

# The Impact of Government Initiatives on Sustainable Water Management and Agriculture

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## Abstract

This study showcases the essential shift towards sustainability in Indian agriculture. Authors have delved into newspaper articles, research papers, public reports and surveys to achieve this objective. India is an agricultural powerhouse, producing a wide variety of crops and livestock. The agriculture sector employs over 50 per cent of the population and contributes 17 per cent to the GDP. However, India's agriculture sector is facing several challenges, including climate change, water scarcity, and rising input costs. There are pressing challenges of resource depletion, climate change, and food security. Through an interdisciplinary lens, this research investigates Water management strategies, Technology integration to enhance resilient and environmentally conscious agricultural systems and Credit Facilities for farmers to carry out sustainable agriculture. The prospects and difficulties of sustainability in the agriculture industry are identified by this study. The outcomes of the investigation are intended to give suggestions to policymakers, farmers, and the agriculture industry to ensure a sustainable future for India's agriculture.

**Keywords:** Agriculture, Economic Growth, Government Initiatives, Sustainability, Water Management

**JEL Classification Codes:** JEL Classification Code: Q25, Q56, Q58

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## 1. Introduction

*'To forget to dig the earth and then the soil is to forget ourselves'*, says Mahatma Gandhi. In the past decade, the concept of sustainable agriculture has been in discussions which debate that sustainable agriculture in India has been adopted by only a small percentage of farmers. Lack of awareness and knowledge on the adoption of sustainable practices has been a major problem among the farmers in India. The government has initiated many schemes that assist and facilitate farmers to carry out their farming activities in a sustainable manner. However, these schemes in India are being adopted by a marginal number of farmers. Therefore, educating the farmers regarding the various schemes and facilities available to them is the need of the hour.

Due to growing urbanisation and the expansion of urban limits across the country, agricultural activities are to be seen only in the rural region of the country. It should also be noted that 70 per cent of Indian rural households rely on agriculture as their primary source of income. The Economic Survey of 2021 indicates that agriculture is the primary source of income for 47 per cent of Indians, who also form the majority of those living in rural areas (65 per cent). In India, the agricultural sector employs over 58 per cent of the workforce and contributes as much as 17 per cent to the country's GDP. The percentage of rural households that rely on agriculture has decreased to 50 per cent over time (National Skill Development Corporation, 2020). Hence, it is necessary to protect the agricultural sector from industrialisation and safeguard nature's gift to our upcoming generations.

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## 2. Literature Review

**Kumar et al. (2016):** Authors suggest that when Indian farmers face poor economic conditions, sustainable practices become essential for enhancing productivity, profitability, and overall production. These practices can significantly improve farmers' financial stability. The challenge lies in promoting agro-processing in India, especially considering the declining farm sizes. Providing training to farmers on organic post-harvest management and marketing can facilitate the adoption of organic farming. This shift to organic methods can help farmers enhance their economic conditions and achieve greater financial stability.

**Sudhakar (2016):** Indian agriculture faces significant challenges, including resource limitations, infrastructural constraints, and technological shortcomings. Water irrigation, the largest consumer of freshwater, is particularly affected as both surface water and groundwater are contaminated by the extensive use of pesticides and other chemicals for crop yield and profitability. Urbanization also plays a major role in the reduction of farmland, converting agricultural land into non-agricultural uses. To achieve sustainable agricultural growth, it is crucial to identify areas of intervention. Preventing the exploitation of Indian farmlands by both rural farmers and urban populations is essential for preserving these vital resources in a growing country like India.

**Coulibaly et al. (2021):** This research investigates the factors that contribute to farmers adopting organic farming, focusing on a study conducted in China in 2021. The study identifies several major factors influencing this shift. Demographic factors include age, education, gender, and income of the farmer. Farm-related factors encompass the size, location, and soil type of the farm. Psychological factors such as the farmer's attitude, perception, and social norms also play a significant role. Additionally, exogenous factors such as information acquisition, training, interactions within networks, and membership access to resources and markets are crucial in the transition to organic farming.

**Nwachukwu (2022):** This research highlights the role of technological innovations, such as solar energy, in making agriculture more accessible for farmers. It suggests that using animal manure as a nutrient source

for plants and adopting green agriculture practices can significantly benefit agricultural lands. While it can be challenging to implement new technologies in farms that rely on traditional methods, over time, these innovations can greatly benefit farmers. Two agricultural techniques—intensive and extensive agriculture—can be employed, with the aid of modern equipment, to reduce labour input and maximize yield. These methods are already in use in many foreign countries and could be adopted in India to enhance agricultural productivity.

