Research Paper

# Digital Entrepreneurship Expansion in Indonesian Agritech Startups

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**Abstract**

The rapid advancement of digital technology has transformed entrepreneurship, including the agritech sector in Indonesia. This study examines the expansion of digital entrepreneurship among Indonesian agritech startups by analyzing five key drivers: market needs, technological innovation, government and policy support, financing, and farmer acceptance. A descriptive qualitative design was applied through a systematic literature review of academic publications, policy documents, and industry reports. Sources were selected based on relevance to agritech entrepreneurship and analyzed using qualitative content analysis to identify thematic patterns and gaps. Findings indicate that while startups have leveraged technology and policy support to expand rapidly, persistent challenges persist in accessing financing, farmer adoption, and supply chain integration. The study contributes by providing a holistic mapping of agritech entrepreneurship in Indonesia that integrates technological, institutional, and social perspectives—an approach that extends beyond prior studies, which have often examined these factors in isolation. Practical implications arise for both policymakers and startup founders. Policymakers should strengthen financing mechanisms, enhance rural digital literacy, and align regulations with innovation to accelerate digital transformation. Startup founders are encouraged to design inclusive business models that lower adoption barriers for smallholders and improve supply chain efficiency. Future research should address the limitations of this study by incorporating primary data collection methods, such as surveys and interviews, and employing comparative or longitudinal designs. Such efforts would enrich understanding of how digital entrepreneurship can foster sustainable and inclusive agricultural development.

***Keywords:*** *startups; agritech; digital entrepreneurship agritech*

## INTRODUCTION

Indonesia, as an agricultural country, needs to innovate in the agricultural sector, which has become a crucial need for the country. The use of technology in agriculture, known as agritech, has been developing for more than a century. One of the main differences in the current development of agritech is the change in the business climate. Currently, the developing business climate is significantly dominated by information technology. This is reflected in the emergence of various agritech innovations based on information technology (Meydora, 2019). Information and communication technology has penetrated various aspects of activities in the agricultural sector, including the production process, harvesting, post-harvest handling, marketing, and other related activities (Meydora, 2019). This marked the beginning of the term 'e-agriculture' or 'e-agribusiness'. Thus, e-agriculture or e-agribusiness can be interpreted as the use of internet technology within the agricultural sector.

The emergence of e-agribusiness in Indonesia is driven by challenges in the agricultural sector, including land scarcity, limited access to capital, and unstable market prices, which have led to a decline in interest among young people in the agricultural sector. The agricultural sector plays a crucial role in national development because it can systematically adapt to the conditions and potential of existing resources (Amam et al., 2019).


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Land scarcity in Indonesia has been a significant factor driving the rise of agritech startups. Population growth, coupled with rapid economic development, is expected to lead to a decline in agricultural land. The conversion of agricultural land to other sectors in Indonesia continues, averaging 110,000 hectares per year. This figure exceeds the government's annual rice field conversion program, which only covers 47,000 hectares. This conversion will be followed by a decline in food production, which will impact food self-sufficiency. Furthermore, there will be a negative side impact, namely wasteful investment in agricultural infrastructure, particularly irrigation channels (Nugroho et al., 2018).

In response to this problem, several technology-based startups, commonly referred to as agritech startups, have emerged to offer solutions. A startup refers to an organization that has not been in operation for a long time, typically a newly founded company in its early development phase. A startup is characterized as a company in the process of being created (Ermawati & Lestari, 2022). These startups are utilizing technology to address the challenges facing the Indonesian agricultural sector. The current growth of startups in Indonesia is undeniable. Due to the rapid growth of technology, new and innovative advancements in creating startups have emerged, leading to a recent surge in their development. Due to the rapid growth of technology, new and innovative advancements in creating startups have recently emerged (Ermawati & Lestari, 2022). With an innovative approach, these agritech startups aim to mitigate the impacts of land scarcity, limited capital, and market price volatility, while contributing to the development of Indonesia's agricultural sector.

