



DEVELOPMENT INNOVATION VENTURES (DIV): PORTFOLIO REVIEW

SUMMARY OF DIGITAL AGRICULTURE GRANTS

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TABLE OF CONTENTS

TABLE OF CONTENTS	2
INTRODUCTION	3
ASSESSMENT METHODOLOGY	4
SCALE JOURNEY	4
DRIVERS OF SUCCESS	5
IMPLICATIONS	10
ANNEX I: GRANT DESCRIPTIONS	12

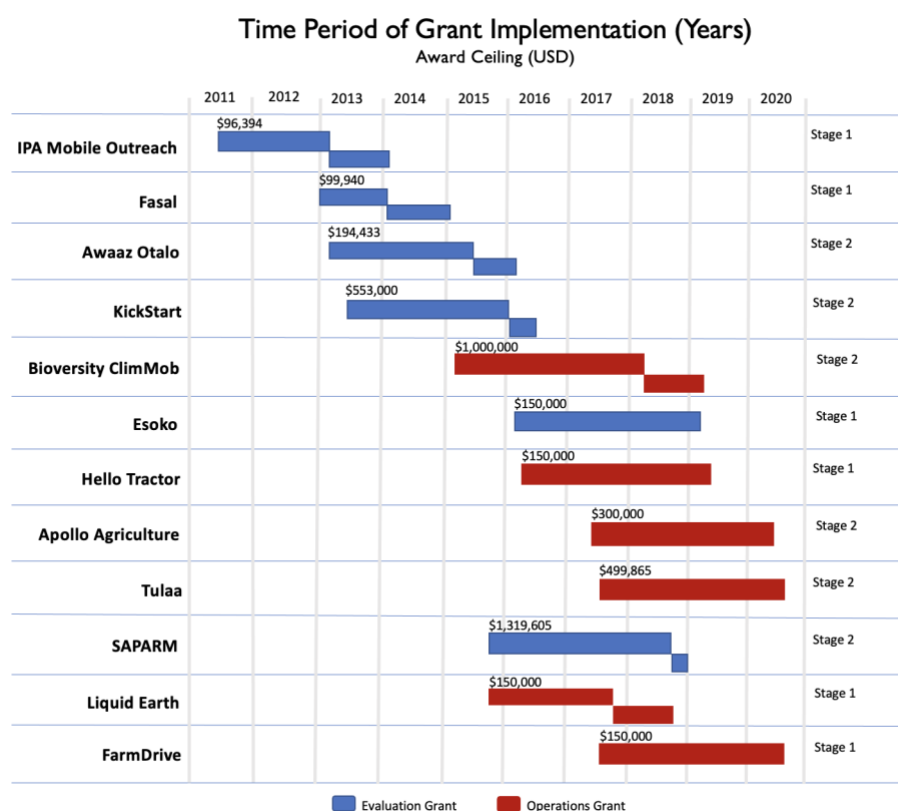
INTRODUCTION

Since 2010, USAID's Development Innovation Ventures (DIV) program has supported over 225 innovations in 47 countries. DIV operates by investing in innovators and researchers to test new ideas, build rigorous evidence of impact, take strategic risks, and advance the best solutions to development issues. DIV contracted USAID's Learning, Evaluation, and Analysis Project (LEAP III) to provide a status update on innovations, to assess the drivers of successful scale journeys, and to pilot a new conceptual framework to review and assess the success of funded innovations.

This independent review elucidated key elements of success and lessons from failure from the scale journeys of DIV-funded innovations and to apply them to DIV programming to improve grant selection and maximize the success rates of supported innovations to achieve impact. DIV is intentionally designed to take a portfolio approach, which is reflected in DIV's investments in innovations occupying similar spaces. This review covers DIV's portfolio of grantees in the digital agriculture sector, meaning those for which their core innovation fell within the agricultural sector and had a significant digital component. DIV funded 12 digital agriculture grants between 2010 and 2020, totaling \$4,663,237 of DIV funding (Figure 1). See Annex 1 for a description of each grant.

Of the 12 digital agriculture innovations funded by DIV, seven were confirmed as on the market in 2021, two were confirmed off market, and three could not be confirmed.