**Rani (2018):** This research addresses the need to promote sustainable agriculture in India by examining the approaches and initiatives taken by the government. To support sustainable agriculture, the government has implemented policies that encourage organic farming and reduce reliance on chemical fertilizers and pesticides. Financial incentives and subsidies are provided to farmers adopting sustainable practices, along with the development of infrastructure for improved water management and irrigation systems. New initiatives include various schemes aimed at educating farmers, such as training programs and workshops on sustainable farming techniques. Additionally, sustainable agriculture education is being integrated into school curriculums and agricultural colleges. Effective marketing strategies are also being employed to raise awareness about the benefits of sustainable agriculture and encourage its widespread adoption. These efforts emphasize the importance of education and awareness in promoting sustainable agricultural practices across India.

**Singh and Parihar (2015).** This research highlights that the reduction in credit facilities by banks has led to unstable financial conditions for farmers, contributing to the agricultural downturn in the country. Open market operations and resource constraints also play significant roles in the decline of farming. Major challenges include the availability of rural credit, agricultural development, trade practices related to export and import, inadequate promotion of agricultural products, and limited knowledge of available schemes. The Indian population, a valuable resource for the country, remains underutilized. The government needs to introduce innovative initiatives to harness the talents of the unemployed population, channelling them into the agricultural sector to boost overall development and improve the agricultural landscape.

**Ashokan and Murugan (2018).** In India, organic farming is based on these principles. The soil is a living thing. Like humans, nature is the best teacher for farming activities. That idea of sustainable agriculture can be explained in three body areas. They are healthcare and equity. Social Equity and economic equity. The usage of pesticides and chemical fertilizers for the good yield of plants can affect the entire food chain as these crops become the food sources that are consumed by humans. That directly affects the food chain and the ecosystem in the biodiversity. For a good biodiversity and ecosystem, the usage of these pesticides and chemical fertilizers needs to be reduced and organic farming and animal manure need to be adopted for a good and healthy food chain.

**Srivastava et al. (2016):** This research states that To feed the growing human population sustainably, an increasingly resilient agro-ecosystem with internal regulation through agro-ecological management—that is, indirect management of ecological interactions—is needed in the face of accelerating climate change and externalities in the regulation of the agro-ecosystem. The efficiency and resilience of the agro-ecosystem may be improved by agro-management techniques based on the understanding of micro-scale resilience, potential efficiency, site-specificity with little off-farm inputs and leach-out (negative effects), economic viability, environmental soundness, ethical justice, and social acceptance are all necessary for agriculture to be considered sustainable. First and foremost, these agricultural methods must be grounded in a combination of conventional ecological knowledge and contemporary scientific insights. To accomplish sustainable development and agriculture, it might eventually cultivate and benefit from the ecosystem's subsidies. Additionally, acts that are grounded in the interactions of the entire ecosystem.

**Chel and Kaushik (2011):** Human nourishment depends exclusively on agriculture. However, the reliance on fossil fuels to power farm equipment accelerates climate change by contributing to greenhouse gas emissions. Promoting the use of renewable energy sources such as solar, wind, biomass, tidal, geothermal, small-scale hydro, biofuels, and wave-generated power can mitigate this environmental harm. These renewable resources hold immense promise for the agricultural sector. To encourage

the adoption of renewable energy technologies, subsidies should be offered to farmers. Sustainable agriculture aims to strike a balance between minimizing the use of limited natural resources, reducing environmental impact, and optimizing agricultural output and financial stability. Given that CO<sub>2</sub> emissions from agriculture have adverse environmental effects, managing energy use in agriculture is a global priority.

