

# Agri-Entrepreneurship in India: Harnessing Innovation and Technology for Sustainable Growth

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**Abstract:-** This study looks at how agri-entrepreneurship, which is fuelled by innovation and technology, is changing India's agricultural sector to meet issues including resource inefficiency, market instability, and unpredictable weather. Since India's economy is based primarily on agriculture, the study intends to examine new trends, pinpoint scaling issues, assess local and international models, and investigate potential future developments in agri-entrepreneurship. To assess the sector's growth, the study reviews current literature, government papers, and case studies using a secondary data analysis methodology. Important conclusions emphasize how AgriTech firms, sustainable farming, and digital technology increase output and market accessibility. Successful initiatives like Apollo Agriculture in Kenya, Tulaa in Ghana, and DeHaat in India show how creative approaches are boosting the resilience and income of farmers. However, issues including inadequate funding, deficiencies in infrastructure and regulatory obstacles still exist. According to the study's findings, agri-entrepreneurship may promote sustainable economic growth, improve food security, and establish India as a global leader in agricultural innovation by encouraging innovation, tackling systemic issues, and bolstering government support.

**Keywords:-** *Agri-entrepreneurship; Agricultural Innovation; AgriTech Startups; Sustainable Farming and Agricultural Resilience.*

## I. INTRODUCTION

Agriculture has long been the cornerstone of India's economy, serving as the primary livelihood for over half of its population and contributing significantly to the nation's GDP. However, the sector stands at a crossroads, grappling with challenges such as unpredictable weather patterns, market volatility, resource inefficiency, and a lack of technological integration. These obstacles threaten the productivity and sustainability of traditional farming practices, calling for a transformative approach to revitalize India's agricultural landscape.

CRISIL's macroeconomic outlook for fiscal 2025 forecasts a slowdown in India's real GDP growth to 6.8%, down from 7.6% in FY24, influenced by weaker domestic demand due to higher interest rates and fiscal tightening. Inflation is projected to decline to 4.5% year-on-year, driven by lower commodity prices and improved agricultural output. The fiscal deficit is expected to reduce to 5.1% of GDP, supported by higher tax revenues and controlled spending. Reduced borrowing needs are likely to lower 10-year government security yields to 7.1%.

CRISIL's macro outlook for fiscal 2025			
Macro parameter	FY24E	FY25F	Rationale for outlook
Real GDP growth (y-o-y %)	7.6% <sup>^</sup>	6.8%	High interest rates and lower fiscal impulse (from reduction in fiscal deficit to 5.1% of GDP) will temper domestic demand. Net indirect tax impact on GDP is expected to normalise next fiscal. Uneven growth in key trade partners will restrict healthy export recovery. But budgetary support to capex and rural incomes will support growth
CPI inflation (y-o-y %)	5.5	4.5	Soft commodity prices and healthier farm output should help moderate inflation. A non-inflationary budget that focuses on asset creation rather than direct cash support bodes well for core inflation and hence monetary policy
Fiscal deficit* (% of GDP)	5.8	5.1	Continued pursuit of fiscal consolidation aided by moderation in revenue spending and robust tax collections will reduce the fiscal deficit and lead to lower government borrowings from the market
10-year government security (G-sec) yield (fiscal-end, %)	7.0	6.8	Lower gross market borrowings will reduce the pressure on yields. Lower inflation and expected rate cuts by the MPC will create downside pressure on yields. India's inclusion in the JP Morgan Emerging Market Bond Index is favourable for capital flows into government debt
Current account balance (% of GDP)	-1.0	-1.0	Softer crude oil prices and moderation in domestic growth will keep trade deficit in check despite tepid exports of goods. Alongside, robust services trade surplus and healthy remittances will keep the current account deficit (CAD) in check
Exchange rate (fiscal-end, Rs/\$)	83.0	83.5	Narrower CAD and healthy foreign portfolio flows into debt amid a favourable domestic macro environment will support the rupee

\*National Statistical Office (NSO) second advance estimate; ^FY24 and FY25 numbers are government's revised and budget estimates  
Note: E - estimate, F - forecast  
Source: CRISIL

**Fig 1:** CRISIL's Macroeconomic Projections for Fiscal 2025: Key Indicators and Outlook.

The current account deficit is forecasted to remain stable at 1.0% of GDP, backed by softer crude oil prices and higher exports. Furthermore, the exchange rate is predicted to hold steady at ₹83 per dollar, aided by robust foreign inflows and a stable domestic macroeconomic environment. These indicators reflect a cautiously positive economic outlook for FY25 [3].