FIGURE 1: OVERVIEW OF DIV DIGITAL AGRICULTURE GRANTS



ASSESSMENT METHODOLOGY

The ET created a conceptual framework to analyze the success and sustainability of each grant in the sector. This conceptual framework was developed by the ET independently of DIV. DIV does not use this framework to analyze its grants. The framework looks at six elements to assess an innovation's success: scaling strategy, model types, evidence generation and utility, partnerships, financial viability, and contextual elements. To assess the status of each grant and understand key drivers of success, the evaluation team (ET) reviewed available secondary data on each innovation, including grant documents and publicly available information, and conducted key informant interviews (KII) with key stakeholders from each grant, as they were available. A total of 14 KIIs were conducted with representatives from eight grants. The ET considered an innovation successful if the core model was found available to its target users in its target market system, reflecting an innovation's success in scaling.¹

SCALE JOURNEY

Scale journeys had two major typologies, determined by the partner types they intend to work with: paths to scale and scale approaches (see textbox).

Paths to scale: The private sector was the primary channel for all seven successful digital agriculture innovations. Of these, five are currently exclusively available through the private providers and two are hybrids (i.e. private with some public providers).

Scale approaches: Collaboration models were the most successful among the innovations included in this review. The main drivers of the successful collaborations included a shared vision or common goals (better farmer outcomes), an overlapping target customer base (smallholder farmers in developing economies), and business complementarity—each adding to the other's business proposition. Expansion models were riskier than collaboration - while conducting all major business functions in-house affords more control over model fidelity and quality (and potential profits), it makes the innovation more vulnerable to shocks unless the original provider (innovation team) has substantial resources in diverse expertise and cash liquidity (a rarity for social enterprises launching an innovation). Finally, replication approaches can offer the fastest route to scale but offers the least control over innovation quality and model fidelity.

Most grants changed either scale paths or approaches during their pilots. The major drivers of most shifts were the discovery that key strategy assumptions did not hold. One common discovery was that grantees lack capacity around key business functions (usually marketing or customer financing) at

TYPES OF SCALE APPROACHES

Collaboration: This scale approach is centered on the intentional cooperation between the original inventors (or here, DIV grantees) and other value chain actors to increase the availability of a product, service, or process to more people, geographies, or market sectors.

Expansion: The original team takes on all core business functions, often maintaining sole ownership or rights to provide the innovation.

Replication: Replicators provide the core model but often bundle it with their products or services or modify it slightly for their customer base. However, there is no formal business relationship with the innovator.

¹

scale. The other was the expectation that an essential partner slated to fill a major scaling role would assume that role. This assumption did not hold in five of the twelve grants reviewed here, necessitating swift pivots.

The successful innovations in this review all reached exponential levels of scale across most key indicators above levels during the DIV grants. All successful innovations expanded beyond their initial geographic reach and most expanded into new markets since the end of their DIV funding. For example, Awaaz Otalo's mobile extension services have expanded to three new sectors, 11 new countries, and reached nearly 680,000 users as of 2021.

DRIVERS OF SUCCESS

SCALING STRATEGY

Finding 1. Resilience is the key to achieving scale. The most essential and overarching finding of this review is that success depends largely on how well the innovation team adaptively manages the journey to scale and its inevitable challenges—resilience was the key. Proving model effectiveness was necessary to get the scale journey off the ground; finding essential partners—both financial and providers that were willing to test the business strategy was necessary to advance the scale journey. After that, the fundamental difference between innovations that succeeded or failed in scaling was the ability of the innovation team to make evidence-based decisions to pivot in real-time to evolving challenges—both internal risks revealed by the pilot and external threats like climate change.

Finding 2. Outsourcing key business functions was a successful strategy pivot for grantees with limited business capacity. Outsourcing was driven by necessity. Pilot results often revealed weaknesses or a lack in key business functions—such as marketing, distribution, and providing customer financing—that had to be filled for the innovation to reach scale. Outsourcing was a successful pivot, as it boosted both initial and sustained uptake of innovations. In addition to operational savings, key informants and secondary data cited the importance of users' trust and familiarity with known distributors for initial uptake. Bundled products or services also provided convenient access for users, boosting sustained uptake. Securing partners with these capacities was straightforward by leveraging the right incentives and enablers. In this sample, uptake of innovations into partner operations had to come with minimal costs and maximum potential to boost partner goals, whether social or financial.

