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Agricultural Transformation in India and Farmer's Challenges in the Post-Green Revolution Era

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ABSTRACT

The Green Revolution, which introduced transformative agricultural practices such as high-yielding variety (HYV) seeds, expanded irrigation, increased use of inorganic fertilizers, and advanced farming equipment, significantly boosted crop productivity in India. However, while these advancements contributed to greater food security, they also gave rise to socioeconomic and environmental challenges that adversely affected farmers in the post-Green Revolution era. These challenges include rising input costs, depletion of soil health, water scarcity, ecological degradation, deepening economic inequalities, farmer suicides, etc. The agrarian distress arising from these issues has become a central force driving farmers' movements in India. The paper tries to analyze the socioeconomic and environmental challenges faced by farmers in the post-Green Revolution period. By reviewing secondary data from academic articles, and government reports, newspaper articles etc, the paper seeks to highlight the root causes of agrarian distress and propose potential solutions aimed at alleviating the problem faced by farmers. Through this exploration, the paper seeks to provide insights into the ongoing struggles of farmers and suggest pathways for sustainable agricultural practices and policy reforms that can ensure long-term food security and rural well-being.

Keywords: Green Revolution, Agricultural Productivity, Socio-economic Challenges, Environmental Degradation, Farmers' Movements, Agrarian Distress

INTRODUCTION

India is primarily an agricultural economy. The sector employs over 65% of the population. It goes to the credit of India that the country has achieved self-sufficiency in food production grains. At the time of India's independence, the figures show that approximately 70% of the people were involved in this sector. India's agrarian economy plays a vital role in society and politics besides the economic field. India is among the highest-ranking countries in terms of production volume for various crops, like cotton, rice, fruits, vegetables, and dairy products. Through the hard work of millions of farmers, scientists, and planners, India was transformed from a food-deficit nation into a food-surplus and net-exporter nation. Food grain production, which was only 51 million tons (Mt) in 1950/51, increased more than sixfold to over 314 million tons in 2022 (ICAR, 2023). India stands as the largest producer of milk, pulses, and jute, and the second-largest producer of rice, wheat, cotton, fruits, and vegetables globally. It is also a leading producer of spices, fish, poultry, livestock, and plantation crops. Despite the voluminous production, the country suffers a loss of $13 billion annually because the country has access to only 60% of the produce (NIAM, 2012). Despite the government spending a lot on agriculture and its allied activities which include encouraging the farmers to go for horticulture, pisciculture, floriculture, and animal husbandry which have seen a record growth year after year the crop yields continue to be lower than the world average.

This paper tries to analyze the socioeconomic and environmental challenges faced by farmers in the post-Green Revolution period and their role in fuelling the contemporary farmers' movement. It provides insights into potential solutions that could address the root causes

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of agrarian distress. The paper is descriptive and relies on a review of secondary data, including academic articles, government reports, newspaper articles, policy analyses, etc.

Agricultural Reform after Independence:

Agriculture has been central to India's development, especially post-independence when policymakers prioritized putting it on a firm footing. Following the USSR's model, India's first Five-Year Plan, known as the Agriculture Plan, introduced measures to revitalize the agrarian economy, which had suffered under colonial exploitation (Ministry of Statistics, 2017). Colonial policies, such as the Permanent Settlement by Lord Cornwallis, the Ryotwari system by Thomas Munroe, and the Mahalwari system, had drained the land's fertility. The Zamindari system further entrenched exploitation, with landlords prioritizing extraction over agricultural development.

The severe droughts of 1965-66 highlighted the urgent need for reforms to achieve food security and reduce dependency on imports. This led to the Green Revolution, introduced in the late 1960s under the guidance of Nobel Laureate Norman Borlaug and Dr. M.S. Swaminathan, India's Agriculture Minister at the time. The Green Revolution, also referred to as the Third Agricultural Revolution, marked a significant technological transformation in Indian agriculture (Patel, 2012). It introduced high-yielding variety seeds, chemical fertilizers, controlled irrigation, and mechanization, significantly boosting food grain production and transforming Punjab, Haryana, and parts of western Uttar Pradesh into India's breadbasket.

The Green Revolution had far-reaching impacts, including poverty reduction, increased income levels, lower infant mortality, and reduced greenhouse gas emissions. However, it also brought challenges, such as soil contamination, water scarcity, and increased vulnerability to pests. Furthermore, it increases social inequalities, as its benefits were concentrated in certain regions and among wealthier farmers, leaving smallholders and rain-fed regions behind. The overuse of chemical inputs and water-intensive crops led to environmental degradation, particularly in Punjab, and raised concerns about the long-term sustainability of these practices.

