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Green revolution in India

Introduction

The purpose of the green revolution is to improve agricultural produce an output at the Indian farms. The revolution started for fulfilling the agricultural requirements of the Indian population. It stresses on increasing the crop yield by adopting methods of artificial fertilizers having direct impacts on the levels of production. By massively increasing yields of grain and cereals the country aims at providing food to the larger population. The concept of green revolution became popular during the 1950s to 1960s when the countries faced a shortage of crop and yields. The governments formulated strategies for supporting the agriculture that could ensure the provision of necessary crop and vegetable supplies. Different methods are adopted for improving agricultural produce such as artificial plant breeding and imported fertilizers (Rahman, 2014). The harvest of crops is based on institutional mechanisms and technology spillovers. India has this researched enough to implement the most effective and advantageous methods that assure high-yield production. The green revolution of India has profound impacts on the social, economic and environmental aspects.

India’s agenda of green revolution

India incorporated the strategy of the green revolution for enhancing agricultural productivity. The common methods adopted include hybrid seeds, irrigation, fertilizers and pesticides. India realized the need for adopting ways for securing food means after Bengal famine 1943. A significant number of people lost their lives in West Bengal due to inadequate access to food. India felt the need for adopting modernized means for producing crops. Although India was good in the production of many crops but it experienced shortage during the off-season. This reflected the need for an effective and productive method of producing crops. The first agrarian reform was presented by the government in 1951 that illustrated the objectives of the land reform. The plan constituted a period of 5 to 10 years that focused on improving the overall production of crops (Stone, 2019).

Plant breeding and green revolution

Technology is crucial for the attaining green revolution. The Indian state has invested billions of dollars for developing effective methods of harvesting. GR strategy has used technology for plant breeding. Investments in technology-assisted the agriculturalists to identify favorable methods for the production for different crops. To maximize the benefits the country provides opportunities for learning to the local agriculturalists by sending them to foreign countries. This allowed them to learn new techniques and develop them in India. Irrespective of huge success made by India the investments declined in 2000s (Ladejinsky, 2000). The country's interest transferred to the industrial sector. In an attempt to strengthen the industrial sector, India ignored the agricultural sector. This had negative impacts on the overall GR strategy.

Fertilizers

Farmers are advised to use the technique of imported fertilizers with irrigation for attaining maximum yields. “A gene that enhances plants’ ability to absorb nitrogen could be used to breed high-yield varieties of rice, wheat and other staple crops that would need less fertilizer” (Rehm, 2018). The performance of these fertilizers is more effective because they are developed in a way that makes them weather and disease resistant. These fertilizers enhanced the quality of pants to absorb maximum amount to nitrogen that increases the rate of growth (Zhang, Huang, Yajuan, & Yang, 2017). Compared to conventional fertilizers these modern ones enhanced farmers capacity of producing high-quality crops. The possibilities of growth become more evident when the farmers rely on improved methods of irrigation.

Reasons for adopting green revolution

The climate plays a significant role in the production of crops and grains. Most of the crops produced by India are seasonal and cannot be grown throughout the year. This reflected the need for producing excessive crops and storing them for the rest of the year. Different techniques are adopted by India for overcoming its agricultural issues. The common methods used for improving its products include using high-yield cereals, modernized methods of production, mechanized means and technology. These are common strategies adopted by the countries throughout the world (Nouman, 2018). The climate favored indie to grow more crop that made their people more productive. Humans managed to control their breeds and feeding. Seasonal variation was also introduced by Americans allowing them to use the vegetables and animals throughout the year.

India has adopted methods for improving the yield of basic staple crops. Evidence suggests that “large public investment in crop genetic improvement built on the scientific advances already made in the developed world for the major staple crops—wheat, rice, and maize and adapted those advances to the conditions of developing countries” (Pingali, 2012). The reason for adopting artificial and mechanical methods is to enhance productivity. Technology intervention has allowed the country to produce more crops within a short duration. This also ensures that the agricultural sector will fill the demands of masses throughout the year. Through artificial methods, it is also possible to eliminate the challenges of famine or crop shortage.

India has devised a strategy for harvesting disease-resistant wheat that could fulfil the requirements of the population through the year. These are extremely effective for converting fertilizers and water into high yields. Imported seeds are also fertilized for enhancing crop production. These seeds are weather resistance and also exhibit high resistance against the diseases. An important advantage of these seeds is that it allowed India to overcome its issue of famine. The overall production of wheat is boosted through this method (Stone, 2019). Adoption of imported fertilizers has increased farmer's capacity for producing crops that India is lacking. Green revolution also adopts the technique of using fossil fuels for increasing productivity and farming. Restoring depleted soils is possible through fossil fuels that provide larger diversity to the crops. The concept of Green revolution depicts that the world can harvest 90 percent of its calories for fifteen crops.

