


Digitally Enabled Agriculture

A landscape study of digital
advisory models for smallholder
farmers in East Africa

April 2022

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1

**Executive
summary**

Executive summary

1

Over the past decade or so, a growing range of digitally enabled solutions has emerged to solve the challenge of providing extension advice to farmers in a more efficient and sustainable manner. In the last 2–3 years, interest in these models has increased exponentially, backed by venture capital investment and increasing donor appetite for engaging with technological solutions to development, as well as the COVID-19 pandemic, all of which have moved social distancing-friendly development solutions to the top of the agenda.

This study aims to get to grips with this rapidly evolving context, synthesising and presenting the latest research and developments around digital advisory models that can support or enable agricultural productivity improvements for smallholders. Specifically, the study aims to: capture and succinctly present a coherent picture of the 'state of play' of digital advisory models for agriculture; highlight and profile some promising emerging and potentially sustainable models; and share some emerging implications for development partners, investors, and governments looking to support the digital advisory ecosystem.

1 Executive summary

Our initial hypotheses

There are many digital advisory firms emerging to fill the gap left by the gradual decline of traditional extension systems in East Africa, but there are several challenges with this proliferation of models which are increasingly apparent. We decided to undertake this study to test the following hypotheses:

- There is now a confusing array of different opportunities for farmers to access inputs, advice, credit and markets through providers with digital capabilities, often with different advice and solutions.
- Many of these providers are not profitable or commercially viable, particularly when they are focused solely on advisory offerings.
- Many new digital offerings are being tied to short-term pilots, often reliant on donor funding.
- As a result, we posit that consolidation and some degree of regulation may be needed to secure greater coherence, assure quality and ensure sustainability.
- To deliver this, donor funding should be more closely tied to real evidence that a particular model is working and can be self-funded in future, which in turn requires more independent evidence on the quality, efficiency and sustainability of different models, given incentives to report 'good news stories' about the potential for impact.
- Equally, governments may need to take greater oversight of which information is being shared with farmers at scale, ensuring it reflects best agronomic practices and could also incentivise consolidation.

These hypotheses have been validated but also deepened through this research.



Scope of the study

To not re-invent the wheel, we draw heavily on excellent recent reports by ISF Advisors, CASA, CTA and GSMA. While these provide a wealth of information, we thought a further study would be of value for two reasons:

1. We focus exclusively on digital advisory and models that have an advisory component to them, where other studies have focused on the broader range of digital models providing access to other services, such as finance, insurance, etc.
2. We hope to emphasise models showing signs of scale, impact and sustainability, to draw out lessons from these. For the purposes of this study, we defined these terms as follows:
 - a. Scale refers to 50,000+ active users or clients of a technological innovation. We emphasise active as [CASA \(2020\)](#) estimate that only 42% of the registrations for ag-tech platforms in Africa constitute active users.
 - b. Impact refers to a statistically significant increase in yields or incomes for farmers that have adopted or accessed the technology in question. This could represent increased income through crop diversification, improved farm productivity, reduced crop losses, better financial access, higher prices, or quality inputs.
 - c. Sustainability refers to business models that operate without or with limited subsidy (e.g. only needing subsidies to promote new growth areas or diversification or expansion of operations) or, alternately, are embedded within governments' core budgets in the case of public offerings.
3. We focus on East Africa (Kenya, Tanzania, Uganda, Rwanda). This is where Gatsby operates and, as such, forms the focus of our analysis.

Key take-aways

- Independent evidence on the digital agriculture ecosystem in East Africa is scarce, so self-reported impact is something that needs to be scrutinised. For most digital models, there is very little published on 'active' users, so the number of farmers stated as using any platform is often inflated. As suspected, there is need for better, independent data on what is and what is not working in this space, particularly in an East African context. There is a role to play for development partners supporting these initiatives to seek independent evidence, as well as for national governments to compile this evidence in a more objective manner and share it widely as a public good.
- Digital advisory on its own is unlikely to be profitable at the current stage of market development in East Africa, even in Kenya, which has the most developed rural agricultural markets. Thus, at the farmer level, advisory services need to be bundled or channelled through other businesses (like off-takers and input suppliers) already serving the smallholder market. Related, most sources point to the need for human interaction to accompany any digitally based model as a means of building farmer trust and delivering impact at scale.
- The sector is suffering from what one interviewee called 'pilot-itis'. Market consolidation is sorely needed as there are close to 100 models in Kenya alone, many of which have limited chance of success. As suspected, this seems to be driven by incentives to attract donor funding. Consolidation will be needed moving forward and further donor investment should be tied to the ability of digital entities to demonstrate impact, scale and sustainability with independent evidence.

1 Executive summary

- While market consolidation is key, there are already clear challenges emerging in regulating the market to avoid commercial digital agricultural advice providers gaining monopoly power over millions of farmers. Unchecked, this power could lead to less competition across a wide range of agricultural inputs and services, with the displacement of vendors and vulnerable small and medium-sized enterprises (SMEs), lower workforce protections and a more significant income divide with those users who cannot easily connect.
- Regulation is going to be hugely important moving forward to protect farmers' interests, and this varies between the four countries. In an analysis of the national and regional policy gaps related to ag-tech firms in East Africa, [ODI \(2020\)](#) pointed out that 'regulatory preparedness varies significantly across countries, especially in terms of conversion of draft laws into implementable acts/laws or protocols.' There are a host of issues identified in their report, but some of the key issues include poor cyber-security and cyber-crime laws, a lack of payment systems laws, and a lack of clarity around how to regulate electronic transactions. Regarding digital advisory more specifically, there is currently limited oversight of the types of information being shared directly with farmers, with no effective monitoring of whether the information provided by various entities is 'correct' from the perspective of the latest agronomic science or is rather focused on selling specific products.

- One option might be to utilise a licensing model, which could be tied to a subsidy whereby digital advisory firms would be incentivised to update their curricula to reflect agronomic best practices. They would then receive a subsidy if their curricula is deemed to be acceptable, with laggards losing their licenses if they are deemed to be spreading outdated or poor information.

At a broader level, it is important to note that digital advisory, while showing promise in terms of reducing the costs of providing smallholders with access to information, should not be considered a panacea to unlocking agricultural productivity in East Africa. By helping to reach farmers with more, and hopefully better quality, advice, digital advisory can spur the uptake of good practices and the use of better quality and more appropriate inputs and services. Hence, we do see digital advisory as a major opportunity to catalyse wider agricultural productivity change. Assuring the quality of the advice, finding links to 'human' advisors in rural areas, and driving sustainability by helping high potential firms reach scale, while starting to regulate the market power of major firms will, however, all be essential to ultimately deliver on this promise.



1 Executive summary

| Model | Access to information | Impact on yields or incomes | Signs of commercial sustainability | Evidence of reaching scale |
|--------------|-----------------------|-----------------------------|------------------------------------|----------------------------|
| Digifarm | ✓ | | ✓ | ✓ |
| eGranary | ✓ | ✓ | ✓ | |
| PxD | ✓ | ✓ | | ✓ |
| Climate Edge | ✓ | | ✓ | |
| Kuza | ✓ | | | ✓ |

Specific models and what they offer

Our study looked in detail at five models showing promise in terms of providing information to farmers, as well as indicating signs of impact, sustainability and/or scale. This is summarised in the table above.

What the five cases indicate is that no single firm we have come across has managed to tick all three boxes of demonstrable impact on farmer behaviour and livelihoods, operating at scale, and showing an indication of commercial sustainability. Instead, various firms have crossed 1–2 of these hurdles, indicating that there are aspects of their models worth emulating.