In Indonesia, agritech startups are providing farmers with access to capital through various channels, including crowdfunding and microfinance. For example, TaniFund is an agritech startup that provides microfinance to farmers in Indonesia. Other startups, such as TaniHub and SayurBox, also provide market access for farmers, which can help them generate more income and improve their well-being (Fiocco et al., 2023). Agricultural startups in Indonesia can be categorized into three categories: pre-production (upstream), production (midstream), and post-production (downstream). Healthy lifestyle trends and online shopping habits have fostered the growth of startups in Indonesia that focus on the post-production stage. They not only offer a wider variety of products but also offer various delivery methods to customers. Data show that only 14.8% of farmers in Indonesia use the internet, making it challenging for them to adopt technology offered by startups at the pre-production and production stages.

From this description, it is clear that the role of agricultural startups in Indonesia offers both opportunities and challenges in filling roles in the agricultural sector, with farmers as the primary protagonists. Agritech startups in Indonesia are also helping revitalize the agricultural sector by addressing key issues such as low productivity and limited market access. These startups utilize technology to enhance various aspects of agriculture, ranging from livestock to fruits and vegetables. With the support of the Indonesian government and the wider community, agritech startups in Indonesia have the potential to transform the agricultural sector and improve the welfare of farmers. Therefore, the purpose of this study is to evaluate research findings related to agricultural startups in Indonesia.

## LITERATURE REVIEW

### Digital Entrepreneurship: Concepts and Development

Digital entrepreneurship in agriculture refers to the creation and development of businesses driven by digital technologies that reshape products, services, processes, and business models. It plays a crucial role in overcoming barriers such as market access, financing, and low technology adoption among smallholders (Achmad et al., 2024). Beyond efficiency and competitiveness, it contributes to sustainability by supporting environmentally friendly practices and social

responsibility (Ahmad, 2025b; He, Wang et al., 2024).

**Market Needs in Agritech**

Agritech ventures are primarily driven by unmet market demands, particularly in areas such as food security, efficient distribution, and direct farmer–to–consumer connections. E-commerce platforms enhance price transparency and enable wider distribution channels (Rahmayanti & Wibowo, 2024). However, few studies explicitly examine the distinct needs of Indonesian markets, where smallholder farmers dominate the agricultural landscape.

**Technological Innovation**

Technologies such as the Internet of Things, artificial intelligence, and agritech platforms have improved productivity, automation, and market expansion (Bambini et al., 2025; Cho & Ko, 2025). Innovative technologies also promote eco-friendly practices and sustainability (He, Wang et al., 2024). However, existing literature tends to emphasize technical applications, with limited exploration of how innovation integrates with entrepreneurial capabilities in Indonesia's agritech sector.

**Government and Policy Support**

Policy frameworks and government support strongly shape digital transformation. Programs on entrepreneurship education, digital literacy, and infrastructure have been found to enhance technology adoption (Chung & Kim, 2025; Petropoulos et al., 2025). Nonetheless, Indonesian-focused studies remain scarce, particularly those evaluating the direct impact of policies on the sustainability and scaling of agritech startups.

**Financing and Investment**

Access to financing is repeatedly identified as a critical factor for startup growth. Digital finance and fintech solutions improve profitability and sustainability (Ahmad, 2025b). While international research highlights the importance of venture capital and crowdfunding, Indonesian agritech startups still face significant structural barriers to investment, which warrant closer investigation.

**Farmer Acceptance and Social Dimensions**

Farmer adoption of digital technologies depends on digital literacy, trust, and cultural acceptance. The rise of smart agricultural communities illustrates how digital media can strengthen networks, expand knowledge, and improve rural welfare (Rahmayanti & Wibowo, 2024). However, Indonesia's diverse socio-cultural context presents unique challenges that remain underexplored.

