SUSTAINABLE AGRICULTURE ECOSYSTEM IN INDIA





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Landscape Overview - Indian Agriculture Sector



Landscape Overview -Indian Agriculture Sector

Nearly one-fifth of the national income and close to two-fifths of the employment opportunities in India are generated by the agricultural sector.



GVA of agriculture and allied sectors

Contribution of Indian Agriculture Sector



Employment

The agriculture sector is the largest source of livelihood in India. The country is one of the largest producers of agriculture and food products in the world. In 2021-22, India's agriculture sector growth rate was estimated to be at 3.9 per cent as compared to the 3.6 percent in the previous year.



Landscape Overview-Indian Agriculture Market



India's agricultural sector is poised to reach a remarkable market value of US\$ 24 billion by 2025.

The sector's growth is fueled by factors such as rapid population expansion, rising income levels in rural and urban areas, and the subsequent surge in demand for agricultural products across the nation.



As India's agricultural sector continues to expand, embracing sustainability is not only crucial for longterm food security and environmental preservation but also presents exciting opportunities for innovation and growth in the market.



Furthermore, the organic food segment is flourishing, projected to achieve a significant CAGR of 10 per cent from 2015 to 2025, with an estimated market value of Rs. 75,000 crore (US\$ 9.1 billion) by 2025.

This growth signifies the growing consumer preference for organic and sustainable food options.



A 2019 NASSCOM study revealed that India has more than 450 agri-tech startups, which are experiencing a 25 per cent annual growth rate.

Additionally, a BIS Research analysis predicts that the global smart farming market will grow at a compound annual growth rate (CAGR) of 19 per cent from 2017, reaching a value of \$15.6 billion by 2025.

Key Components of the Sustainable Agriculture Market Ecosystem



Key Components of the Sustainable Agriculture Market Ecosystem

1. Farming Practices

There are more than 30 sustainable agriculture practices (SAPs) prevalent in India. Most SAPSs are being adopted by less than five million (or four percent) of all Indian farmers. Many are practiced by less than one percent. Natural farming is the fastest-growing sustainable agricultural practice in India.

Crop rotation

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It is widely practiced across India, covering approximately 30 million hectares and involving around 15 million farmers.

Agroforestry

Agroforestry, predominantly popular among large cultivators,encompasses about 20 million hectares.

Integrated Pest Management

Despite being promoted for several decades, it has limited coverage of five million hectares.

Biodynamic agriculture

A variant of organic farming utilizing specific inputs, covers an estimated 0.1 million hectares.

Precision farming

Precision farming, with a reported area of nine million hectares, primarily consists of microirrigation practices promoted by the National Mission on Micro Irrigation.



Organic farming

It covers only two percent of India's total net sown area, which amounts to 140 million hectares. The country has approximately two million certified organic producers, while data on uncertified organic farmers is not readily available.

Natural farming

It has witnessed recent adoption, with close to one million farmers practicing it, primarily in Andhra Pradesh, Karnataka, Maharashtra, and Himachal Pradesh, covering approximately 0.7 million hectares.

SRI

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The system of rice intensification (SRI) has gained popularity,occupying an estimated area of three million hectares nationwide. Total production of carrier-based solid biofertilizers, liquid biofertilizers, and organic fertilizers in India, 2020-21



The biofertilizers market is projected to reach USD 243.61 million by 2029, growing at a CAGR of 12 percent during the forecast period.

Additionally, the organic fertilizers market, valued at USD 8.3 billion in 2020, is expected to reach \$15.9 billion by 2030, with a CAGR of 6 percent from 2021 to 2030.

These statistics indicate significant growth potential for both the biofertilizers and organic fertilizers sectors in India.



Biofertilizer manufacturing units in India



In 2017, India had 424 solid biofertilizer manufacturing units and 108 liquid biofertilizer manufacturing units. IFFCO and **KRIBHCO** are leading cooperatives and major biofertilizer manufacturers in India.

Organic fertilizer manufacturing units in India



Certification and Standardization Bodies

National Centre of Organic Farming operates under the Ministry of Agriculture and Farmers Welfare, Government of India. It is responsible for implementing and promoting organic farming practices in the country. NCOF provides certification for organic farming and assists in the development of organic standards and guidelines.

