INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
IFPRI

POLICY NOTE DECEMBER 2025

Digital Agricultural Technology in Egypt:

Insights from App Developers

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Introduction

Digital technologies have rapidly reshaped agricultural systems worldwide, and Egypt is no exception. Over the past decade, the proliferation of smartphones, mobile internet, and low-cost digital tools has opened new channels through which farmers, traders, processors, and aggregators access information and services. Smartphone applications, websites, call centers, and SMS-based platforms now offer advice on crop management, weather and climate alerts, input and output price information, traceability tools, and digital marketplaces. For smallholder farmers—who make up the backbone of Egypt`s agricultural sector—these tools have the potential to reduce information frictions, improve decision-making, and increase productivity and profitability. For larger firms engaged in aggregation, processing, or export, digital platforms can streamline supply chains, enhance coordination, and improve quality assurance.

Despite this growing ecosystem of digital agricultural services, substantial questions remain about how app developers, farmers, and firms actually engage with these tools, what needs they are trying to meet, and what barriers they face. Understanding such patterns is particularly critical in Egypt, where agriculture is simultaneously modernizing and confronting challenges related to climate change, water scarcity, fluctuating input prices, and market volatility.

The existing literature highlights both the promise and the heterogeneity of digital agriculture. Prior work in low- and middle-income countries has emphasized the role of mobile phones and SMS services in reducing information asymmetries, improving price discovery, and enhancing farmers' bargaining power (Aker, 2010; Jensen, 2007). Studies on smartphone-based advisory platforms show potential benefits in delivering tailored agronomic guidance, though adoption often varies with digital literacy, trust, and local relevance of content (Fabregas et al., 2019). Work on digital marketplaces and supply-chain platforms suggests that they can improve traceability and coordination, but also that integration with existing informal networks remains uneven (Reardon et al., 2021). In the Middle East and North Africa, literature specifically focused on Egypt is comparatively limited, though emerging studies point to gaps in digital

access, gender disparities in usage, and the importance of intermediaries in mediating information flows (Tabe-Ojong et al, 2024).

In this study, we focus on app developers in Egypt, their experiences, views, and the challenges they have faced and continue to face. The developer landscape in Egypt is described as fragmented, dominated by early-stage startups facing funding shortages, limited technical capacity, and inconsistent demand from farmers and agribusinesses (Tabe-Ojong et al, 2024). Developers often struggle between piloting and scaling—apps are launched but fail to secure sustainable business models, long-term financing, or integration with government services. Egyptian developers often rely on partnerships with NGOs and donor-funded programs to reach farmers, creating dependency on project cycles rather than stable revenue streams. The regulatory environment for digital agriculture in Egypt is improving but still inconsistent. Egypt performs better than several other countries in the region in both telecom infrastructure and fintech regulation, but lags behind leaders like Morocco in agritech-specific incentives and incubator support.

Building on this body of work, this study contributes new qualitative evidence from interviews with app developers of digital agricultural tools—across apps, websites, and SMS platforms. It examines the challenges app developers face, recommends potential solutions, and discusses the potential of these apps to scale.

Literature

Early research on mobile technologies in developing-country agriculture documented substantial welfare gains from reducing information frictions. Studies exploiting mobile phone rollouts show that improved access to price and market information reduces search costs and price dispersion, leading to higher producer welfare (e.g., Jensen, 2007; Aker, 2010). These foundational findings established that even low-bandwidth digital channels can meaningfully improve market functioning in settings with fragmented supply chains—conditions characteristic of much of rural Egypt.

As smartphones became more accessible, digital agriculture interventions expanded beyond basic communication into richer advisory content. Experimental and quasi-experimental evidence from low- and middle-income countries indicates that digital extension and advisory services can increase farmer knowledge, adoption of certain recommended practices, and in some cases productivity, though effects are heterogeneous and context-dependent (Fabregas, Kremer & Schilbach, 2019). Key moderating factors include digital literacy, trust in the information source, relevance of content, digital infrastructure, and linkages to complementary services.

Egypt is identified as one of the most active digital agriculture ecosystems in the Middle East and North Africa (MENA) region, with relatively strong mobile penetration and growing private-sector innovation. Tabe-Ojong et al, 2024 conduct a detailed study into the digital agricultural space in the region. The study highlights that many Egyptian digital tools remain pilot-stage or region-specific, with very few achieving national scale.

In Egypt, a growing number of smartphone apps—such as Hodhod, Mahsooly, and The Smart Farmer Guide—aim to fill gaps left by overstretched public extension systems. These platforms, however, vary dramatically in uptake, quality of information, and sustained engagement. Hyper-localized content, Arabic-language content, and direct expert–farmer interfaces are crucial, particularly for smaller-scale producers.

