

Ecosystem-Led Transformation of Indian Agriculture: Enhancing Sustainable Agribusiness and Policy Innovation for Viksit Bharat 2047

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Abstract

Unpredictable weather patterns, uneven agricultural policy, cultural diversity, and socioeconomic inequality continue to impede India's agrarian economy. However, India's agricultural sector can develop into a profitable and sustainable agribusiness with innovation, entrepreneurship, and effective policy support. This chapter will examine how an entrepreneurial ecosystem might support the expansion of agricultural farm earnings. Additionally, it will shed light on how domestic policy, globalization, and the evolving agricultural technology landscape affect agribusiness. The dynamic character of the agricultural and allied industries' entrepreneurial environment has attracted and continues to attract attention in recent years. Using the Isenberg Model and pertinent policy viewpoints to examine the challenges and prospects faced by rural business owners, this chapter will outline how rural entrepreneurs face both possibilities and challenges due to the intersections of policy, access to finance, access to markets, infrastructure, and human capital. Even though programs like Startup India and RKVY-RAFTAAR have contributed to the development of a more startup-friendly institutional ecosystem in India, rural entrepreneurs still face a number of serious challenges, including a highly fragmented value chain, a lack of infrastructure, a scarcity of knowledge-based resources, and restricted access to funding sources. As business-oriented endeavors become more incorporated into traditional agriculture in collaboration with ecosystem stakeholders (universities, government programs and initiatives, and incubators), agri-startups are becoming more

common, according to evidence from case studies. The study's conclusion provides a comprehensive, ecosystem-integrated approach appropriate for the socioeconomic diversity of India. This would promote sustainable food systems, help local businesses, and sustain rural livelihoods. Consequently, it offers a way to change the entrepreneurial agrarian ecosystem and is consistent with India's Viksit Bharat 2047 goal.

Keywords : Agri-entrepreneurship, entrepreneurial ecosystem, rural innovation, agribusiness development

1. Introduction

In honour of the nation's centennial of independence in 2047, the Indian government unveiled Viksit Bharat 2047, a comprehensive vision plan. Under the direction of NITI Aayog, the nation's leading policy think tank, the program offers a 25-year development plan to make India a global leader in innovation and technology, a model for social welfare and human development, and an advocate for environmental sustainability. This idea holds that agriculture is essential to Amrit Kaal's inclusive growth, green development, and profitable employment.

India already has a big impact on the agricultural sector. It has the world's largest herd of buffalo and the largest area used for crops like wheat, cotton, and rice. In addition to being the world's leading producer of milk, pulses, and spices, the country ranks second in terms of wheat, cotton, sugarcane, tea, fruits, vegetables, farmed fish, and meat from sheep and goats. An essential component of India's economy has always been agriculture. Agriculture employs around half of India's labour force and accounts for about 17% of the country's GDP. (Mohankumar et al., 2025; Singh, Kademani, Nain, and Mishra, 2020).

However, a number of issues jeopardise the industry's sustainability and productivity, despite the fact that agriculture is a major source of income for many people and a foundation of the Indian economy. Long-standing agricultural cycles have been upset by unpredictable weather patterns brought on by climate change. Due to the agricultural sector's substantial reliance on the monsoon for rainfall, it is susceptible to droughts and floods, which can lead to irregular crop yields and unpredictable farmer incomes (Kumar et al., 2020; IPCC, 2022).

The country's social and economic conditions significantly worsen these vulnerabilities by limiting farm productivity through inheritance policies that cause land fragmentation and by preventing smallholder farmers from using formal credit

systems and technology to increase farm productivity and develop climate-resilient practices. Additionally, price fluctuations and insufficient market connections make farmers more susceptible to exploitation and uncertainty (Government of India, 2019).

Apart from these systemic problems, several structural problems continue to impede agricultural transformation.

Cropping patterns and agricultural output are greatly impacted by climate variability, and the recent rise in weather events is one factor contributing to this. Farmers are more vulnerable due to insufficient adaptation attempts (Tittonell, 2020). Furthermore, given the inefficiencies associated with smaller, dispersed plots of land, supply chains have an impact on farmers' scalability (Mohankumar et al., 2025). Due to their lack of official financial channels, farmers must rely on expensive alternatives for financing, which restricts their ability to pursue entrepreneurship (Cheng et al., 2024; Xu et al., 2024). According to Mohankumar et al. (2025) and Kademani et al. (2020), access to infrastructure for transportation, storage, and irrigation has a detrimental effect on both sustainability and competitiveness because it is insufficient for both. Finally, a lack of knowledge and awareness regarding technology, agriculture, and entrepreneurship also limits farmers' ability to innovate (Yoon et al., 2021; Soam et al., 2023).