Participatory Guarantee System for India (PGS-India)

is a certification system for organic farming that involves the active participation of farmers. It operates under the Ministry of Agriculture and Farmers Welfare and is aimed at promoting local markets and ensuring the integrity of organic products. PGS-India certification is based on mutual trust, transparency, and peer evaluation.

International Federation of Organic Agriculture

Movements is a global organization promoting organic agriculture and sustainable farming practices. In India, it has a presence through its affiliated organization, IFOAM Organics India. IFOAM Organics India works towards promoting organic farming, providing certification, and facilitating knowledge exchange and networking among stakeholders.



Agricultural and Processed Food Products Export **Development Authority** is an apex body under the Ministry of Commerce and Industry, Government of India. It is responsible for the promotion and export of agricultural and processed food products. APEDA provides certification for organic farming, ensuring compliance with organic standards for exportoriented agricultural products.

Bureau of Indian Standards is the national standardization body in India. It develops and promotes standards across various sectors, including agriculture. BIS has developed standards related to organic agriculture, agro-inputs, and food safety, which play a crucial role in ensuring sustainable agriculture practices.

Government and Policy Support

India's government introduced the **National Mission for Sustainable Agriculture (NMSA)** since 2014-15, aiming to promote sustainable practices. However, the NMSA receives only 0.8 percent of the Ministry of Agriculture and Farmers Welfare budget, while the majority is allocated to fertilizer subsidies.

Pradhan Mantri Krishi Sinchai Yojana encourages adoption of precision farming techniques such as micro-irrigation.

Paramparagat Krishi Vikas Yojana (PKVY) supports cluster-based organic farming, providing farmers with Rs. 50,000 per hectare over three years, including an Rs. 31,000 incentive for organic inputs.

Mission Organic Value Chain Development for North Eastern Region (MOVCDNER) promotes organic farming through Farmer Producer Organizations (FPOs) and offers Rs. 25,000 per hectare assistance for three years.

The National Food Security Mission (NFSM) offers financial aid of up to 50 percent of the cost, limited to Rs. 300 per hectare, for bio-fertilizers.

Research and Development

The Indian government is actively promoting the agri-tech industry to double farmer income. **Collaborations with companies like IBM and Microsoft are driving the adoption of technologybased solutions in agriculture,** such as AI-powered crop-yield protection models and AI sensors for enhanced productivity and pricing management.

Initiatives like **Sensor-based Smart Agriculture (SENSAGRI)** are leveraging drones to collect real-time data for efficient farming practices

Technology advancements **including artificial intelligence, machine learning, drones, sensors, GPS navigation systems, and satellites are transforming Indian agriculture** by reducing risks associated with soil problems, climate, irrigation, and supply chain gaps.

Several innovative companies like **OpenCube**, **AgNext Technologies**, **Energy Bots Private Limited**, **and Tata Kisan Kendra**, along with government organizations like ISRO and research institutes, are actively involved in developing smart farming solutions. These efforts are expected to drive an evergreen revolution in Indian agriculture. **#FUTUREPOSSIBLE**

Market Opportunities and Challenges



Market opportunities

Growing demand for organic products

Export potential

Sustainable farming inputs

Technology and innovation

Government support and initiatives

The organic food market in India is expected to reach \$9.1 billion by 2025, with a compound annual growth rate of 10 percent from 2015 to 2025. This presents an opportunity for entrepreneurs and farmers to tap into the growing demand for organic produce.

India has the potential to become a major exporter of organic products. The global organic food market is projected to reach \$320 billion by 2025, and India's organic exports are expected to grow at a CAGR of 25 per cent during the same period.

There is a rising demand for sustainable farming inputs such as biofertilizers, biopesticides, and organic seeds. The biofertilizers market in India is anticipated to reach \$243.61 million by 2029, growing at a CAGR of 12 per cent.

Adoption of technology-driven solutions such as precision agriculture, smart farming, and IoTbased sensors can enhance productivity and sustainability. The smart agriculture market in India is projected to reach \$11.61 billion by 2025, growing at aCAGR of 13 per cent.

