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Review Article

Initiatives to Promote Sustainable Agriculture in India: An Overview

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Abstract

Indian agriculture faces two obstacles such as economic and ecological. The Indian economy and society are based primarily on agriculture due to its significant contribution to job creation and generating livelihoods. Approximately 43% of India's land area is devoted to agriculture. The industry receives its food, fodder, and raw materials from this sector. In light of these facts, the Indian government has launched a number of national and regional initiatives to support the sustainable growth of agriculture. Despite this, the GDP share of agriculture has been rapidly declining in recent years. Indian farmers face a number of challenges, including high input costs, poor profitability, depleting water tables, land degradation, and climate change risks. Many socio-economic and environmental issues that arise from unsustainable farming practices can potentially be addressed by sustainable agriculture. Environmental health, financial profitability, and socioeconomic equity are the three main objectives that center on the idea of sustainable agriculture. Since the Indian government is aware of this, it has implemented a number of policies and programs that meet the needs for essential inputs in an environmentally friendly way. In this paper, significant Indian initiatives-such as the Soil Health Card scheme, PM Krishi Sinchayi Yojna, PM Fasal Bima Yojna, National Mission on Sustainable Agriculture, and Parampragat Krishi Vikas Yojna-are listed and evaluated. Analyzing India's efforts and strategy for the advancement of sustainable agriculture is the goal of the study.

Keywords: Sustainable Agriculture, SDGs; Govt. Initiatives; New Initiatives

Introduction

The United Nations developed the Sustainable Development Goals (SDGs), a collection of 17 global goals, to address pressing issues such as poverty, inequality, climate change, and environmental degradation. The fields of agriculture and food are closely related to many of the SDGs. Ending hunger, achieving food security, improving nutrition, and advancing sustainable agriculture are the main objectives of SDG 2, which is called Zero Hunger. The need for sustainable food systems and the decrease of food waste is addressed in SDG 12, Responsible Consumption and Production. Agriculture and efforts to mitigate and adapt to climate change are closely related, as highlighted by SDG 13, Climate Action.

Furthermore, the importance of protecting terrestrial ecosystems and biodiversity—which are frequently harmed by agricultural practices—is emphasized in SDG 15, Life on Land.

The significant role that food and agriculture play in achieving more general sustainable development goals is highlighted by these goals taken together. India leads the way in tackling the Sustainable Development Goals (SDGs) in the field of agriculture due to its substantial agrarian foundation. This paper explores the various challenges the Indian economy faces in achieving the Sustainable Development Goals (SDGs) in agriculture, as well as the wide range of government initiatives that have been put forth to address these issues. This research highlights the government initiatives are needed to achieve the SDGs.

For livelihoods and the general economic stability of India, agriculture is extremely important. Chemical and biological factors, as well as technical factors that are closely linked to market demand, all have an impact on the growth of agriculture. For the agricultural sector to remain prosperous, it is necessary to address a wide

range of challenges due to the complex interplay of these factors that highlight the difficulty of maintaining and improving agricultural practices.

Agriculture is the main sector in India that employs the most people. By creating agribusinesses, adding value, and using sustainable practices, we can boost employment and encourage economic expansion. Agriculture still accounts for almost two-fifths of all employment opportunities, but its share of the GDP has been declining over time. Despite its decreasing share of the country's GDP, the agricultural sector still accounts for more than one-fifth of the country's total income. To promote responsible production and consumption and lessen the negative environmental effects of agriculture, it is essential to implement sustainable farming techniques, such as organic farming and prudent resource management.

Growth-oriented agricultural policies have significant costs, as numerous macro and micro studies examining their effects have repeatedly demonstrated. One of these costs is the depletion of vital natural resources required to sustain agricultural systems. In order to meet the increasing global demand for food, society must either double food production by 2050 or embrace sustainable agricultural practices, which will ensure food needs for the present and the future. While there is a substantial subsidy for chemical inputs, public investment in bio inputs is substantially less than the threshold.

While chemical fertilizers receive a subsidy of $18,666.67 billion in India, organic inputs receive a total allocation of just $176 million. However, more recent government initiatives like the Paramparagat Krishi Vikas Yojana (PKVY) seek to encourage the use of bio inputs by giving farming units access to resources and funding. Focusing on sustainable management and utilization of water and energy resources in agriculture is crucial, and this should be emphasized in the national emphasis on increasing agricultural productivity.