Given the persistent digital divide in parts of rural MENA, SMS and IVR services remain important channels for reaching farmers without smartphones. Multi-country reviews of SMS-based advisory programs show modest average effects on knowledge and adoption, with stronger impacts when messages are well-timed, continuous rather than one-off, and part of a complementary package involving in-person demonstrations or group-based learning (Fafchamps & Minten, 2012; Cole & Fernando, 2021). In Egypt, SMS delivery has been used for weather alerts, pest warnings, and market price notifications, but national evidence on behavioral or yield impacts remains scarce.

A growing body of work examines digital platforms that connect farmers to buyers, input dealers, logistics providers, or export certification services. Theory predicts that such platforms can lower coordination costs and increase market access, yet the risks of exclusion or market power concentration remain (Reardon et al., 2021). In the MENA region, digital marketplaces such as Mahsoly and Egypt-based FreshSource are credited with reducing intermediaries and improving cold-chain efficiency, though empirical evaluations are limited.

Aggregate promises obscure persistent heterogeneity. The Groupe Speciale Mobile Association (GSMA) and other sector syntheses show uneven geographic coverage, gender gaps in smartphone ownership and usage, and barriers stemming from low digital literacy or prohibitive data costs. For Egypt specifically, recent policy notes and IFPRI work document nascent investments in digital extension and pilot programs while pointing to gaps in digital skills, the need for localization of content, and the role of public-private partnerships to scale effective models. These contextual factors shape both who benefits from digital agriculture services and what design features are likely to succeed (e.g., multimodal delivery, integration with extension workers, and co-design with farmers).

Comparative landscape in the MENA region

Across the MENA region, digital agriculture ecosystems display substantial heterogeneity in maturity, regulatory environments, and innovation trajectories. Yet several structural patterns emerge that situate Egypt's digital agriculture landscape within a broader comparative frame. A review by Tabe-Ojong et al. (2024) provides a foundational assessment of climate-smart and market-oriented digital tools in Egypt, Morocco, and Uzbekistan, and these insights help contextualize the wider regional patterns.

First, countries differ significantly in whether digital innovation is primarily state-driven, private-sector led, or supported by mixed ecosystems. Egypt's landscape is dominated by a dense but fragmented private-sector ecosystem, where public advisory tools such as *Hodhod* coexist with commercial platforms *like FreshFarm, Mahsoly, and Tekeya* (Tabe-Ojong et al., 2024). Morocco, by contrast, illustrates a more balanced ecosystem in which precision-agriculture firms (e.g., SOWIT; see Abdelkhalek et al., 2021) operate alongside strong state regulatory engagement. Uzbekistan represents a contrasting model in which state-led modernization strategies shape digital agriculture development—particularly for irrigation optimization, early warning, and supply-chain coordination—again documented in Tabe-Ojong et al. (2024). Lebanon and Algeria stand at the other end, with innovation highly constrained by macroeconomic instability (Hamadeh & Sayegh, 2021; Channa et al., 2022).

Second, differences in regulatory and business environments shape the scalability and sustainability of digital tools. The comparative Doing Business indicators summarized in Tabe-Ojong et al. (2024) show that Morocco provides a relatively favorable environment for agritech investment, with stronger tax and export regulations that support digital traceability and irrigation-efficiency tools. Tunisia shows similar patterns: export-oriented data governance supports olive-oil traceability and compliance tools (Ben Fradj

et al., 2021). In contrast, Lebanon's weak regulatory structures and Jordan's middling business environment place greater constraints on tool adoption, despite notable public-sector interest in digital extension (Al-Rawashdeh et al., 2022). Algeria's comparatively restrictive digital governance framework has limited private-sector participation in farmer-facing platforms (Channa et al., 2022). Regulatory frameworks and investment incentives can be as important as technological availability itself.

Third, despite national differences, a recurring set of structural constraints spans the region. Tabe-Ojong (2024) identifies widespread demand-side barriers related to digital literacy, interface complexity, and limited rural smartphone penetration. These constraints appear across most MENA countries: rural digital literacy remains low in Jordan (Al-Rawashdeh et al., 2022), rural connectivity gaps constrain scale-up in Tunisia (Ben Fradj et al., 2021), and macroeconomic instability sharply limits uptake in Lebanon (Hamadeh & Sayegh, 2021). On the supply side, persistent challenges include the fragmentation of digital pilots, limited business-model sustainability, insufficient marketing outreach, and the absence of robust monitoring-and-evaluation structures (Tabe-Ojong et al. 2024). Even in relatively advanced ecosystems, such as Egypt and Morocco, many tools face fragile pathways to scale and rely heavily on grant funding rather than market-based revenue models.

