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The Impact of Green Revolution in India

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ABSTRACT: The Green Revolution in India was initiated in the 1960s by introducing high-yielding varieties of rice and wheat to increase food production in order to alleviate hunger and poverty. Post-Green Revolution, the production of wheat and rice doubled due to initiatives of the government, but the production of other food crops such as indigenous rice varieties and millets declined. This led to the loss of distinct indigenous crops from cultivation and also caused extinction. This review deals with the impacts the Green Revolution had on the production of indigenous crops, its effects on society, environment, nutrition intake, and per capita availability of foods, and also the methods that can be implemented to revive the indigenous crops back into cultivation and carry the knowledge to the future generation forward.

KEYWORDS: green revolution, indigenous, rice, wheat, cultivation, future, generation

I.INTRODUCTION

The Green Revolution was a period that began in the 1960s during which agriculture in India was converted into a modern industrial system by the adoption of technology, such as the use of high yielding variety (HYV) seeds, mechanised farm tools, irrigation facilities, pesticides and fertilizers. Mainly led by agricultural scientist M. S. Swaminathan in India, this period was part of the larger Green Revolution endeavor initiated by Norman E Borlaug, which leveraged agricultural research and technology to increase agricultural productivity in the developing world.[3] Under premiership of Congress leaders Lal Bahadur Shastri and Indira Gandhi,[4][5] the Green Revolution within India commenced in 1968, leading to an increase in food grain production, especially in Punjab, Haryana, and Uttar Pradesh. Major milestones in this undertaking were the development of high-yielding varieties of wheat,[6] and rust resistant strains of wheat.[7][8] The long-term effects of green revolution have been analysed by environmentalists like Vandana Shiva and others who say that it caused greater environmental, financial and sociological problems like droughts, rural indebtedness and farmer suicides.[9] Reports have shown soil deterioration from the use of chemicals which has led to the collapse of agricultural systems in many regions of the country, and negatively affected the farmers, food and water supply. [10]

A number of people have been recognized for their efforts during India's Green Revolution.

- M. S. Swaminathan, the main architect or the Father of the Green Revolution in India.[12]
- Chidambaram Subramaniam, the food and agriculture minister at the time, a Bharat Ratna, has been called the Political Father of the Green Revolution.[13]
- Dilbagh Singh Athwal, is called the Father of Wheat Revolution.[14]
- Scientists such as Atmaram Bhairav Joshi.
- Institutions such as Indian Agricultural Research Institute (IARI).

The main development was higher-yielding varieties of wheat,[6] for developing rust resistant strains of wheat.[7] The introduction of high-yielding varieties (HYV) of seeds and the improved quality of fertilizers and irrigation techniques led to the increase in the production to make the country self-sufficient in food grains, thus improving agriculture in India. Also, other varieties such as Kalyan Sona and Sonalika were introduced by cross breeding of wheat with other

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crops.[15] The methods adopted included the use of high-yielding varieties (HYVs) of seeds[16] with modern farming methods. The production of wheat has produced the best results in fueling self-sufficiency of India. Along with high-yielding seeds and irrigation facilities, the enthusiasm of farmers mobilized the idea of agricultural revolution. Due to the rise in use of chemical pesticides and fertilizers, there was a negative effect on the soil and the land (e.g., land degradation). The other practices include high-yielding varieties (HYVs) of seeds, Irrigation infrastructure, use of pesticides, insecticides and herbicides, consolidation of holdings, land reforms, improved rural infrastructure, supply of agricultural credit, use of chemical or synthetic fertilizers, use of sprinklers or drip irrigation systems and use of advanced machinery. The Green Revolution in India was first introduced in Punjab in the late 1966-67 as part of a development program issued by international donor agencies and the Government of India.[17] During the British Raj, India's grain economy hinged on a unilateral relation of exploitation.[18] Consequently, when India gained independence, the weakened country quickly became vulnerable to frequent famines, financial instabilities, and low productivity. These factors formed a rationale for the implementation of the Green Revolution as a development strategy in India.