Achieving sustainable economic growth and promoting resilient livelihoods both depend on this strategic approach. Agriculture's susceptibility to climate change and its contribution to greenhouse gas emissions make the adoption of climate-smart agricultural practices imperative. By implementing these strategies, farmers are less of a contributor to climate change and are also more resilient.

The preservation of biodiversity and the general health of terrestrial ecosystems depend heavily on reforestation, conservation initiatives, and sustainable land management techniques. For the agriculture sector to experience sustainable development, collaboration between NGOs, governments, and private companies is necessary. In order to achieve the common goal of resilient and sustainable agriculture in the future, collaborations are crucial for facilitating information sharing, technology transfer, and resource mobilization.

Reviving agricultural development in India will require substantial reforms as well as strengthening of the country's systems for agricultural research and extension. Given the vast and diverse terrain of India, which includes a range of agro-climatic and economic circumstances, a one-size-fits-all approach is insufficient.

Development in agriculture will require a radical shift in agricultural research and extension. The transformation of government objectives into tangible measures that promote agricultural development depends on these services.

Objectives of the study and methodology of the study

This study draws its information from secondary sources, including government publications, newspapers, magazines, journals, and websites, among others. The following objectives are the focus of the study's research

- To evaluate the government's efforts in the agriculture sector to fulfill the SDGs.
- To analyze the strategy that the Indian government has chosen to promote sustainable agriculture.
- To examine the significant steps have been made to advance it thus far.

Concept of sustainable agriculture

The idea of "sustainable agriculture" promotes the same idea of sustainability, which states that we must meet our needs now without sacrificing the capacity of future generations to meet their own. Natural resource conservation is essential for the agriculture industry as well as the continuation of life on Earth.

Using farming practices that safeguard the environment, public health, and the welfare of people and animals while producing food, fiber, plants, or animal products is known as sustainable agriculture. It integrates a number of environmentally safe farming techniques that preserve productivity and profitability while being

the least toxic and energy-intensive. Some examples of these farming techniques are organic farming, strip farming, mixed cropping, crop rotation, and so forth. Organic farming is thought to be the most popular and successful of these.

The strategy and initiatives of India

Concerns regarding climate change, global warming, environmental degradation, population growth, and widespread food insecurity are among the global issues that the world is facing. India has adopted a comprehensive approach to meet its obligations under international agreements such as the Paris Climate Change Agreement (2015) by protecting the environment and ensuring the welfare of its citizens. India has devised a multifaceted plan that will, either directly or indirectly, contribute to the growth of sustainable agriculture as well as the sector's resurgence.

India's strategy is centered on important elements such as regional physiography, local climate, water resources availability, and technology accessibility. emphasizes creating climate-resilient agriculture that is appropriate for regional climates, bringing back traditional farming practices like crop rotation, organic farming, and mixed farming, as well as utilizing India's dry land and rain-fed agriculture potential. In addition, by promoting micro-irrigation techniques, the Indian government has placed a greater emphasis on the sustainable development of irrigation facilities with efficient water use.

In addition, the government encourages farmers to expand their horizons and engage in different agricultural pursuits like goat farming, chicken raising, beekeeping, and timber plantations. Farmers in hilly areas, particularly those in Western Himalayan states and North-Eastern India, receive financial assistance to enable them to engage in sustainable horticulture.The programs pertaining to food processing, dairy farming, and infrastructure development fund lessen farmers' reliance on agriculture.

Government's major initiatives

Climate change resilient

- National Mission on Sustainable Agriculture
- Dry Land Area Agriculture Development

Irrigation facilities

- PM Krishi Sinchayi Yojna
- National Mission on Micro-Irrigation

Soil management

- Soil Heath Card Scheme
- Paramoragat Krishi Vikas Yojna
- Neem Coated Urea

Insurance

- PM Fasal Bima Yojna

Credit and price

- Kisan Credit Cards
- MSP, e-NAM

Technology and innovations

- Krishi Vigyan Kendras, Kisan TV,
- Kisan Suvidha App.