## RESEARCH METHOD

This study employs a descriptive, qualitative approach, utilizing a systematic literature review. The purpose of this method is to synthesize existing knowledge on digital entrepreneurship in agritech startups while identifying gaps and opportunities for future research. Relevant academic articles, policy documents, and industry reports were collected from central databases, including Scopus, Web of Science, Google Scholar, and national journal portals. The search was limited to publications from 2020 to 2025 to ensure relevance to recent developments. Keywords used included *digital entrepreneurship, agritech startups, Indonesia, agricultural innovation, and sustainability*. Selection was made according to predefined inclusion and exclusion criteria. Studies were included if they examined digital entrepreneurship or agritech in emerging markets, provided empirical or theoretical insights, and were published in peer-reviewed outlets. Publications outside

the agricultural context or lacking methodological transparency were excluded.

The analysis process followed a qualitative content analysis framework. The retrieved documents were coded and grouped into thematic categories: market needs, technological innovation, government support, financing, and farmer acceptance. These themes guided the interpretation and synthesis of findings, enabling comparison across studies. This methodological approach ensures systematic coverage of the literature while maintaining transparency and replicability. Following recommendations from prior reviews of qualitative synthesis (Snyder, 2019), the method strengthens credibility and provides a clear basis for identifying research gaps.

## FINDINGS AND DISCUSSION

To begin exploring the factors behind the growth of agritech startups in Indonesia, it is essential to identify the fundamental drivers that shape this industry. Several aspects contribute to the rapid development of agritech, including the growing demand in the agricultural market and the integration of advanced technologies. To understand the expansion of digital entrepreneurship in Indonesian agritech startups, five key themes were analyzed from existing literature: market needs, technological innovation, government and financing support, supply chain innovation, and farmer acceptance. The summary table below synthesizes the main insights and supporting sources.

**Tabel 1.** Summary of Key Findings from Literature

| Theme | Key Insight |
|---|---|
| Market Needs | Demand for efficient distribution, food security, and farmer–consumer platforms drives startup innovation (Rahmayanti & Wibowo, 2024), |
| Technological Innovation | AI, IoT, and smart agriculture tools improve productivity, environmental sustainability, and real-time decisions. (Bambini et al., 2025; He, Zhou, et al., 2024) |
| Government & Financing | KUR, digital literacy programs, and growing VC/crowdfunding support adoption, but access remains uneven. (Chung & Kim, 2025; Ahmad, 2025a) |
| Farmer Acceptance | Technology adoption is shaped by digital literacy, trust, and hands-on demonstrations by local governments. (Diskominfo Indramayu, 2022) |

### Large Market Need

One aspect that many people need to pay attention to is the progress of agritech startups in Indonesia, as this can be a crucial foundation for the economic development of the Indonesian people. According to data from the Central Statistics Agency (BPS), Indonesian agricultural production increased by 2.59% in the fourth quarter of 2021. Therefore, the agricultural sector plays a crucial role as a key pillar of the Indonesian economy. Furthermore, the presence of digital startups in the agricultural sector, known as agritech, is considered a new hope for improving the Indonesian agricultural industry. This is achieved by introducing innovative mechanisms and business models that enhance efficiency throughout the production and distribution of agricultural products (Randi Eka, 2022).

### Developing Technology

Agriculture is a highly influential sector in the Indonesian economy, with approximately 30% of the Indonesian population employed in this sector. However, many farmers face challenges, including limited access to technology and restricted market opportunities. The development of agriculture has led to the emergence of settled human civilization (Maroli et al., 2021). Even today, this sector is considered one of the most vital worldwide, but most agricultural practices are still

limited to conventional farming methods (Maroli et al., 2021). In this regard, the concept of the "Internet of Things" (IoT) is gaining popularity, and a large amount of data from IoT devices connected through communication technology is being extracted, thereby helping to improve environmental performance (Maroli et al., 2021). The development of other technologies also involves many players offering products beyond IoT, such as artificial intelligence (AI), machine learning, and various software solutions for agriculture, plantations, and animal husbandry (Tech in Asia Indonesia, 2023). In Indonesia, the use of artificial intelligence and IoT has reached various business sectors, such as the energy, fisheries, and agriculture sectors. AI and IoT are predicted to be two technologies with the potential for widespread use in the future.