The Indian government is actively promoting sustainable agriculture through initiatives like Paramparagat Krishi Vikas Yojana (PKVY) and the National Mission on Sustainable Agriculture. These initiatives provide financial incentives, technical assistance, and certification support to entrepreneurs and farmers.

Market challenges



Limited awareness and adoption

Lack of infrastructure and technology

Land fragmentation and small farm holdings

Climate change and natural resource management

Access to finance and market linkages

Many farmers lack awareness of sustainable practices. Only 2 percent of India's net sown area is currently under organic farming, indicating a need for greater adoption. Less than 5 percent of the farming population contributes to the 95 percent usage of the bio-fertilizers in India.

irrigation.

Fragmented land holdings make it challenging to implement sustainable practices. Around 85 percent of farmers in India have small or marginal land holdings.

Climate change impacts and soil degradation pose challenges. India loses 5.3 million hectares of agricultural land due to soil erosion each year.

Farmers struggle to access finance and find reliable markets for sustainably produced crops. Only 20 percent of farmers have access to institutional credit. Stronger policy frameworks and institutional support are needed.

Inadequate irrigation facilities and limited access to modern farming equipment hinder sustainable agriculture. For example, less than 50 percent of agricultural land in India is under

Competitive Landscape



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Competitive Landscape - Startups in Precision Farming

	Cropín CropIn	Aus Aarav Unmanned Systems	Fasa Fasal
Offerings	Cloud based ERP software and solutions for the agriculture sector and farmers.	Advanced drone-based engineering solutions for GIS surveying/mapping, industrial inspection, and precision agriculture.	AI-powered platform for the agricultural ecosystem.
Headquarters	Bengaluru (India)	Bengaluru (India)	Bengaluru (India)
Total funding received	USD 65M	USD 748.5K	USD 9.9M
About	It utilizes AI models to provide agnostic agricultural knowledge graphs and intelligence at various levels such as crop, location, and pin code. By combining satellite imagery and cloud computing, it offers solutions for farming companies, agri-input companies, crop insurance providers, seed production companies, governments, and advisories.	Their drones provide precise 3D terrain representations and enable optimized decision- making in agriculture, including irrigation, fertilization, pesticide distribution, and early warning systems. With its technology, it has the potential to scale up precision agriculture in India, where the adoption of such technology is currently limited.	Using artificial intelligence and data science, the company captures diverse farming conditions and provides on-farm predictions. The generated insights can be accessed from any device, such as Android, iOS, tablets, and the web.FASAL's innovative technology has already conserved approximately 3 billion liters of freshwater.



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Competitive Landscape - Startups in Organic Farming





	Nimble Growth Organics	Just Organik	Herbivore Farms
Offerings	Grow and deliver organic fruits and vegetables using a patented package of practices (PoP).	Make safe and healthy (Organic) food more accessible to the consumer and create sustainable wealth for the farmers by motivating them to adopt organic farming practices.	100% pesticide-free produce and ingredients grown using state-of-the-art hydroponic polyhouses and organic techniques in open fields.
Headquarters	Bengaluru (India)	Uttarakhand (India)	Mumbai (India)
Total funding received	USD 2.7M		USD 77.3K
About	The company specializes in cultivating and supplying organic fruits, vegetables, exotics, and greens. Additionally, they offer agricultural consulting services, including marketing and research on agricultural products. Their business model revolves around contract farming, where they collaborate with local farmers, purchasing their harvest at pre-agreed prices.	The company collaborates with more than 4,000 farmers to encourage sustainable farming practices and offer consumers authentic, certified organic food. Their products are available in leading retail outlets, online marketplaces, and are exported to countries like the USA, Canada, Singapore, UAE, Denmark, and Vietnam.	The company operates a temperature-controlled indoor farm in Mumbai, where it sells fresh organic vegetables. Covering an area of 1,000 sqft, the farm cultivates 2,500 plants using a clean and pesticide-free environment. By utilizing a recirculating irrigation system, the farm achieves up to 80% water savings compared to traditional farming methods.