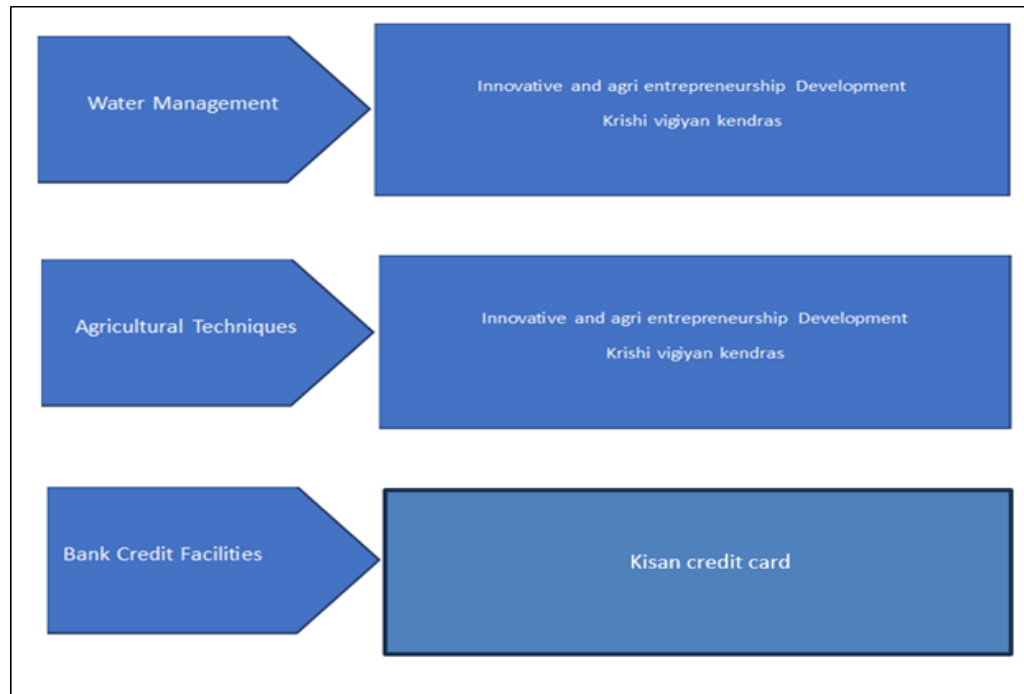
### 3. Agriculture Sector in India an Overview

Millions of people in India depend on the agriculture industry for their lives it is vital to the country's economy In many rural regions, traditional farming practices continue to be predominant despite efforts at modernization The unpredictable weather patterns brought on by climate change are a serious threat to crop harvests Through direct income transfers, government programs such as PM-Kisan seek to assist smallholder farmers To address environmental issues, sustainable approaches like organic farming are becoming more popular The use of AI and mobile apps, in particular, is transforming farming practices Investments in irrigation infrastructure are necessary because water scarcity is still a major problem Recent farmer demonstrations have brought attention to the need for equitable pricing methods and legislative reforms Value addition and supply chain management are critical functions of the agribusiness and food processing sectors.

### 4. Research Objectives

- i. To examine the government initiatives available for sustainable water management and agriculture.
- ii. To investigate the challenges that exist with the government Initiatives for sustainable agriculture.
- iii. To suggest possible highlights for policymakers, farmers and agricultural industry.

### 5. Government Initiatives for Sustainable Agriculture



**Figure 1.** Figure showing the initiatives/schemes for sustainable agriculture.

Source: Authors' work

## 5.1 Water Management

Rainwater collection is the main method used by the Water Management Program to increase groundwater and restore depleted subterranean aquifers. Long-term improvements in groundwater availability and quality result in rural families having access to secure water supplies. Approximately 4,000 cubic kilometres of water are accessible nationwide each year as a result of precipitation. There are 1,869 cubic kilometres of surface water and replenishable groundwater available. Only sixty per cent of this can be used effectively. Therefore, the nation's total usable water resource is merely 1,122 cubic kilometres.

## 5.2 Jal Jeevan Mission

The Accelerated Rural Water Provision Programme was introduced in 1972 as the first step in the Central Government's aid to States for rural water provision. In 2009, it was renamed the National Rural Drinking Water Programme (NRDWP), a federally funded initiative that is divided equally between the federal government and

the states. "Enable all households to have access to and use safe and adequate drinking water within premises to the extent possible" was one of the goals under the NRDWP. The aim was supposed to be accomplished by 2030, in line with the Sustainable Development Goals of the United Nations. However, it is now intended to use the Jal Jeevan Mission (JJM) to accomplish the target by 2024. As per the information available with DDWS, as of 31st March 2019, only 18.33 per cent of rural households, i.e., 3.27 Crore out of the total 17.87 Crore rural households in the country, have piped water connection.