Frequent famines: In 1964–65 and 1965–66, India experienced two severe droughts which led to food shortages and famines among the country's growing population.[19] Modern agricultural technologies appeared to offer strategies to counter the frequency of famines.[20] There is debate regarding India's famines prior to independence, with some arguing they were intensified by British taxation and agrarian policies in the 19th and 20th centuries,[18] and others downplaying such impact of colonial rule. Lack of finance: Marginal farmers found it very difficult to get finance and credit at economical rates from the government and banks and hence, fell as easy prey to the money lenders. They took loans from landlords, who charged high rates of interests and also exploited the farmers later on to work in their fields to repay the loans (farm labourers). Proper financing was not given during the Green Revolution period, which created a lot of problems and sufferings to the farmers of India. The government also helped those under loans. Low productivity: In the context of India's rapidly growing population, the country's traditional agricultural practices yielded insufficient food production. By the 1960s, this low productivity led India to experience food grain shortages that were more severe than those of other developing countries. Agricultural technological advancements offered opportunities to increase productivity.[20]

II. DISCUSSION

The Green Revolution yielded great economic prosperity during its early years. In Punjab, where it was first introduced, the Green Revolution led to significant increases in the state's agricultural output, supporting India's overall economy. By 1970, Punjab was producing 70% of the country's total food grains,[21] and farmers' incomes were increasing by over 70%.[21] Punjab's prosperity following the Green Revolution became a model to which other states aspired to reach.[22] However, despite the initial prosperity experienced in Punjab, the Green Revolution was met with much controversy throughout India. Criticism on the effects of the green revolution include the cost for many small farmers using HYV seeds, with their associated demands of increased irrigation systems and pesticides. A case study is found in India, where farmers are buying Monsanto BT cotton seeds—sold on the idea that these seeds produced 'non natural insecticides'. In reality, they still had to pay for expensive pesticides and irrigation systems, which led to increased borrowing to finance the change from traditional seed varieties. Many farmers had difficulty in paying for the expensive technologies, especially if they had a bad harvest. These high costs of cultivation pushed rural farmers to take out loans—typically at high interest rates.[17] Over-borrowing entrapped the farmers into a cycle of debt.[17] India's liberalized economy further exacerbated the farmers' economic conditions. Indian environmentalist Vandana Shiva writes that this is the "second Green Revolution". The first Green Revolution, she suggests, was mostly publicly funded (by the Indian Government). This new Green Revolution, she says, is driven by private (and foreign) interest—notably MNCs like Monsanto—as encouraged by Neoliberalism. Ultimately, this is leading to foreign ownership over most of India's farmland, undermining farmers' interests.[17] Farmer's financial issues have become especially apparent in Punjab, where its rural areas have witnessed an alarming rise in suicide rates.[17] Excluding the countless unreported cases, there has been estimated to be a 51.97% increase in the number of suicides in Punjab in 1992–93, compared to the recorded 5.11% increase in the country as a whole.[17] According to a 2014 Indian news

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Vol. 4, Issue 7, July 2015

report, indebtedness continues to be a grave issue affecting the people of Punjab today, demonstrated by the more than 900 recorded farmer committed suicide in Punjab in the last two years.[23]

Excessive and inappropriate use of fertilizers and pesticides polluted waterways and killed beneficial insects and wildlife. It has caused over-use of soil and rapidly depleted its nutrients. The rampant irrigation practices led to eventual soil degradation. Groundwater practices have fallen dramatically. Further, heavy dependence on few major crops has led to loss of biodiversity of farmers, and the increase of stubble burning cases since 1980. These problems were aggravated due to absence of training to use modern technology and vast illiteracy leading to excessive use of chemicals.[24] The green revolution spread only in irrigated and high-potential rainfed areas. The villages or regions without the access of sufficient water were left out that widened the regional disparities between adopters and non-adopters. Since, the HYV seeds technically can be applied only in a land with assured water supply and availability of other inputs like chemicals, fertilizers etc. The application of the new technology in the dry-land areas is simply ruled out. The states like Punjab, Haryana, Uttar Pradesh, etc. having good irrigation and other infrastructure facilities were able to derive the benefits of the green revolution and achieve faster economic development while other states have recorded slow growth in agriculture production.[25]

In the years since Green Revolution was adopted, issues of sustainability have come up due to the adverse environmental and social impacts. To meet this challenge other alternatives of farming have emerged like small subsistence farms, family homesteads, New Age communes, village and community farming collectives and women's cooperatives with the common purpose of producing organically grown, chemical free food. In green revolution areas of the country increasing numbers of families are experimenting on their own with alternative systems of land management and the growing of crops. Building upon the idea of sustainable development, commercial models for large scale food production have been developed by integrating traditional farming systems with appropriate energy efficient technology.[26]

III.RESULTS

Green Revolution (Features)

1. Introduced High Yielding Variety seeds in Indian agriculture.
2. The HYV seeds were highly effective in regions that had rich irrigation facilities and were more successful with the wheat crop. Therefore, the Green Revolution at first focused on states with better infrastructure such as Tamil Nadu and Punjab.
3. During the second phase, the high yielding variety seeds were given to other states, and crops other than wheat were also included in the plan.
4. The most important requirement for the high yielding variety seeds is proper irrigation. Crops grown from HYV seeds need good amounts of water supply and farmers could not depend on monsoon. Hence, the Green Revolution has improved the irrigation systems around farms in India.
5. Commercial crops and cash crops such as cotton, jute, oilseeds, etc were not a part of the plan. Green revolution in India mainly emphasized food grains such as wheat and rice.
6. To enhance farm productivity green revolution increased the availability and use of fertilizers, weedicides, and pesticides to reduce any damage or loss to the crops.
7. It also helped in promoting commercial farming in the country with the introduction of machinery and technology like harvesters, drills, tractors, etc.