Competitive Landscape - Agricultural Companies

		BAYER
	ITC Limited	Bayer Cropscier
Offerings	Agricultural commodities trading, sourcing and export of agri-products, contract farming, value-added food products.	Crop protection products, seeds, trai farming solutions.
Headquarters	Kolkata (India)	Global HQ: Leverkusen, Germany South Asia HQ: Thane, Maharashtra
About	ITC Agri Business promotes sustainable agriculture in India by working with farmers to improve crop productivity and quality. Through inclusive value chains and sourcing a wide range of agricultural commodities, ITC contributes to the development of the agriculture and food processing sectors.	Bayer CropScience collaborates with India to promote sustainable agricult providing tailored solutions for farme land, water, and energy usage. These collaborations reflect Bayer's commi reducing environmental impact and i resource efficiency in Indian agricult



Ince Godrej Agrovet Animal feed, crop protection, oil palm, dairy, poultry, and processed foods. Mumbai (India) Animal feed, crop protection, oil palm, dairy, poultry, and processed foods. Mumbai (India) It is a leading food and agri conglomera India. Their focus is on developing innomination. It is a leading food and agri conglomera

ners to optimize se nitment to I improving Iture. It is a leading food and agri conglomerate in India. Their focus is on developing innovative products and services to enhance crop and livestock yields sustainably, supporting Indian farmers.

Industry Map



Market Trends, Innovations and Future Trends



Market Trends and Innovations



Drone Technology

These aerial devices enable farmers to assess crop conditions, optimize fertilization strategies, and gather valuable data for better farm management. The use of drones in agriculture provides cost-effective remote monitoring, analysis of field conditions, and informed decision-making.



Ariel Imaging

Aerial imaging using GIS technology assesses irrigation projects' impact on land degradation and drainage. It enables detailed analysis of plant foliage to detect pests and diseases, protecting crops. This is especially beneficial for evaluating soil conditions during waterscarce summers.



Agricultural sensors

Wireless sensors in agriculture collect data on soil moisture, nutrients, and airflow, allowing farmers to optimize crop growth. This helps reduce costs for pesticides and labor, while increasing production and resource efficiency.

IoT technologies support agriculture by deploying sensors to monitor various farm parameters such as light, humidity, soil moisture, and crop health. This enables data collection for farm analysis, utilization of drones for crop assessment, and the use of predictive tools.



Hydroponics & Vertical Farming

Hydroponics farming maximizes yields and flavor while conserving water. By eliminating the need for extensive root systems, plants prioritize leaf and fruit production. Vertical farming in urban areas minimizes transportation and emissions, providing fresh and convenient access to produce while requiring less land space.

IoT in Agriculture

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Future Trends

1 - Increasing Adoption of Sustainable Practices

Area under organic certification in India



India sees a rising trend of farmers embracing sustainable practices, with organic certification covering 3.56 million hectares in 2020-21, a 138% increase from 2015-16

2. Potential for Innovative Solutions and Technologies

Embracing digital tools, precision agriculture, and IoT applications is expected to drive growth, with India's smart agriculture market projected to reach \$15.6 billion by 2025 (NASSCOM).

3. Collaboration between Stakeholders

Collaboration among stakeholders, such as public-private partnerships and farmer cooperatives, facilitates knowledge exchange and resource sharing, addressing challenges and driving market growth.

4. Addressing Potential Challenges

Targeted government policies, investments in rural infrastructure, farmer education programs, and market linkages are essential to overcome challenges like limited awareness, access to finance, and infrastructure constraints.

5. Strategies for Development and Expansion

Key strategies include increasing awareness, providing policy support, investing in R&D, promoting market linkages, leveraging digital technologies, and enhancing capacity building programs for farmers, fostering sustainable agriculture's development and expansion.

Key takeaway: The future outlook for sustainable agriculture in India is positive, driven by the increasing adoption of sustainable practices, technological advancements, collaboration among stakeholders, market opportunities, and the implementation of strategies to overcome challenges. This presents a promising landscape for the growth and development of sustainable agriculture in the country.

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