Post-independence, the government also implemented progressive measures such as the *"Land to the Tiller"* policy, which redistributed surplus land to farmers. This move aimed to dismantle the Zamindari system and promote equity by empowering cultivators with ownership rights, ensuring better land stewardship (Sud, 2006). The policy further integrated agriculture with industrial growth by providing raw materials and increasing food self-sufficiency.

Agriculture remains the backbone of the Indian economy, contributing between 14% and 29% to the GDP, employing over half of the population, and supporting industries, trade, and export activities. India is a leading global producer of pulses, jute, milk, rice, sugarcane, and wheat. It has also achieved notable self-sufficiency in food grains. Despite this progress, the sector faces persistent challenges, including small and fragmented landholdings due to inheritance practices, reliance on intensive subsistence farming, and inadequate irrigation and infrastructure. Moreover, over 70% of India's exports come from agricultural commodities such as coffee, tea, spices, and jute, emphasizing the sector's role in earning foreign exchange and driving revenue for the government and transportation sectors.

The World Bank has highlighted that slow agricultural growth remains a concern for policymakers. Many current practices are neither economically nor environmentally sustainable, with low yields and poor infrastructure hampering progress. Farmers often lack access to markets, credit, and modern technologies, while poorly maintained irrigation systems (World Bank, 2007).

Farmer Issues after the Green Revolution:

In this section, the author has explained the major issues/ challenges faced by the Indian farmers after the Green Revolution.

Lack of Infrastructure and Lack of Storage Facilities:

Agriculture relies heavily on natural factors like monsoons, which pose challenges, while the benefits of the Green Revolution are limited to irrigated areas. Farmers struggle with inadequate irrigation, storage facilities, flood control systems, cold storage, and rural road connectivity, which affects the timely supply of inputs and outputs. Shifting monsoon patterns, especially for rice crops, intensify these issues. Lack of proper infrastructure leads to significant post-harvest losses. Poor roads and unreliable transportation increase costs, while inadequate market systems and modern retail options result in high wastage. Farmers often sell their produce at low prices

to middlemen due to urgent financial needs, leaving them with minimal profits. Bumper crops face storage issues, with much produce left to rot due to insufficient cold storage and on-farm facilities. Despite the efforts of the Food Corporation of India (FCI), food storage remains inadequate. Increased government investment in infrastructure, cold storage, and farmer support is essential to address these challenges and ensure sustainable agricultural growth.

Change in Climatic Conditions:

About two-thirds of the cultivated land in India is dependent on monsoons, the pattern of which is changing dramatically. The yield of rice crops decreased in 2022 because of high temperatures in the Eastern and Northeastern states of the country like Bihar, Odisha, and Uttar Pradesh, and because of insufficient rainfall. On the other hand, excessive rain in the year 2022 in Central and Southern India led to flooding in Madhya Pradesh, Kerala, and Karnataka which has led to the rice fields being flooded (ICAR, 2022). The policy planners need to take the report of the *Intergovernmental Panel on Climate Change (IPCC)* seriously which said that food security may be a big problem in the region by 2030. The IPCC is an intergovernmental body of the United Nations whose job is to investigate climate change because of human activities. It was established in 1988 by the World Meteorological Organisation and the United Nations Environment Programme.

Most of the farmers depend upon monsoons. Rainfall is usually unpredictable and with the climatic changes taking place it has become a big challenge. If there are areas where there is a problem of delayed monsoons there are other areas where rainfall leads to excess water in the fields. Water absorption methods must be worked upon. The rainfall pattern is variable and unpredictable. The high-yielding crop variety gives bumper crops but lays great stress on the water table because they are water-intensive crops.

Depleting Groundwater:

Indian irrigation includes a network of canals from rivers, tanks, rainwater harvesting projects as well as groundwater. India is fortunate to have a big reservoir of the groundwater system but it is depleting fast. There are many reasons for this. Farmers are growing water-intensive crops like rice and sugar, which occupy 24% of the cultivable area. Attractive Minimum Support Price (MSP) and free electricity are the incentives for farmers to grow such crops. This leads to groundwater depletion and groundwater mining. Though the government is encouraging rainwater harvesting projects along with tapping solar energy, the farmers are not adopting the projects because of the costs. Over pumping which has been made possible because of subsidized electric power is leading to a shocking drop in the aquifer levels. At times, the groundwater resources are overexploited when surface water sources dry up, especially during droughts. The increased use of fertilizers has polluted the groundwater as well as the freshwater, leading to grave concerns.