- **Sustainability:** Three models – eGranary, Digifarm and Climate Edge – all show promise in terms of commercial sustainability, albeit for distinct reasons. Digifarm has been able to achieve commercial success based on its ability to leverage its existing network and brand via association with Kenya’s largest mobile operator, Safaricom. Climate Edge, alternately, is a small firm offering digital solutions to off-takers, input suppliers and specialised companies like Crop Nutrition Laboratories (CropNuts). Thus, commercial principles are integrated into their operational model as they must rely on commercial clients to operate and have limited grant funding to fall back on. eGranary operates distinctly from either of these models, focused instead on providing a digital backbone to an established farmer-based grain-trading network. Each of these models is unique, which suggests that there are multiple pathways to achieving

commercial sustainability in advisory services. However, there are a few salient lessons that these cases highlight: (i) serving farmers directly with advisory services is not profitable and these are going to be a loss-leader for other services and/or impact targets; (ii) being tied to a major brand and reputation (e.g. to a mobile operator like Safaricom) is helpful in reaching a wide market segment quickly, is value adding to their customers, and can link advisory to financial products; and (iii) being able to leverage an existing network – either in terms of agents or farmer groups – is vital to the success of these models.

- **Impact:** There were only two models we studied that were able to highlight demonstrable impact in terms of changing farmer behaviour and/or having an impact on yields or incomes: PxD and eGranary. PxD has been able to do this by applying a ‘test, iterate and learn’ approach and embedding a learning from failure mindset into the DNA of their organisation. Unlike most of the other models we looked at, they publish rigorous, independent data on their website and share the results of randomised control trials of their work. This ability to learn from what is not working marks them out in an industry that tends to only publish stories of success. Likewise, eGranary has hired IDH to conduct a detailed assessment of its business model, and although it is too soon to tell if it will be impactful at scale, their model has shown early promise in terms of delivering impact for its members. This highlights the importance of good data to understand the impact of digital

solutions on farmer behaviour, something that will require significant donor or government subsidy or incentives to become commonplace.

- **Scale:** Three models were operating at a significant (tens of thousands of farmers active) scale: Kuza, Digifarm, and PxD. Two of the organisations that were able to do this, PxD and Digifarm, have done so through partnership with both government entities and the private sector. In Digifarm's case, this was done through its association with Safaricom and by linking to service operators like iProcure, as well as corporate input suppliers like Syngenta and Yaro. In PxD's case, their clients are 80%+ government entities, so they can leverage existing contact databases supplied to them by agencies that have been providing extension for years or, in some cases, decades. Kuza is different, as it has been able to draw on donor support to bring their model to scale and applies an agent model to scale up quickly. It has recently offered its platform to NGOs, governments and donors, which are licensing its services to select and incubate the Agripreneurs (rural youth agents) and support them for two seasons.

“ By helping to reach farmers with more, and hopefully better quality, advice, digital advisory can spur the uptake of good practices and the use of better quality and more appropriate inputs and services.”





2

Context

2

At Gatsby Africa, we aim to work in partnership with others to transform sectors in East Africa, generating millions of better jobs and livelihoods. We know that the agricultural sector is crucial to this agenda, where close to 60% of sub-Saharan Africa's workforce is employed, with growth in this sector up to **11 times more effective at reducing poverty** than growth in other sectors.

In 2018, we conducted a study into how development actors and commercial entities have enhanced – or in some cases established – distribution pathways for agricultural inputs to smallholder farmers. The study attempted to move past ‘good news stories’ to understand where other development actors and commercial entities had developed last mile distribution pathways that were:

**1.
Operating to some degree of scale,**

**2.
Reaching smallholders (1–3 acres),**

and

**3.
Functioning without subsidy.**

More recently, there is a growing number of digital-enabled technologies emerging to solve the challenge of providing smallholders with access to markets, inputs and advice to enhance their productivity and reach higher value markets. We believe these technologies could prove to be vital enablers of agricultural transformation, an issue we explore in our recent [Horizon Kenya chapter on technological trends in Kenya](#). As CTA's [Digitalisation of Agriculture in Africa Report \(2019\)](#) put it, 'An inclusive, digitally-enabled agricultural transformation could help achieve meaningful livelihood improvements for Africa's 250 million smallholder farmers and pastoralists. It could drive greater engagement in agriculture from women and young people and support employment opportunities along the agricultural value chain – and it could help build resilience to climate change.'

This study is meant to help enhance understanding of this rapidly evolving context. While we recognise that there remain many problems with the provision of inputs, transparency of market information and access to finance, we also see that it is increasingly viable and common to provide these services commercially. However, access to agronomic advice remains more challenging to deliver commercially, where there are even greater constraints to farmers' assessment of what is good quality advice and what is not. It is for this reason this study focuses on those firms providing digital advisory services to farmers either directly or through intermediaries. Specifically, the study aims to: capture and succinctly present a coherent picture of the 'state of play' of digital advisory models for agriculture; highlight and profile some promising emerging and potentially sustainable models; as well as share some emerging implications for development partners, investors, and government entities looking to support the digital advisory ecosystem.



3

**Scope of
the study**

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3

Digital agriculture has been an area of active development interest in recent years. This study builds on previous landscape studies undertaken by [ISF Advisors \(2021\)](#), [GSMA \(2020\)](#) and [CTA \(2019\)](#), which all lay an excellent foundation for our analysis.



We thought it worthwhile to undertake a separate study, however, for three main reasons:

1. We focus exclusively on digital advisory and models that have an advisory component to them, where other studies have focused on the broader range of digital models providing access to other services, such as finance, insurance, etc.

2. We hope to emphasise models showing signs of scale, impact and sustainability.

There are countless case studies being developed of digital agriculture models but, given many are so nascent, less has been written independently about their impact in terms of farmer productivity and/or income increases, their potential for commercial sustainability, and their scale, not just in terms of registered, but also active users, (i.e. the proportion of users that are regularly utilising the platform to support their farming activities). For the purposes of this study, some straw-person definitions of these terms are outlined below:

a. Scale refers to 50,000+ active users or clients of a technological innovation. We emphasise **active** as [CASA \(2020\)](#) estimate that only 42% of the registrations for ag-tech platforms in Africa constitute active users. Where possible, we also analyse the replicability of the technology, i.e. the ease of scaling a model in different countries.

b. Impact refers to statistically significant increase in yields or incomes for farmers that have adopted the technology in question. This could represent increased income through crop diversification, improved farm productivity, reduced crop losses, better financial access, higher prices, or quality inputs. [CASA \(2020\)](#) also analyses impacts on firms involved in ag-tech platforms through efficiencies and reduced management costs; greater quantity of supply (through increased productivity and reduced losses); higher profit margins; and higher quality of supply, including the end product complying with market requirements.

c. Sustainability refers to business models that operate without or with limited subsidy (e.g. only needing subsidies to promote new growth areas or diversification or expansion of operations) or, alternately, are embedded within government core budget in the case of public offerings. To the extent possible, this study looks at the economics of business models, unpacking the main cost and value drivers.

3. We focus on East Africa (Kenya, Tanzania, Uganda, Rwanda). This is where Gatsby Africa operates and, as such, forms the focus of our analysis. It is also a region which has seen rapid growth in digital agricultural technologies in recent years, with Kenya in particular emerging as a global leader in the field.

We hope to emphasise models showing signs of scale, impact and sustainability.

3 Overview of the digital advisory landscape in sub-Saharan Africa



As we look ahead to the next decade and aspire to grow the number of farmers we serve, our bottom line remains what it has always been: impact. We remain committed to increasing the scale (number of farmers we reach), depth (measurable outcomes for each farmer), and efficiency (cost of achieving outcomes) of our impact, and digital innovation is our primary means of achieving this goal."