### 5.2.1 Jal Jeevan Mission Rural 2019 (JJM)

The National Rural Drinking Water Programme (NRDWP) has been restructured and merged by the Indian government into the Jal Jeevan Mission (JJM) to provide every rural family, or Har Ghar Nal Se Jal (HGNSJ), with a Functional Family Tap Connection (FHTC) by 2024. The government aims to provide tap water connections to 100 per cent of rural households by the end of 2024. Under this mission, each family is provided with 55 litres of clean water per day per person.

The following types of works/schemes are proposed to be undertaken under JJM:

1. In-village water supply (PWS) infrastructure for tap water connections to every household.
2. Reliable drinking water source development/augmentation of existing sources.
3. Transfer of water (multi-village scheme; where quantity and quality issues exist in local water sources).
4. Technological intervention for treatment to make water potable (where water quality is an issue, but quantity is sufficient).
5. Retrofitting of completed and ongoing piped water supply schemes to provide FHTC and raise the service level.
6. Grey-water management.
7. Capacity building of various stakeholders and support activities to facilitate implementation.

### 5.2.2 Jal Jeevan Mission Urban 2021

To provide functional household tap connections to houses in all 4378 urban local bodies

### 5.2.3 Challenges and Issues while Implementing this Scheme (JLL)

- i. COVID-19 epidemic: The worldwide epidemic has impacted numerous industries, including infrastructure-building initiatives like the “Har Ghar Jal” mission. These limitations have slowed down the pace of implementation by affecting the supply of essential materials such as pipes and other building supplies, leading to additional delays.
- ii. Water Contamination: Certain areas, such as Kerala and West Bengal, continue to face challenges with contaminated water, making it difficult to ensure that people have access to clean drinking water. Additionally, there is a shortage of qualified labour in several states to construct water connections, cisterns, and tanks of adequate quality.
- iii. Implementation Delay: Instances have occurred where the Jal Jeevan Mission (JJM) has not initiated

the process of supplying tap connections to houses, resulting in delays in meeting the goals. Approximately 1 crore families (5 per cent of the total) out of the approximately 19.5 crore intended to be covered by the initiative have not yet commenced any activity.

- iv. Certification and Connectivity: Although there has been an increase in the number of tap connections in areas such as Rajasthan and Uttar Pradesh, additional efforts are still needed as certification and full connectivity of villages remain low. In most communities, there is insufficient connectivity between every household, with many having piped water connected to only half or three-fourths of their houses.

## 5.3 Pradhan Mantri Krishi Sinchayee Yojana 2015 (PMKSY)

The **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)** is an irrigation scheme initiated by the Indian government. Recently, the government announced the Pradhan Mantri Krishi Sinchayee Yojana to enhance irrigation and agriculture. Introduced on July 1st, 2015, the PMKSY is executed with the motto “Har Khet Ko Paani” (Water to Every Field), aiming to expand the cultivated area with assured irrigation, minimize water wastage, and enhance water utilization.

### 5.3.1 Beneficiaries of Pradhan Mantri Krishi Sinchai Yojana

- i. Farmers in any level or class.
- ii. Farmers who possess or own land.
- iii. Participants in producer farmer groups, trust cooperative societies, and self-help organisations.
- iv. Farmers who farm property under lease;
- v. Farmers who exclusively have Indian citizenship

### 5.3.2 Challenges and issues while implementing this scheme

Among the Indian states, Tamil Nadu is leading to the installation of drip irrigation systems. The purpose of the study was to determine the barriers that the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) beneficiaries

in the Tamil Nadu districts of Dharmapuri, Salem, and Erode faced in adopting drip irrigation systems.

Data was gathered through in-person interviews. The limitations were divided into four categories: **Technical, Infrastructure, Financial, and Educational**. The respondents were questioned about the different obstacles they encountered when using drip irrigation systems. The Garrett Ranking approach was utilized to rate the restrictions.

- i. The PMKSY beneficiaries encountered various technical obstacles when implementing drip irrigation technology, including claims that it was “not suitable for field crops” (74.38), that “clogging of drippers by suspended materials” (62.82), that it needed regular maintenance (59.71), that it was challenging to maintain the ideal pressure to discharge water (50.85), and other issues.
- ii. The PMKSY beneficiaries encountered various infrastructure-related obstacles when implementing drip irrigation technology. These included inadequate electricity supply for irrigation fields (72.76), subpar after-sales service from the companies (62.90), lack of technical staff availability (55.65), inadequate distribution network in rural areas (41.56), untimely availability of spare parts (39.11), and subpar quality of pipes and micro-tubes (38.06).
- iii. The farmers faced financial challenges in adopting drip irrigation systems, including high maintenance costs (89.38), “high cost of equipment / spare parts” (86.11), needing an additional tank to achieve optimal pressure (81.86), inadequate subsidies provided (80.75), a laborious loaning process (77.88), and expensive liquid fertilizer (72.20).
- iv. The Educational constraints faced by the PMKSY beneficiaries were perceived as inadequate awareness about the advantages of drip irrigation technology (73.15).

