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Digitalization of the Agriculture Sector: Insights from India

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INTRODUCTION

As global food demand, energy pressures, and environmental concerns intensify, digital technologies present a viable pathway to address these challenges and accelerate progress across sectors (Pfluger, 2022). Agriculture, traditionally dependent on manual labor and climatic uncertainty, is undergoing a major transformation through digital integration (Meher, 2023). This shift, often referred to as AgriTech, encompasses a wide range of tools designed to enhance efficiency, productivity, and sustainability. Central to this transition is precision agriculture, which uses data analytics, Internet of Things (IoT) sensors, and remote sensing to enable informed decision-making. These technologies allow precise monitoring of crops, soil, and livestock, improving resource-use efficiency and farm management. Consequently, agriculture can better meet rising food demand while minimizing environmental impact and resource wastage (Pareek, 2024).

Investment in agritech is opening new avenues to modernize agriculture and promote sustainable growth. Financial support mechanisms include INR 0.05 crore at the idea/pre-seed stage and INR 0.25 crore at the seed stage. Although India's agriculture market exceeded USD 35,500 crore in 2023, only 1,138 agri-startups have received support totaling INR 70.30 crore under the Agriculture Accelerator Fund (CXOtoday News Desk, 2023). Projections suggest that agriculture could contribute USD 60,000 crore to India's GDP by 2030, representing a 50% increase from 2020 levels, provided productivity improvements are realized (McKinsey & Company, 2020). The sector, valued at USD 43,590 crore in 2022, is expected to grow to USD 58,082 crore by 2028 at a CAGR of 4.9% (Priya, 2023). Government initiatives such as the National Agricultural Market (e-NAM) further support this transition by offering free software and INR 0.75 crore per APMC mandi for infrastructure and quality enhancement (Sirsikar & Dutta, 2023).

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Despite these advancements, challenges remain. India's farm yields are still 30–50% lower than those of other developing countries (Bordoloi, 2022). However, the country ranks among the top fifteen global agricultural exporters, and the sector supports 54.6% of the population (Department at a Glance, 2022; Sirsikar & Dutta, 2023). Agritech startups present a significant opportunity, estimated at USD 2,400 crore, though much of this potential remains untapped (Sirsikar & Dutta, 2023). Venture capital investment in the sector has risen sharply from USD 0.20 crore in 2018 to USD 120 crore in 2022 (Keelery, 2023). The rapid expansion of internet access, 692 million users and 467 million social media users, has further enabled agritech adoption, with 46.31% of the population online as of 2021 (Statista, 2023; World Bank, 2021). This connectivity empowers farmers with real-time information and market access, enhancing productivity and sustainability.

Promoting AgriTech through start-ups:

AgriTech start-ups in India are playing a transformative role in addressing key agricultural challenges, including low productivity, inefficient supply chains, and limited access to modern technologies. By leveraging digital platforms, these ventures enable farmers, particularly small and marginal ones, to adopt improved practices, access real-time information, and benefit from emerging innovations. In addition to enhancing farm productivity, they generate rural employment, bridge the rural–urban divide, and strengthen food and nutritional security. Favourable government policies and investments further support their growth. According to the Start-up India Portal, India has 6,202 DPIIT-recognized AgriTech start-ups (Fig. 1). Maharashtra leads with 1,257 start-ups, followed by Karnataka, Gujarat, Uttar Pradesh, and Tamil Nadu. However, agriculturally advanced states like Punjab and Haryana lag in developing a strong start-up ecosystem, resulting in lower technology adoption across production and supply chains (Syamala & Wag, 2023).

India's agritech ecosystem is expanding rapidly, with companies driving innovation in farm management and market access. AgroStar provides agronomic advisory and inputs via mobile platforms, while Ninjacart connects farmers directly to retailers, reducing losses and improving price realization. CropIn leverages analytics and satellite data for crop monitoring, while DeHaat and BigHaat offer integrated services and e-commerce solutions for agricultural inputs (EY, 2020). Together, these firms highlight the growing impact of technology-driven entrepreneurship in Indian agriculture.