Overall, the comparative findings reinforce that successful digital agriculture requires sustained investment in rural connectivity, predictable regulatory environments, incentives for private-sector engagement, and user-centered design that reflects the realities of smallholder farmers. While digital tools across MENA and CWANA have become more diverse and sophisticated, their transformative potential remains contingent on overcoming persistent structural bottlenecks documented consistently across the region (Tabe-Ojong et al., 2024; Abdelkhalek et al., 2021; Channa et al., 2022; Ben Fradj et al., 2021; Hamadeh & Sayegh, 2021; Al-Rawashdeh et al., 2022). Table 1 displays strengths, use cases and platforms, regulatory and institutional features, and key challenges for seven countries.

Table 1: Digital agricultural landscape across the MENA region

Country	Digital Agriculture Strengths	Major Use Cases / Platforms	Regulatory & Institutional Features	Key Challenges
Egypt (Tabe-Ojong et al., 2024)	Relatively active digital-ag ecosystem; numerous advisory and market tools; strong private-sector presence; significant experimentation with climate-smart tools.	FreshFarm/FreshSource; Bashaeir; Mahsoly; Tekeya; Fish Network; Mazra3ty; Hodhod; El-Mufeed; Pomegranate Management; IRWI; Irri-Smart.	Open-door stance by MOALR; moderate ease of doing business; mixed public–private ecosystem with weak coordination; active interest in digital extension.	Digital and basic literacy gaps; weak rural connectivity; fragmented ecosystem; donor-reliant models; fragile scaling; limited M&E.
Morocco (Abdelkhalek et al., 2021, Tabe-Ojong et al., 2024)	Strong climate-smart and precision-ag ecosystem; active marketplaces; supportive investment climate.	SOWIT; Irri-Smart; Index Phytosanitaire Maroc; Flaha; Fila7a; Taswiq; BeinAgriculture; Maroc Agriculture.	Supportive government environment; strong irrigation and export regulations; robust business ecosystem.	Fragmented adoption; rural connectivity gaps; ecosystem scaling constraints.
Uzbekistan (Tabe-Ojong et al., 2024)	Rapid expansion of digital-ag pilots; strong state-driven modernization; expanding early-warning and climate tools.	Digital advisory apps; early-warning tools; supply chain digitization apps (e.g., O'zimizniki; Jasilawil; Agromart).	State-led digital strategies; structured public investment; active support for entrepreneurship.	Limited interoperability; low digital literacy; challenges scaling beyond pilot phase.
Algeria (Channa et al., 2022)	Gradually expanding digital-ag footprint; emerging irrigation and climate tools; strong state ICT investments.	E-agriculture portals; irrigation scheduling tools; SMS-based advisories; small but growing marketplaces.	Highly state-controlled digital and agricultural sectors; slowly improving regulatory frameworks.	Weak private-sector incentives; rural connectivity gaps; limited farmer-focused innovation.
Lebanon (Hamadeh & Sayegh, 2021)	Small but growing agritech ecosystem; innovation in high-value niche value chains.	Apps for specialty crops; small-scale e-commerce platforms.	Weak regulatory environment; dependence on donor-led pilots.	Severe economic crisis; poor rural connectivity; limited scalability.
Jordan (Al-Rawashdeh et al., 2022)	Government interest in digital extension; investment in structured farmer-information portals.	Market pricing portals; extension systems; weather and advisory applications.	Smart-agriculture referenced in national strategies; moderate donor–government coordination.	Low smartphone penetration in rural areas; limited domestic agritech innovation.
Tunisia (Ben Fradj et al., 2021)	Growth in digital tools for export crops; strong traceability systems; emerging value-chain digitalization.	Olive-oil traceability platforms; export compliance tools; niche advisory applications.	Strong export-oriented data regulations; government support for digital traceability.	Rural connectivity gaps; smallholder exclusion risks in export-oriented systems.

Digital Agriculture in Egypt: Ecosystem, Developers, and Regulation

Egypt occupies a pivotal position in the MENA region's digital agriculture landscape. Thanks to relatively high mobile and internet penetration, coupled with a large agrarian economy, the country represents both a promising market for agritech innovation and a microcosm of regional challenges. According to a recent UNDP–Egypt digital agribusiness map, Egypt's agritech scene is geographically stratified across its four main agro-ecological zones (the Delta, Northern Coast, Upper Egypt, and Desert), revealing distinct patterns of technology use, investment, and infrastructure (UNDP, 2025).