OAF (2021) One Acre Fund's Digital Innovation

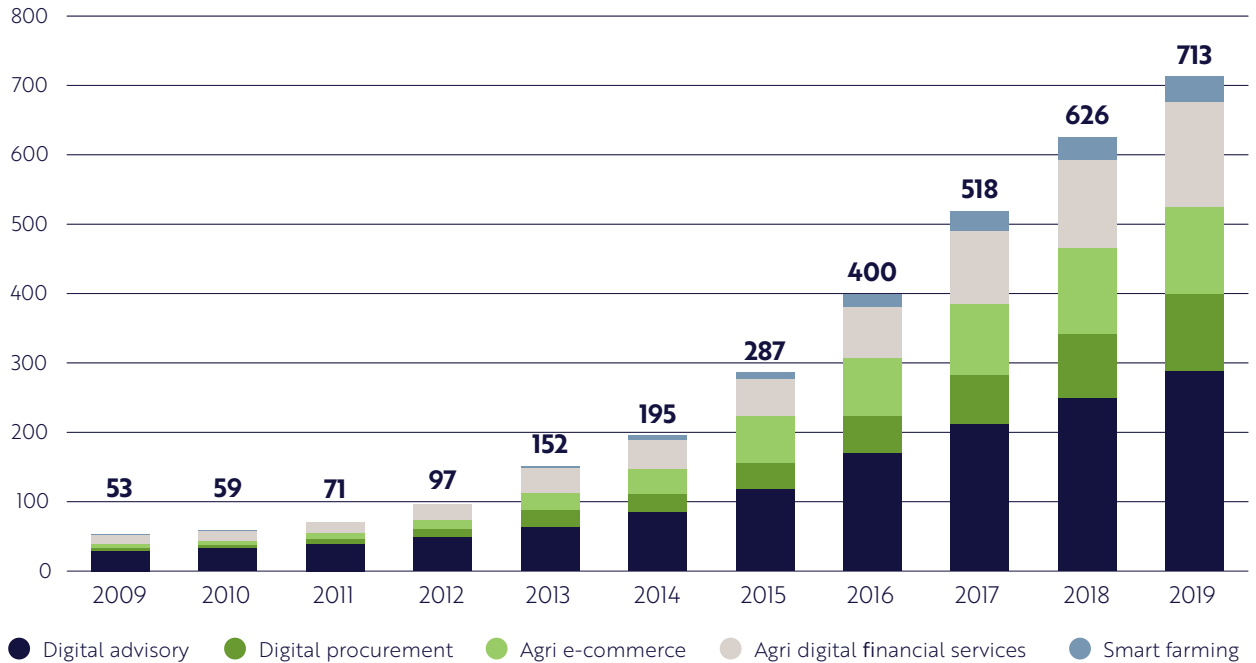


3 Overview of the digital advisory landscape in sub-Saharan Africa

Figure 1:

Expansion of digital agricultural services.

From GSMA (2020) Digital Agricultural Maps



According to CTA (2019), there were at least 390 digital advisory technologies across sub-Saharan Africa as of 2019 and – as an indication of how quickly the sector is growing – nearly 60% of them were launched in the previous three years. Kenya alone has 95 ag-tech solutions on the market, Uganda has 43 and there are another 28 in Tanzania. Globally, we can see growth from 53 such models in 2009 to 713 a decade later (Figure 1).

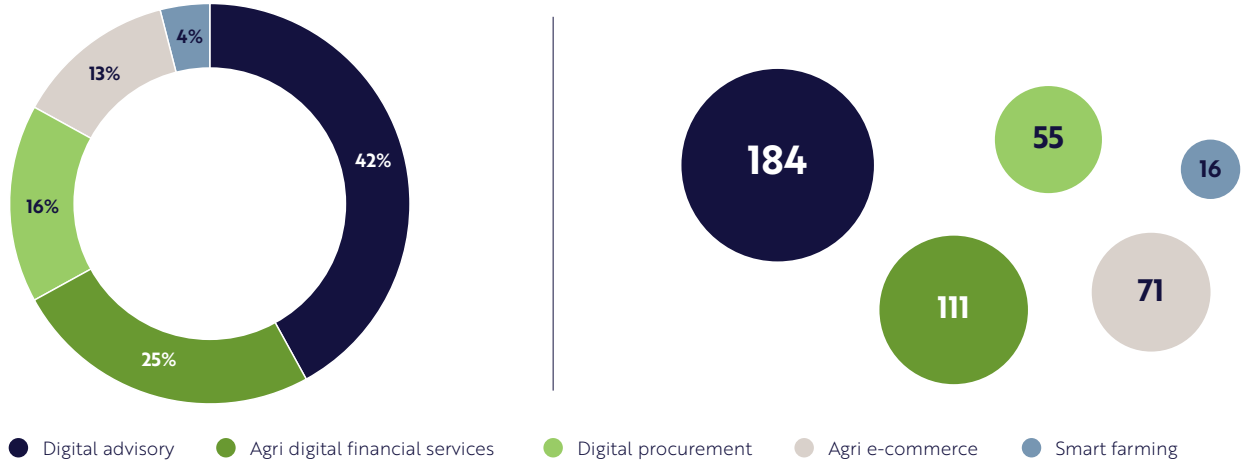
Across sub-Saharan Africa, digital advisory remains the most prolific of these business models, making up 42% of the overall market (Figure 5). However, there has been considerable growth in agri-financial service providers as well, from 52 to 111 such providers over the past five years. The number of agri e-commerce services has also grown rapidly across the continent, from 3 to over 70 in 2020.

390

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3 Overview of the digital advisory landscape in sub-Saharan Africa

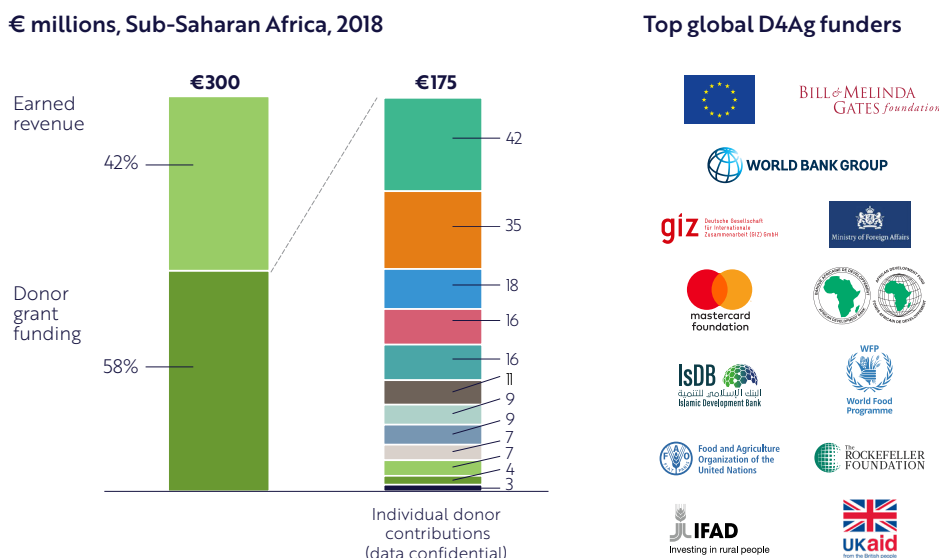
Figure 2: Breakdown of digital agricultural business models across sub-Saharan Africa by type.
From GSMA (2020) Digital Agricultural Maps.



The rapid growth in digital agricultural business models has coincided with an uptake of donor funding and commercial investment being channelled into digital agriculture, with this trend set to continue. CTA (2019) predicts ‘that both donor and private capital flows to solution developers and implementers in Africa will accelerate significantly in the next few years.’ They estimate that upwards of \$1 billion will be needed over the next few years to keep pace with the sector’s current growth trajectory. However, only 25% of investment into the sector currently comes from commercial sources of capital.

As CASA (2020) notes, ‘Private investment is still lagging, as there is not enough clarity about the types of services and supporting business models that can achieve an adequate return on investment as well as a positive developmental impact.’ There is likely to be a need for development partners to play an early role in providing targeted funding to establish a few proven models, gathering evidence as to what works as a means of channelling further investment.