Finding 3. Locally based innovation teams with a deep knowledge of customers' needs could pivot to challenges and improve the model. This review found that innovation teams that were locally based and had a deep knowledge of the customers' needs were strongly positioned to pivot to challenges as they arose and to adapt innovation design or delivery to meet customers' evolving needs and preferences. As explained by a key informant, *"A locally based [team] is everything. We need to understand the context and the customer, but we also must be on the ground to manage challenges."* Sometimes such knowledge and expertise resided with innovation staff. In other examples, locally based agents were hired to facilitate growth with customers. Benefits to local sales agents included affording a deep understanding of customer needs, preferences, and barriers, and providing high-touch customer service.

MODEL TYPES

Finding 4. Beyond effectiveness, successful innovation designs responded to user demands and needs. Pilot or randomized control trial (RCT) data revealed in several cases that the innovation design did not meet users' needs or was not of sufficient quality to sustain uptake among target users. Successful innovations responded swiftly to null results to redesign models based on this feedback on user needs and preferences.

Finding 5. Tailored features and flexible financing were found to be effective incentives for initial user uptake. Beyond evidence of effectiveness, user feedback reiterated a demand for features and functions that made innovations easier to pay for and more user-friendly and specific. This finding echoes common scale principles² that any change—even positive—must be tangibly better than the status quo to enable ease of use and meet user preferences.

Finding 6. An intentional focus on customer experience and constant improvement was key to sustained uptake. KIs stressed the importance of constant innovation model improvement for sustaining scale. User needs and capacities rapidly evolve (especially true for digital technologies) and require frequent design iterations and improvements on the business strategy and innovation model.

EVIDENCE

Finding 7. The quantity and quality of evidence generated varied widely across the twelve grants, as did evidence utility. All twelve grants in this sample generated evidence, whether via an RCT or pilot studies. Seven grants conducted RCTs on various elements of the innovation's proof of concept or effectiveness of impact or cost.³ There are several strong instances when robust evidence—significant and null results—informed strategic pivots in model and business strategy design. In several cases, primary data on strategy assumptions collected during the pilot phase informed pivots that directly led to results that generated evidence on innovation effectiveness, cost-efficiency, and financial returns essential in securing provider and investment partners.

In certain instances, innovations failed to secure additional and necessary partners to scale because they lacked sufficient evidence or data to incentivize that partnership. In other instances, RCTs faced serious design issues due to limited key stakeholder involvement.

Finding 8: Evidence gaps existed for gender dynamics of access. Only three of the twelve pilots were found to have basic gender data, and all grants lacking robust evidence on differentiated levels of access. Several of the innovations included in this sample directly targeted smallholder farmers as their main clients or users. Yet, this review found few points of evidence that innovations provided on the gender dynamics of their customer base or robust evidence on differentiated access. Only three of the innovations included basic data on gender.

The digital agriculture revolution is a promising strategy to advance women's empowerment and reduce gender inequality gaps. In addition, women represent a large potential market segment. Should an

² See online libraries of MSI <https://msiworldwide.com/our-impact/scaling-development-outcomes> and the Scaling Community of Practice <https://www.scalingcommunityofpractice.com/> for publications with this principle.

³ The 3iE evidence map on agricultural innovations indicated that evaluations with experimental designs and particularly those measuring cost-effectiveness were severely lacking in the evidence base. DIV-funded RCTs are contributing to directly informing that evidence base. <https://3ieimpact.org/sites/default/files/2018-02/egm12-ag-innovation.pdf>

innovation design not account for potential access issues or availability for women customers, particularly in small-scale agriculture, they may be missing a large market segment. Across the sector, more work is needed to target end-users that are women, youth, or other marginalized or vulnerable groups.⁴

PARTNERSHIPS

Finding 9: A shared commitment to social outcomes was key to successful provider, investor, and scale partnerships. Each of the successful grants in this sample cited partners as pivotal in their scale success. All informants interviewed stressed that the foundation of these partnerships was a commitment to common development goals that cemented the relationship. As one informant shared, “Someone who’s committed to [the innovation’s] success will weather the ups and downs of the trial period.” The inverse was also found. Innovations whose only partners were only interested in potential profits failed to support grantees at critical junctures, and the innovations failed to scale.