A recent diagnostic report by the International Center for Agricultural Research in the Dry Areas (ICARDA) also underscores that, while a variety of digital agriculture tools are technically available in Egypt, adoption remains uneven (ICARDA, 2025). The report identifies eight categories of digital tools (e.g., mobile apps, sensors, e-extension, early-warning systems) but notes that only mobile apps and sensors are "fairly widely used." Government-led apps such as Al Mufeed, Hudhud (extension), and DAIRS (climate early warnings) are under development but face uptake constraints due to limited digital literacy, data-security concerns, and inflationary pressures that increase the cost of platform maintenance and usage (ICARDA, 2025).

On the innovation front, Egypt's agritech start-up landscape is burgeoning but remains fragile. According to a new industry report by Entlaq, the sector is drawing increasing private and foreign investment, with key players like Mahaseel Masr driving innovation (Entlaq, 2024). One of Mahaseel's flagship products is the Qamhawey app — an AI-powered platform that uses image recognition and real-time chat to provide agronomic insights and even allows farmers to connect with buyers or monetize farm waste. Despite these advances, many agritech solutions remain tethered to grant funding or donor-supported pilots. The pilot-to-scale challenge is recurrent: many start-ups lack a stable business model or long-term financing, and their products do not always match on-the-ground user needs (e.g., localized content, user-friendly user-interface) (Entlaq, 2024).

Regulatory conditions are mixed. On one hand, Egypt benefits from a relatively mature ICT infrastructure, but policy and regulatory frameworks for agritech are still evolving. The GSMA has called for reforms to stimulate mobile investment, highlighting fragmented licensing regimes and sector-specific taxation that hinder scaling of digital services in MENA, including Egypt. Meanwhile, the AgriTech 2025 forum — convened by various Egyptian ministries in 2025 — laid out a roadmap for smart agriculture, stressing the need for public–private partnerships, digital extension modernization, and scaling of data-driven farming tools (Egyptian Gazette, 2025).

However, several structural constraints remain. According to Tabe-Ojong (2025), widespread digital literacy gaps (especially in rural and Upper Egypt), concerns about data ownership, and trust in app providers slow adoption. The ICARDA report adds that knowledge barriers and inflationary pressures further limit smallholders' willingness to engage with e-extension systems (ICARDA, 2023).

In sum, Egypt's digital agriculture ecosystem is dynamic and rapidly expanding, but it remains constrained by institutional, financial, and social frictions. Agritech developers are innovating, but their success hinges on designing for local contexts, building sustainable business models, and navigating an evolving regulatory terrain.

Methodology

Our study used a convenience sample design. A list of digital agriculture apps in Egypt was compiled (it included 26 active and inactive apps), and we categorized them into the largest apps, some smaller apps, and inactive apps. We then attempted to contact the app developers in each of these categories and interviewed those who responded to our request and agreed to an interview.

Our sample includes three app developers, two from the private sector and one NGO. Two apps are still active, and the third is more of a digital platform that supports several apps, some of which are still active and some of which are no longer in use. We also interviewed two experts in the digital agricultural space in Egypt: one academic expert and the other a funder for these apps.

We conducted semi-structured interviews that covered the following topics:

1. Description of the app and how it started.
2. When the app was established and the number of active users.
3. What services it provides, and to whom.
4. The platform (website, mobile app, SMS platform, etc.).
5. Main users and their demographic profile.
6. Data sources and management.
7. User consultation and marketing.
8. Barriers faced and how they overcame them.
9. Barriers for farmers.
10. Potential opportunities and recommendations.

Interviews were conducted by IFPRI staff. Some interviews were conducted in English and some in Arabic. An informed consent statement was read out to the respondent, and they provided verbal consent for the interview. Consent was also sought to record the interview, and they also provided verbal consent. No respondents did not consent.

The interview recordings were transcribed (within the program used for the interviews – Microsoft Teams) and then translated into English. Subsequently, transcripts were reviewed and major themes identified. The most frequently cited responses to questions were grouped into themes and similarities and differences were compared to compile a coherent account of respondents' viewpoints. Also included were new ideas that did not fall under a specific theme but were noteworthy.

Results

Background on Digital Agriculture Service Platforms

Building on the rapid digital transformation of Egypt's agricultural sector, a diverse ecosystem of active mobile applications has emerged to serve farmers, aggregators, and agribusinesses. These platforms, leveraging widespread smartphone adoption, address critical information and service gaps across the value chain. The active landscape can be broadly categorized into three types: digital marketplaces, comprehensive farm management advisors, and specialized crop advisory tools.

Digital marketplaces are prominently represented by apps like Mahaseel, Khodarcom, and Khodar Supply, which directly connect producers with buyers to streamline sales and improve price transparency.