The national sustainable agriculture mission

It is listed as one of the National Action Plan for Climate Change's eight missions. The Mission aims to tackle concerns related to "Sustainable Agriculture" in light of the hazards posed by climate change. By developing appropriate adaptation and mitigation strategies for ensuring food security, equitable access to resources, and the enhancement of livelihood opportunities that lead to economic stability at the national level, it aims to transform agriculture into an ecologically sustainable and climate-resilient production system. Ten essential dimensions have been identified by the mission to support the adoption of sustainable agricultural practices through the implementation of a Plan of Action (PoA) that addresses both mitigation and adaptation strategies.

It is centered on four functional areas: infrastructure, capacity building, products and practices, technologies, and research and development.

PMKSY, or Pradhan Mantri Krishi Sinchai Yojna

On July 1st, 2015, the Union Government introduced this scheme under the slogan "Har Khet Ko Paani." The PMKSY plans to combine current programs such as the On Farm Water Management, Integrated Watershed Management, and Accelerated Irrigation Benefit Program. It seeks to offer complete irrigation supply chain solutions, including water resources, distribution systems, and farm-level applications. In addition to providing sources of guaranteed irrigation, it also focuses on producing protective irrigation by using "Jal Sanchay" and "Jal Sinchan" to collect rainfall at the micro level. Expanding cultivable area under guaranteed irrigation, increasing on-farm water use efficiency to cut down on water

waste, and achieving convergence of irrigation investments at the field level are the main goals of PMKSY. Along with improving aquifer recharge and introducing sustainable water use conservation practices, it also aims to increase the adoption of precision irrigation and other water-saving technologies (Per Drop, More Crop).

National mission on micro-irrigation

Micro-irrigation facilities were intended to be developed and promoted by its launch.Between 2005 and 2012, the area under micro-irrigation increased from 3.09 million hectares to 6.14 million hectares, nearly doubling under this program.By saving water, electricity, and labor, micro-irrigation lowers the overall cost of irrigation while also increasing crop productivity through a variety of methods and improving water use efficiency. Micro-irrigation methods include drip irrigation and sprinklers. Thus, another means of encouraging sustainable agriculture is through micro-irrigation.

Soil health card scheme

To revitalize India's depleted soils, the government introduced a nationwide Soil Health Card program in 2015. In accordance with this program, farmers receive soil health cards containing crop-specific recommendations for nutrients or fertilizers. Through the prudent use of chemical fertilizers, such as secondary and micro-nutrients, in conjunction with organic manures and biofertilizers, it seeks to promote integrated nutritional management (INM), which improves soil health and productivity.

Pradhan Mantri Fasal Bima Yojna

The Government of India introduced this flagship program in 2016 to assist farmers in dealing with crop losses. Its goal is to give farmers a uniformly low premium so that, in the event of crop losses due to weather-related events, natural disasters, or climate change, they can continue farming. By providing financial assistance to farmers who have lost crops or sustained damage from unanticipated events, PMFBY seeks to promote sustainable production in the agriculture sector. In order to stabilize their incomes and advance sustainable agriculture, it also pushes farmers to embrace cutting-edge and contemporary farming techniques.

Organic farming

Organic farming has become a viable alternative farming system that not only solves sustainability and quality issues, but also guarantees profitable livelihood options for India's rural communities. The strict reliance on chemical pesticides and fertilizers calls into question the whole idea of sustainability. It damages the food chain and the environment. Organic farming steers clear of all methods that harm the agricultural ecosystem. In addition to producing wholesome food, it creates an ecological balance that guards against pest issues and low soil fertility. India is endowed with all the human and natural resources needed to advance organic farming. As a result, the government is focusing on organic farming as a means of encouraging sustainable agriculture.

Parampragat krishi vikas yojna (PKVY)

The program is designed to encourage farmers to switch to organic farming and is based on clusters. A group of fifty or more farmers who own fifty acres of land come together under this project to start organic farming. This will result in the formation of 10,000 clusters over three years, covering 5 lakh acres under organic farming. By employing conventional resources in an environmentally responsible manner, organic farming will be encouraged.

New initiatives by government for sustainable agriculture

In a significant stride towards revolutionizing the agricultural sector and promoting sustainable farming practices. Those initiatives have the potential to drastically alter the nation's agricultural landscape. They include the CFQCTI Portal for Fertilizer Sample Testing, School Soil Health Programme, Krishi Sakhi Convergence Programme (KSCP), and Revamped Soil Health Card Portal and Mobile Application.