#### 5.4 Atal Bhujal Yojana (2019)

Atal bhujal yojana is also called Atal Jal A central sector programme valued at Rs. 6,000 crore, the Atal Bhujal Yojana seeks to manage groundwater sustainably while including the community. It calls for public involvement in

the creation of water budgets, the planning and execution of water security strategies at the gram-panchayat level, etc.

The Ministry of Jal Shakti, formerly the Ministry of Water Resources, River Development, and Ganga Rejuvenation, is in charge of carrying it out. The World Bank and the Indian government are contributing 50 per cent each to the program’s funding. For the scheme’s implementation, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, and Uttar Pradesh have been recognized as overexploited and water-stressed regions.

In the state of Haryana, it consists of 1656 Gram Panchayats, 36 blocks, and 14 districts. The degree of groundwater exploitation and degradation, the presence of established legal and regulatory frameworks, institutional preparedness, and prior experience implementing groundwater management programs have all been taken into consideration in the selection of the States.

##### 5.4.1 Challenges and Issues While Implementing this Scheme

- i. Groundwater Management: Ensuring effective management of groundwater resources, including monitoring usage and replenishment, is a significant challenge.
- ii. Stakeholder Participation: Engaging and coordinating with various stakeholders, including farmers, local communities, and government agencies, to ensure their active participation and support.
- iii. Data Availability: Accessing accurate and up-to-date data on groundwater levels, recharge rates, and usage patterns can be challenging, hindering informed decision-making.
- iv. Technological and Infrastructure constraints: implementing ABHY requires the use of advanced technologies for groundwater monitoring, recharge, and management which may be lacking in some areas.
- v. Additionally insufficient infrastructure to store the water like dams, canals, recharge wells, Buildings etc.
- vi. Community participation and Governance: Engaging local communities in groundwater management and ensuring their participation in decision-making

processes is crucial for the success of ABHY but can be challenging to achieve.

- vii. Policy Implementation: Ensuring that policies and regulations related to groundwater management are effectively implemented at the grassroots level.
- viii. Behavioral Change: Promoting behavioural change among farmers and other water users to adopt more sustainable water practices and reduce over-extraction of groundwater.
- ix. Funding and Financing: Securing adequate funding and financing mechanisms to support the implementation of ABHY projects and initiatives.
- x. Climate Change Impact: Addressing the potential impact of climate change on groundwater availability and recharge patterns, which may exacerbate existing challenges.

## 5.5 Adoption of Digital (Smart Farming) and Innovative Farming Techniques

The adoption of modern and smart farming technologies by farmers depends on various factors such as socioeconomic conditions, geographical conditions, crop growth, and irrigation facilities.

### 5.5.1 Innovative and Agri-Entrepreneurship Development

The Indian government helps and encourages state governments to advance agriculture across the nation and integrate cutting-edge, intelligent farming technologies into the agricultural industry. The Sub-Mission on Agricultural Mechanism promotes the employment of contemporary machinery, such as Kisan drones. Funding for digital agriculture projects utilizing cutting-edge technologies like blockchain, Internet of Things (IoT), artificial intelligence and machine learning (AI/ML), and others is provided to state governments through the NeGPA program. In 2018–19, the Rashtriya Krishi Vikas Yojana (RKVY-RAFTAAR) introduced a component dubbed “Innovation and Agri-Entrepreneurship Development” to foster the incubation ecosystem and advance innovation and Agri-entrepreneurship through financial support.

Start-ups are encouraged to apply cutting-edge technologies under this plan to address problems in the agriculture and related sectors. The States receive the funds by their recommendations. The Per Drop More Crop (PDMC) Centrally Sponsored Scheme is being implemented by the government to improve farm-level water use efficiency by means of Micro Irrigation, specifically Sprinkler and Drip Systems. By fertigation, the Micro Irrigation reduces the need for fertiliser and saves water. It also lowers labour costs and other input prices while increasing farmers’ overall income. Micro Irrigation is relevant in attaining national priorities including increasing crop output, raising on-farm water usage efficiency, improving the quality of agri/horticultural goods, etc., according to recent evaluation studies of the plan. Opting digital and smart farming techniques involves leveraging technology and new methods to enhance productivity, sustainability, and efficiency in agriculture.