Similarly, Mahsoly and Cropsa facilitate market linkages and aggregation. For on-farm decision support, comprehensive farm management platforms such as Mazra3ty (مزرعتي), Fila7a, and the Digital Services Portfolio (El-Mufeed) offer bundled services including weather alerts, cultivation advice, and pest management, reaching tens of thousands of users. Bashaier also falls into this category, supporting various crops.

Complementing these are specialized advisory applications tailored for high-value export crops, such as the Comprehensive Pomegranate Management and Comprehensive Olive Management apps, which provide deep, crop-specific technical guidance. Niche platforms like Chia and Al Morshed Poultry further demonstrate the segmentation of digital services, catering to specific commodities or livestock.

The significant user bases reported from 100K+ for Mahsoly and AlMorshed Poultry to 10K+ for several advisory platforms indicate substantial adoption and a growing reliance on these digital tools. This active suite of applications illustrates a maturing digital agricultural landscape in Egypt, moving from general information dissemination to targeted, transactional, and specialized support with the potential to enhance resilience and profitability for stakeholders at various scales.

In contrast to the currently active platforms, a notable number of digital agricultural initiatives in Egypt have become inactive. This category includes specialized tools such as the Early Climate Warning System, IRWI (likely for irrigation), and Shary (for machinery services), which targeted specific operational challenges. Other apps, like the Mango Production in Egypt App, Grapes Information System, and Pesticides Guide, offered valuable crop-specific or input-focused knowledge. Broader platforms such as the Agri database, Taswiq (marketing), Al-Nota, The Strawberry Farm, and Notebook also show as discontinued. Their inactivity, despite addressing clear needs, highlights common challenges in the digital agriculture space, including difficulties in securing sustainable business models, maintaining user engagement, and ensuring long-term technical and financial support. The presence of these discontinued apps underscores the experimental and evolving nature of the sector, where many innovative concepts are piloted, but only those achieving critical user adoption and operational sustainability endure.

Building on the landscape of active and inactive platforms, interviews were conducted with the teams behind two current applications to gain deeper operational insights. For anonymity, these are referred to as App 1 and App 2. App 1 is a well-established digital marketplace, exceeding 100,000 users, which successfully facilitates crop and land trading while providing price information and open forums for farmers in Arabic. App 2, launched more recently, represents an evolved service model. It pivoted from a business-to-business (B2B) input trader platform to a direct farmer-facing (B2C) service. It now provides an integrated triad of support: facilitating access to interest-free harvest-linked finance, delivering both online and on-the-ground technical agronomic support, and connecting farmers to buyers and exporters. It maintains an active user base of 5,000 to 6,000 farmers per month.

A primary and overarching barrier to adoption and sustained use identified across discussions is the fundamental challenge of building user trust. In the context of Egyptian smallholder agriculture, where informal networks and face-to-face transactions have long dominated, digital platforms must overcome deep-seated skepticism. Farmers are hesitant to rely on apps for critical decisions involving finances, crop sales, or cultivation advice due to concerns about the credibility of information, the reliability of remote partners, and the security of digital transactions. This trust deficit affects every service type, from marketplaces where price and quality assurances are paramount, to advisory services where the accuracy of recommendations carries real economic risk, and especially to financial platforms where the stakes are highest. Trust in data accuracy is also a hindrance. The interviews revealed that there is both

low trust in data and that agricultural data is fragmented in Egypt with the public sector being hesitant to share data with app developers.

> *"this [trust in data] is a general problem in Egypt, in any sector, not just in agriculture. So yeah, there is a big problem with that accuracy."* – Expert 2

Without establishing a foundational level of trust, even the most well-designed applications struggle to move beyond early adopters to achieve widespread, impactful use.

Apart from the usual reports of lack of infrastructure or digital literacy, the interviews revealed that some of the most profound barriers are cultural and institutional. A recurring theme is the "mentality of the farmer," which manifests as a deep-seated distrust of digital transactions, fear of counterfeit products, and skepticism towards offers that seem too good to be true, such as interest-free loans.

> *"Farmers are cautious about unfamiliar digital actors, data usage, and whether information is reliable. Many still prefer dealing with their usual traders."* – Expert 1

This trust deficit is a more significant impediment than regulatory hurdles, which both platforms reported were minimal. From the perspective of the platforms, the primary barriers are a complex interplay of human factors and infrastructural limitations, with trust emerging as the most significant and recurrent obstacle. This distrust is multifaceted; farmers are skeptical of the platform's intentions, fearing scams, especially with financial services like interest-free loans. Furthermore, there is an underlying distrust between value chain actors themselves, such as between farmers and traders, which a digital platform must overcome rather than simply mirror.