Impact of Green Revolution in India

1. Green Revolution has remarkably increased Agricultural Production. Foodgrains in India saw a great rise in output. The biggest beneficiary of the revolution was the Wheat Grain. The production increased to 55 million tonnes in the early stage of the plan itself.

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Vol. 4, Issue 7, July 2015

2. Not just limited to agricultural output the revolution also increased per Acre yield. Green Revolution increased the per hectare yield in the case of wheat from 850 kg per hectare to an incredible 2281 kg/hectare in its early stage.
3. With the introduction of the Green revolution, India reached its way to self-sufficiency and was less dependent on imports. The production in the country was sufficient to meet the demand of the rising population and to stock it for emergencies. Rather than depending on the import of food grains from other countries India started exporting its agricultural produce.
4. The introduction of the revolution inhibited a fear among the masses that commercial farming would lead to unemployment and leave a lot of the labour force jobless. But the result seen was totally different there was a rise in rural employment. The tertiary industries such as transportation, irrigation, food processing, marketing, etc created employment opportunities for the workforce.
5. The Green Revolution in India majorly benefited the farmers of the country. Farmers not only survived but also prospered during the revolution their income saw a significant rise which enabled them to shift from sustenance farming to commercial farming.

Besides the positive impact, the revolution had a gloomy side too. Some of the negative effects of the Green Revolution are stated below:

- Retardation of agricultural growth due to inadequate irrigation cover, shrinking farm size, failure to evolve new technologies, inadequate use of technology, declining plan outlay, unbalanced use of inputs, and weaknesses in credit delivery system.
- Regional dispersal of the evolution created regional inequalities. The benefits of the green revolution remained concentrated in the areas where the new technology was used. Moreover, since the revolution for the number of years remained limited to wheat production, its benefits were mostly accrued only to wheat-growing areas.
- Interpersonal inequalities between large and small scale farmers. The new technologies introduced during the revolution called for substantial investments which were beyond the means of a majority of small farmers. Farmers having large farmlands continued to make greater absolute gains in income by reinvesting the earnings in farm and non-farm assets, purchasing land from the smaller cultivators, etc.

IV. CONCLUSIONS

Green Revolution – Krishonnati Yojana

- The government of India introduced the Green Revolution Krishonnati Yojana in 2005 to boost the agriculture sector.
 - Government through the scheme plans to develop the agriculture and allied sector in a holistic & scientific manner to increase the income of farmers.
- It comprises of 11 schemes and mission under a single umbrella scheme:
 - Mission for Integrated Development of Horticulture (MIDH)
 - National Food Security Mission (NFSM)
 - National Mission for Sustainable Agriculture (NMSA)
 - Submission on Agriculture Extension (SMAE)

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- Sub-Mission on Seeds and Planting Material (SMSP)
- Sub-Mission on Agricultural Mechanization (SMAM)
- Sub-Mission on Plant Protection and Plant Quarantine (SMPPQ)
- Integrated Scheme on Agriculture Census, Economics and Statistics (ISACES)
- Integrated Scheme on Agricultural Cooperation (ISAC)
- Integrated Scheme on Agricultural Marketing (ISAM)
- National e-Governance Plan in Agriculture (NeGP-A)

The Evergreen Revolution

The improvements brought out by the Green Revolution came at the cost of adverse environmental effects in areas subjected to intensive farming. However, where population pressure is high, there is no option except to produce more food. Hence, the need for the Evergreen Revolution was called out by Dr. M S Swaminathan, the Father of the Green Revolution in India. Under the Evergreen Revolution, it is envisaged that productivity must increase, but in ways which are environmentally safe, economically viable and socially sustainable. The evergreen revolution involves the integration of ecological principles in technology development and dissemination.

