



Crop Diversification And Sustainable Farming In North India: Viksit Bharat 2.0

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Abstract:

Agriculture in North India faces growing challenges due to climate change, soil degradation, water scarcity, and market uncertainties. Crop diversification has emerged as a key strategy to enhance sustainability, improve farm productivity, and ensure food security. This study explores the role of diversified cropping systems in promoting ecological balance, increasing farmer incomes, and reducing dependency on monoculture farming. By integrating traditional wisdom with modern agricultural innovations, including climate-resilient crops, precision farming, and organic practices, farmers can achieve long-term sustainability. The Viksit Bharat 2.0 initiative aims to revolutionize Indian agriculture by encouraging sustainable farming techniques, leveraging technology, and strengthening policy frameworks. This paper analyzes government interventions, agronomic innovations, and market-driven solutions that facilitate crop diversification. Findings suggest that adopting multi-cropping systems, agroforestry, and integrated farming models can enhance soil fertility, optimize resource use, and mitigate climate risks. Strengthening institutional support, farmer education, and infrastructure development will be crucial in realizing a resilient and sustainable agricultural future for North India.

Key Words: Crop diversification Viksit Bharat 2.0, multi-cropping systems, climate-resilient crops

Introduction:

Various technological advancements in agriculture make the life of 'farmers' easier and profitable, various techniques are involved in increasing agricultural production, including precision farming to reduce waste and increase sustainability, which includes technological resources like GPS, drones, soil sensors, etc. Which play an important role in monitoring soil moisture, maintaining animal habitats, animal biology cycles, and also reduce water usage by analyzing the data, using the above technologies farmers improve the health and quality of plants, animal resources through smart irrigation.

Agriculture in North India faces growing challenges due to climate change, soil degradation, water scarcity, and market uncertainties. These factors threaten farm productivity and food security, necessitating innovative and sustainable solutions. Crop diversification has emerged as a key strategy to enhance sustainability, improve farm resilience, and reduce dependency on monoculture farming. By integrating traditional agricultural knowledge with modern innovations, including climate-resilient crops, precision farming, and organic practices, farmers can adapt to changing environmental conditions while ensuring long-term productivity.

1. Government Initiatives and policies

Role of Viksit Bharat 2.0 in modernizing Agriculture:

In "Developed India 2.0" Indian PM Modi's main aim is to make the whole of modern India 140 crore India 60 agricultural laborers so to improve agriculture in India by reforming agricultural laws and using new kind of technology and machines especially in the affected areas. Under this mission, small farmers, medium farmers are to be connected to modern technologies, artificial technology information training for utility, AI tools for good use and irrigation, use of GM crops through biotechnology, use of innovative techniques, solar pumps micro irrigation for increasing food production, increasing the quality of fertilizers, through which the farmers of India have to increase their income.

* Agricultural Policy Reforms:

* Technological Advancement:

* Soil and Fertilizer Management:

•Increase in Food Production and Sustainability:

Through these strategic initiatives, Developed India 2.0 aims to empower farmers with modern equipment, sustainable practices and government supported policies, thereby ensuring a resilient, high yielding and future ready agriculture sector.

•Resilient and sustainable agriculture: The main objective of “Developed India @ 2047” is to create an agricultural system that can withstand the changing times like increasing global heat and other conditions like climate change, biological successional cycle. Under Developed India 2.0, the main agricultural production in all areas (rural, wasteland, forest) of North India is to ensure long-term sustainability of major cereals, pulses, seasonal vegetables, seasonal fruits, flowers, sugarcane, fisheries, poultry, aquaculture etc.

•Increase in food productivity: Through “Developed India 2.0” to double the income of farmers from crop yield and increase overall productivity in North India and across India, through simple integration of technology, better benefits of government schemes can be availed by the farmers in any disaster situation and modernization of agriculture can be made better and important from urban to rural through better practices.

•Food Processing and Value Chain: Under this, not only in North India but in the whole of India, food items should be priced according to their production, like sugarcane, wheat, rice should be kept in the original source of world food processing and value chain, which ensures the supply of adequate food items for the country. So that hunger can be eliminated from India. Apart from this, by adding foreign missions, hunger can be eliminated and India can be called an agricultural country again.

•Policy and Regulatory Framework: Under “Developed India 2.0”, special attention has been given to rationalizing subsidies, arrangements like crop insurance to protect the farmers of the country from big risks, empowering farmers through cooperative projects, providing projects to farmers without any discrimination, getting fair price in the market to promote contract farming and ending deposit-taking, brokerage, etc. Which can be given the slogan of “Majboor Kisan Se Majboot Kisan”

Role of other missions to modernize agriculture across India:**1.PM Kisan Samman Nidhi Yojana:**

PM Kisan Samman Nidhi Yojana (PM-KISAN) was announced by Piyush Goyal on 1 February 2019 during the Interim Union Budget 2019. PM Kisan Samman Nidhi Yojana is a famous Bala Central Program Scheme managed by the Government of India, in this scheme eligible farmers get success with highyielding seeds, pesticides and other conditions every year, the Government of India provides financial

assistance of 6000 to the farmers. By keeping this scheme regular, farmers should give priority to the installment available on time.