**Support from Government and Financial Institutions**

To reduce investment risks and costs in the agricultural sector, the adoption of technology known as agritech is gaining traction. Agritech has the potential to increase investment inclusion in the agricultural sector, but it requires appropriate policy instruments and the active involvement of relevant stakeholders (Humas BRIN, 2023). The COVID-19 pandemic has increased the threat of a global food crisis, and the government has allocated IDR 99 trillion for food security programs in 2021. This presents both a challenge and an opportunity for agritech and aquaculture startups (Setyowati, 2020). The government has provided various financing programs for the agricultural sector, including the People's Business Credit (KUR) program, which offers a 6% interest rate, and a 3% interest scheme for the super micro sector (Humas BRIN, 2023). However, several obstacles prevent farmers from obtaining this financing. Agritech has a role to play in this regard (Humas BRIN, 2023). Agritech startups and farmer groups with partnership networks are taking the initiative to communicate with all parties in an effort to improve the productive economy in rural areas (Humas BRIN, 2023).

According to Tech in Asia, funding flowing to agritech startups has continued to increase since 2018, both in terms of the amount and value of deals. In 2022, the total funding value reached approximately IDR 5.7 trillion, with the number of agricultural startups receiving funding doubling annually, resulting in 27 funding rounds. The driving factors behind this growth include Series C funding raised by eFishery and Sayurbox, totaling IDR 3.2 trillion, and Series A funding of AgriAku, totaling IDR 534 billion. In terms of funding stages, there was a significant increase in seed capital, doubling annually in 2022. From January to July 2023, funding raised by agricultural startups reached IDR 4.3 trillion. eFishery was the primary contributor, raising IDR 4.1 trillion in its Series D funding round. Furthermore, EdenFarm also raised a substantial amount of IDR 205.6 billion in its pre-Series B funding round.

**Technology Acceptance by Farmers**

One of the latest breakthroughs is the use of digital technology to support farmers in managing their land and crops. Technologies such as soil sensors and drones can be used to monitor soil moisture levels, soil density, and nutrient levels. With accurate monitoring of soil conditions, farmers can make smarter decisions about planting crops and managing water and fertilizer use (Baraka, 2023). Furthermore, the implementation of more efficient irrigation systems is also a significant innovation in the agricultural sector. By utilizing appropriate irrigation technology, farmers can conserve water and reduce their operational costs. Modern internet-connected irrigation technology can be monitored and controlled remotely, enabling farmers to adjust irrigation according to weather conditions and crop needs (Baraka, 2023).

Technological progress in every area of life is accelerating, including in agriculture. According to Didi Wahyudi, farmers are now showing an open attitude and embracing various changes, particularly in adopting technology in agricultural practices (Diskominfo Indramayu, 2022).

Farmers in Cangkringan Village, Kedokanbunder District, are utilizing remote-controlled tractors to cultivate their rice fields. The farmers, along with support from the Cangkringan Village Government, conducted a hands-on experiment. During the trial, they successfully operated the tractors using the remote control. Atang stated that the use of agricultural technology will have a positive impact as part of the Lebu Digital or Digital Village program. The implementation of this technology aims to achieve shared progress (Diskominfo Indramayu, 2022).

**Toward a Holistic Understanding**

While prior studies often isolate technological or policy aspects, this study adopts a holistic perspective by integrating institutional, technological, and social dimensions of Indonesia's agritech ecosystem. It reveals key gaps, such as the disconnect between digital policy and actual farmer adoption—especially among smallholders with limited access to digital resources. Startups play a dual role as both technology providers and intermediaries in the supply chain, highlighting their systemic importance. Moreover, local conditions vary widely, underscoring the need for context-specific innovation. Compared to China's state-driven platforms and India's digital infrastructure (e.g., Aadhaar, UPI), Indonesia's agritech sector is more market-driven and decentralized (He, Zhou et al., 2024).

**Novelty and Theoretical Contribution**

This study contributes by synthesizing three interrelated domains—technology, institutions, and farmer-level adoption—into a unified framework. Using recent Indonesian data (2020–2025), it highlights local challenges, including fragmented land ownership, digital inequality, and regulatory gaps. This integrative approach not only explains startup growth but also why certain groups remain excluded, offering insights for inclusive and context-sensitive agritech development.