Lack of Irrigation System:

In many parts of the country, the irrigation system is inadequate, which leads to crop failure. Excessive rainfall in many parts of the country leads to flooding in various regions which means that the irrigation system has not been developed to harness the excess water. The irrigation facilities have increased and improved over the years but there is a lack of mechanisation. Lack of power supply leads to problems in running the machinery, like tubewells, motors, etc. Because of the growth of water-intensive crops there is increased demand for water but in many parts of the country, the infrastructure for irrigation is still old. There is inadequate drainage, which leads to water logging which leads to the rotting of crops. Waterlogging also leads to a buildup of salts in the soils of some irrigated areas which is not healthy for the crops. Sometimes because of a lack of irrigation facilities, the farmers must pump up groundwater even when surface water is available in adequate proportion. The pumping of groundwater leads to depletion of groundwater levels which becomes a problem in the dry season when enough water cannot be pumped up to keep the crop alive.

A good system for irrigation would help the farmer to carry out timely agriculture activities and would also lead to a stop in the depletion of the groundwater table. The government must work with farmers to manage irrigation systems to improve cost recovery and allocate sufficient resources for the maintenance of the irrigation system. Many states are reeling under water shortage because of water-intensive crops.

Excessive use of Fertilizers and Pesticides:

The Green Revolution spurred excessive use of

chemical fertilizers, pesticides, and weedicides, depleting soil nutrients and degrading fertility. Continuous cropping of the same land without replenishment has reduced yields and increased soil erosion, salinization, and desertification. Punjab's pesticide usage rose from 5743 tonnes in 2014-15 to 5835 tonnes in 2017-18 (Times of India, 2020). Before this, farmers relied on organic fertilizers from crop residues. Urbanization and land degradation further threaten agriculture, with per capita land availability dropping from 0.89 hectares in 1951 to 0.27 hectares in 2011 (Department of Agriculture, 2020). The quality of soil has degraded because of excessive use of chemical fertilizers. This excessive use has led to reduced organic matter content and humous content which has led to fewer beneficial insects and increased pest attacks. The altering of soil pH has led to low productivity. Continuous cultivation without giving the soil rest has led to a lack of productivity. Inadequate soil conservation measures lead to reduced soil fertility and increased chances of pests and diseases. Soil erosion because of floods, insufficient vegetation cover, and heavy rains lead to a loss in productivity. Stubble farming leads to soil degradation as the organic quality goes down. According to reports, burning one metric tonne of stubble leads to a loss of 5.5 kg of Nitrogen, 2.3 kg of Phosphorus, 25 kg of Potassium, and approximately 1 kg of Sulphur besides organic carbon (Yadav, 2019).

Inadequate Farming Techniques and Fragmented and Small Land Holdings:

Except for the areas touched by the Green Revolution most of the farmers are still involved in agriculture or with the traditional techniques which are obsolete. Most of the farming is still done by labourers, which makes it a labour-intensive occupation. There is machinery to do weeding and other agriculture operations yet, very few farmers use it because it is very expensive and there is an erratic power supply. Either the farmers are ignorant and lack knowledge about modern practices or the costs are very high. The farmers then fall back upon traditional knowledge and techniques.

Smallholdings of the land make farming less competent. The costs of production become very high and low productivity leads to losses. In small holdings, mechanisms cannot take place as it would lead to an increase in costs of production. The fast-growing population has led to the fragmentation of land at a rapid pace. There was less emphasis on commercial seeds like oilseeds, mustard, groundnut, soybean, etc.

Disadvantage of High-Yielding Variety Crops (HYV):

Genetic modification, such as Bt cotton, introduced pest resistance but disrupted ecosystems by inviting other pests, like bollworms. Bt cotton, producing a toxin from Bacillus thuringiensis, harms specific pests but affects biodiversity. Maharashtra banned its sale in 2012 to promote native, low-input seed varieties. High-yielding crop varieties (HYVs) from the Green Revolution stressed irrigation, reduced genetic crop diversity, and displaced traditional low-input crops. In Punjab, wheat and rice now occupy 84% of agricultural land, compared to 39% pre-Green Revolution, pushing out diverse crops like pulses, millets, and oilseeds, essential for soil fertility. India has lost over 1 lakh indigenous rice varieties due to monocropping, threatening biodiversity (Chaba, 2022).