Integration of Services

The digital agricultural landscape features platforms with distinct but complementary approaches that have evolved and expanded over time. App 1was initially conceived to streamline the agricultural value chain by directly connecting farmers and traders, thereby eliminating intermediaries and expanding market access for small communities. It has evolved to offer a suite of services including a crop marketplace, land sale listings, a price information tool, and an e-commerce supply shop. App 2 pivoted from a business-to-business (B2B) model for input suppliers to a direct farmer-centric model (business to consumer – B2C), focusing on a tightly integrated offering of interest-free finance, technical support via both digital and physical ground teams, and market linkages. This demonstrates an active and adaptive digital ecosystem.

> "It is important to have digital support and ground teams." – App developer 2

> *"I believe many apps fail because they overestimate farmer demand and underinvest in user support"* – Expert 1

Further analysis reveals that the most resilient digital services are those that integrate multiple services. The strategic bundling of services, as seen in App 1's combination of finance with online and offline technical support, recognizes that access to capital is most effective when coupled with the knowledge to use it productively. Similarly, the expansion of App 2 from a pure marketplace to include input sales creates a more holistic "one-stop-shop" model. This integration increases user dependency and stickiness, suggesting that the future of digital extension lies not in standalone apps, but in interconnected ecosystems that solve several core problems simultaneously. The pivot of one platform from B2B to B2C

further indicates that a farmer-first model may hold greater immediate potential for scale and impact within the Egyptian context, focusing on the most pressing transactional needs of the end-user.

Ultimately, the success of these digital tools hinges on their ability to build trust within a traditionally relationship-based sector. Both platforms implicitly acknowledge that a purely digital interface is insufficient; they incorporate a vital human element to bridge the credibility gap. This is evidenced by one platform's deployment of a ground team for field visits and another's proactive customer service calls. This blended human-digital approach is a critical innovation, using technology for scalability while leveraging personal interaction for trust-building and complex problem-solving. The field agents and customer service representatives are not merely support staff but are fundamental to user acquisition and retention, directly combating the digital trust deficit and fostering a more resilient and adopted agricultural technology landscape.

User Engagement and the Centrality of Trust

The strategies for user consultation and marketing reveal a critical dynamic in the digital agriculture space: while digital channels are effective for reach, overcoming deep-seated trust barriers require high-touch, personal engagement. Both apps utilize a combination of digital and direct methods to understand user needs. One platform employs a reactive and proactive approach to user consultation, responding to incoming calls and emails while also initiating contact with users who exhibit hesitancy, such as abandoning an online cart, diagnosing problems and gathering feedback on a weekly or monthly basis. Similarly, the other platform uses initial social media engagement as a funnel, which is then quickly transitioned into direct conversations via a sales team to understand specific user requirements, even if those needs fall outside their current service offering. This indicates a shared understanding that valuable user insights are often obtained through personal interaction rather than passive data collection. Regular engagement is also essential.

> *“In practice, only a small share of farmers actively use agricultural apps. Based on our research in Upper Egypt, awareness may be moderate, but consistent utilization is low. Smartphone-based apps struggle to scale unless users are digitally literature and trust that these apps actually add more benefit than what regular traders can add, they clearly also need regular trainings, reminders and incentives to return.”* – Expert 1

In marketing, both platforms leverage digital tools, with social media, particularly Facebook, being a dominant and successful channel for reaching new users. However, this digital reach is met with significant on-the-ground challenges. The primary obstacle is not a lack of technological access but a profound deficit of trust. Farmers exhibit skepticism towards the quality of goods sold online due to prevalent counterfeit products in the physical market and a general suspicion of being cheated in digital transactions.

> *“we have all the technology, but we need to work on trust”* – App developer 2

> *“the agriculture community is generally very conservative and very resistant to change. This is why you will find that a lack of investment and the conservative nature of the farmer community allows that it's very hard for start-ups to succeed.”* – Expert 2

This is compounded by the absence of a large, universally recognized player in the digital agri-service market that can provide a seal of credibility. In response to this challenge, the platforms' strategies evolve beyond pure digital advertising. One supplements its online presence with agricultural seminars, a tradi-

tional yet trusted forum for knowledge exchange, while the other relies on word-of-mouth, which leverages existing community trust networks. This illustrates that marketing in this sector is less about promoting features and more about systematically building credibility through both online visibility and offline validation.

> *“a lot of information about apps is word of mouth*” – Expert 1

These services require a lot of data from various sources. A critical challenge emerging across these platforms is the imperative of data reliability. The need to ensure the accuracy and timeliness of dynamic information, such as user-generated crop listings and market prices, is paramount for building user trust. One platform addresses this through a human-in-the-loop model where customer service agents manually verify user submissions and correct errors via direct phone calls, while another sources wholesale data from external websites. These methods, though effective, highlight a reliance on manual or third-party processes that may not be fully scalable. This presents a significant opportunity for a systemic solution, such as a public-private partnership to establish a centralized, verified data hub. Such an initiative would provide a trusted source for key metrics, enhance the credibility of all digital services, and free private companies to focus on developing more advanced, value-added features for their users, ultimately turning certified data reliability into a key market differentiator.