Ways forward for digital investment in agriculture:

In India, agritech applications are increasingly visible in automated irrigation, weather forecasting, soil monitoring, and AI-based pesticide management. Digital investment is emerging as a key driver of agricultural transformation by improving efficiency, enhancing productivity, and promoting sustainable growth. Major focus areas include precision agriculture, where drones, IoT sensors, and data analytics optimize the use of water, fertilizers, and pesticides while reducing environmental impact. Digital market platforms are enabling direct farmer–buyer linkages, improving price realization, and minimizing the role of intermediaries.

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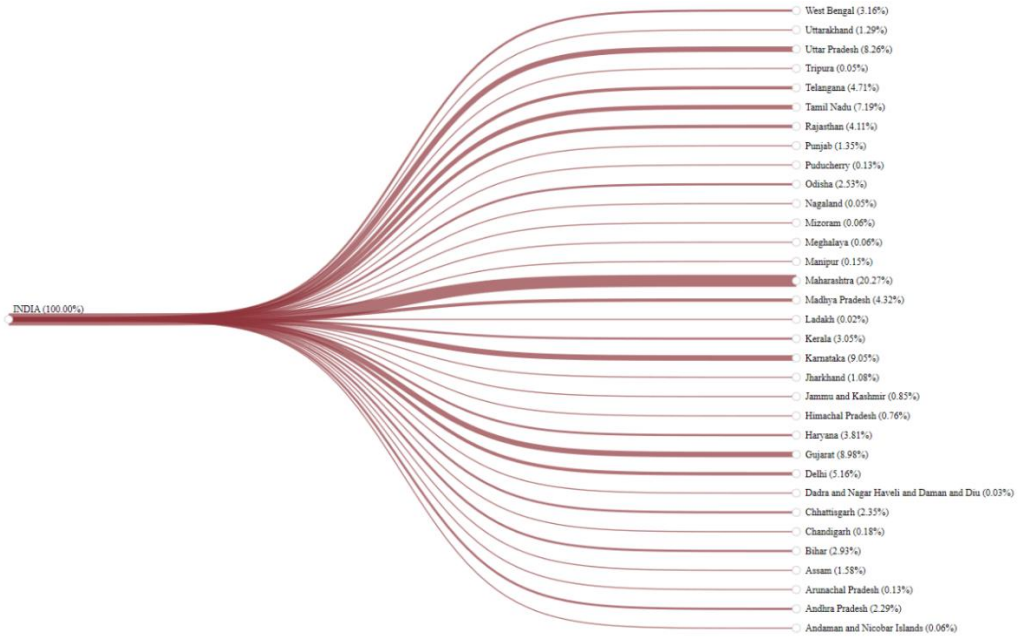

Fig. 1: State-wise Distribution of Agritech Startups in India (*Source: Startup India Portal)*

In addition, tailored financial services such as microloans, insurance, and savings products are improving farmers' access to capital and their ability to manage risk. Digital education and training platforms are equipping farmers with knowledge on best practices and emerging technologies. Supply chain optimization through blockchain enhances transparency and traceability, ensuring product quality. Government incentives and multi-stakeholder collaborations further support adoption. Collectively, these interventions demonstrate how digital investments can modernize Indian agriculture and strengthen its long-term resilience.

Fig 2. Potential areas for digital investment (*Source: Compiled by author)*

CONCLUSION

The convergence of digital investment and agriculture represents a transformative force with the potential to reshape the future of farming. By leveraging digital technologies, agriculture can enhance productivity, ensure food security, promote sustainability, and improve farmers' livelihoods. Advancements in precision agriculture, automation, biotechnology, and digitalization are redefining farming systems and driving economic growth. As food demand rises alongside growing environmental concerns, integrating technological innovation with sustainable practices is essential for a resilient, future-ready agricultural sector. Realizing this potential requires coordinated efforts among governments, industries, and stakeholders to balance economic gains with environmental sustainability. The rapid growth of agritech start-ups further highlights the impact of digital investment, offering innovative solutions that improve efficiency and sustainability across the agricultural value chain.

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