Initiatives for Soil Health Management

- Redesigned Soil Health Card Portal and Mobile App:
- A mobile application for collecting and testing soil samples has been introduced, along with a redesign of the Soil Health Card website. A geo-coordinate mapping registry and real-time status of soil labs are included in the portal.
- It also offers real-time data on the creation of Soil Health Cards, lab testing, and soil sample collection. The new portal includes Geographic Information System (GIS) analytics along with a centralized dashboard at the federal, state, and local levels.
- Other features of the portal are heat maps of nutrients, a nutrient dashboard, and fertilizer management.
- The project makes it possible to register plot specifics, automatically record geo-coordinates during sample collection, and track progress in real-time.

School soil health program

- A pilot project was started by the Department of School Education and Literacy and the Department of Agriculture and Farmers' Welfare (DA and FW). Twenty soil laboratories were

set up in rural Kendriya and Navodaya Vidyalaya schools as part of this project.

- Teachers and students received training and study materials. The school program was given its own customized mobile application, and the portal features a section specifically for the program to record all student activities. As part of this program, schoolchildren will gather soil samples, test them in labs, and create Soil Health Cards. They will also inform farmers about the recommendations on the cards, encouraging critical thinking and hands-on learning.
- The Soil Lab Program also educates students about sustainable agriculture and the effects of human activity on soil health, with the goal of instilling in them a sense of environmental responsibility and respect.
- This program has now been expanded to 1000 schools. Under this program, Kendriya Vidyalaya, Navodaya Vidyalaya, and Eklavya Model Schools have been selected. The Department of Agriculture and Farmers Welfare (Da and FW) will establish soil labs in these schools in partnership with the National Bank for Agriculture and Rural Development (NABARD).

Krishi sakhi convergence programme (KSCP)

- The KSCP was started by an agreement between the Ministry of Agriculture and Farmer Welfare and the Ministry of Rural Development. Its goal is to empower Krishi Sakhi and change rural India.
- A Krishi Sakhis Training Program is part of the program, which certifies 70,000 Krishi Sakhis as "Para-Extension Workers."
- Krishi Sakhis are qualified para-extension specialists and active farmers. They guide Natural Farming and Soil Health Management, acting as friends to farmers. Krishi Sakhis are essential to the execution of several programs, including the Pradhan Mantri Fasal Bima Yojana (PMFBY) and the National Mission of Natural Farming (NMNF).
- Qualified Krishi Sakhis serve as para-extension agents, helping farmers develop their awareness and skills.
- They act as a liaison between the Departments of Agriculture and Allied Services, Krishi Vigyan Kendras (KVKs), and farmers.
- Agroecology, crop diversity, natural resource management, and nutritional security are among the topics covered in the training that Krishi Sakhis receives.
- The program has trained close to 3500 Krishi Sakhis and is being implemented in 13 states, contributing to sustainable agriculture and rural development. • They hold awareness generation meetings on topics like natural farming and soil health management. Krishi Sakhis act as change agents, promoting sustainable agriculture and transforming India's rural areas.

CFQCTI Portal

To ensure quality control in fertilizer management, the Central Fertilizer Quality Control and Training Institutes (CFQCTI) portal introduces facilities for sample collection and testing.

The portal expedites the process of quality assessment by facilitating the generation of OTP for sample verification, automatic lab assignment, and the issue of analysis reports.

Impact to be initiatives envisage

Encouraging the use of sustainable farming methods

Through the promotion of sustainable farming methods like organic farming, these initiatives hope to secure long-term benefits for the environment and the economy.

Improvement of farmer incomes

These programs aim to improve farmer livelihoods and economic well-being by addressing issues with soil health, fertilizer quality, and agricultural sustainability.

Authenticity of organic agriculture

It is anticipated that initiatives such as the Krishi Sakhi Convergence Programme and the Soil Health Card Portal, which aim to bolster the legitimacy of organic farming, will increase consumer trust and promote the uptake of organic products.

Fertilizer quality and efficacy

As can be seen in the CFQCTI Portal, efforts to address issues with fertilizer quality and effectiveness seek to protect farmers' interests by guaranteeing the use of reliable inputs.

Issues concerning india's soil health

With over 95% of food coming from them, soil and water are essential resources for life.

Both agricultural systems and the realization of UN Agenda 2030 depend on the symbiotic relationship between soil and water.

Soil and water resources are under too much stress due to current climatic changes and human activity.

India produces 40% of its total food production from rainfed agriculture, which accounts for about 50% of the nation's net sown area.

