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JOURNEY OF GREEN REVOLUTION IN INDIA WITH FOCUS ON PUNJAB

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ABSTRACT

The Green Revolution marked a transformation in Indian agriculture particularly in Punjab. It is main state to the production of wheat (Triticum aestivum L.) and rice (Oryza sativa L.). This review examines the historical context and consequences of the Green Revolution, emphasizing the dramatic improvements in crop yields and national food security. Beginning in the 1960s, the introduction of high-yielding crop varieties, chemical fertilizers, irrigation systems shifted India from food scarcity to self-sufficiency. While the Green Revolution is widely credited with averting famine and reducing poverty, it also showed some negative effect. This paper analyses both the achievements and limitations of this agricultural transformation, offering a comprehensive perspective on one of the most significant agrarian movements in modern India.

Keywords: Green Revolution, Punjab Agriculture, Wheat, Rice, Food Security, High-Yielding Varieties

1. INTRODUCTION

India holds the second-largest agricultural land in the world and has historically relied on agriculture as a key sector for employment, food security, and economic stability. Punjab a northwestern state of India is a strategically important region of the country relative to production and productivity of two major food grain crops wheat (Triticum aestivum L.) and rice (Oryza sativa L.). Prior to the Green Revolution, Punjab's agriculture was largely subsistence-based, with low yields, subsistence farming, and minimal mechanization. Since the Green revolution increase the production of wheat and rice in Punjab which helped India to meet the frequent food shortage of the 1960s (Singh et al 2016). The introduction of high yield variety seeds, fertilizers, and irrigation transformed it into India's breadbasket but at the cost of oil degradation, groundwater depletion. India is self-sufficient in food production, its food production between 1947 and 1960 was so bad that there were risks for the occurrence of famine. Therefore, the Green Revolution was initiated in the 1960s in order to increase food production, alleviate extreme poverty and malnourishment in the country, and to feed millions (Nelson et al 2016). The Green Revolution led to a dramatic increase in agricultural production in India and the state Punjab has been a star performer. It was the first state to widely adopt the modern high-yielding varieties of wheat and rice, (Murgai 2001) Punjab, with its suitable climate, soil and pre-existing canal irrigation network in the colonial period, along with a size able population of large landholders, was considered to be a part of this new form of agricultural transformation. and Punjab has been the most widely cited Indian success story of the Green Revolution (Dutta 2012).

This paper critically examines the trajectory of the Green Revolution in India, with a special focus on Punjab. It explores the historical drivers, production outcomes, while also addressing the limitations and criticism of this profound transformation.

2. HISTORICAL BACKGROUND

The word "Green Revolution" was coined by William S. Gaud of United States Agency for International Development (USAID) in 1968, for the introduction of new technology and policies implemented in the developing nations with aids from industrialized nations between the 1940s and the 1960s to increase the production and yield of food crops (Nelson et al 2019).

In the particularly developing world and in India Green revolution beginning most distinctly in late 1960s. The country was grappling with food shortages and the looming threat of famine. To address these challenges and increase the production of food grain Ford Foundation and Indian government collaborated to import wheat seed from the International Maize and Wheat Improvement Centre (CIMMYT).One of the key figures in this process was Dr. Norman Borlaug, whose work in breeding semi-dwarf wheat varieties played a foundational role in the revolution. He was invited to India in 1961 by C. Subramaniam, then India's Minister of Agriculture, to help combat the nation's food crisis. Punjab was selected by the Indian government to be the first site to try the new crops because of its reliable water supply and a history of agricultural success (Kumar 2017).

The Green Revolution in wheat refers specifically to the development and diffusion of semidwarf wheat varieties in the developing world which began in South Asia during the 1960s. These semidwarf varieties contain the Rhtl or Rht2 genes, two of numerous dwarfing genes in the wheat gene pool. They were initially introduced into Japanese breeders' materials. A cross descended from Daruma, Norin IO, was introduced into a US breeding program at Washington State University in 1949. and the dwarf characteristic from Norin 10 was successfully incorporated in the Green Revolution wheats by N. Borlaug in Mexico. The semidwarf wheats currently developed by the International Maize and Wheat Improvement Canter (CIMMYT) and released in the early phases of the Green Revolution (Smale 1997).As a result, wheat yields soared from an average of 800–1,000 kg/hectare before the Green Revolution to over 4,000–5,000 kg/hectare as shown in table 1. Similarly, rice yields increased from 600–800 kg/hectare to over 3,500–4,500 kg/hectare.

Table 1 Agriculture indicator pre green revolution and post green revolution

Indicator	Pre- green revolution (Before 1965s)	Post green revolution (After 1970s)
Wheat yield (Kg/hectare)	800-1000	4000-5000
Rice Yield (Kg/hectare)	600-800	3500-4500
Irrigated Area %	30-35	95-99
Fertilizer use (kg/hectare)	< 5 kg	200kg+

Sources: Government of Punjab reports, FAO data

3. POSITIVE IMPACT OF GREEN REVOLUTION

Green revolution was highly successful as agricultural production increased in most of countries. India which was dependant on import of food grains for satisfying need of its population gradually become exporter of food grains.

3.1. INCREASED FOOD PRODUCTION

The world population has grown by about four billion since the beginning of the Green Revolution and many believe that, without the Revolution, there would have been greater famine and malnutrition. India saw annual wheat production rose from 10 million tons in the 1960s to 73 million in 2006. Between 1950 and 1984, as the Green Revolution transformed agriculture around the globe, world grain production increased (Ameen and Raza 2017).