India's agriculture sector is undergoing a significant transformation, fueled by the rise of AgriTech startups offering innovative solutions to various challenges across the agricultural value chain. These startups leverage the country's vast arable land and diverse agro-climatic conditions to drive progress. Prominent examples include Shapos Services (Reshamandi), streamlining the silk supply chain by enabling farmers to connect directly with markets; Agrarian Agro Industries, introducing water-efficient irrigation through its Hose-reel technology; Zentron Labs, automating food grading with advanced computer vision systems; and Athreya Global Solutions, boosting crop yields and photosynthetic efficiency using biotechnology. Recognized by the National Startup Awards, these startups are pivotal in establishing India as a global food hub. Entrepreneurs in the agriculture sector are encouraged to explore opportunities for growth and contribute to this evolving ecosystem [4].

**Future of Agri-Entrepreneurship in India:** Agri-entrepreneurship, the convergence of agriculture and innovative business practices, is emerging as a powerful solution to these challenges. It embodies the shift from subsistence farming to a technology-driven, market-oriented model that emphasizes value addition, sustainability and economic empowerment.

By fostering a culture of innovation and entrepreneurship, this approach not only addresses long-standing issues but also unlocks new opportunities for growth and development in rural India. Key drivers of this transformation include advancements in digital technology, government initiatives supporting startups, and changing consumer preferences for organic and high-quality produce. Entrepreneurs are leveraging tools like mobile apps, precision agriculture, and e-commerce platforms to enhance efficiency and profitability. Simultaneously, agri-tech startups are revolutionizing the sector through innovations in supply chain management, smart farming, and financial solutions tailored to agricultural needs. As the global demand for sustainable and climate-resilient farming solutions intensifies, India's agri-entrepreneurs are uniquely positioned to lead this transition. By adopting innovative practices, building resilient ecosystems, and addressing systemic challenges such as infrastructure gaps and market inefficiencies, agri-entrepreneurship can play a pivotal role in shaping the future of Indian agriculture. This transformation not only ensures food security and rural prosperity but also establishes agriculture as a dynamic and vital contributor to India's economic growth.

## II. OBJECTIVES

- To analyze emerging trends in agri-entrepreneurship.
- To identify challenges in achieving scalability and sustainability.
- To evaluate domestic and global models for fostering agri-entrepreneurship.
- To explore future opportunities for innovation and sustainability in agri-entrepreneurship.

### III. METHODOLOGY

This study employs a secondary data analysis methodology, reviewing existing literature, government reports, and case studies on agri-entrepreneurship trends and challenges. It synthesizes insights from domestic and global models to understand key drivers, opportunities, and barriers in the agri-entrepreneurship ecosystem.

### IV. DISCUSSIONS

#### A. Current Trends in Agri-Entrepreneurship

The digital revolution is changing traditional farming methods and reshaping agri-entrepreneurship in India. Farmers may now access weather forecasts, market trends, and farm management solutions in real time thanks to digital tools including e-commerce platforms, mobile applications, and precision farming technologies. These technologies increase productivity, decrease resource waste, and facilitate data-driven decision-making. Drones and Internet of Things devices, for example, are precision agriculture technologies that maximize resource use and reduce environmental impact [8].

E-commerce platforms also give farmers direct access to markets, reducing the need for middlemen and boosting their profit margins. Significant change is also being driven by organic farming and sustainability. Growing customer demand for environmentally friendly, healthier products has prompted business owners to embrace sustainable farming methods like organic farming, agroforestry, and integrated pest management. These methods lessen reliance on chemical inputs, support biodiversity, and satisfy customer preferences [1]. Entrepreneurs are seeing profitable prospects in both local and foreign markets as they venture into the community-supported agriculture (CSA) and organic product sectors.

Current trends are further defined by the agri-tech boom, as firms concentrate on cutting-edge solutions like biotechnology to create robust crop types, blockchain to increase supply chain transparency, and artificial intelligence to monitor crops. Growing agri-tech venture capital investment indicates the industry's potential for large profits and scalability [6]. When it comes to solving issues like supply chain inefficiencies and post-harvest losses, startups are essential. Agribusiness expansion has been further enhanced by government backing through initiatives like the Pradhan Mantri Kisan Samman Nidhi and Startup India. Through infrastructure development, skill training, and

financial assistance, these initiatives promote youth involvement in agriculture [5]. The combination of sustainability, technology, and policy assistance highlights how agri-entrepreneurship in India has the potential to revolutionize the country.