To support food security, provide long-term sustainable rural development, and protect millions of people's livelihoods from instability and unpredictability, comprehensive policy frameworks specifically aimed at promoting adaptability and a sustainable farming system that embraces the socio-economic realities, climate change resilience, and sound governance associated with each aspect of adaptive/sustainable farming must be developed. Such initiatives require collaboration between local communities, researchers, policymakers, and agricultural specialists in order to create an environment that supports a prosperous, sustainable, and profitable agricultural sector in keeping with India's goal for Viksit Bharat 2047. (FAO, 2021).

2. Literature Review

2.1 Agri Startup Ecosystem

The agri-startup ecosystem is helping to create a revolutionary shift in agriculture through providing innovative, sustainable, and economically viable environments. Within this response, the agri-startup ecosystem will be thoroughly discussed, covering why it exists, what motivates agri-startups, how they function, how to

market themselves, what developments could take place in the future, and what challenges agri-startups face.

2.1.1 The Agri-Startup Ecosystem: Importance and Relevance

Innovation in Agriculture

Innovation is the primary purpose of agri-startups by incorporating modern technological advancements such as blockchain, artificial intelligence (AI), precision agriculture, Internet of Things (IoT), etc., thereby leading to improvements in productivity and efficiency and resource use (Shahab et al., 2024; Raj et al., 2024; Roy & Medhekar, 2025). In addition, through the application of technology and data analytics, agri-startups provide tools to enhance agricultural productivity and reduce post-harvest losses for the achievement of Sustainable Development Goals (SDGs) (Kumar et al., 2024).

Sustainability

The agri-ecosystem emphasizes sustainable ecological farming practices, water conservation measures, climate-resilient farming, and reduced chemical inputs via digital data (Kamyab et al. 2023; Roy et al. 2025). With the deteriorating environment, companies also contribute toward sustainable farming through organic farming methods and assisting with the development of future sustainable agribusiness opportunities for the global market (Kumar et al. 2024).

Economic Empowerment

Agri-startups create economic opportunities by promoting entrepreneurship in rural areas. The agri-startups provide value-added products and services that increase income, facilitate farmers' access to market, and create new jobs (Mishra et al. 2024; Hegde et al. 2025). They provide financial assistance, connect smallholder farmers to markets, and offer unique products and services to them. The success of agri-startup businesses is dependent on the type of crop and production system; however, agri-startups are critical to facilitating the integration of smallholder farmers into high-value supply chains (Prakash et al. 2023).

Food Security Focus

Food security is a critical focus for startups working on scalable solutions through enhanced supply chain efficiency, reduced post-harvest losses, and more effective crop management technologies (Zhao and others, 2024; da Silveira et al., 2023). By utilizing technology and strengthening supply chains, agri-tech start-ups are also contributing towards the availability and stability of food markets as well as improving rural livelihoods and environmental sustainability.

2.2 Ecosystem-Led Drivers of Change in India

Developing an inclusive ecosystem approach to India's agricultural transformation requires an integrative ecosystem framework that integrates digital, financial, institutional, policy, and cultural components. Each type of ecosystem has its own role in supporting agricultural development, and together they create synergies to create a more equitable, resilient, and sustainably productive agriculture sector.

Digital Ecosystem

At the heart of many digital technologies in agriculture, such as ICT, IoT, AI, and blockchain, is the provision of timely information, instruments/integration of precision agriculture equipment, and access to market connections, which have transformed the agricultural processes of farmers. Furthermore, the integration and inclusion of these technologies has addressed long-standing issues associated with agricultural production and distribution bottlenecks for smallholder farmers (Zhang & Florek-Paszowska; Ujwary-Gil).

From the perspective of Zhang & Florek-Paszowska (2022) and Ujwary-Gil, one of the main uses of digital technologies for farmers using precision agriculture is to assist farmers in optimizing their resource utilization and assist farmers in making more informed decisions about their sustainability practices through the use of tools such as geospatial analysis and ICT.

Blockchain and IoT Enable Transparency: Blockchain and IoT have improved transparency and increased financial and supply chain efficiencies, leading to an atmosphere of increased trust among all agricultural stakeholders (Florek-Paszowska & Ujwary-Gil, 2022; Li et al., 2024).