Figure 3: Sources of revenue and funding by donors of digital agricultural models in Africa.
From CTA (2019) The Digitalisation of African Agriculture Report.



3 Sustainability, scale and impact

According to [CTA \(2019\)](#), **a few firms are showing signs of sustainability.** They estimate that 70% of enterprises studied for their report generated some revenue and that 80% of those were able to maintain several revenue streams. Furthermore, 26% were breaking even at the time, with evidence that some companies were able to achieve 30–40% gross margins. They highlighted that a few firms found it is possible to generate up to £85–90 of revenue per farmer annually, although the average was much lower and closer to £4–5 for advisory services. According to the authors, 'The economics are improving, and a handful of players are beginning to develop viable businesses with attractive financial models.'

[CASA \(2020\)](#) note that there tend to be five different business channels by which ag-tech companies operate. These includes business-to-client (B2C) models, which involve the use of user or subscription fees, 'freemium' models, mark-up or commission fees taken directly from farmers. There are also business-to-business (B2B) models catered to agribusinesses, lead firms or inputs suppliers. In their sample of 104 ag-tech firms, the most common models were B2B and B2C, making up over 70% of the active market surveyed. Of the total, 58% reported that they were currently making a profit and a further 26% expected to break even over the next two years¹.

A few companies are also scaling, but they are few and far between. The companies CTA profiled had, as of 2019, already registered over 33 million smallholder farmers and pastoralists across sub-Saharan Africa. This would be 13% of all smallholders on the continent if there was no double counting and no gap between registered and active users. Regardless, the number of active users utilising these technologies grew by 44% per annum from 2016–2019 and 15 companies were able to reach the milestone of 1 million registered farmers over this period. In Kenya alone, large and fast-growing examples include WeFarm (1.4 million users), iCow (0.8 million users), Pula (0.6 million users), KCB/Mobigrow (0.4 million users), and Precision Development (0.4 million users). However, [CASA \(2020\)](#) note that only 55% of the 104 firms they studied have more than 50,000 users and 66.5% of services reached fewer than 250,000 users. According to the report, 'This highlights significant difficulties for the majority of services to reach a meaningful scale.'

Some appear to be achieving impressive impact, but most impact numbers are self-reported.

Of CTA's sample of 50 impact studies, they highlighted average yield improvements of roughly 20% for advisory services. However, [CASA \(2020\)](#) note that none of the models they studied have conducted any sort of rigorous analysis of their impact. The proportion of them that self-report their impact is much higher, which could suggest they represent a marketing tool to attract more customers and funders. Precision Development (PxD), highlighted in the case study section of this report, represents a strong outlier here, with independent research of their work published openly on their website.

On the positive side, there are signs of consolidation and proof of concepts emerging, which we dive into further in this study. According to [CASA \(2020\)](#), 'The largest 20 ag-tech firms currently account for nearly 80% of all registered users, indicating that the industry is starting to prove the sustainability, scalability and impact of certain services and business models.'

Lastly, where rigorous data has been collected, there are promising signs that digital advisory services can change farmer behaviour and improve yields. For example, a meta-analysis of six studies ([Fabregas et al., 2019](#)) in Kenya and Rwanda found that, on average, farmers who received advisory text messages promoting the use of agricultural lime adopted the input at a rate 11.3% higher than farmers who did not. Furthermore, evidence suggests that changes in farmer behaviour can lead to yield increases across a variety of settings. For example, a meta-analysis of seven studies in Africa and India demonstrates a 4% average yield gain associated with digital agriculture programs ([Fabregas, Kremer, Schilbach, 2019](#)). This increase is an average effect amongst all farmers to whom messages were sent, including farmers who did not open or engage with the content, indicating that actual impacts are likely to be much higher for those that opened the messages and changed some aspect of their farming practices as a result.

¹Note the discrepancy between the CTA and CASA figures stem from the use of different samples.



4

**State of the
market in
East Africa**

State of the market in East Africa

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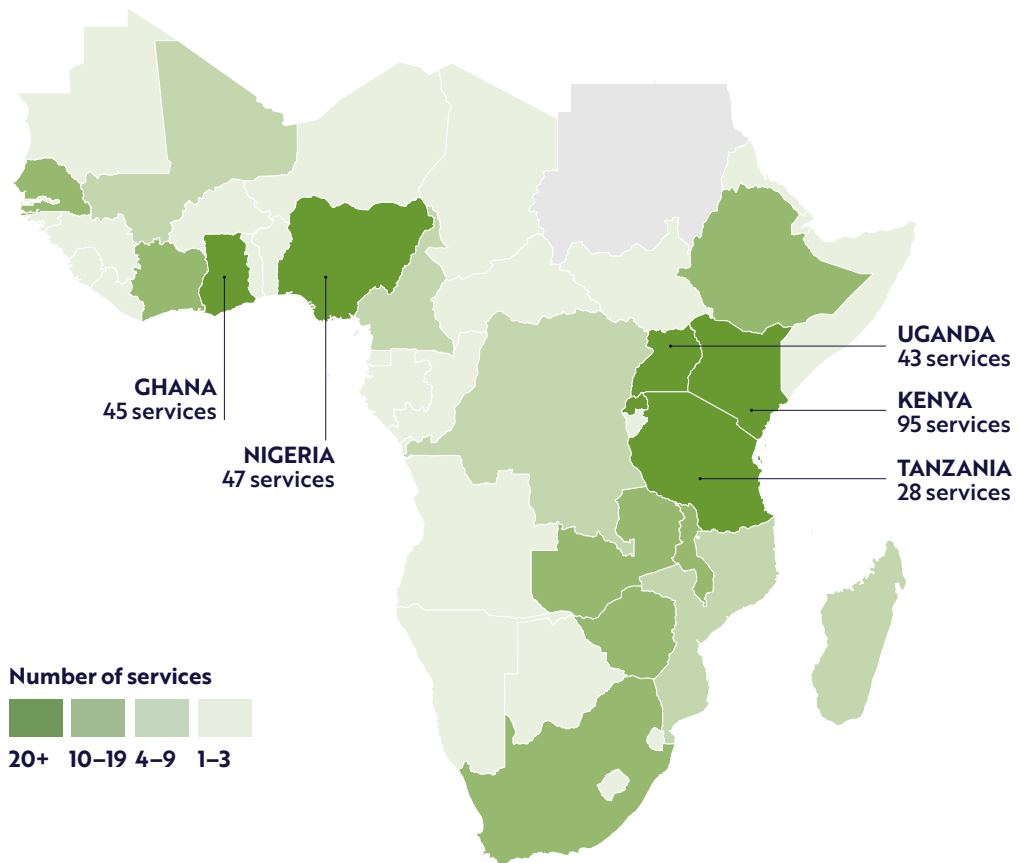
East Africa is where innovation in digital agriculture is happening. **ISF Advisors (2021)** note that 'East Africa, with Kenya in the lead, is home to half of the headquarters of agriculture-related digital solutions that are active in Africa and more than two-thirds of registered users.' Kenya has 95 ag-tech solutions on the market, followed by Uganda with 43 and another 28 in Tanzania.

4 State of the market in East Africa

In terms of which models are most prominent, East Africa mirrors the global trend, with an emphasis on digital platforms providing some sort of advisory services as the primary source of innovation. One [ODI report \(2020\)](#), for example, found that of 70 ag-tech firms sampled in the EAC (East African Community) region, close to 86% specialised in data-connected agriculture – that is, farming apps that tend to have a strong advisory component to them.