The shared vision of reaching more farmers with quality inputs was attractive to both government and NGO partners who also aim to improve rural livelihoods. However, because profits were not a driver for these partners, adopting an innovation into their programs had to come at a minimal cost (e.g., major investments required).

Finding 10: Local agro-dealers and commission-based sales networks were found to be effective partners in scaling innovation availability, access, and uptake. This review found four examples of successful distribution strategies that utilized a large corps of local retailers. Adding a digital innovation into local retail operations had to come with minimal costs and profit potential. Minimal costs were achieved by leveraging their existing clientele and bundling innovations into their existing agriculture product or service packages, requiring no new supply chains. Commission-based sales and retailer financing for inputs were effective financial incentives for third-party distribution partners, incentivizing sustained availability.

Finding 11: Evidence of farmer creditworthiness is a primary incentive for securing traditional FSP partners. For traditional FSP partners, credit score algorithms were found to be promising incentives, but these partners require high volumes of performance records. Lack of steady income and collateral used in traditional credit ratings have long prevented smallholder farmers from accessing loans through traditional FSPs. Six of the twelve grants reviewed had farmer financial services as a central component of their innovation models. Four either tested or incorporated new farmer credit score algorithms into their innovation models.⁵

This review found that direct financing had short-term advantages, including faster customer service and less fraud and waste. However, it also required significant resources, such as securing debt capital and teams of skilled staff, among others. Such resources are among those most DIV innovations—particularly those funded at Stages 1 and 2—lack. Cultivating a corps of quality FSP partners to provide financing services for farmers is likely more scalable and sustainable in the long run. However, no evidence was found in this sample of successfully securing these partners before or after their DIV grant closed.

⁴ <https://openknowledge.worldbank.org/handle/10986/31565>

⁵ There is an evidence gap for digital financial services to improve credit options for small-scale farmers and poorer actors in the agriculture sector (<https://agricultureinthedigitalage.org/evidence-gap-map/>). DIV should continue to fund and test these innovative models to bridge the gap in this much needed space.

Finding 12: Challenges with the public sector as a scale partner reinforces the need for innovations to have diversified groups of scaling partners for digital agriculture innovations.

Of the twelve grants reviewed, four had strategies that included a major role for governments as scale partners. No evidence could confirm that the public sector facilitated scale for three of these four innovations. In this small sample, instances when the public sector declined to scale during an innovation's journey to scale jeopardized the innovation's scale and sustainability prospects by not only retracting major distribution networks but by shifting substantial operating costs back onto the innovation teams. While the public sector was a challenging partner for several grants included in this review, it is important to note that the broader literature identifies the key roles the public sector assumes for rapidly scaling impactful digital agricultural innovations.⁶

FINANCIAL VIABILITY

Finding 13: Grantees required resources beyond DIV funds to finance and implement strategy pivots. Often overlooked, this review demonstrated that financial stability during pilot phases was often the difference between success and failure of the scale journey. If an innovation cannot make it out of the gate, it will not make it to market. Grant budgets often do not account for necessary pivots. Innovation teams required flexible time and funding to implement critical pivots.

Internally, operational efficiencies and new revenue streams were the most common strategies to save or generate operating funds. The outsourcing of key business functions and leveraging partner networks generated substantial savings in operating budgets. Externally, securing “emergency funds” and in-kind contributions from both DIV and other partners were critical factors to bridging the “transition gap.”

Finding 14: For target users, income potential and reduction of risks to livelihoods were key financial incentives, and credit scores, flexible loan terms, and online marketplaces were effective financial enablers for uptake. The financial viability of digital agriculture innovations was complex for target users. Farmers and pastoralists at the bottom of the pyramid face the most constraints and the highest risks around their livelihoods, so enablers were found to be as important as incentives. Clear potential to boost income remained a fundamental incentive, but non-monetary benefits, such as an innovation's ability to reduce livelihood risks, were also important for user uptake

Several of the reviewed grants also provided financial access to inputs. Three financial enablers were tested in this subset—links to FSPs via online marketplaces, flexible payment plans, and new credit score algorithms. Importantly, these enablers were often intertwined, with the success of one depending on the others.