Lack of access to Credit and Insurance:

Timely, adequate, and low-interest credit is crucial for marginal and small farmers. Access to affordable credit can enable farmers to invest in better inputs, such as modern equipment, high-quality seeds, and fertilizers, leading to improved productivity. However, farmers face challenges due to collateral requirements and complex banking procedures. Many resort to moneylenders, who provide easy but exploitative credit, defeating the purpose of formal financial systems. Farming is inherently risky due to dependence on natural factors such as erratic rainfall, delayed monsoons, and pest attacks. Crop insurance is essential but remains underutilized due to limited availability and lack of awareness among farmers. Existing schemes often fail to provide timely or adequate compensation, leaving farmers vulnerable and reliant on delayed government relief. Addressing these gaps through accessible credit and effective insurance can significantly enhance agricultural resilience.

Inconsistent Government Policies:

Farmers often express frustration over abrupt changes in agricultural subsidies and taxes for short-term political gains. With agriculture being a state subject, inconsistent policies between state and central governments exacerbate challenges. Rural productive sectors, including agriculture, face market failures due to urban-focused policies and unfavorable lending systems. After achieving self-sufficiency, agriculture lost priority among policymakers in the 1980s, with renewed

attention only in response to rising food prices in the 2000s.

Inefficient institutions and outdated land reforms hinder agricultural progress. Complex land ownership regulations lead to litigation, and many agricultural universities, after initial successes, fail to effectively guide farmers. The lack of training and extension services leaves farmers unaware of modern techniques, limiting their ability to improve yields and incomes. Strengthening these areas is crucial for advancing the sector.

Lack of Knowledge of Budgeting:

Farming in India, predominantly practiced by small-scale farmers with limited holdings, is often not viewed as a lucrative business. Many farmers rely on traditional knowledge and techniques, lacking a structured approach to evaluating costs and profits. There is an urgent need to educate farmers on financial planning, including assessing the costs of inputs like seeds, machinery, irrigation, transportation, and marketing. Farmers should be encouraged to consult accountants and experts who can help them manage budgets effectively, ensuring expenses remain under control and profits are optimized.

Displacement for Urban Projects:

Agricultural land is rapidly diminishing due to infrastructure expansion, often displacing farmers from fertile lands. Farmers allege that the government, influenced by bureaucrats and businesses, acquires fertile land instead of non-arable land they are willing to part with. Displaced farmers, lacking alternative skills, struggle to earn a livelihood. Compensation is often below market rates, forcing many to pursue lengthy legal battles, with much of the compensation spent on legal fees. Women, excluded from compensation packages, face additional hardships, losing their homes and health. Some farmers face repeated displacement, exacerbating their struggles.

Suicides by Farmers:

Crop failures and rising costs have driven many farmers to financial ruin, leading to widespread suicides across India. High-quality seeds, essential for good yields, are often unaffordable, and even when purchased with high-interest loans, natural calamities can cause devastating losses. Loan burdens, combined with family responsibilities, push many to despair. The introduction of costly Genetically Modified Crops (GMCs) by corporations adds to the financial strain. Market price volatility forces farmers into panic selling, resulting in significant income losses. In 2022, Maharashtra (4,248), Karnataka (2,392), Andhra Pradesh (917), Tamil Nadu (728), and Madhya Pradesh (641) reported the highest farmer suicides (NCRB, 2022).

Failure of Farmers Organisations:

Though the farmers have their unions and pressure groups the problems of farmers have not been solved in the past few decades. Petty, vested interests in the farmer's groups lead to the politicisation of issues which does not let the political parties take the issues of farmers seriously. The farmer's groups get divided into factions and the infighting leads to the grievances of the farmers not being articulated properly.

Social Conflict:

The Green Revolution primarily benefited wealthy farmers with large landholdings and the capital to invest in expensive machinery, irrigation, high-yielding variety seeds, and fertilizers. Small and marginal farmers, lacking such resources, were left disadvantaged. This widened the gap between rich and poor farmers, exacerbating social inequality. Mechanized farming further displaced agricultural labourers, increasing unemployment. Moreover, the Green Revolution's benefits were regionally concentrated, intensifying disparities across India.