86%
of agtech firms
specialised in
data-connected
agriculture

Figure 4: Map of digital agriculture services by geography.
From [GSMA \(2020\)](#)



Kenya

Most sources will point to Kenya, along with India, as the world's leader in digitally driven agriculture. [ISF Advisors \(2021\)](#), for example, highlight that 'Kenya has just under 4% of Africa's population (...) yet account for nearly 25% of agricultural tech start-ups in Africa.' Roughly 100 agriculture-related digital solutions are present in Kenya and an estimated 20–30% of Kenyan farmers make use of at least one digital solution. According to [CTA \(2019\)](#), as of 2019, 31% of operators on the continent had locations in Kenya, with combined revenues of £16–33 million in 2019. This is likely to have increased over the past two years, with DigiFarm alone surpassing these revenue totals in recent years.

This has begun to attract investors into the sector. According to [Horizon Kenya \(2021\)](#), half of the venture capital/private equity investment in ag-tech in sub-Saharan Africa occurs in Kenya and, [ISF Advisors \(2021\)](#) note, 'Many enterprises (...) build or rely on mobile money solutions. This foundation of existing digital solutions and mobile and digital connectivity provides a fertile ground for digital platforms.'

Although the outlook in Kenya is positive, when looking more specifically at advisory services, [CTA \(2019\)](#) have pointed out that some experts on Kenya's agricultural sector are concerned about the speed at which extension services have decreased in recent years. [Birch \(2018\)](#) for example, notes that government spending on agricultural research as a proportion of GDP (Gross Domestic Product) has fallen steadily over the past decade, with Kenya having 1,158 full-time equivalent agricultural researchers, compared with 3,025 in Ethiopia. Data on the current number of extension officers in the country is hard to find, but [IFPRI \(International Food Policy Research Institute\)](#) estimates that Kenya has 1400 field level extension staff, or 1:1800 farmers, far below the FAO (Food and Agriculture Organization) recommended 1:400 ratio. One issue is around an overemphasis on the tech component of these models, with some arguing farmers respond much better to extension workers using digital tools, rather than digital-only services. This will be important to monitor in the coming years, as the efficacy of digital solutions vis a vis in-person training is still far from proven.

Digital advisory innovations happening in Kenya ([CTA 2019](#); [Horizon Kenya 2021](#))

- **DigiFarm**, an offshoot of Safaricom, is an agribusiness solution tailored for smallholder farmers. The firm provides farmers with access to finance, quality inputs at a discount and information on different crops and livestock. DigiFarm represents direct-to-farmer hubs as 'one-stop shops' through which third-party agricultural service providers offer their services directly to farmers registered on the hub, while farmers can take orders directly from buyers.
- **Apollo Agriculture** is a firm using agronomic machine learning, remote sensing and mobile phones to efficiently deliver finance, farm products and tailored advice to smallholders.
- **Arifu** is a digital content and interactive learning platform which is personalised and free for its learners.
- The **KALRO ASAL K-Hub** is a platform promoting data exchange, sharing, learning, collaboration, and innovation for equitable access and utilisation of agricultural knowledge within the arid and semi-arid lands.
- **Ujuzi Kilimo** uses big data and analysis to adjust irrigation and determine the needs of individual plants, hoping to transform farmers into a knowledge-based community, and improving productivity through precision insights.

Rwanda

ODI (2020) highlight that, relative to its regional neighbours – that have seen a growth in development funding and private interest in ag-tech – Rwanda has many more government-supported apps and projects, run by the Ministry of Agriculture and the Ministry of Commerce. As a specific example of government-sponsored technology adoption, the Bank of Kigali TechHouse runs the Smart Nkunganire System (SNS), which provides farmers and agro-dealers with government subsidised inputs, order processing for supply chain management, and financing.

Donors and NGOs are also present in the space. For example, CTA (2019) note that the FAO chose to pilot a digital flagship initiative, Agricultural Services and Digital Inclusion in Africa, in Rwanda and developed four smallholder farmer-focused digital products and services in 2019. In response to this ecosystem-building, a few ag-tech firms, such as N-Frnds and Kumwe have located operations in Rwanda. Despite these developments, most sources suggest that private investors have not yet demonstrated much interest in this space in Rwanda.

Digital advisory innovations happening in Rwanda (ODI 2020)

- **IPoVaF** is a mobile platform that is aimed at bridging the gap between farmers and access to information and financial services. The platform has developed an integrated mobile technology, based on USSD messaging that does not require the use of a smartphone, or even access to internet data. It is specifically designed for the simple mobile phones that the majority of rural farmers use where farmers can keep track of their harvest and sales records using a personalised dashboard. This information is used by financial institutions to predict harvests (and therefore collateral) and approve loans, which enables farmers to borrow money without having to step foot inside a bank.

Uganda

In Uganda, the market, particularly for digital advisory, is more nascent than in Kenya, but the ag-tech space in general has been able to leverage on a wide use of mobile data and mobile money as a foundation for further innovation. In 2018, for example, the total value of transactions over mobile money platforms accounted for more than half of Uganda's GDP (UNCTAD, 2018). Mobile network operators (MNOs) are providing services for mobile payment through e-wallets, using a growing agent banking network, which may be leveraged, as with Digifarm in Kenya, to provide advice and services directly to farmers.

Digital advisory innovations happening in Uganda (ODI 2020)

- **M-Omulimisa** is a product and exchange model that uses a network of village agents to provide a bundle of agriculture-related services, including agriculture insurance, input demand aggregation and distribution, mobile-based extension, soil testing and micro loans. The network of over 40 village agents works with over 300 farmer groups with a combined membership of over 9,000 members spread across 9 districts. The platform earns a commission from supplying inputs, which is shared with their network agents.
- **EzyAgric** is a trading and sharing android app that offers a range of services: farmer digital profiling, extension, information and complex information services, matching buyers and farmers, and horizontal facilities such as credit vouchers to buy input and services as well as crop insurance. EzyAgric has over 60,000 registered farmers and has created over 480 jobs for youth supporting agriculture and ICT development.

4 State of the market in East Africa

Tanzania

According to [Agrinfo](#), 'agriculture is one of the leading sectors in Tanzania accounting for at least 24% of the GDP, 30% of total exports and 65% of raw materials for Tanzanian industries.' However, the sector is still behind in its use of modern technology to improve productivity. Most digital technologies are still at pilot stage and few are reaching the level of scale seen in Kenya or Uganda. Despite this, there are growing centres of innovation in the country. According to one report (quoted in [CABI 2021](#)), there are approximately 40 hubs and innovation labs in Tanzania; more than half of which are in Dar es Salaam. Like Uganda, Tanzania is building on its large mobile presence to lay the foundation for further innovation in digital advisory.

Digital advisory innovations happening in Tanzania (Agrinfo)

- **Tigo Kilimo** provides agronomic tips on ten major crops (maize, rice, Irish potato, cassava, onions, banana, citrus, sweet potato, tomato and cashew); market price information on these crops for main markets; and 1-, 3-, and 5-day weather forecasts available for 26 regions of the country.
- **Digital Mobile for Africa (DMA)** offers a digital platform to help manage a network of SMEs and farmers on behalf of MNOs, financial service providers and input companies – merging mobile money, savings, credit and input supply chain inventory management systems.





5

Case studies

5

The case studies below attempt to take a deeper dive into the digital advisory landscape with an emphasis on specific firms that are showing promise in terms of impact, sustainability and scale. It follows with an attempt to draw out salient lessons from these five models, with implications for development partners and those looking to invest in this space.

DigiFarm

A 'super' platform in Kenya combining advisory, access to inputs and markets, as well as credit

Overview of the model

Launched in 2017, DigiFarm is Safaricom's mobile platform for digital services to smallholder farmers. As with mobile money, it is accessible on a basic USSD (Unstructured Supplementary Service Data) phone, and it provides farmers with access to products and services enabling them to source products, make transactions, as well as access relevant information on good agricultural practises. Over time, additional services have been added to the platform with the goal of making DigiFarm a 'one-stop shop' for Kenyan farmers, including the recent introduction of DigiSoko, an open marketplace for agricultural produce. In 2018, DigiFarm rolled out the DigiFarm Village Advisor network, providing 1,500 field experts to support farmers' in accessing services related to the platform.