Flexible financing options for consumers were found to be a highly successful—even essential—business strategy to scale uptake in this sample. Five grants reviewed here had business strategies that offered farmers flexible financing options—either by design or strategy pivot. Purchase options that reflect smallholder or pastoralist cash flows were an important financial enabler for target users.

Online marketplaces were also found to be an effective enabler of financial access for target users. However, their inherent risk is the dependence on external partners to be beneficial. Marketplaces that

⁶ Schroeder, Kateryna; Lampietti, Julian; Elabed, Ghada. 2021. *What's Cooking: Digital Transformation of the Agrifood System*. Agriculture and Food Series; Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/35216>

enabled or facilitated market linkages were specifically beneficial to target users. However, while links to FSPs on these platforms increase the *potential* for farmers to access input loans, securing loans depends upon farmer credit ratings.

Access to credit has long been a known barrier to uptake of innovations for smallholder farmers, and four grants in this sample piloted credit score algorithms as a financial enabler. Four grants in this sample tested farmer credit score algorithms. To test the algorithms, grantees planned (or had to) provide loans to farmers themselves to generate evidence on payment performance to feed into the algorithm.

Finding 15: For distribution partners, the financial viability of taking on an innovation depended on three factors, including ease of integration into their current operations, the clear potential of innovations to boost their target numbers, and commission-based sales and procurement financing for local agents. Distributors differ from providers because they are not responsible for innovation model fidelity or quality but rather are motivated by financial incentives to add the innovation to their roster of offerings. The prospect of profit was found to matter more to distributors than to providers across this sample, meaning successful incentives maximize value-added and minimize adoption burdens.

Whether hardware or credit, the ability to bundle the innovation into existing distribution operations was an effective enabler for distributors. Bundling meant minimal investment was required in new supply chains, staff training, and marketing, minimizing the transition costs. Adding a new input to their bundle also meant new revenue streams.

Innovations in this sample that reached a rapid scale in availability through partner distribution networks report that mutual benefits were key. For both private retailers and NGO partners, informants noted that the ability or potential of the innovation to help them reach their target numbers was essential.

For local retailers, profit margins are an effective incentive—steady revenue streams even at low margins are often incentive enough to take on new products or services—but their ability to procure new inventory should not be assumed. Local distributors and demand aggregators for agricultural inputs are often last-mile retailers (agro-dealers or small agri-businesses) with tight cash flows. In this sample, commission-based sales and financing for local distributors were found to be effective tools that allowed these retailers to access new inputs with minimal cash down, substantially broadening the potential retail corps for innovations, boosting market availability.

CONTEXTUAL ELEMENTS

Finding 16: Innovations in the digital agriculture sector must address and pivot around external challenges triggered by weather and climate change. Several of the innovations included in this sample either intentionally addressed weather or systemic climate change issues or pivoted quickly to challenges that arose from weather or systemic climate change. Certain innovations were direct solutions to extreme weather events exacerbated by systematic climate change. Other innovations were specifically designed to be flexible in responding to changing weather events, as the model directly relies on many environmental factors to succeed. Finally, other innovations, quickly pivoted to address challenges spurred by weather or systematic climate change.

IMPLICATIONS

Overall, this review reinforces that the journey to scale must be one of resilience. To survive the transition from pilot to market, scale strategies must be as responsive and innovative as their inventions. This often depends on the innovation team's ability to pivot and secure strategic partnerships willing to take risks. This review found the DIV program to be exceptional in its support for pivots, both from modification records and key informant interviews.

Among the 12 digital agriculture grants funded by DIV, collaboration models were successful as an efficient and effective scale strategy to achieve last mile availability but require incentives for both partners and users for uptake. Agriculture is a geographically dispersed industry requiring an extensive value chain of actors, and timing is critical for all partners to succeed. Digital tools lend themselves to this sector with their unique ability to exchange critical information over vast distances and to multiple stakeholders almost instantly and cheaply, but information is only one input.