Impact on the Environment and Health of the People:

The excessive and indiscriminate use of fertilizers, pesticides, and weedicides has led to adverse effects on the environment. The beneficial nutrients in the soil have been depleted and the farmer-friendly insects have been killed leading to a loss of biodiversity. The mechanized irrigation system has led to the groundwater being polluted. The natural cropping pattern was in sync with the surroundings but it has been disturbed because of the diktats of the Green Revolution which talks of profits. Water is essential to life but the manner it is being exhausted does not augur well for the future. Genetically Modified crops led to the production of modified plants and organisms affecting the bio-diversity as the existing, local species, have been overrun by the new dominant species causing havoc to the biodiversity. The term 'biodiversity' was coined by Walter G. Rosen.E.O. Wilson in the 1980s called biodiversity the 'stuff of life.' The curse of the Green Revolution is that the people of Punjab are paying for food security with their health. Cancer,

stillborn babies, birth defects, and renal failure are some of the health hazards that are being faced by people. It is estimated that the people in rural Punjab spend approximately rupees 7.6 crore every year on treatment caused by stubble burning. The Abohar-Jodhpur Express train was dubbed the Cancer Express as patients in large numbers traveled in this train for treatment from Punjab to Rajasthan. The Express is soon going to lose its sad tag because hospitals treating cancer have opened in large numbers in the Abohar belt (Indian Express, 2021). This is the area that benefitted the maximum from the Green Revolution. The increased use of fertilizers and pesticides has led to a decrease in several farmer-friendly insects like earthworms, honeybees, moths, butterflies, etc.

Farmer's Movement in India:

The farmers' movement in India gained momentum during the 1980s, challenging exploitative relations between agrarian systems and industrial and international capital. New organizations such as Shetkari Sangathana and Bharatiya Kisan Union emerged during this period, addressing issues related to globalization and the state's role in the agricultural economy. In western India, particularly Maharashtra, the movement evolved from grassroots agitations into political party formation, exposing contradictions between populism and democratic power structures. Recent protests have witnessed farmers and agricultural labourers asserting their rights against privatization and policies perceived as anti-farmer, with leadership playing a vital role in raising awareness and influencing political agendas. The movement highlights the complex interplay of populist ideology, mass participation, and electoral politics while addressing rural India's class and gender issues.

The farmers' movement after the Green Revolution arose as a response to challenges derived from rapid marketization and neoliberal policies. While the Green Revolution initially improved agricultural productivity, it eventually led to production stagnation, increased input costs, and environmental degradation, particularly in Punjab. Issues such as monoculture cultivation, over-mechanization, and reliance on expensive chemicals led to declining profit margins and mounting farmer debt. Recent government policies aimed at corporatizing the agro-food system have triggered mass mobilizations by farmers' unions. These protests build on decades of rural union activity that has resisted debt, dispossession, and caste-based land inequities.

The farmers' movement in Punjab has been particularly significant, emerging in response to the agricultural laws introduced in 2020. Farmers fear these laws will dismantle the Minimum Support Price (MSP) system and enable corporate dominance in agriculture. The key demands of the movement included repealing the controversial farm laws, ensuring MSP was a legal right, addressing rising input costs and farmer debts, and promoting crop diversification and sustainable farming practices. The movement demands the repeal of these laws, which are seen as a threat to agricultural livelihoods and cultural practices. The movement is recognized as one of the largest in recent history, both nationally and globally. Farmers, supported by unions like the Bharatiya Kisan Union (BKU), organized peaceful protests, sit-ins, and rallies, with the Singhu, Tikri, and Ghazipur borders becoming the focal points of their movement. Women and youth actively participated, symbolizing unity and resilience. The movement achieved a historic victory in 2021 with the repeal of the farm laws. However, challenges such as economic sustainability, environmental degradation, and rural distress persist, highlighting the need for long-term, farmer-centric solutions. The farmers' movement in Punjab continues to stand as a piece of evidence of resilience, unity, and the quest for justice, influencing the discourse on agricultural reforms in India.

Strengthening Indian Agriculture: Policies and Progress

India, with over 1.3 billion people, is the world's largest democracy and has witnessed significant economic growth, becoming the fourth-largest global economy in purchasing power parity terms. Despite progress in reducing poverty from 37% in 2004-05 to 32% in 2009-10, disparities in income and human development persist. To strengthen agriculture and rural development, India must focus on building a productive, competitive, and diversified agricultural sector while encouraging rural entrepreneurship. Recognizing this, the government has introduced several schemes to improve agriculture. The Pradhan Mantri Krishi Sinchayee Yojana emphasizes efficient water use through rainwater harvesting and watershed management. The National Mission for Sustainable Agriculture promotes climate-resilient crops and efficient water use. The Soil Health Card Scheme guides farmers on soil fertility and suitable crops, while the Pradhan Mantri Fasal Bima Yojana offers crop insurance against natural calamities and pests.

