- **Incorporating various irrigation methods, such as tube wells,** canals, dams, and sprinklers, to reduce the dependence on rainfall and ensure regular water supply for the crops.
- **Mechanization of major agricultural practices,** such as ploughing, sowing, harvesting, and threshing, using tractors, harvesters, and drills, to reduce labor costs and increase efficiency.
- **Use of chemical fertilizers and pesticides to enhance soil fertility** and protect the crops from pests and diseases.
- **Double cropping in the existing farmland,** which means growing two crops in the same field in one year, to increase the cropping intensity and yield.
- **Expansion of the farming area, by bringing more land under cultivation,** especially in the semi-arid and arid regions, using irrigation and HYV seeds.

What were the Impacts of the Green Revolution?

- **Increased Food Production:** The Green Revolution led to a significant increase in agricultural productivity. New high-yielding crop varieties, such as **dwarf wheat** and rice, produced higher yields per hectare of land, helping to meet the growing global demand for food.
 - For example, in 1978-1979, a tremendous increase in crop production led to a grain output of 131 million tonnes, making India one of the largest agricultural producers in the world.
- **Reduced food-grain imports:** India is a net exporter of wheat, rice and other food grains such as rye, **maize, sorghum, buckwheat, bajra, ragi** and their import is negligible.
 - In 2020-21, India exported **18.5 million tonnes** of rice, which was the highest ever in a year. India also exported **2.1 million tonnes** of wheat in 2020-21, which was the highest in six years.
- **Poverty Alleviation:** Higher agricultural productivity often translates into higher incomes for farmers. The Green Revolution helped lift many small-scale farmers out of poverty by increasing their crop yields and income levels.
 - For example, the poverty ratio in rural India declined from 50.1% in 1993-94 to 25.7% in 2011-12, partly due to the impact of the Green Revolution.
- **Technological Advancements:** The Green Revolution introduced farmers to new agricultural technologies, including improved seeds, fertilizers, and pesticides. These technological advancements continue to benefit agriculture today, contributing to sustainable practices and greater efficiency.
 - For instance, the use of improved seeds has increased the genetic diversity of crops, making them more resilient to pests, diseases, and climate change.
 - The use of mechanized farm tools, such as tractors, harvesters, and irrigation systems, has reduced labor costs and increased farm productivity.
- **Rural Development:** Increased agricultural productivity can stimulate rural development. **As farmers earn more income, they can invest in their communities, leading to improved infrastructure, education, and healthcare in rural areas.**
 - For example, in India, the Green Revolution led to the expansion of rural roads, electrification, irrigation, and communication networks, which improved the accessibility and connectivity of rural areas.
- **Reduction in Land Conversion:** By increasing crop yields, the Green Revolution helped reduce the need to convert forests and other natural habitats into agricultural land. This has had positive environmental impacts by preserving biodiversity and reducing deforestation.
- **Economic Growth:** The increased agricultural productivity resulting from the Green Revolution has been linked to overall economic growth in many countries. Agriculture is a key driver of economic development in many regions, and higher yields can boost the overall economy.

What are the Challenges brought by the Green Revolution?

- **It caused environmental degradation** due to the use of synthetic fertilizers and pesticides, and soil erosion and water pollution. For example, the reliance on modern agricultural technologies has made some countries and communities dependent on external inputs, which can be expensive and subject to market fluctuations.
- **It led to the loss of biodiversity and genetic diversity of crops**, as well as the displacement of indigenous crops and traditional farming practices. For example, the production of wheat and rice doubled after the Green Revolution, while that of other food crops, such as indigenous rice types and [millets](#), decreased.
- **It created social and economic inequalities** and conflicts among farmers, regions, and countries. For example, the Green Revolution has been linked to farmer suicides, rural indebtedness, and droughts in India.
- **It increased the vulnerability of crops** to pests, diseases, and climate change. For example, the monoculture of rice and wheat made them more susceptible to outbreaks of pests and diseases, such as the brown plant hopper and the wheat rust.

Is Green Revolution 2.0 a Solution to the Green Revolution?

- **Green Revolution 2.0 is seen as a way to make agriculture more adaptive and resilient** to the changing climate and socio-economic conditions, and to ensure food and nutrition security for the present and future generations.
- Some of the features of Green Revolution 2.0 are:
 - **Biotechnology and Genetic Engineering:** Green Revolution 2.0 places a strong emphasis on biotechnology and genetic engineering to develop crops that are more resilient to climate change, pests, and diseases. [Genetically modified \(GM\) crops](#), if adopted responsibly, can contribute to increased productivity and reduced environmental impact.
 - **Precision Agriculture:** This approach involves the **use of advanced technologies like GPS-guided tractors and drones to optimize the use of resources such as water, fertilizers, and pesticides**. Precision agriculture can increase efficiency and reduce the environmental footprint of farming.
 - **Sustainability:** Green Revolution 2.0 prioritizes **sustainability by promoting practices that conserve soil health, reduce chemical inputs, and minimize the environmental impact of agriculture**. This includes organic farming, agroecology, and integrated pest management.
 - **Diversification:** Unlike the first Green Revolution, which primarily focused on a few staple crops like wheat and rice, **Green Revolution 2.0 promotes crop diversification. Encouraging the cultivation of a wider variety of crops** can enhance nutrition, reduce risks associated with mono-cropping, and preserve biodiversity.
 - **Holistic Approach:** Green Revolution 2.0 takes a holistic view of agriculture, recognizing that **it's not just about crop production but also includes aspects like soil health, food processing, marketing, and value addition**. Integrated approaches address the entire food supply chain.
 - **Environmental Considerations:** Efforts are made to mitigate the negative environmental impacts associated with modern agriculture, such as soil erosion, water pollution, and greenhouse gas emissions. Sustainable practices aim to minimize these effects.
 - **Adaptation to Climate Change:** As climate change poses new challenges to agriculture, Green Revolution 2.0 seeks to develop climate-resilient crop varieties and practices that can adapt to changing weather patterns and extremes.

Drishti Mains Question:

How does Green Revolution 2.0 aim to address contemporary challenges and ensure food security while mitigating environmental impacts?

UPSC Civil Services Examination Previous Year Question (PYQ)

Mains

Q. How was India benefited from the contributions of Sir M. Visvesvaraya and Dr. M.S. Swaminathan in the fields of water engineering and agricultural science respectively? **(2019)**

Q. Explain various types of revolutions, took place in Agriculture after Independence in India. How these revolutions have helped in poverty alleviation and food security in India? **(2017)**

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