Pesticides for a green revolution

Pesticides are also used in the green revolution for maximizing agri-produce. The purpose of using pests is to control diseases and pest attacks. These are chemicals that provide resistance to crops for fighting against pests. There are different types of pesticides each used for a different purpose. Such as algaecides are used for slowing the growing proportion of algae (Pingali, 2012). The development of algae is bad for the crop because it causes destruction and undermines its natural growth. Wood preservatives are used for making the wood strong. This adds the capacity for fighting against insects and fungus that weakens the quality of wood (Zhang, Huang, Yajuan, & Yang, 2017). Molds and fungi can also damage crop produce or affect their patterns of growth (Stone, 2002). To overcome these challenges the farmer uses fungicides that adds resistance to fight against fungi and molds. Insect growth regulators are used for protecting the crops and fields against insects. Microbial communications are also prevented by using these pesticides (Rahman, 2014). This is also an advantageous feature of the green revolution that promotes agricultural production.

Economic impacts

Green revolution contributes to the economy because the high-yield crops are linked to high exports. The increased capacity of India to produce crops create opportunities for earning revenues that result in the growth of GDP. The crops harvested by the country such as rice, wheat, maize, sorghum, millet, potatoes and beans have direct impacts on the economy (Zhang, Huang, Yajuan, & Yang, 2017). Countries that are capable of producing these crops are more likely to earn revenue through exports. The demand for these crops is significantly high all across the world. India has been engaged in export of these crops to the Asian countries including Pakistan and Bangladesh. The evidence also suggests that India has managed to earn huge revenue through agricultural exports. Facts indicate that "bred innovative high‐yielding dwarf wheat that was adopted after he brushed aside the backwards-looking traditionalists in the Indian establishment" (Stone, 2019).

Water resources

The produce of agriculture relies on the quantity of water. Crop production demands an effective mechanism of irrigation that provides continuous access to water. Effective irrigation systems are crucial for the attainment of GR agenda. This also requires management of the irrigation operations for promoting viable crop productivity. This reflects the need for taking “into account agronomic, economic, soil related, hydraulic and environmental factors (Ladejinsky, 2000). The layout and managing of irrigation systems at filed level is an aspect of the first importance for efficient use of water, economic enhancement of the agriculture and its environmental viability” (Nouman, 2018). India has adopted a policy of supplying water by adopting artificial irrigation methods. The selection of the methods is also linked to the quality of solid, nature of crop and weather conditions.

India will need to improve its methods for irrigation because the increase in population has threatened water resources. The excessive use of water in artificial methods of producing crops will affect water resources. The irrigation systems demand water that reflects limitations for the future. (Zhang, Huang, Yajuan, & Yang, 2017). Due to population rise the country will face more challenges for managing its water for the mechanized farms. This will require modern and efficient irrigation methods.

Another issue that needs to be addressed involve equal and fair distribution of water. The early developments of green revolution revealed that the owners of large farms managed to gain access to more water compared to the small landowners. This prevented the opportunities of growth for the owners of small farms (Zhang, Huang, Yajuan, & Yang, 2017).

Construction of adequate tube wells is also part of GR strategy. It is important to provide continuous access to water by constructing tube wells near farms. “Tube wells were also key to rice production, which boomed in the mid‐1970s as tube wells proliferated on rice farms. The wells not only provided more water but freed farmers from the monsoon cycle. As with wheat, the role of the dwarf rice seeds has been overstated” (Stone, 2019). The analysis of the current situations indicate that the owners of small farms and villages are lacking access to tube wells. This undermines the agenda of green revolution that focuses on improving the crop productivity of all farms.

Impacts on the environment

Although artificial methods have helped the country to attain its goal of high crop yield it has some disadvantages. The common consequences include loss of soil fertility, soil erosion, soil toxicity, the salinity of underground water, livestock diseases and global warming. This reflects the need for controlling the adverse impacts of the green revolution. Because the concept of green revolution relies on fossil fuels that provide effective means of producing crops, it also leads to some consequences (Zhang, Huang, Yajuan, & Yang, 2017). Global warming is linked to green revolution because fossil fuels contribute to release of greenhouse gases. The emission of toxic gases promotes environmental degradation. The reliance on fossil fuels will also undermine the natural breed of livestock and dairy.