The key insight here is that user acquisition and retention are fundamentally linked to trust-building, not just service provision. The most effective marketing strategy appears to be a hybrid model that uses cost-effective digital channels for broad awareness but relies heavily on personal, human interaction, whether through sales teams, customer service calls, or seminars to convert skepticism into adoption. This suggests that for digital extension services to scale, they must invest in a "high-touch" infrastructure alongside their "high-tech" platforms. A significant opportunity exists for partnerships with established, trusted entities like cooperatives, banks, or government extension services to co-brand services and leverage their existing credibility to accelerate user acquisition and overcome the initial trust barrier that currently limits market penetration.

> *“Understand the farmer, understand the needs of the farmer, understand the daily life and the routine of the farmer to be able to integrate yourself into his life. Don't expect the farmer to change from you, but you try to change and to suit the farmer.”* – Expert 2

Financing

> *“Funding. It's very simple - funding.”* – NGO representative

The path to scaling digital agricultural services is fraught with systemic barriers that extend far beyond mere technical development. A primary and pervasive challenge is securing stable and predictable financing within an investment ecosystem that remains cautious of the agricultural sector. Both app developers relied heavily on initial self-funding and bootstrap financing, with one leveraging personal salaries and support from friends, and the other self-financing for two years. This highlights a critical funding gap in the early stages of agri-tech ventures. Investors are reportedly hesitant due to a perception of high risk, rooted in the well-documented challenges of farmer mentalities of mistrust of digital tools and their limited purchasing power, which creates a cycle where proving sustainability without initial investment becomes a formidable task. While one platform has navigated this by securing project-based funding from international development partners to achieve operational sustainability, the reliance on such grants may not be a scalable model for the entire sector.

> *“one of the major issues that agriculture and start-ups they face is how can they monetize? They have very good ideas, but they don't know how to monetize*.” – Expert 2

Furthermore, convincing established institutions like banks and government entities to collaborate with a new digital platform presents a separate but equally daunting challenge, requiring extensive effort to build credibility. The app developers have adopted a hands-on, ethnographic approach to overcome these hurdles, with one emphasizing the need to "go down with a large number of farmers" to tailor services to their actual needs, and the other proactively contacting users to understand their hesitations intimately. Finally, investors need to understand that both initial adoption and scaling of such apps require a long timeframe. Long-term and flexible investments that are cognizant of the overall economy are strongly needed.

Infrastructure and Digital Literacy

The ultimate challenge for digital agricultural extension is not the development of the service, but its adoption by the end-user—the farmer. Compounding the issues around trust are tangible barriers in digital infrastructure and literacy. While mobile cellular coverage is near-universal, with 97 subscriptions per 100 inhabitants nationally, this does not equate to reliable internet access (CIT, 2024). A significant urban-rural divide persists: as of early 2025, while national internet penetration stood at 81.9%, the rate in rural areas was approximately 63%, leaving an estimated 24.5 million rural Egyptians offline compared to 84% penetration in urban centers (CIT, 2024). This gap is particularly acute in the villages of Upper Egypt, where infrastructure investment has historically lagged, creating the "digital deserts" that exclude entire communities.

> *“lack of Internet coverage in remote areas, lack of electricity, you will need either diesel solar pumping or you will have to buy very expensive solar pumps.”* – Expert 2

Beyond connectivity, digital literacy remains a fundamental hurdle. A specific, cited rate of digital literacy among Egyptian farmers was not identified, reflecting a common data gap; however, its importance is underscored by its inclusion as a key pillar in national initiatives like the "Digital Egypt Cubs" program (CIT, 2024). This aligns with insights from developers, who note that technological illiteracy and complex interfaces can be daunting. A crucial reframing of this problem comes from one respondent:

> *"farming is often a family business, and thus it may only require one digitally literate member with a smartphone to manage the platform for the entire household".* – App developer ?

This shifts the focus from needing to educate every farmer to enabling key, often younger, family members as digital intermediaries. To address these intertwined issues, the platforms have found that technology alone is not the answer.

Additionally, some limitations in knowledge of and benefits of these technologies persist.