- i. Precision Agriculture: This involves using GPS, sensors, drones, and satellite imagery to monitor and manage crops and livestock with precision. Farmers can optimize inputs like water, fertilizers, and pesticides, reducing waste and environmental impact while maximizing yields.
- ii. Smart Farming: Integrating IoT (Internet of Things) devices and sensors in farming operations enables real-time monitoring of environmental conditions such as soil moisture, temperature, and humidity. This data helps farmers make data-driven decisions, such as when to irrigate or apply treatments.
- iii. Vertical Farming: Utilizing indoor farming techniques like hydroponics, aquaponics, and aeroponics, where crops are grown in stacked layers under controlled conditions, allows for year-round production in urban areas. This method conserves space, water, and resources while minimizing transportation costs.
- iv. Robotics and Automation: Employing robots for tasks like planting, harvesting, and weeding reduces the need for manual labor, addresses labor shortages, and improves efficiency. Autonomous vehicles and drones can also be used for tasks like crop scouting, spraying, and mapping.
- v. Blockchain Technology: Implementing blockchain in agriculture can enhance transparency and traceability

throughout the supply chain. Farmers can record data such as crop origin, cultivation practices, and transportation details, ensuring food safety and quality while building trust with consumers.

- vi. **Data Analytics and AI:** Analyzing large datasets using AI algorithms helps predict crop yields, optimize planting schedules, and detect disease outbreaks early. AI-powered solutions can also provide personalized recommendations to farmers based on historical data and real-time observations.
- vii. **Agri-Tech Startups and Collaboration:** Encouraging innovation through partnerships between traditional agricultural companies, startups, research institutions, and government agencies fosters the development and adoption of new technologies and practices.

### 5.5.2 Challenges and Issues while Implementing this Scheme

- i. **Access to Capital:** Securing funding for innovative agricultural ventures can be challenging due to the high upfront costs, perceived riskiness, and lack of collateral among entrepreneurs.
- ii. **Market Access:** Connecting innovative agripreneurs with markets for their products can be difficult, especially for those operating in remote or underserved areas with limited infrastructure and distribution channels.
- iii. **Technology Adoption:** Embracing new technologies in agriculture requires significant investment in equipment, training, and infrastructure, which may be beyond the reach of small-scale entrepreneurs.
- iv. **Regulatory Hurdles:** Navigating complex regulations and bureaucratic processes related to land use, permits, and certifications can pose significant barriers to entry for agripreneurs.
- v. **Climate Change and Environmental Sustainability:** Increasingly unpredictable weather patterns and environmental degradation present challenges to sustainable agricultural practices, impacting productivity and profitability.

vi. **Access to Information and Education:** Limited access to relevant information, technical knowledge, and business skills can hinder the ability of agripreneurs to innovate and succeed in their ventures.

vii. **Infrastructure and Logistics:** Inadequate transportation, storage, and processing facilities can constrain the growth of agricultural enterprises by limiting their ability to scale up production and reach larger markets.

viii. **Access to Inputs:** Availability and affordability of quality inputs such as seeds, fertilizers, and pesticides are essential for agricultural productivity, but access can be constrained by factors such as market monopolies or supply chain disruptions.

ix. **Market Volatility:** Fluctuations in commodity prices, exchange rates, and global trade dynamics can create uncertainty for agripreneurs, making it difficult to plan and manage their businesses effectively.

## 5.6 Krishi Vigyan Kendras (KVK)

The Krishi Vigyan Kendra's (KVKs) project is being implemented by the Indian Council of Agricultural Research in several States of the country to assist farmers in embracing cutting-edge farming methods created by National Agricultural Research Systems. The activities of KVKs include testing technology on farms to determine its location specificity under different farming systems; demonstrating on the ground the production potential of enhanced agricultural technologies; building farmers' capacity to upgrade their knowledge and skills; and producing high-quality seeds, planting materials, and other technology inputs to make them available to farmers. The KVKs engage in a wide range of extension activities to raise farmers' awareness of agricultural advancements and technologies.