REFERENCES

1. Kumar, Manoj, and Matthias Williams. 2009 January 29. "Punjab, bread basket of India, hungers for change." Reuters.
2. ^ The Government of Punjab (2004). Human Development Report 2004, Punjab (PDF) (Report). Archived (PDF) from the original on 8 July 2011. Retrieved 9 August 2011. Section: "The Green Revolution", pp. 17–20.
3. ^ Hardin, Lowell S. 2008. "Meetings That Changed the World: Bellagio 1969: The Green Revolution." *Nature* (25 Sep 2008):470-71. Cited in Sebby 2010.
4. ^ Swaminathan, M. S. (10 August 2009). "From Green to Ever-Green Revolution". *The Financial Express*. Retrieved 16 April 2014.
5. ^ Rajagopal, Gopi (13 October 2014). "The Stories of Ehrlich, Borlaug and the Green Revolution". *The Wire (India)*. Retrieved 16 April 2014.
6. ^ "About IARI". IARI. Retrieved 11 June 2014.
7. ^ "Rust-resistant Wheat Varieties. Work at Pusa Institute". *The Indian Express*. 7 February 1950. Retrieved 13 September 2013.
8. ^ Newman, Bryan. 2007. "A Bitter Harvest: Farmer Suicide and the Unforeseen Social, Environmental and Economic Impacts of the Green Revolution in Punjab, India." *Development Report 15. Food First*. Cited in Sebby 2010.
9. ^ Shiva, Vandana (March–April 1991). "The Green Revolution in the Punjab". *Living heritage. The Ecologist*, Vol. 21, No. 2. Retrieved 5 March 2014.
10. ^ Jackson, M.G. (2013). *The Future for Rural India. Permanent Green*. pp. 87–97.
11. ^ Swaminathan, M. S. (1 September 2013). "Genesis and Growth of the Yield Revolution in Wheat in India: Lessons for Shaping our Agricultural Destiny". *Agricultural Research*. 2 (3): 183–188. doi:10.1007/s40003-013-0069-3. ISSN 2249-7218.
12. ^ Rudolf, John Collins (19 January 2010). "Father of India's Green Revolution Says Nation Is Threatened by Global Warming". *The New York Times*. ISSN 0362-4331. Retrieved 3 December 2014.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

13. ^ Dugger, Celia W. (10 November 2000). "Chidambaram Subramaniam, India's 'Green' Rebel, 90, Dies". The New York Times. ISSN 0362-4331. Retrieved 3 December 2014. Chidambaram Subramaniam, the political architect of the green revolution in India...
14. ^ "'Father of Wheat Revolution' DS Athwal passes away". Hindustan Times. 15 May 2014. Retrieved 3 December 2014.
15. ^ "The Green Revolution in India". U.S. Library of Congress (released in public domain). Library of Congress is Country Studies. Retrieved 6 October 2007.
16. ^ Rowlatt, Justin (1 December 2014). "IR8: The miracle rice which saved millions of lives". BBC News. Retrieved 5 December 2014.
17. ^ Dutta, Swarup (June 2012). "Green Revolution Revisited: The Contemporary Agrarian Situation in Punjab, India". Social Change. 42 (2): 229–247. doi:10.1177/004908571204200205. ISSN 0049-0857. S2CID 55847236.
18. ^ Davis, Mike (2014). Late Victorian holocausts : El Niño famines and the making of the Third World. ISBN 978-1-78168-360-6. OCLC 1051845720.
19. ^ Sangha, Kamaljit Kaur (2014). "Modern agricultural practices and analysis of socio-economic and ecological impacts of development in agriculture sector, Punjab, India - A review". Indian Journal of Agricultural Research. 48 (5): 331. doi:10.5958/0976-058x.2014.01312.2. ISSN 0367-8245. S2CID 59152682.
20. ^ Jain, H. K. (2012). Green revolution : history, impact and future. Studium Press LLC. ISBN 978-1-4416-7448-7. OCLC 967650924.
21. ^ Sandhu, Jashandeep Singh (2014). "Green Revolution: A Case Study of Punjab". Proceedings of the Indian History Congress. 75: 1192–1199 – via JSTOR.
22. ^ Shiva, Vandana. (1991). The Violence of the green revolution : Third World agriculture, ecology, and politics. Zed. ISBN 0-86232-964-7. OCLC 24740968.
23. ^ Bharti, Vishav (12 February 2014). "Farm suicides unabated in Punjab, over 900 in 2 years". The Tribune.
24. ^ "Ethiraj College for Women (Autonomous) – Department of Business Economics: Syllabus" (PDF). Archived from the original (PDF) on 29 January 2014. Retrieved 23 January 2014.
25. ^ "Green Revolution Bypassed Eastern India". GKToday. Retrieved 26 December 2014.
26. ^ George, Lathika (2014). Mother Earth, Sister Seed. Penguin Books. pp. 177–191.