Digital Platforms for Markets: As a result of exploiting the advantages of digital technologies and building digital marketplace platforms, farmers have a more direct relationship with their respective markets, and the pricing mechanisms for agricultural produce have been improved, reducing the need for reliance on middlemen (Florek-Paszowska & Ujwary-Gil).

AI Advisory Services: The utilization of drone-based, real-time solutions and the ability to receive AI-supported advice in a farmer's native language allows farmers to more easily and effectively make adjustments as necessary (Florek-Paszowska & Ujwary-Gil, 2022).

Financial Ecosystem

Within an agricultural framework, both scalability and long-term viability are firmly supported by a strong framework, including legislative support (i.e., the

emergence of agri-startups), and technological innovation will drive the evolution of the overall financial ecosystem (Karami et al., March 2023).

Mobile Technology: With digital mobile payments and mobile access, providing improved access to agricultural inputs/materials/equipment and a highly critical source (Krishnan et al., 2025; Ramos-González et al., 2019).

Incorporating Blockchain for Digital & Electronic Insurance Claims Collection— There is evidence from extensive research and analysis that blockchain can protect the collection of electronic insurance claims, subsidies, and loans (Laurent et al., 2024).

Intermediary Services of Fin-Tech Startups – Some startup companies provide farmers with financial products that help protect against extreme volatility in prices, as well as weather-indexed coverage, hedging, or similar products (Amar et al. 2019).

Financial Incentives through the Reform of the Subsidy System – Through the shift of subsidies for chemical fertilizers to subsidies for the use of bio-fertilizer for the support of smallholder farming, thus promoting sustainability (Hwang et al., 2021).

Institutional Ecosystem

Institutions are the building blocks of research, entrepreneurship, and farmer support, while strong institutional relationships lead towards the best sustainable and productive capacities.

Supportive policy frameworks: The National Agricultural Innovation Project (NAIP) promotes agricultural competitiveness (Karuppan-thetty et al., 2014).

Regulatory framework: Through the establishment of cooperatives, farmers can now access markets and have greater autonomy over their farms (Febrianti, 2024).

Access to inputs: The production aspect of agriculture can only benefit from increased financial investments and technological advancements utilized to facilitate production (Binswanger-Mkhize et al., 2012).

Human Capital Development: Investing in training will lower the chance of possible loss. Additionally, there will be more opportunities for you to earn money in other ways.

Farmers, suppliers, and markets will be able to access various resources, optimise their profits through their value chains, and establish networks with one another by cooperating. The process of working together as a group enterprise will encourage creativity and enhance the ability to develop sustainable livelihoods through developing a culture of collaboration (Sharma et al., 2011).

Policy Ecosystem

Improving environmental sustainability through reform of agricultural policies, as well as aligning them with international obligations.

Farmers build their resilience by gaining knowledge of organic farming, integrated pest management (IPM), and agroforestry through educational programs (Arumugam & Manida, 2023).

Increased funding for research and development will enable innovation with respect to creating new technology to support sustainable agricultural practices (Pradhan, 2022).

By redirecting government subsidies towards purchases of sustainable agricultural inputs, such as biofertilizers and sustainable farm equipment, the financial viability will be enhanced for smallholder farmers (Paul et al., 2023).

Assisting Farmer-Producer Organizations (FPOs) to grow their rural supply chains and develop better market infrastructure increases the bargaining power of FPOs (Mahesh et al., 2023; Philip et al., 2025).

The National Agri-Ecosystem Index will be used to assess the ecosystem preparedness of each state, while the use of policy innovation platforms, such as policy sandboxes, will allow for targeted experimentation with new policies.

2.3 Cultural Ecosystem

Cultural transformation regarding growing resilient and sustainable agricultural practices is essential for adaptation. Adaptive agricultural practices involve inclusive crop diversity and climate-resilient varieties and sustainable and effective ways to manage water, including using drip irrigation and rainwater harvesting methods (Rajesh et al. 2024; Bamniya et al., 2024; S. et al. 2024). According to Rajesh et al. (2024) and Kumar et al. (2024), technological developments like as precision agriculture, GIS, and information and communications technology (ICT) are facilitating improved player-based decision-making and enhancing resource management.