Further, as per the Budget Announcement for the year 2023-24, the Ministry of Agriculture and Farmers Welfare has taken various initiatives to build Digital Public Infrastructure (DPI) for agriculture as an open source, open standard and interoperable public good. These initiatives intend to provide access to technology and information to the farmers across the country to address



the farmer-centric solutions, through various digital initiatives.

### 5.6.1 Challenges and Issues while Implementing this Scheme

- i. **Limited Resources:** Many KVKs struggle with limited funding, manpower, and infrastructure, hindering their ability to effectively implement programs and reach out to farmers.
- ii. **Technology Adoption:** Encouraging farmers to adopt modern agricultural practices and technologies can be challenging due to factors like lack of awareness, access, and initial investment costs.
- iii. **Extension Services:** Ensuring effective extension services to disseminate agricultural knowledge and information to farmers in remote and rural areas can be difficult due to logistical constraints and communication barriers.
- iv. **Tailored Solutions:** Providing customized solutions and advice to diverse farming communities with varying needs and conditions requires specialized expertise and resources.
- v. **Market Linkages:** Facilitating market linkages for farmers to sell their produce at fair prices and access to markets can be a challenge, particularly for smallholder farmers.
- vi. **Climate Change:** Addressing the impacts of climate change, such as erratic weather patterns, water scarcity, and pest outbreaks, requires adaptive strategies and resilient farming practices.
- vii. **Policy Support:** Advocating for supportive policies at the government level to address agricultural challenges and provide necessary resources and infrastructure for KVKs to function effectively.

## 5.7 Bank Credit for Sustainable Agriculture

Land management, soil recovery, livestock, equipment, and forestry are the five lines of credit that make up the instrument's ten-year revolving credit facility concept. Concessional and commercial capital will be used by the facility to accumulate an investment fund.

## 5.8 Kisan Credit Cards (KCC)

Introduced in 1998, the scheme was introduced by NABARD (NATIONAL AND BANK AGRICULTURE OF RURAL DEVELOPMENT) the Kisan Credit Card (KCC) scheme aims to provide farmers with credit cards based on their holdings, which will be uniformly adopted by banks. This will allow farmers to easily buy agricultural inputs, such as pesticides, fertilizers, and seeds, and to obtain cash for their production needs. In 2004, the programme was expanded to include allied and non-farm industries that farmers needed investment assistance for. A working group led by Shri T. M. Bhasin, CMD of Indian Bank, reexamined the programme in 2012 in an effort to streamline it and make it easier to issue Electronic Kisan Credit Cards. The plan gives banks extensive instructions on how to operationalize the KCC plan.

**Interest rate** - Interest rate are very low for farmer which can repayable by farmers

**Eligibility** - That are no specific age limit for applying for KCC applicant must be legal age to enter into financial agreement. But applicant must be a farmer who owns a land either individual or jointly with others

**Documentation** - Identify proof, address proof, land owner ship document and other relevance document.

### 5.8.1 Challenges and Issues while Implementing this Scheme

- i. Many of the farmer are not aware of this scheme or its benefits. Lack of awareness are need for farmer to update about KCC scheme.
- ii. Farmers often faces challenges in providing the necessary and meeting the eligibility criteria for obtain KCC.
- iii. The farmer may misuse the KCC loans amounts like non-agriculture, leading to indebtedness, repayment difficulties this may properly monitoring and evaluation mechanisms and needed to prevent such issues.
- iv. Technology is the main issue for fill the forms and digitally banking services.
- v. Lack of infrastructure facility.

## 6. Suggestions for Improvement

### 6.1 Jal Jeevan Mission

- i. Provide training and programs for local communities, especially women, to operate and maintain the water supply infrastructure.
- ii. Design and implement water supply systems that are resilient to climate change, considering factors like changing rainfall patterns, droughts, and floods.
- iii. Implement smart water meters to track consumption, detect leakages, and encourage responsible water use.

### 6.2 Pradhan Mantri Krishi Sinchai Yojana

- i. Encourage the use of alternative and sustainable sources of irrigation such as micro-irrigation, drip irrigation, and sprinkler systems to improve water use efficiency.
- ii. Invest in and promote the adoption of modern technologies like sensor-based irrigation systems, automated irrigation scheduling, and precision farming techniques to optimise water usage.
- iii. Provide financial incentives and subsidies for farmers adopting water-saving technologies and practices. This can encourage widespread adoption and make the scheme more attractive.