India's soil health is beset by deficiencies in nutrients, with an average soil organic carbon (SOC) of only 0.54%.

With roughly 30% of the land impacted, land degradation is a serious problem that affects population nutrition intake and results in nutrient deficiencies in plants.

Productivity declines due to nutrient deficiencies and depletions as well as improper fertilizer application.

Techniques like sufficient nutrient replenishment, individualized fertilizer applications based on soil analyses, and raising soil organic matter are necessary for sustainable food production.

An estimated 3 billion tonnes of soil are lost to wind and water erosion each year in India.

Other soil conservation initiatives

The Indian Five-Pronged Programme of Soil Conservation aims to conserve soil biodiversity, maintain soil moisture, prevent soil erosion, mitigate soil degradation, and make soil chemical-free.

The Soil Health Card scheme was introduced by the Indian government in 2015. It shows descriptive terms and indicators of soil health to help farmers make the necessary soil amendments.

Findings of the study

Without a doubt, the Indian government offers a wide range of well-defined programmes to address practically all of the demands and problems associated with the advancement of sustainable agriculture. However, the smooth execution of these programs is the key to the answer and its achievement. Since agriculture is a state topic in India, related actions and solutions have become politicized and fragmented. At the federal level, states must come to an agreement in order to carry out a national agenda on sustainable agriculture. Additionally, by teaching and assisting farmers in implementing sustainable farming techniques, higher education institutions could support environmentally sustainable agriculture. The growth of organic farming is more important to the advancement of sustainable agriculture.

Suggestions

It's time to move decisively and effectively to remove the obstacles standing in the way of organic farming. A thorough framework that combines bottom-up solutions with organic farming is required. Additionally, it ought to tackle the spread of technology and the mutual exchange of knowledge from agricultural institutions.

Indian agriculture contributes to job generation and subsistence despite facing ecological and economic concerns.

Government efforts notwithstanding, agriculture's share of GDP has been falling. High input prices, poor profitability, falling water tables, deterioration of the soil, and risks associated with climate change are among the problems.

The three main objectives of sustainable agriculture are environmental health, economic profitability, and socioeconomic equity. To encourage sustainable agriculture, the Indian government has implemented laws and initiatives such as the Parampragat Krishi Vikas Yojna, PM Fasal Bima Yojna, PM Krishi Sinchayi Yojna, National Mission on Sustainable Agriculture, and Soil Health Card program by effective implementation of Government [1-6].

Conclusion

There's no denying that the Indian government offers a wide range of well-defined programmes to address practically every need and problem associated with the growth of sustainable agriculture. However, a smooth implementation of these programs is the key to the success and solution. India has made agriculture a state subject, which has caused politics to enter the field and divided efforts to address it. In order to implement a national agenda on sustainable agriculture, states must come to an understanding on the national level. Education and support for farmers to adopt sustainable farming practices are further ways that higher education institutions can support ecologically sustainable agriculture. Growth in organic farming has a greater bearing on sustainable agriculture progress. It is imperative that deliberate and practical measures be taken to remove the obstacles that organic farming faces. A thorough framework that combines organic farming with bottom-up solutions is required. Along with reciprocal knowledge flow from farmers' institutions, it should address the diffusion of technology.

The Indian government recently decided to implement initiatives at doubling farmers' income by 2030. The strategy's main objectives are post-harvest management, irrigation, high-quality seeds, marketing, insurance, and auxiliary activities. In order to

achieve the objectives of environmental health, economic profitability, and socio-economic equity, this strategy must be integrated with the principles of sustainable agriculture. India has to quickly implement climate-smart farming methods, which include using renewable resources like solar and biofuels, managing nutrients with precision, managing nitrogen, agroforestry, organic farming, ICT-based agro-advisories, and more.

In summary, this study sought to assess India's historical and contemporary agricultural performance in addition to offering a thorough analysis of government programs aimed at attaining the Sustainable Development Goals (SDGs) within the country's agricultural sector. A more comprehensive knowledge has been obtained by analyzing production levels, employment creation, contributions to economic growth, the effectiveness of food distribution networks, and the adoption of climate-smart agricultural practices. But in order to realize its future potential, India needs to transform from a largely rural, informal economy into a center of contemporary information, manufacturing, and services.

India would be able to benefit from the worldwide movement toward sustainability and higher levels of technological sophistication in this way.

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