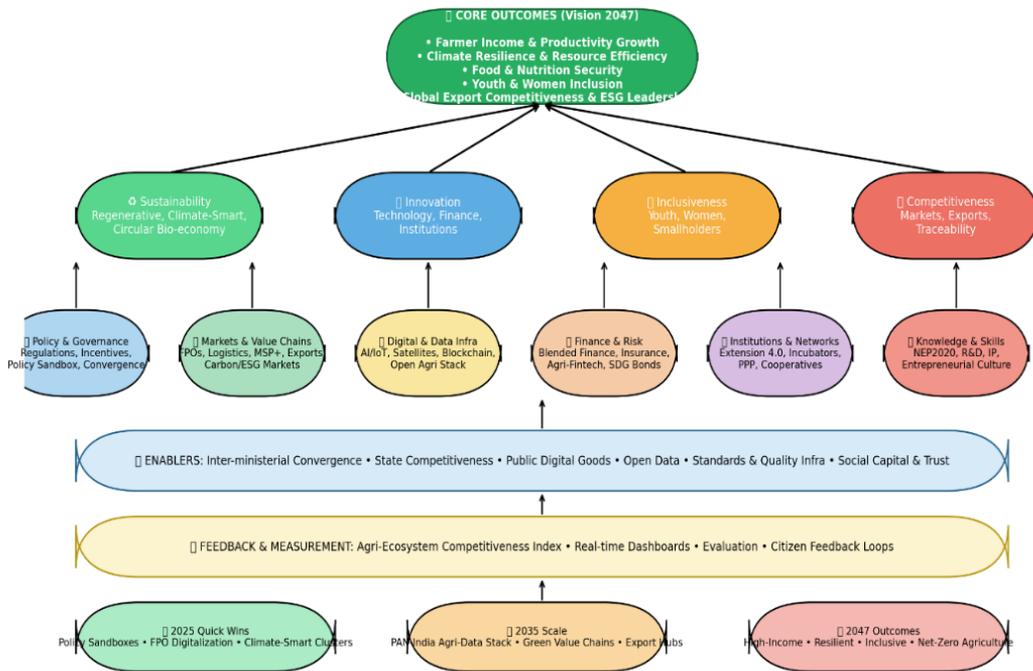
Opportunities for on-the-job training help communities, farmers, extension workers, and the general public swiftly adopt new and improved farming techniques (S. et al. 2024).

According to Rajesh et al. (2024), Couldrick (2024), and Angeon et al. (2024), collaborative partnerships between community organizations and the public and private sectors are increasing resources within their particular areas to promote sustainability-oriented practices and products. Creating frameworks for including

women’s interests and concerns in agriculture will enable us to close current disparities, realize the full potential of all women-related companies, and create wider economic benefits that are achievable through women’s participation.

Viksit Bharat Agri-Ecosystem Model (VBAEM)

Ecosystem-Led Transformation of Indian Agriculture for Sustainable Growth



Model Logic: Enablers → Levers → Pillars → Core Outcomes, supported by continuous Feedback. A time-bound roadmap (2025 → 2035 → 2047) aligns interventions with Viksit Bharat Vision.

Challenges Faced by the Agri Startup Ecosystem

Growth and innovation in the Indian agriculture sector are hampered by a number of issues. Lack of access to internet infrastructure in rural areas has a significant impact on digital agriculture. The main obstacle preventing farmers from utilizing precision farming technologies, connecting with other digital markets, and obtaining real-time data is the lack of access. Additionally, farmers suffer from a lack of training and understanding on how to use the digital instruments at their disposal. All this has also created some financial obstacles for agribusiness ventures: many farmers cannot find the needed funding to start an agribusiness. Furthermore, bureaucratic obstacles and bulky regulations stand as a barrier to investment and limit opportunities for innovation by the agribusinesses. Then there is technology, which also provides a barrier to broad-scale use: the high costs of

these technologies and a lack of adaptation to local conditions of many of these technologies. Furthermore, it will be hard to penetrate the market because of a lack of infrastructure, logistical issues, and cultural barriers. Resource-intensive processes give considerable environmental challenges to agribusiness startups at the same time as many agribusiness startups are committed to sustainability.

Thus, there also needs to be a rising trend and awareness regarding eco-friendly practices and climate-smart practices. Moreover, it is essential that partnerships between government institutions, agritech start-ups, and the corporate world exist to facilitate the development and scaling up of innovation within the context of agribusiness. (Chauhan, 2023; Kumar et al., 2024; Gangwar & Jadoun, 2023).