### 6.3 Atal Bhujal Yojana

- i. Provide training and capacity-building programs for local communities, water user associations, and officials to enhance their understanding of groundwater management techniques and practices.
- ii. Strengthen the monitoring and evaluation system by investing in advanced technologies for real-time data collection on groundwater levels, quality, and extraction rates. Use this data for informed decision-making.
- iii. Implement and enforce regulations on groundwater extraction, especially in critical and over-exploited areas. Use pricing mechanisms to discourage excessive use and promote sustainable practices.

### 6.4 Adoption of Digital and Innovative Farming Techniques

- i. Facilitate partnerships between the government and private sector to drive innovation in agriculture. Encourage technology companies to invest in research and development for solutions tailored to Indian farming conditions.
- ii. Implement a feedback mechanism that allows farmers to share their experiences, challenges, and suggestions regarding the use of digital tools. This feedback loop can help refine and improve the effectiveness of these technologies.
- iii. Develop and promote affordable digital tools and technologies tailored to the needs of small and marginal farmers. Subsidies or financial incentives can make these technologies more accessible.

### 6.5 Krishi Vigyan Kendras

- i. Facilitate linkages between farmers and markets. Help farmers understand market demands, negotiate better prices, and explore opportunities for value addition and agri-business.
- ii. Conduct regular field demonstrations to showcase modern agricultural techniques, new crop varieties, and innovative practices. This hands-on approach helps farmers understand and adopt new methods more easily.
- iii. Facilitate farmer-to-farmer learning programs where successful farmers share their experiences and best practices. This peer-learning approach can be highly effective in promoting adoption.

### 6.6 Kisan Credit Cards

- i. Increase awareness about the KCC scheme among farmers and aim for higher enrolment to ensure broader coverage.
- ii. Simplify the application process to make it more accessible, especially for small and marginal farmers. Introduce digital platforms for online application submission.

- iii. Regularly review and rationalise interest rates to ensure they remain affordable for farmers, taking into account inflation and changing economic conditions.

## 7. Findings

1. In Sustainable Agriculture in past the utilisation of cover crops due to the cost associated with it and now the utilisation of these cover crops has improved the soil health, prevented erosion and suppressed weeds.
2. Before the technology and Digital Adoption in agriculture was very less, but in these days the adoption of New Technology such as Artificial Intelligence (AI), Machine Learning (ML) and Internet of Things (IOT) and drones for better for cultivating the crops and get better yields.
3. These days the Different Irrigation Techniques such as Drip Irrigation sensors and Micro-Irrigation and Sprinkler Irrigation has been utilised more by the farmers.

### 7.1 Future Directions for Research

The future direction for sustainable agriculture and water management involves implementing innovative technologies such as precision agriculture, hydroponics, and drip irrigation to maximize resource efficiency. Additionally promoting agro-ecology practices, soil conservation, and water recycling, system will be crucial for long term sustainability. Collaborative efforts among stakeholder including government, farmers. And researcher, will be essential to address challenges like climate change and water scarcity while ensuring food security and environmental stewardship. Agriculture sector is an important contributor to the Indian economy around which socio-economics privileges and Deprivations revolve and any change in its structure is likely to have corresponding impacts on the existing pattern of social equity. Sustainable production depends upon the climate, rainfall, and topology. Indian agriculture faces resource constraints, infrastructural constraints, and institutional constraints. Technological constraints and policy induces limitation.

### 7.2 Conclusion

Sustainable agriculture in India holds significant potential to make a positive impact among all farmers if they are educated and supported in adopting sustainable methods. Government initiatives play a crucial role in aiding farmers to adopt new farming practices. It is essential for Indian farmers to be educated about these initiatives, as only a small fraction of the farming population currently utilizes them. Word-of-mouth marketing strategies can be employed by farmers to spread awareness about these initiatives, particularly targeting first-generation school-goers. When farmers are aware of these schemes, they can effectively utilize resources while ensuring their availability for future generations. If sustainable agriculture and water management practices are adopted by the majority of farmers in India, the country can eradicate food shortages and become a leading exporter of food products to other nations.

As many economists and leaders have emphasized in the past, agriculture is the backbone of the country, and effective measures must be taken to protect this sector for the nourishment of future generations. Agriculture, being the first occupation of humankind and encompassing the entire earth, serves as the foundation for all other industries (Stewart). Therefore, ensuring the success of agriculture is paramount, as any failure in this sector can have cascading effects on other aspects of society.

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