Only land-holder farmer families can avail the benefits of this scheme, who have sufficient areas available for agriculture. Upper caste class, government employees, leaders and farmer families receiving pension of more than 10,000 are deprived of this scheme.

2.Digital Agriculture Mission:

The Digital Agriculture Mission was passed by the Government of India on 2 September 2024 with a budget of 2,817 crores. Under this mission, the farmers of India are to be connected to each other through digital network. The main objective of this mission is to provide information to the farmers about growing advanced seeds and suitable crops according to different types of climate in different states of India. The objective of Digital Agriculture Mission is to improve the efficiency of the government machinery, support for evidence-based policy etc. And achieve success in it.

If the Government of India brings Digital Agriculture Mission App, information about climate, advanced seeds, weather, price, market price, demand production, farmers installment Samman Nidhi Yojana, upper farmer class, lower farmer class, land-holder farmers etc. Is available to farmers at one place.

2.Tecnological advancements are :

1.Precise farming:

It is another method for transforming agriculture by using various technologies that enhance various productivity, increase efficiency and economy. Various technologies involve.

Drone technology: Drone technology is being used for monitoring in farming, sprinkling seeds, pesticides spraying and also help farmers monitoring their farm in great detail drone technology mainly used in India, Netherlands, Japan, government of India allowed ICRISAI stands for international crop research institute to use drone for fertilizer because of its potential to revolutionize agriculture

IOT sensor: Help to analyses data, humidity of soil and help the farmer to make their decision about fertilizer.

2. Smart irrigation technology: Advanced technology that helps to optimize the usage of water in agriculture by using various data analytics and provide water to the plant according to their needs at exact time. There are various types including:

- **Drip irrigation**
- **Sensor based irrigation**
- **3. Sprinkler irrigation**

Drip irrigation: Help to deliver the water to the roots of the plant with the help of dropper it prevents waste of water and the efficiency of fertilizer.

Sensor based irrigation: IOT and AI technique are used to observe the soil humidity and weather conditions for irrigation. BenefitSmart irrigation conserve almost 30 to 50 per of water. Maintain quality and quantity of crop.

Micro irrigation: Micro irrigation technique helps to minimize the usage of water and deliver the exact amount of water to the plant at specific area at specific time with the help of “micro spray”

Overhead irrigation: help to transfer the water with the help of sprinkler

Micro irrigation technique is not easy to afford, it's a very complex process and hard to install.

The main objective of the technology advancements is to improve the agricultural production and increase productivity

Methodology

This research paper adopts a conceptual research approach, primarily based on an extensive review of published scientific literature. Conceptual research involves synthesizing existing studies to analyze and explain the phenomenon under investigation. It systematically outlines the necessary actions in the research process by integrating knowledge from ongoing studies and diverse scholarly perspectives on the subject.

The research process began with topic refinement, ensuring a focused and relevant scope. Given that conceptual research relies heavily on secondary data, a critical step involved collecting and analyzing information from credible sources. This included peer-reviewed scientific journals, published research papers by renowned scholars, and other scholarly materials accessible through digital repositories and public libraries.

To establish a structured research framework, I identified key variables relevant to crop diversification and sustainable farming in North India. These variables were selected based on their significance in the research context and their potential to contribute to a comprehensive understanding of the topic. The integration of these variables helped shape the research design and theoretical foundation.

Finally, the research framework was constructed by synthesizing insights from various studies and aligning them with the research objectives. The research problem statement formed the basis of this framework, guiding the study toward addressing existing knowledge gaps. This approach ensures that the study contributes meaningful and well-supported information to the academic and practical discourse on crop diversification and sustainable farming in North India under the *Viksit Bharat 2.0* initiative.

Conclusion

Agricultural transformation in North India under the "*Viksit Bharat 2.0*" initiative is a critical and timely endeavor to address the mounting challenges of climate change, soil degradation, water scarcity, and market uncertainties. The strategic integration of advanced technologies such as precision farming, drone monitoring, IoT-based soil sensors, and smart irrigation systems has the potential to revolutionize traditional farming practices. By improving resource management, enhancing productivity, and promoting sustainable agriculture, these innovations are equipping farmers to adapt to environmental changes and achieve higher resilience.

Government initiatives like the PM-Kisan Samman Nidhi Yojana, Digital Agriculture Mission, and reforms under *Viksit Bharat 2.0* have further strengthened the agricultural ecosystem by providing direct financial support, technological empowerment, and policy interventions to ensure inclusive growth. The emphasis on modernization, diversification, and value chain enhancement demonstrates a holistic vision to not only increase food production but also ensure the long-term economic stability of farmers.

The conceptual research approach adopted in this study highlights the importance of synthesizing scholarly literature to build a strong theoretical foundation for understanding agricultural modernization. It underscores the interconnectedness of technological adoption, government support, and sustainable practices in creating a future-ready, prosperous farming sector.

In conclusion, the path to a developed and self-reliant agricultural sector in North India—and by extension all of India—lies in the seamless integration of technology, tradition, and policy. Through continuous innovation, focused interventions, and capacity building, the dream of "*Majboor Kisan se Majboot Kisan*" (From Helpless Farmer to Empowered Farmer) can be realized, paving the way for India's resurgence as a global agricultural powerhouse by 2047.

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