#### B. Challenges and Considerations in Agri-Entrepreneurship

The most significant obstacle facing Indian agri-entrepreneurs is the lack of financing. Due to the assumption that agriculture is a high-risk industry and the dearth of financial instruments specifically designed to meet their demands, the majority of entrepreneurs have trouble getting loans. Even while new agri-fintech solutions and government programs like the Pradhan Mantri Fasal Bima Yojana are being developed to solve these problems; broad acceptance is still difficult [6]. For risk management and growth promotion, extra care must be taken when granting credit and customizing insurance plans for agribusinesses. Agri-entrepreneurship in rural areas faces considerable infrastructure hurdles. Inadequate cold storage, poor connectivity, and restricted access to contemporary logistics systems lead to substantial losses and inefficiencies in post-harvest handling. Roads, irrigation systems, and storage facilities are examples of rural infrastructure that must be developed in order to increase market accessibility and decrease waste [5]. These investments are bolstering the overall agricultural ecosystem in addition to helping agri-entrepreneurs. Agri-entrepreneurs are further limited by inefficiencies and market access. Many small-scale farmers find it difficult to enter high-value marketplaces due to information asymmetry and the dominance of middlemen. E-commerce and digital platforms have the power to bring farmers and consumers together directly, increasing profitability and transparency [8]. One obstacle to attaining wide-ranging advantages is the rural digital divide. Another difficulty is the intricacy of regulations. The industry is governed by fragmented policies, which frequently cause delays and stifle innovation. A more hospitable policy environment and the simplification of regulatory frameworks both promote entrepreneurship and draw in more capital [1].

Finally but not least, the growing effects of climate change necessitate adaptive measures. To maintain sustainability, entrepreneurs must implement climate-resilient innovations, such as crops resistant to drought and effective water management systems [5]. To overcome these obstacles and create a robust agri-entrepreneurial ecosystem, government organizations, financial institutions, and private stakeholders must work together.



**Fig 2:** Impact of RKVY-RAFTAAR on Agri-Startups: Selection, Training, and Financial Support (2018-2024)



**Fig 3:** RAFTAAR-Agriculture Business Incubators (R-ABIs, Institutions)  
(Source: Innovation and Agri-entrepreneur programme of RKVY- RAFTAAR)

The image highlights the progress made in fostering agri-entrepreneurship through various initiatives. It displays key metrics such as the number of startups selected and trained, the total funds released under Rashtriya Krishi Vikas Yojana (RKVY), and specific funding allocated to startups from 2018-19 to 2023-24. The number of startups selected increased from 163 in 2019-20 to 399 in 2023-24, while those trained rose from 856 in 2019-20 to 1,036 in 2023-24. Additionally, financial support showed consistent growth, with total RKVY funding reaching ₹4,333 lakhs in 2023-24 and startup-specific funding increasing from ₹313 lakhs in 2019-20 to ₹3,263 lakhs in 2023-24. These figures demonstrate the growing emphasis on nurturing agri-entrepreneurship in India.

While addressing the Challenges in Agri-Entrepreneurship through RAFTAAR, Agriculture Business Incubators (R-ABIs) program provides an effective solution to these issues. Institutions such as CCSU, CSK, IGKV, IIMs, IIT-BHU, ICAR-IVRI, JKNV, PAU, SEKU, and COF serve as hubs under the RAFTAAR initiative, offering critical