Responsive leadership and technical expertise among innovation teams were important for innovations to scale, the lack of one or the other was not necessarily a detriment to the innovation's success in scaling. For innovations that provided services direct to consumers, it was essential that the innovation team had physical proximity and deep contextual expertise of the customers' needs and experiences. Having teams near operations and supply chains enabled innovation teams to successfully pivot to challenges in real time, like delayed input deliveries.

Successful model designs delivered better solutions that fit users' preferences and need, in addition to general demand. Users were willing to pay for new products or services that have no existing competition if the benefits are immediately apparent, either in cost-savings, increased incomes, or reductions to livelihood risk. Innovation designs and business strategies that leverage strong market research, have an intentional focus on customer experience using the innovation, and can articulate the competitive advantage of the innovation for users have high levels of success for sustaining uptake and growth.

Successful innovations regularly used evidence and evaluation or monitoring results to inform pivots in both innovation model design and business strategy. Evidence utility was enabled in a variety of different formats, including strongly rated academic publications to routine customer feedback collected during monitoring exercises. The key was that innovation teams disseminated evidence in appropriate channels to target key stakeholders for uptake and utility.

Key partnerships are critical to facilitate a successful transition to scale for innovations. The most successful innovations in this sample had multiple and a diversified set of partners across their value chains, including, but not limited to, investors. The key was that successful innovations had the right types of partners essential for their model to scale, and that they secured a diversified pool of partners to reduce the risk of the innovation folding due to partnership challenges.

The financial viability of innovations requires that innovations can be sustained at multiple levels. First, it must be maintained for innovations to succeed beyond the pilot gate to market. Second, it must then be accessible and effective for users and essential partners to achieve and sustain uptake. And finally, it must be cost-effective for stakeholders across the value chain to maintain sustainability. Lessons learned indicated that multiple incentives exist to facilitate scale for each: innovation business strategy, user uptake, and key partners (providers, distributors, FSPs, and investors).

In general, more innovations are required across the agriculture sector to improve solutions that enable stakeholders to better adapt to and mitigate effects of climate change and unpredictable weather.⁷ In addition to innovations that may focus on solutions to weather and climate issues directly, a vast majority of innovations (model design and business strategy) in the digital agriculture sector will be affected by unforeseen weather challenges or those associated with climate change. Innovation teams should anticipate how their model could be affected by potential challenges and preemptively plan to adapt to such vulnerabilities.

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ANNEX I: GRANT DESCRIPTIONS

GRANT NAME	INNOVATION DESCRIPTION
Apollo Agriculture	Utilizes satellite imaging and machine learning to assess credit and offer input loans and customized agronomic advice to smallholder farmers via mobile applications.
Awaaz Otalo	Mobile platform that sends push notifications with expert advice to customer bases (farmers).
Bioversity ClimMob	Tested the Crowdsourcing Crop Improvement (CCI) method for the effectiveness of increasing new seed uptake by farmers and cost-efficiency for trial plot managers over traditional trial plots.
Extensio Mexico	Provides customized agronomic advice to client farmers from on-site labs via two-way digital platform, which also links farmers to financial service partners (FSPs), buyers, and sellers, to boost crop productivity and incomes.
FarmDrive	Connects small shareholder farmers to traditional lending through an innovative credit assessment model designed to increase the rates of loans given to farmers.
Fasal	A mobile application that sends crop price data to farmers based on their locations (prices at the nearest market) to inform sales prices for smallholder farmers.
Hello Tractor	Smart Tractor technology combines global positioning system (GPS) units with an online booking service enabling farmers to rent nearby tractors online while generating revenue for tractor owners.
IPA Mobile Outreach	Replaced traditional in-person extension support to outgrowers with short message service (SMS) advice and call-in centers to agronomists to increase crop productivity and company cost efficiencies.
KickStart Pumps	Tests various user financing models for purchasing human-powered small-volume irrigation pumps.
Liquid Earth	A mobile application that generates SMS alerts based on satellite images and weather predictions to warn coastal communities of impending floods and predicted inundation areas to enable risk mitigation/ reduce losses.
Tulaa mCommerce	A full-service online marketplace connecting farmers to input suppliers, agronomic advice, buyers, and aggregators. Includes a credit score algorithm for subscribing farmers to enable credit access.
SAPARM	Overlays traditional grazing boundaries onto satellite imagery to generate maps of green pastures and safe access areas for pastoralists.