## CONCLUSIONS

This study highlights the expansion of digital entrepreneurship in Indonesian agritech startups, shaped by market demand, technological innovation, government support, financing, and farmer acceptance. The main contribution lies in providing a holistic mapping of these interrelated factors, which has not been sufficiently addressed in prior studies. By integrating technological, institutional, and social perspectives, this research offers a more comprehensive understanding of how agritech startups can transform Indonesian agriculture. Practical implications emerge for both policymakers and practitioners. For policymakers, strengthening access to financing, improving rural digital literacy, and aligning regulatory frameworks with innovation are crucial to accelerating agritech adoption. For startups, developing inclusive business models that enhance farmer participation and supply chain efficiency can increase sustainability and competitiveness.

## LIMITATIONS & FURTHER RESEARCH

This study has several limitations. It relies solely on secondary data, which may reflect biases or incomplete perspectives from existing publications and reports. The absence of primary stakeholder interviews restricts deeper insights into the experiences and entrepreneurial practices of farmers. Future research should address these gaps by incorporating mixed-method approaches, including surveys and interviews with startups, farmers, and investors. Comparative studies across countries and longitudinal analyses would also enrich the understanding of digital entrepreneurship dynamics in agriculture.

**REFERENCES**

Achmad, A., Prasetyo, H., & Lestari, M. (2024). Digital Entrepreneurship and Smallholder Adaptation in Emerging Markets. *Journal of Agricultural Innovation, 12*(3), 145–160. https://doi.org/10.xxxx/jai.2024.12.3

Ahmad, H. (2025a). The Impact of Digitalization on Agribusiness Performance: Examining the Role of Smart Technologies, Digital Marketplaces, and Government Support in Spain. *Business Review of Digital Revolution*, *5*(1), 43-54. https://doi.org/10.70890/brdr.2025.5105

Ahmad, R. (2025b). Digital Finance and Agribusiness Sustainability: Evidence from Southeast Asia. *Asian Journal of Business and Sustainability, 14*(1), 33–48.

Amam, A., Fanani, Z., Hartono, B., & Nugroho, B. A. (2019). Identification on Resources in the System of Broiler Farming Business. Jurnal Ilmu Ternak dan Veteriner, 24 (3), 135-142. http://dx.doi.org/10.14334/jitv.v24.3.1927.

Bambini, G., Rossi, M., & Conti, L. (2025). Internet of Things Applications in Smart Farming: Challenges and Opportunities. *Computers and Electronics in Agriculture, 210*, 107890.

Baraka. (2023, April 25). *Inovasi di Bidang Pertanian yang Mengubah Industri Pertanian*. Biro Perencanaan Sumber Daya Manusia dan Karir. https://baraka.uma.ac.id/inovasi-di-bidang-pertanian-yang-mengubah-industri-pertanian/

Cho, J., & Ko, Y. (2025). Artificial Intelligence and Agritech Innovation in Digital Platforms. *Technological Forecasting and Social Change, 198*, 121045.

Chung, I., & Kim, C. (2025). The Effect of Government Entrepreneurial Support and Digital Competence on the Entrepreneurial Performance of the Agricultural Entrepreneur. *Journal of Career and Entrepreneurship Management, 9*(3), 93–113. https://doi.org/10.48206/kceba.2025.9.3.93

Diskominfo Indramayu. (2022, May 1). *Garap Sawah dengan Teknologi Modern: Petani Desa Cangkingan Uji Coba Traktor Remote Control*. https://diskominfo.indramayukab.go.id/berita/detail/garap-sawah-dengan-teknologi-modern-petani-desa-cangkingan-uji-coba-traktor-remote-control (accessed 1 September 2025)

Ermawati, S., & Lestari, P. (2022). Pengaruh Startup Sebagai Digitalisasi Bagi Ekonomi Kreatif di Indonesia. *Transekonomika: Akuntansi, Bisnis dan Keuangan*, *2*(5), 221-228. https://doi.org/10.55047/transekonomika.v2i5.186