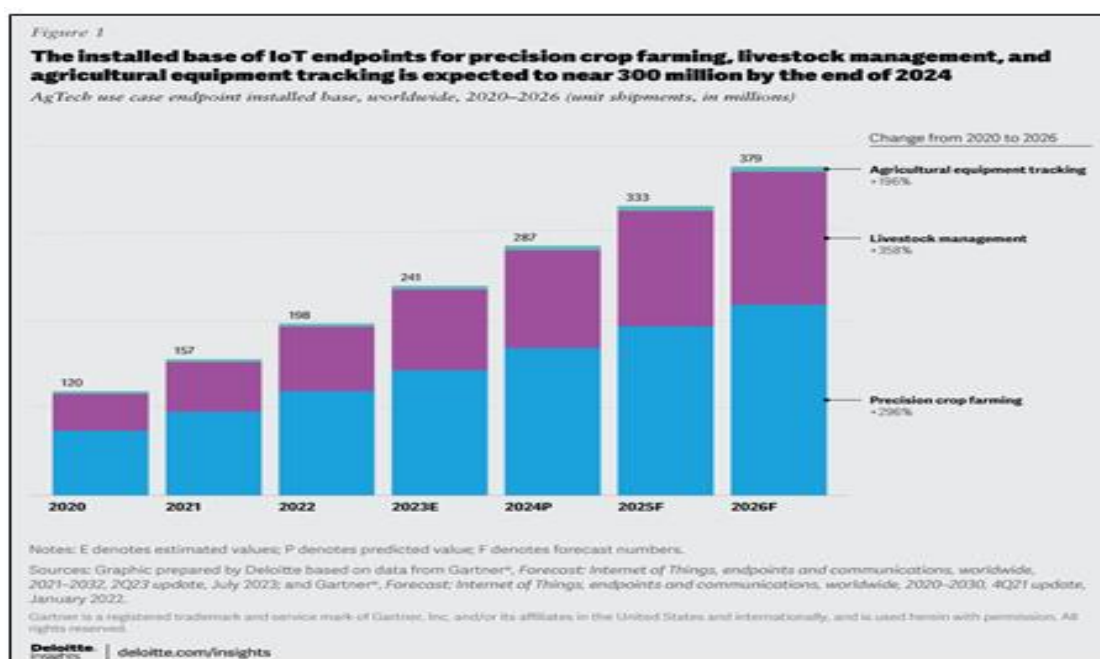
support through mentorship, specialized training, funding, and resource-sharing. RAFTAAR addresses funding constraints by channeling financial support directly to startups, as evident in the increasing funding trends. Moreover, the program bridges the skills gap by offering comprehensive training to entrepreneurs, enabling them to develop innovative solutions and scale their ventures effectively. By fostering collaboration and providing market linkages, RAFTAAR empowers startups to overcome barriers and contribute to sustainable agricultural development, ensuring long-term impact in the sector [7].

*C. Future Opportunities in Agri-Entrepreneurship*

India’s agribusiness sector has a bright future thanks to consumer demand, environmental requirements, and technology breakthroughs. One of the most promising areas is precision agriculture, which uses technologies like drones, Internet of Things gadgets, and AI-based analytics to optimize resource use, increase yields, and reduce environmental impact. Data-driven farming is made possible by these innovations, which raise productivity and profitability.

Startups that concentrate on these solutions have a strong chance of revolutionizing conventional farming methods [8]. Sustainable and organic farming methods present another important potential. By growing organic crops and implementing sustainable practices like agroforestry and integrated pest control, agri-entrepreneurs can profit from consumers growing desire for eco-friendly and health-conscious products. Strong local marketplaces and the development of consumer-producer relationships are further advantages of community-supported agriculture (CSA) programs [1]. Both the environment and business owners hoping to satisfy high-end consumer needs gain from this move towards sustainability. Another profitable sector is food

processing and value addition. Entrepreneurs can set up food processing facilities to produce value-added goods like organic snacks, drinks, and condiments in response to the rising demand for packaged and ready-to-eat foods. In addition to increasing agricultural revenue, these endeavors support local economic growth and the creation of jobs in rural areas [6]. Additionally, direct marketing platforms and e-commerce offer unmatched chances to link farmers with customers directly. Farmers can avoid middlemen by using digital tools, which increases supply chain transparency and profit margins. By using these platforms, entrepreneurs can diversify their revenue sources and reach larger audiences [5].



**Fig 4:** Projected Growth of IoT Endpoints in Agriculture (2020–2026): Enhancing Precision, Livestock Management, and Equipment Tracking.

There are several prospects for agri-entrepreneurship due to the expansion of IoT endpoints for tracking agricultural equipment, managing livestock, and precision crop growing. Precision farming is expected to grow by 296%, livestock management by 358%, and equipment tracking by 196%, contributing to the predicted 379 million deployed IoT units by 2026. Data-driven decision-making, more productivity, and lower expenses are made possible by these developments. Creating IoT-enabled services like real-time agricultural monitoring, intelligent irrigation systems, and livestock health tracking are examples of future prospects. In order to promote sustainability, entrepreneurs should also investigate tailored technology solutions for small-scale farms. This technological revolution improves agricultural value chains and generates lucrative business opportunities [10].