Strategy/vision

According to Fred Kiio, Head of Commercial Operations and Segments at Safaricom, "Safaricom's purpose is to transform lives through the use of mobile technology. We have a customer base of more than 26 million subscribers in Kenya. We're therefore ideally positioned to leverage technologies that will empower Kenyans with opportunities and give them the right tools for economic growth." (Quoted in [Mezzanine 2019](#)). DigiFarm aims to support this mission by addressing five challenges faced by smallholders:

1. A lack of statistical data on farms and farming activities in Kenya, meaning services are not well catered;
2. A lack of adequate extension services;
3. Limited access to quality and affordable agricultural inputs such as seed, fertiliser and pesticides;
4. Limited access to financial services; as well as,
5. Middlemen taking unfair margins.

Value proposition

DigiFarm's value proposition is to offer a 'one-stop' shop for all of a farmer's essential needs, linking farmers to services providers for agricultural inputs (via iProcure, YARA, Syngenta, etc), advice (via CropIn), loan management (via FarmDrive), digital learning tools (via Arifu and iShamba), off-takers (UNGA, East African Breweries Limited, etc), and crop insurance (One Acre Fund, Pula).

In December 2018, DigiFarm also launched an online marketplace, DigiSoko, to provide farmers with more secure and fairer access to markets. DigiSoko aims to raise farmgate prices by reducing transport costs and trader margins. Likewise, they argue that more transparency can empower farmers to negotiate better, also improving prices. This, in turn, incentivises farmers to invest more in productivity enhancements as they know there will be a guaranteed market for their produce. Lastly, the company argues that this marketplace reduces post-harvest loss through more efficient and timelier off-taker arrangements.



Operational model

DigiFarm offers a text-based service whereby farmers register on the platform and record details about the size of their farms and the nature of their farming activities. This information is then used to ensure that they receive support relevant to their specific farming activities. Once registered on the platform, farmers have access via mobile to a host of agricultural and financial services that the system offers. These include:

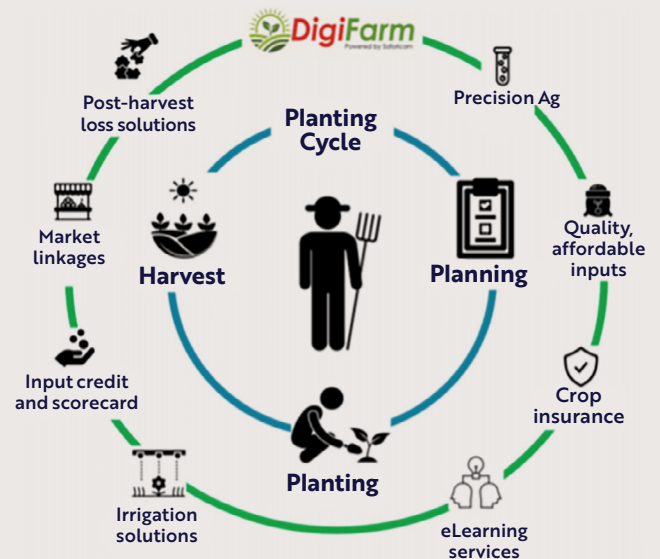
- i. **Ordering inputs:** DigiFarm allows farmers to purchase inputs from 26 input providers, via iProcure and, more recently, corporates such as Syngenta and YARA².
- ii. **Soil testing:** DigiSoko tests soil to understand required inputs and suitability for value chain production.
- iii. **Connections with buyers:** DigiFarm links farmers to markets through DigiSoko and other partners (e.g. UNGA, EABL).
- iv. **Credit:** DigiFarm provides digital credit products based on their own credit scoring system bundled with insurance. Using DigiFarm's loan system, farmers can also apply for small loans for inputs such as fertilisers and livestock feed. Users can pay for their goods using M-Pesa, and can top up their own money with loans from DigiFarm, which are typically in the \$10 to \$15 range.
- v. **Crop insurance:** DigiFarm offers agri-insurance through partners, either bundled with input credit as mandatory insurance, or as a separate offering for farmers who decide to pay for inputs in cash. More recently, DigiFarm has partnered with Pula and One Acre Fund to offer a more comprehensive insurance package focused on compensating farmers for when yields fail due to flooding, drought, etc.
- vi. **Advisory:** DigiFarm provides access to educational content on good agricultural practices as well as financial literacy. The company shares knowledge through education partners, e.g. Arifu, on topics such as planting methods, farming, cultivation and other useful farming information. With support from Mercy Corps Agrifin, advisory is also provided in-person via a network of DigiFarm Village Advisors (DVAs) who are each tasked with engaging between 150–200 farmers, organising inputs orders, aggregating production and providing advice on good agricultural practices. This network is supported by CropIn's SmartFarm app, which tracks farmer data on production, number of times DVAs have reached these farmers, and a list of services they are receiving.

²For more on iProcure, see here: <https://www.gatsby.org.uk/uploads/africa/reports/pdf/2019-gatsby-last-mile-distribution-study.pdf>

The platform is also being used to build a national database of farming activities in Kenya that can be used for long-term planning and other projects.

Figure 5: The DigiFarm Model

(Source Agrifin 2021)



Revenue drivers

DigiFarm is linked to Safaricom's overall revenue model so that it can generate revenue for the company via fees from M-Pesa transactions utilising the service. DigiFarm is also able to earn revenue through interest from loans as well as trading fees from its market access platform (DigiSoko). Elizabeth Mudogo, Senior Manager for Digital Services at Safaricom, has noted that the major revenue drivers for the business to date have been inputs sales – which provide a first point of interaction for many farmers with the platform – as well as commissions on sales from their partnerships with off-takers, which have seen a recent push for more engagement with smaller millers as well.

1500

field experts support farmers in accessing services related to the platform.

Cost drivers

The main cost drivers for digital are for new customer acquisition, which requires an extensive marketing budget. Ongoing costs related to tech development/improvement, software licensing as well as ongoing customer service costs. DVAs are also a big cost driver as they require a small salary to get up and running, with the view that they should operate principally on a commission business.

Impact data

– Scale

As of May 2019, DigiFarm has over one million farmers registered on its platform, accessing educational content, inputs, digital credit for inputs and cash loans. Of these, 62,000 have been served to date in an 'end to end' capacity, meaning they have been provided with inputs, advice, credit, as well as links to off-takers. The goal for the upcoming season is to reach 181,000 farmers in this way. By 2023, at its current trajectory of growth, the company will see 4.35 million farmers subscribed, with 3.5 million farmers actively using the platform in some capacity. Thus, by any question of scale, DigiFarm is a major player in Kenya's agricultural sector.

– Sustainability

While detailed figures of revenue and costs have not been published, Safaricom's internal projections anticipate earnings of between 25–250 billion shillings annually (\$235 million–\$2.35 billion) within five

years from the platform. The upper end of this would represent up to 10% of annual agricultural transactions in the country.

– Farmer impact

Mercy Corps Agrifin (2021) recently undertook an impact study of DigiFarm. They found that:

- To date, nearly 60,000 digital input loans have been approved, with nearly 90% repayment rates, with growing numbers of repeat borrowers building credit histories.
- Nearly 310,000 farmers have accessed learning content through platform learning partners.
- More than 50,000 farmers have purchased inputs through the DigiFarm input platform with partner iProcure, many of whom were repeat customers.

Of all the platform features and services, access to markets, education and credit are the most popular features, while uptake of soil testing is a less conventional option among farmers. In 2019, AFA (AgriFin Accelerate), in partnership with Busara, **conducted a baseline study** with 3,239 farmers, with 27% (874) of registered users in this study being active users. When asked about perceived changes, approximately 90% of these active users agreed or strongly agreed that DigiFarm had strengthened their capacity by equipping them with better farming knowledge and information. A further **Randomised Control Trial (RCT) is being conducted by Georgetown University in the U.S.**, but detailed results have yet to be published.