Suggestions

By changing daily activities and lifestyle, everyone can contribute towards this national agenda. It is revealed that “while self-sufficiency in foodstuffs is indeed a welcome-and likely-prospect for India, the concern is rising that for all its technological feasibility it may fall short in helping solve some of the grave problems of a good many villages poor” (Ladejinsky, 2000). This suggests that the country still needs to develop its green revolution in a way that would benefit the small farmers and villagers. The criticism of the green revolution depicts that the large and powerful landlords gained the benefits. This undermined the concept of providing fair means for producing crops at a larger scale.

The analysis of the overall situation also indicates that the conditions of the small landowners did not improve. They continued to live in poverty that is against the agenda of providing better survival and growth opportunities to all farmers. The slow or little progress in GR has been the result of social and political aspects (Rahman, 2014). The governments failed to monitor the policy at a larger scale that resulted in the disadvantage of a small farmer. Although fossil fuels provide productive means of harvesting they also involves some disadvantages (Rehm, 2018). The country needs to develop more effective irrigation system that will prevent waste of water resources. With the predictions of population rise the state will need to devise policy that consider effective means or providing water to the farmers.

Conclusion

India has adopted bold and modern methods of crop breeds. The purpose of using transformed and artificially developed crops is to improve their resistance against disease and harsh environment. Hybrid seeds also assured that the developed crops are more powerful and disease resistant. These seeds are also used for fulfilling basic requirement of the Indian population. The governments formulated strategies for supporting the agriculture that could ensure the provision of necessary crop and vegetable supplies. The harvest of crops is based on institutional mechanisms and technology spillovers. To fight against the pests and insects the farmer uses fungicides that adds resistance to fight against fungi and molds. India has adopted a policy of supplying water by adopting artificial irrigation methods. The selection of the methods is also linked to the quality of solid, nature of crop and weather conditions. Different methods are adopted for improving agricultural produce such as artificial plant breeding and imported fertilizers. There are different types of pesticides each used for a different purpose. Such as algaecides are used for slowing the growing proportion of algae. Investments in technology-assisted the agriculturalists to identify favorable methods for the production for different crops. To maximize the benefits the country provides opportunities for learning to the local agriculturalists by sending them to foreign countries.

Green revolution also adopts the technique of using fossil fuels for increasing productivity and farming. Restoring depleted soils is possible through fossil fuels that provide larger diversity to the crops.

Countries that are capable of producing these crops are more likely to earn revenue through exports. The green revolution of India also reflects some flaws. The criticism of the green revolution depicts that the large and powerful landlords gained the benefits. This undermined the concept of providing fair means for producing crops at a larger scale. The common consequences include loss of soil fertility, soil erosion, soil toxicity, the salinity of underground water, livestock diseases and global warming. This reflects the need for controlling the adverse impacts of the green revolution. India still needs to invest in green revolution for maximizing the gains for Indian population and the country.

References

Ladejinsky, W. (2000). Ironies of India's Green Revolution. *Foreign Affairs*.

NWF. (2018). *National water footprint*. Retrieved 11 04, 2018, from https://waterfootprint.org/en/water-footprint/national-water-footprint/

Nouman, M. (2018). *Irrigation System and Efficiency in Agriculture Crops*. Retrieved 04 05, 2019, from https://www.technologytimes.pk/irrigation-system-agriculture-crops/

Pingali, P. L. (2012). Green Revolution: Impacts, limits, and the path ahead. *Proc Natl Acad Sci, 109*, 12302–12308.

Schultz, T. W. (1964). Transforming traditional agriculture. New Haven, CT: Yale University Press.

Schurman, R. (2018). Micro(soft) managing a ‘Green Revolution’ for Africa’: The new donor culture and international agricultural development. World Development, 112, 180–192.

Stone, G. D. (2019). Commentary: New histories of the Indian Green Revolution. *Wiley*.

Stone, G. D. (2002). Both sides now: Fallacies in the genetic‐modification wars, implications for developing countries, and anthropological perspectives. Current Anthropology, 43, 611–630.

Subramanian, K. (2015). Revisiting the green revolution: Irrigation and food production in 20th century India. PhD thesis, Kings College London

Rahman, S. (2014). Green Revolution in India: Environmental Degradation and Impact on Livestock. *Asian Journal of Water, Environment and Pollution, 12* (1), 75-80,

Rehm, J. (2018). ‘Green revolution' crops bred to slash fertilizer use. *Nature*.

Zhang, Y., Huang, K., Yajuan, & Yang, B. (2017). Mapping of water footprint research: A bibliometric analysis during 2006e2015. *Journal of Cleaner Production*.