> *“there's a very huge problem of awareness of how these new technologies and how these apps can benefit them. And if they do see the benefit, then they wouldn't have the knowledge how to properly utilize it”* – Expert 2

And the knowledge gaps are further exacerbated for women and youth. As the NGO representative put it:

"there are programs which need to be designed specifically for youth and women, and this is not done yet." – NGO representative

A Pathway for Digitally Enabled Agricultural Transformation

The analysis of digital agricultural services in Egypt shows that the main barrier to scale is not technology, but trust. While infrastructure and platforms exist, adoption is limited by skepticism and weak alignment with farmers' realities. Successful services embed themselves in existing social networks rather than operating as standalone apps.

Key insights:

1. **Blended delivery is essential.** Scaling requires a human-digital model that pairs technology with field staff, trusted farmers, and direct support. Human interaction is central to adoption, not an add-on.
2. **Trust drives growth, not visibility.** Social media creates awareness but does not convert users alone. Face-to-face engagement and partnerships with trusted institutions (e.g., cooperatives, banks, extension services) matter more than marketing spend.
3. **Viable services require three inputs:** agronomic expertise, context-specific design, and patient capital. Technical skills alone are insufficient, and funding must allow time for trust to develop.
4. **Adoption is social before it is digital.** Farmers adopt tools through relationships and community validation, not app features. Digital extension must be treated as a social intervention supported by technology.

In conclusion, the digital transformation of Egypt's agricultural sector presents a tremendous opportunity. However, realizing this potential requires a paradigm shift from building superior technology to building trusted socio-technical ecosystems. For policymakers and investors, the imperative is clear: support must extend beyond code and connectivity to include the development of "high-touch" infrastructures, the fostering of strategic partnerships, and the funding of culturally intelligent solutions. By doing so, Egypt can cultivate a digital agriculture landscape that is not only innovative but also inclusive, effective, and truly transformative for the farmers it aims to serve.

Conclusion

This study examined Egypt's rapidly expanding digital agriculture ecosystem through a qualitative assessment of digital platforms and in-depth interviews with app developers and sector experts. It documented the current landscape of active and inactive applications, spanning marketplaces, advisory tools, and integrated service platforms, and explored how developers design, implement, and attempt to scale these services. By focusing on the perspectives of those directly building and operating digital agricultural tools, the study provides grounded insight into how digital technologies are actually being deployed in the Egyptian context, rather than how they are assumed to function in theory.

The findings show that trust is the single most important determinant of adoption and sustained use of digital agricultural applications. Farmers are deeply cautious about relying on digital platforms for advice, transactions, or finance, particularly because of concerns about data accuracy, fraud, and unfamiliar digital actors. Cultural and institutional barriers were more influential than regulatory barriers, which respondents generally described as minimal. A consistent pattern across platforms is that services scale more

effectively when they integrate multiple functions—such as finance, technical advice, and market access—rather than operating as standalone tools. Both studied platforms had evolved toward bundled service models and emphasized farmer-first design, demonstrating that farmers are more likely to adopt technologies that address multiple constraints simultaneously. User engagement strategies further reinforced the centrality of trust: personal contact, direct phone calls, field visits, and customer service teams were essential for converting interest into use, while social media alone was primarily a visibility tool rather than a driver of uptake. Data reliability emerged as another binding constraint, with fragmented government data systems and weak data-sharing arrangements undermining credibility. Finally, financing remains a major bottleneck, as most platforms rely on bootstrapping or donor funding, and struggle to secure patient capital in a sector perceived as high risk. This is compounded by infrastructural constraints, including uneven rural internet access and low digital literacy, especially in Upper Egypt, which further limit scale and deepen regional inequality in access to digital services.

Scaling digital agricultural applications in Egypt therefore requires a shift from a purely technological approach to a socio-technical one. Investments should prioritize blended delivery models that combine digital platforms with on-the-ground extension, customer support, and trusted intermediaries. Partnerships with cooperatives, financial institutions, and government extension services can help accelerate adoption by lending institutional credibility to platforms. In parallel, stronger public–private coordination around agricultural data systems would improve data quality and reliability across applications. Sustainable financing mechanisms are also essential, including investment models that recognize the long timeframes required for trust-building and adoption. Finally, efforts to close infrastructure and literacy gaps—particularly in rural and southern regions—and to design services that deliberately include women and youth are critical to ensuring that digital agriculture scales inclusively rather than reinforcing existing inequalities. Without these complementary investments, digital tools are likely to remain fragmented pilots rather than engines of transformation.

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ACKNOWLEDGMENTS

We gratefully acknowledge funding from the CGIAR Science Program on Scaling for Impact (S4I). We also thank Fatma Abdelaziz for helpful advice, and the respondents in our interviews.

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Funding for this work was provided by the CGIAR Science Program on Scaling for Innovation (S4I). This publication has been prepared as an output of the Scaling for Innovation Program and has not been independently peer reviewed. Any opinions expressed here belong to the author(s) and are not necessarily representative of or endorsed by IFPRI.

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