India adopted IR8 – a semi-dwarf rice variety developed by the International Rice Research Institute (IRRI) that could produce more grains of rice per plant when grown with certain fertilizers and irrigation. In 1968, Indian agronomist S.K. De Datta published his findings that IR8 rice yielded about 5 tons per hectare with no fertilizer, and

almost 10 tons per hectare under optimal conditions (Kumar 2017). India became one of the world's most successful rice producers, and is now a major rice exporter, shipping nearly 4.5 million tons in 2006.The production of Rice, Wheat and other cereals increased with high yield varieties of green revolution shown in table. During the 1960s and 1970s India, received world attention for their agricultural progress (Borlaug 1997).

Table 2 year wise production of cereal crops in India

Year	Milled Rice (million tonnes)	Wheat (million tonnes)	All Cereals (million tonnes)
1961	46	11	70
1970	54	20	93
1999	112	71	186

Source: FAO AGROSTAT, April 2000

3.2. CHEMICALS FERTILIZERS AND PESTICIDES

The success of the Green Revolution dependent not only on genetic innovation but also on the extensive use of modern inputs. The new high yielding varieties required consistent irrigation, chemical fertilizers, and pesticide application to achieve their potential.High yielding Wheat and Rice varieties were introduced earlier during 1960s and 1970s but India's accomplishment of self-sufficiency in cereals achieved in 1975. It could not have been maintained without use of heavy investment of fertilizers (Borlaug 1997). The new seeds accompanied by chemicals fertilizer, pesticides and for the most part irrigation had replaced the traditional farming practices (Rosset et al 2000). In India, average level of fertilizer application in grain production raise from approximately 15 kg/ha to over 75 kg/ha between 1975 and 1990 (Fitzgerald et al 1996).The proportion of irrigated agricultural land in Punjab rose from approximately 30–35% to over 95%, supported by canal systems and the construction of tube wells.

4. LIMITATIONS AND CRITICISMS

The Green revolution contributed to wide spread poverty reduction, prevent hunger for millions of people, and avoided the conversion of thousands of hectares of land into agricultural cultivation. At the same time, the green revolution also induces some negative consequences, often not because of the technology itself but rather, because of the policies that were used for rapid intensification of agricultural systems and increase food supplies (Pingali 2012) According to Pimentel (1996) the Green Revolution's reliance on chemical inputs, particularly pesticides and fertilizers. While acknowledging the dramatic increase in crop yields during the Green Revolution, especially in developing countries, there is range of negative side effects associated with the intensive use of agricultural chemicals. These include public health issues such as poisoning and chronic illnesses due to pesticide exposure, particularly in developing nations. Environmental damage including pesticide resistance, destruction of beneficial organisms, groundwater contamination, loss of biodiversity, and ecosystem disruption. Economic impacts, such as crop loss, damage to livestock and fisheries, and increased costs due to pest resistance and pollution. Fertilizer-related issues like nitrate contamination of water and eutrophication.

The Green Revolution has been criticized on several ways, mostly by environmental and critics of globalization. These criticisms can be in different categories like Decline in agricultural quality and Concerns about the social implications of the Green Revolution and Broad concerns about the sustainability of Green Revolution and agricultural practices (Ameen and Raza 2017).

5. CONCLUSION

The Green Revolution in India, particularly in Punjab, played a transformative role in the country's transition from a food-deficient to a food-secure nation. It showed the potential of scientific innovation in addressing large-scale challenges such as hunger and poverty. The adoption of high-yielding varieties, coupled with fertilizers, irrigation, and modern farming practices, significantly boosted the productivity of wheat and rice. However, this success came with unintended consequences environmental degradation, overuse of chemicals, water resource depletion, and reduced crop

diversity. The Green Revolution stands as both a triumph of human ingenuity and a cautionary tale of unbalanced agricultural intensification. As India moves forward, it is crucial to integrate sustainable practices and equitable policies to ensure long-term food security without compromising ecological integrity.

CONFLICT OF INTERESTS

None.

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REFERENCES

Ameen, A., and Raza, S. (2017). Green revolution: A review. International Journal of Advances in Scientific Research, 3(12), 129–137.

Borlaug, N. E. (1997). Fertilizers and the green revolution: past contributions and future challenges. Fertilizer Society of South Africa Journal, 11-26.

Dutta s (2012). Green Revolution Revisited: The Contemporary Agrarian Situation in Punjab, IndiaSocial Change, 42(2): 229–247

Eliazer Nelson A R L, Ravichandran K, Antony U (2019) The impact of the Green Revolution on indigenous crops of India. Journal of Ethnic Foods, 6(8).

Fitzgerald-Moore, P., & Parai, B. J. (1996). The green revolution. University of Calgary, 1-17.

Kumar, P. (2017). Green Revolution and its after effect on biodiversity. International Journal of Research in Humanities and Social Sciences, 5(3), 54–57.

Murgai R (2001). The Green Revolution and the productivity paradox: evidence from the Indian Punjab. Agricultural Economics 25 :199-209

Pimentel D. (1996). Green revolution agriculture and chemical hazards. The Science of the Total Environment, 188(Suppl. 1), S86–S98.

Pingali, P. L. (2012). Green Revolution: Impacts, limits, and the path ahead. Proceedings of the National Academy of Sciences, 109(31), 12302–12308.

Rosset, P., Collins, J., & Lappé, F. M. (2000). Lessons from the green revolution. Third World Resurgence, 11-14.

Ryan, J. G., & Asokan, M. (1977). Effect of Green Revolution in wheat on production of pulses and nutrients in India. Indian Journal of Agricultural Economics, 32(3), 8-15.

Singh S, Benbi D K (2016) Punjab-soil health and Green Revolution: A quantitative analysis of major soil parameters. Journal of Crop Improvement, 30(3), 323–340.

Smale, M. (1997). The green revolution and wheat genetic diversity: some unfounded assumptions. World development, 25(8), 1257-1269.