Summary

DigiFarm is the largest player in the digital agriculture space in East Africa. The company has several advantages, such as its ability to leverage existing technologies, brand reputation and its network to reach scale quickly. It has also been able to leverage these to bring in credible partners like iProcure, Arifu, and CropIn to provide their services directly to farmers.

Off the record, however, several experts have pointed out major flaws in the company's model, especially as they relate to its ability to provide digital advisory services. For example, of a network of 2000 Digital Village Advisors (DVAs) that the company has promoted as part of its model, there are only 150 currently being retained. It is not immediately clear why this is the case, but likely relates to a need to ensure there is a

viable business case for DVAs to engage with farmers outside of the small salaries that they receive directly from DigiFarm.

DigiFarm has been able to reach a level of scale that provides a strong basis for sustainability and has done so in a short timeframe, building on the network of the Safaricom brand. It has huge ambitions to grow much larger though, aiming for 4 million farmers in Kenya, which, if achieved, would technically represent 1 member of every rural farming household. The model has drawbacks though, as it appears to rely on support from MercyCorps as a major implementing partner and it is unclear the extent to which the more costly aspects of the model, e.g. around hiring and retaining new DVAs, can be viable in the absence of this support.

eGranary

A commercially viable, farmer-led platform for improving market access as well as financing inputs

Overview

eGranary is a platform developed by the Eastern Africa Farmers' Federation (EAFF) – a network of 14 farmer-based organisations across 8 countries – focused on access to markets and financial services, and, to a lesser extent, providing farmers with access to extension. The model is now operational in Rwanda and Tanzania as well as Kenya, where it was first piloted and has been in operation since 2015.

The platform was developed to establish and broker commercial partnerships between private sector operators and smallholder farmers, on both the inputs and outputs side. It provides up-to-date data on farmers and can disaggregate farmer data by location, group, gender and age as well as useful data on harvest size and harvest projections, which is then used to facilitate access to markets and the roll out of credit via mobile money. It also aggregates demand for inputs.

Strategy/vision

eGranary's model is based on the premise that a market-driven approach, coupled with bulking of produce and input requests are needed to help smallholder farmers sustainably increase their incomes and improve their livelihoods.

Value proposition

For farmers, eGranary allows the sale of farm produce at a decent price, access to certified inputs and affordable, specialised financial solutions.

Operational model

eGranary's model focuses on five key service offerings:

i. Farmer training: eGranary provides training on good agricultural practices to farmers through text and voice messages, as well as offline through a system of lead farmers. This involves a training of trainers approach, where field officers train farmer leaders who in turn train farmers on good practices.

They are paid a commission on each bag of maize or soy they can procure from the farmers they have mobilised. This is paid for by e-Granary as part of their operational costs and involves support from the Kenyan Ministry of Agriculture and the International Institute of Tropical Agriculture (IITA) for up-to-date content on farming practices.

ii. Access to inputs: eGranary supports farmers to access agro-inputs as part of the services they offer. This input bundle includes seeds, agrochemicals and fertiliser bought from reputable suppliers (SeedCo and ETG) directly.

iii. Access to finance and insurance: eGranary also connects farmers to a microfinance institution (MFI) that provides them with access to finance through a bundle of services. The bundle includes credit for seeds, fertiliser, agro-chemicals, insurance, as well as irrigation for the soy farmers it works with.

iv. Post-harvest services: eGranary relies on farmer groups to provide storage for produce prior to collection by a contracted off-taker. In the future, the company plans to lease warehouse facilities to be used to store produce when market prices are low, to be sold once prices improve.

v. Market linkages: Lastly, eGranary provides farmers with access to markets by aggregating produce and linking them to an off-taker via a contract farming arrangement. The company currently has off-take agreements with ETG and Cargill as well as Mukwano for its Ugandan operations. Given their size and ties to the EAFF, eGranary can negotiate contracts with large off-takers at the beginning of the season before contracting farmers through these. They can manage this through a network of farmer groups tied to the federation.

Revenue drivers

eGranary earns revenues by delivering inputs through a commission on agrochemicals and fertilisers, as well as the financing it provides through interest paid by farmers on their loans. The company also makes money from subscription fees paid by the wealthier, regular farmers using the service, and plans to charge a mobile dryer fee to farmers as part of its post-harvest handling services.

Across all the services, IDH (2020) found that the commissions obtained from input and output provision were profitable at scale and platform subscription fees were a positive revenue generator as well. Mechanisation was deemed to be marginally profitable, while providing loans to farmers lost money for the company.

The company also received funding from EAFF throughout the first three years of operating as well as a substantial grant from IFAD (International Fund for Agricultural Development) (\$2.6 M) in 2017.

Cost drivers

A major challenge for the company has been access to affordable financing. In Kenya, interest payments took up to 40% of loan value, although now the company claims this is closer to 10%. So far, the company has only found an MFI to partner with as opposed to a commercial bank in any of its countries of operation.

At the farmer level, hired labour is the largest cost driver, and according to IDH (2020), accounts for an average of 42% of total costs vs 31% of revenues for farmers engaged with the company. Mechanisation is also a major cost driver, representing on average 15% of total costs. These costs tend to be higher for the larger commercial farms that access shelling services.

Impact data

— Scale

In Kenya, 136,832 farmers have been registered and verified as legitimate users on the platform (as of 2019). Despite this large registration, the company has started off at a small scale. In 2019, eGranary sourced maize from just 790 farmers with a view to grow to 22,000 farmers by 2025.

— Sustainability

IDH (2020) calculated that eGranary is profitable when commercial (sourcing, processing and sales) activities are taken into consideration, although initial operations have seen a loss with a view to achieving a break-even point in 2022. According to IDH's modelling, profit per farmer improves over time and by 2025 a wealthier farmer in maize should contribute about US\$100 of annual profit to the company.

— Farmer impact

While it has yet to be proven, IDH estimate that a maize farmer who has been with the company for five years and receives all its services (including finance and market access) can earn up to US\$1,914 net income per 3.5 acres a year and soy farmers should earn up to about US\$ 782 per year on the same land size. This compares favourably to the \$364 per acre per season Agcenture estimates a maize farmer could receive over the course of a season if all conditions around use of best seed, proper land prep, etc are met³. While not particularly high, especially for soy farmers, this is expected to be supplementary income and thus justifies the investment. Thus far, the company has provided digital training to 30,000+ farmers, in collaboration with IITA.

Summary

eGranary is a promising model that links into existing farmer networks through the EAFF, which makes it less liable to the side-selling challenges of other off-take based commercial models. It is still early days, but IDH's assessment of the company's prospects for profitability are promising and its digital advisory services are linked into good agronomic advice through a partnership with a CGIAR institute.

The company highlights the usefulness of combining online access to information and services with established methods of organising farmers in-person, in this case via a network of producer organisations. In eGranary's case, the digital component is more of an efficiency enabler for their current business model, rather than a fundamental break with what is known to work in sound agribusiness strategies that engage smallholder farmers. As a result, it has the potential to be sustainable, scalable and to have impact over time.

³\$364 * 3.5 acres = \$1274. Assuming an agrological zone with two seasons, the max a farmer could receive is c. \$2450.

Precision Development (PxD)

Evidence-based digital extension at scale

Overview of the model

PxD is a non-profit organisation with a mission to support people living in extreme poverty by providing customised digital information and services to increase productivity, profitability, and environmental sustainability. It currently works in ten countries in Africa, Asia, and Latin America, and is expanding very quickly. As of earlier this year, PxD was serving nearly 4.5M farmers through a range of initiatives, providing tailored information on crop optimisation, pest management, input utilisation, and environmental stewardship. A majority of PxD's services aim to deliver customised digital agricultural advice to smallholder farmers via their mobile phones and their model is mostly implemented in collaboration with partner organisations to maximise scale.