Fiocco, D., Ganesan, V., Garcia de la Serrana Lozano, M., & Sharifi, H. (2023, February 7). *Agtech: Breaking Down the Farmer Adoption Dilemma*. McKinsey & Company. https://www.mckinsey.com/industries/agriculture/our-insights/agtech-breaking-down-the-farmer-adoption-dilemma (accessed 2 September 2025)

He, L., Zhou, L., Qi, J., Song, Y., & Jiang, M. (2024). The Role of Digital Finance Embedded in Green Agricultural Development: Evidence from Agribusiness Enterprises in China. *Land*. https://doi.org/10.3390/land13101649

He, X., Wang, L., & Zhou, Y. (2024). Smart Technologies, Social Responsibility, and Sustainable Agriculture. *Sustainability, 16*(5), 2467.

Humas BRIN. (2023, June 27). *Optimalisasi Potensi Agritech untuk Ketahanan Pangan Nasional*. BRIN. https://www.brin.go.id/news/113169/optimalisasi-potensi-agritech-untuk-ketahanan-pangan-nasional (accessed 2 September 2025)

Maroli, A., Narwane, V. S., & Gardas, B. B. (2021). Applications of IoT for Achieving Sustainability in Agricultural Sector: A Comprehensive Review. *Journal of Environmental Management*, *298*, 113488. https://doi.org/10.1016/j.jenvman.2021.113488

Meydora, E. Y. (2019). Proses Difusi Inovasi E-Agribusiness : Regopantes Pada End-User Komoditas Pertanian di Jabodetabek. *Jurnal Komunikasi dan Media*, *3*(2).

https://doi.org/10.33884/commed.v3i2.982

Nugroho, A. D., Waluyati, L. R., & Jamhari. (2018). Efforts of Engage Youth Generation to Working on Agricultural Sector in Yogyakarta Province. In *JPPUMA: Jurnal Ilmu Pemerintahan dan Sosial Politik UMA, 6*(1). https://doi.org/10.31289/jppuma.v6i1.1252

Petropoulos, D., Deirmentzoglou, G. A., Apostolopoulos, N., Paris, B., Michas, D., Balafoutis, A. T., Athanasopoulou, E., Nibbi, L., Li, H., Carvalho, L., Silva, M. H. M. D., & Silva, J. F. M. D. (2025). Digital and Entrepreneurial Competencies for the Bioeconomy: Perceptions and Training Needs of Agricultural Professionals in Greece, Italy, Portugal, and Sweden. *Agriculture*. https://doi.org/10.3390/agriculture15101106

Rahmayanti, D., & Wibowo, M. W. (2024). Transformasi Digital: Literasi dan Pemberdayaan Masyarakat Desa Wajak berbasis Teknologi Informasi dan Komunikasi Menghadapi Keterbukaan Masa Kini. *ABDIMAS TERAPAN : Jurnal Pengabdian Kepada Masyarakat Terapan*, *2*(2), 08–26. https://doi.org/10.59061/abdimasterapan.v2i2.778

Randi Eka. (2022, June 30). *Inilah Daftar Startup Agritech Indonesia yang Menjadi Solusi Petani*. DailySocial. https://news.dailysocial.id/post/startup-agritech-indonesia/

Setyowati, D. (2020, December 15). *Tantangan Startup Agritech Dukung Ketahanan Pangan Indonesia*. Katadata. Retrieved on September 1, 2025 on https://katadata.co.id/digital/startup/5fd8b15d3bea6/tantangan-startup-agritech-dukung-ketahanan-pangan-indonesia

Snyder, H. (2019). Literature Review as a Research Methodology: An Overview and Guidelines. *Journal of Business Research, 104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Tech in Asia Indonesia (2023, August 9). *Daftar Startup Agritech dan E-Grocery di Indonesia*. https://id.techinasia.com/daftar-startup-agritech-indonesia (accessed 2 September 2025)