Finally, the rising need for climate-resilient innovations creates avenues for developing solutions like drought-resistant seeds, sustainable water management systems, and solar-powered equipment. Such technologies not only address climate challenges but also position agri-entrepreneurs as pioneers in sustainable development [8]. These opportunities

underscore the immense potential of agri-entrepreneurship to reshape India's agricultural landscape.

#### D. Success Stories from Across the Globe

##### ➤ Apollo Agriculture – Kenya, Strategy:

Satellite imagery, agronomic machine learning, and mobile technologies help Apollo Agriculture provide credit and advisory services to smallholder farmers. Using satellite data, Apollo accurately evaluates the size of farms, health of crops, and possible yields and delivers customized financial products according to the needs of the farmers. And the results are more than 100,000 farmers achieved an increase of up to 60% in yield because of Apollo's integrated support system, which includes finance provision, input provision, and training in advanced agriculture.

##### ➤ Tulaa – Ghana, Model:

Tulaa provides mobile commerce and credit, which links farmers to suppliers, buyers, and financial services. The platform allows the farmers to buy inputs on credit, receive agronomic guidance via SMS, and sell their produce through a



vetted marketplace. And the results are Tulaa has provided credit to over 15,000 Ghanaian farmers, enhancing crop yields and securing better market prices. This approach reduces dependency on intermediaries and ensures fair returns for farmers.

➤ *Pula- Africa and Asia, Innovation:*

Pula uses mobile technology to reach African farmers with agricultural insurance protection from weather-related dangers, and pest infestation; bundled with expert agronomic guidance and high-quality inputs to help farmers become as self-assured as anyone might want them to. By so doing, operating across 13 countries with an already impressive milestone; of reaching over 4.3 million farmers enabling to invest in their farms while reducing loss occurrences with a firm foundation on agricultural resiliency.

➤ *DeHaat – India, Framework:*

DeHaat is an integrated agricultural service suite that provides premium input distribution, advisory support personalized for farmers, financial products, and direct market links. DeHaat uses artificial intelligence and data analytics for the optimization of farm productivity of over 350,000 Indian farmers. In terms of achievement, incorporating technology into agriculture, it has increased the incomes of farmers, while also enabling fair access to resources and knowledge for sustainable farming.

➤ *Tanihub – Indonesia, Platform:*

Tanihub is an agri-fintech platform that directly connects farmers to consumers and businesses, cutting out the middlemen. It provides access to financial tools, including loans and micro insurance, along with a safe marketplace for farmers produce. And the innovations are backing more than 30,000 farmers; Tanihub increases income opportunities, opens up market access, and fosters financial inclusion among Indonesian farmers.

➤ *Agrosmart – Brazil, System:*

Agrosmart offers precision agriculture solutions by utilizing big data and the Internet of Things. It provides up-to-date information on crop health, soil conditions, and weather trends. Data-driven models empower farmers with informed decisions and access customized financial services. And it shows, as over 100,000 farmers in Latin America have transformed agricultural productivity, improving resource utilization and boosting crop yields through advanced technology [2].

## V. CONCLUSION

The future of India's agribusiness sector has a bright future full with transformational possibilities. Agri-entrepreneurs have the power to transform the agricultural industry by implementing creative, sustainable, and market-driven strategies that will increase its resilience, productivity, and financial viability. Traditional agricultural methods are changing as a result of emerging trends like supply chain optimization, value-added products, organic farming, and precision agriculture. Meanwhile, important issues like financing accessibility and the effects of climate change are

being addressed by developments in agri-fintech and climate-smart technologies. Technological advancements combined with the rising demand from consumers for premium, organic food items create special chances for innovation and expansion in this industry. Government programs that encourage infrastructure development and financial assistance are essential to fostering an environment that is supportive to agri-entrepreneurs. By taking these steps, a strong ecosystem is created that supports the growth of new businesses. However, issues including regulatory barriers, market inefficiencies, and infrastructure deficits must be addressed if agri-entrepreneurship is to realize its full potential. Overcoming these challenges requires efficient cooperation between governmental organizations, the commercial sector, academic institutions, and the rural community. Agri-entrepreneurship may promote sustainable economic growth, improve rural communities, and guarantee food security. India can position itself as a world leader in agricultural innovation and sustainability by leveraging new trends and opportunities, ensuring a successful future for its agricultural sector.

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