The Rashtriya Krishi Vikas Yojana provides states with financial aid for agricultural projects, and the National Food Security Mission focuses on increasing rice, wheat, and pulse production. Additionally, the Mahatma Gandhi National Rural Employment Guarantee Act supports rural labor needs during peak seasons. Finally, the National Agriculture Market connects markets online, ensuring farmers get better prices by reducing intermediaries. These initiatives collectively aim to make Indian agriculture more sustainable and profitable.

Recommendations :

Approximately three-quarters of India's families depend upon rural livelihood and income. 70% or 770 million people of India's poor are found in the rural areas of India (World Bank, 2012). The Indian farmers and the Indian government to ensure fuel food security should produce cereal crops as well as increase production of fruits, vegetables, and milk to meet the demands of a growing population, which has great spending power. The agriculture sector will have to be diversified and made more competitive with its foundation in sustainable agriculture. The agricultural productivity for unit land has to be raised. The need is to increase yields by diversifying into higher-value crops. Regional disparities must be reduced. Irrigation facilities must be worked upon. The policy of, 'more crop per drop,' needs to be found and implemented. Intensive, extensive, and urgent steps need to be taken to reverse the adverse effects of the Green Revolution. Some of the steps can be:

a) ***Adopt Sustainable Irrigation Practices***: The focus should shift from mechanized irrigation to drip irrigation systems. The *'Seechewal'* model can be adopted which is very successful in Sultanpur Lodhi district and has got an impetus from Baba Seechewal, a social worker and Rajya Sabha member (2022 onwards for 6 years). He is also known as 'Eco Baba' as he has cleaned the 160 km long holy rivulet Kali Bein in the Kapurthala district of Punjab (Mahal, 2020).

b) ***Promote Environment-Friendly Crops*:** Encourage the cultivation of traditional crops in Punjab, such as oilseeds, barley, and sugarcane, which are more sustainable and improve soil fertility.

c) ***Build Market Infrastructure:*** Develop robust infrastructure and ensure seamless connectivity to markets, enabling farmers to sell their produce efficiently and at fair prices.

d) ***Focus on Organic Farming:*** Increase emphasis on organic farming practices and create support systems to help farmers transition to sustainable agriculture.

e) ***Educate and Empower Farmers:*** Raise awareness among farmers about modern agricultural technologies, available credit facilities, and government schemes to enhance productivity and access to resources.

f) ***Reduce the Role of Intermediaries:*** Minimize the influence of middlemen in the agricultural supply chain to ensure farmers receive maximum returns for their produce.

g) ***Strengthen Policy Implementation:*** Implement government policies effectively and ensure they are executed with the same intent and commitment as initially designed.

h) ***Adopt Sustainable Practices:*** Encourage the use of sustainable agricultural methods, such as crop rotation, rainwater harvesting, and drip irrigation, to conserve natural resources and improve productivity.

i) ***Minimize Synthetic Inputs:*** Reduce reliance on synthetic fertilizers and pesticides, promoting the use of natural alternatives to protect the environment and soil health.

Conclusion:

Agricultural transformation in India has been a pivotal aspect of its economic and social development, particularly since the Green Revolution in the 1960s. The introduction of high-yielding varieties of crops, improved irrigation techniques, and the increased use of fertilizers and pesticides significantly boosted agricultural productivity. This transformation helped India achieve food self-sufficiency and reduce dependence on imports. However, the sector still faces challenges such as low productivity in some regions, inadequate access to

modern technology, water scarcity, and climate change impacts. The government has introduced various reforms and initiatives like the Pradhan Mantri Fasal Bima Yojana and PM-KISAN to support farmers, improve crop insurance, and enhance rural income. The digital technologies, organic farming, and sustainable practices are emerging as crucial factors in transforming agriculture towards greater environmental and economic sustainability. Despite progress, comprehensive policy interventions, infrastructural development, and better market linkages are needed for a more inclusive and resilient agricultural sector in India. The Green Revolution brought remarkable advancements in agricultural productivity but, it also introduced challenges such as environmental degradation, social inequality, and health risks etc. To secure the future of agriculture, it is essential to strike a balance between traditional wisdom and modern practices. Policymakers must prioritize sustainable agriculture that preserves the environment, safeguards farmer livelihoods, and promotes long-term food security. This approach will ensure a resilient and equitable agricultural sector for generations to come.

Declaration of Conflicting Interests:

The authors stated that they have no conflicts of interest related to the research, writing, or publishing of this article.

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