Cross-Cutting Innovations and Strategies for Promoting the Agri-Startup Ecosystem

A major role is being played by agri-startups in the transformation of the Indian agriculture sector. They help the integration of the digital, financial, institutional, policy, and cultural ecosystems. Factors leading to the development of agri-startups include:

Initiatives: With collaboration with international organisations, the ‘Innovation and Agri-Entrepreneurship Development Initiative’ in India promotes innovative agricultural entrepreneurship (Kumar et al., 2024).

Technological Innovations: The adoption of digital technologies, including blockchain, artificial intelligence, drone technology, and precision agriculture, has impacted the agricultural sector positively by maximizing the output and utilization of available resources (Gangwar and Jadoun, 2023). Furthermore, social innovators assist small-scale farmers through the adoption of community radio and artificial intelligence consulting in their local languages.

Market Demand: Producers who produce organic and sustainable products are benefiting from increasing consumer demand for such products, as well as having greater opportunities to develop scalable solutions to secure and enhance food quality (Sulillari, 2023).

Investment Flows: The agri-tech industry received significant capital investments, with \$1.18 billion in 66 transactions recorded in 2021, including increasingly larger transactions over \$5 million (Kumar et al., 2024).

Business Incubators and Accelerators: Business incubators and accelerators provide valuable financial and legal resources, along with mentorship, and positively impact the growth and success of agribusiness companies (Isher, 2024).

How youth agripreneurship can be enhanced through innovation competitions and hackathons as part of the National Education Policy (NEP) 2020’s skill-education

ecosystem to create enthusiasm among youths towards agripreneurship and entrepreneurship.

The need for policy innovation to create a “technology-agriculture-entrepreneurship” (t-a-e) relationship to align start-up businesses with national developmental goals. The transition from input subsidy-centric approaches to ecosystem subsidy-based approaches and the creation of a benchmarking system, such as the National Agri-Ecosystem Index, for measuring state progress, as well as the development of AI-driven policy feedback loops to guide and facilitate smart governance.

Models of sustainable convergence through holistic and authentic integrative models based on the concept of One Health, One Farm, and One Future. These converging models will encourage, enable, and empower agriculturalists, entrepreneurs, and rural economic development stakeholders to work collaboratively to achieve sustainable development of the food and agricultural systems of India.

3. Strategies for Promoting the Agri-Startup Ecosystem

To maintain and scale up such innovations, the following approaches are key:

A supportive policy environment further furthers startups through priority access to lending, increased transparency of regulations, and reduced financial risks.

Training and skill development raise youths’ and farmers’ adoption of digital technologies and their entrepreneurial capacity.

Collaboration among the three stakeholders—enterprises, governments, and the local community—encourages the latter to organize for collective action, which in turn encourages the implementation of technology-driven business models.

Blended finance and digital credit offerings provide companies with increased access to funding.

Specific technology options, which are affordable, enable smallholders to bridge the gap in the absence of access to Internet facilities by providing solutions that are flexible and low-cost.

This will help in further enhancing and developing the digital marketplace and logistics that will, in turn, provide better market access and higher trading opportunities to poor rural communities.

There, one may find the entire set of logical proof techniques that can be used for mathematical reasoning.

The dynamic environment that is entrepreneurship is fueled by new developments in technology and industries that have been disrupted by global markets. Internationalization is encouraged by developments in technology as well as

communication. Entrepreneurs are encouraged to take risks and become innovative and learn from failure. It is better when knowledge and resources flow and when entrepreneurs, investors, mentors, and institutions of higher learning, as well as governments, work together. Entrepreneurs are starting to make sustainability and social responsibility an integral component of entrepreneurship, which is a reflection of society and an engine to drive innovation within sustainability.

4. Conclusion

During the Amrit Kaal, a paradigm shift is required in the functioning and mindset of the agricultural sector in India for green, inclusive, and meaningful job creation. To enable this in the agriculture sector, science-based tech adoption is required; the agricultural sector has to become more liberalized, and the existing ancient legislation has to be made more up-to-date. Some crucial components for this transition include the promotion of the public sector, liberalization of the agricultural output market, development of a robust land leasing market, and seeking more support for greater efficiency. Though there exist numerous obstacles in the agri-startup ecosystem, the significance of the agri-startup ecosystem cannot be overlooked for innovation, sustainability, and effective growth. The challenges presented by the agri-start-up ecosystem have to be tackled through a strategic approach to enable the agri-start-up ecosystem to become a crucial aspect in the coming days of the agricultural sector for achieving the ‘Viksit Bharat’ vision for the country’s future goals within the target timeframe of 2047.

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