Strategy/vision

The main focus of PxD is to address issues of what they refer to as 'information poverty'. According to their [website](#), 'Throughout its existence, Precision Development's work, at its core, has been to scale cost-effective digital information provision via services that empower poor people with knowledge to improve their lives.' They take the view that the spread of actionable and useful knowledge, ideas and information accelerates increases in human welfare and can be achieved at a low cost.

Value proposition

PxD's value proposition revolves around developing and distributing high-quality, actionable, information at scale. Central to this value proposition is the claim that mobile technology can allow them to comprehensively serve wide geographies at a fraction of the cost of traditional extension and without a significant on-the-ground presence. According to founder Owen Barder⁴, "Our value is in generating content and in figuring out what content works."

Operational model

PxD's model involves reaching farmers and other users with personalised advice through their mobile phones. It advocates for doing this through partnering with in-country partners, governments,

and multilateral institutions to scale. As of now, over 55% of their work is done in partnership with governments in a 'build, operate, and transfer' model, 40% is providing advisory services to partners in setting up information systems and only 5% involves direct service provision.

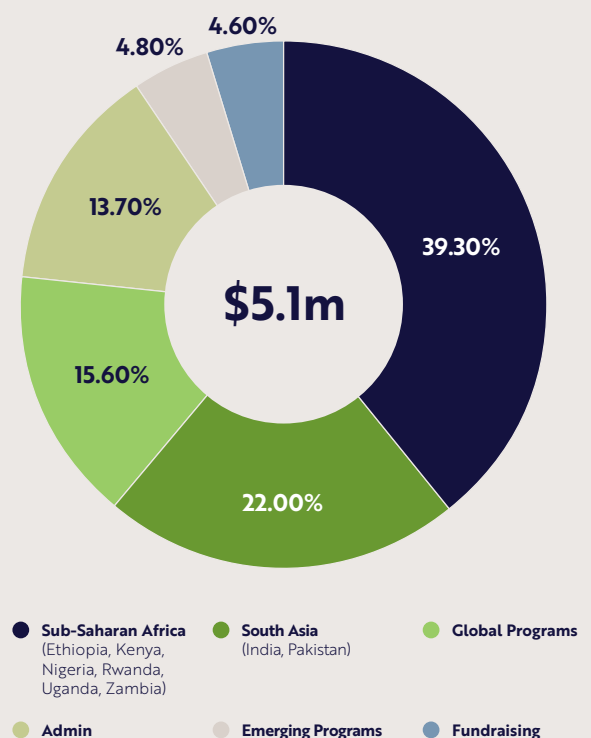
Their model incorporates insights from behavioural economics, human-centred design, and social learning theory, and makes use of A/B testing and data science to identify what types of information and delivery mechanisms work best for users.

Revenue drivers & cost drivers

PxD is a not-for-profit and does not earn any revenue from its service offering. They currently have a \$5.1 million budget – funded by a mix of donors and government contracts – with the biggest proportion being spent in East Africa, especially Kenya, where they have a major presence and have directly interacted with 750,000+ farmers.

Figure 6: PxD expenditure

(Source: PxD Annual Report 2020)



⁴Interview with the author

Fall Army Worm – Zambia

Utilising a randomised control methodology, PxD pushed out messages on how to deal with fall army worm to farmers in Zambia and found that treated farmers knew more about the pest and adopted more recommended practices than farmers who did not receive any advisory messages. In Kenya, this increased the self-reported likelihood of farmers adopting recommended practices to address the army worm by 5–23%.

Whether or not this had a discernible impact on yield is harder to say. According to [PxD's 2020 annual report](#), 'We would need to have a sample size as large as 160,000 respondents to be able to statistically detect the observed 65 kg/acre increase in yield. Stated differently, with the current sample size, we would only be able to statistically detect a yield effect if it were larger than 401.9 kg/acre (38 percent increase) – a very significant yield increase, indeed!'



Impact data

– Scale

In 2020, working alongside their partners, PxD was able to reach 3.8 million users across eight countries, and, according to their 2020 annual report, user reach increased by 8.2% from 2019, with the addition of 289,110 farmers. With legacy services, PxD has been able to reach 4.5M farmers, the bulk of whom are in Kenya and India.

– Sustainability

Over 2020, PxD was able to achieve a 12% reduction in the average cost of services, with costs per farmer falling from \$1.57 in 2019 to \$1.38 in 2020. To contrast, in 2016 this cost was \$43.66 per user highlighting how rapidly PxD has been able to drive efficiency in its service delivery model.

– Farmer impact

PxD has a strong emphasis on evidence gathering and is unusually transparent and self-aware about its impact. For example, they recently conducted an experiment to find out if farmers adopt their advice about maize and bean cultivation and whether adopting this advice affected yields. It found that adopting more recommended practices was correlated with higher yield, yet there was no evidence suggesting that receiving text message advice led to statistically significant changes in the adoption of recommended practices. These results hint that the content and approach were right but that the mechanism for sharing information was not working. According to Owen Barder, “We are doing our best to provide good information to people and to learn from what is and isn’t working.”⁵

Summary

PxD’s emphasis is on providing the most efficient service to as many people as possible without trying to monetise their service offering. Their philosophy emphasizes partnership and seeking to embed their service offering within public and private extension systems where possible. From this standpoint, they are accomplishing their mission, rapidly expanding their reach to 4.5M farmers, while reducing their cost-of-service 40x over the past five years. From a commercial sustainability standpoint, however, PxD is not viable without recourse to donor funding. One avenue PxD is actively pursuing to achieve this in future is to seek to embed its service offering within government extension systems, where it has already partnered with the likes of the Kenya Agricultural and Livestock Research Organization (KALRO) in Kenya.

The lessons to take away from PxD’s example are a focus on reducing cost of service through a ‘test, iterate, and learn’ approach, partnering with local institutions that have the networks and expertise to help reach scale quickly and ensure that the service can be offered on a sustainable basis, as well as being completely transparent about what is and what is not working as a prelude to a more impactful service offering. PxD provides the possibility of a neutral, adaptive learning platform for farmer knowledge that can be adopted and utilised by public sector agencies, radically improving their extension offering and cutting costs.

⁵Interview with the author

Climate Edge

A pragmatic Business-to-Business (B2B) solution focused on delivering the most relevant information to farmers

Overview of the model

Climate Edge's focus is on finding solutions for how digital technology can bridge the gap between commercial and smallholder farmers. They do this through developing a B2B solution that works with market players – off-takers, input companies, etc – that in turn engage with smallholders, offering these companies support on how to expand reach and impact.

Value proposition

The company notes that servicing smallholders using field agents can be expensive and inefficient, while farmers are left without access to relevant services such as financing, insurance and advisory support. To address these issues, it focuses on:

- **General accessibility:** Climate Edge is focused on developing technology that is appropriate to its context. According to Co-Founder James Alden, "A lot of people are making fancy apps, then say they are trying to reach the bottom of the pyramid, but smart phone access is only 20% though!"⁶ Thus, bespoke apps are missing the mark. Alternately, Climate Edge uses a basic system (USSD), that can be applied to SMS and WhatsApp based on the context of a farmer. It has also developed a process called internalisation that allows them to quickly translate their content into a variety of local languages.
- **Engagement:** Climate Edge's system is focused on engaging farmers as opposed to simply sharing information. So, for example, in their partnership with CropNuts – a soil testing company – they engage farmers not just on what is wrong with a farmer's soil, but also on what they might be noticing and what actions they can take to deal with the issue.
- **Scalable user research:** Climate Edge makes use of push notifications to monitor user engagement. For example, they will send 3 messages instead of 1 to gauge if farmers are clicking through to access the next piece of information. This helps the company get a sense of what bits of information are useful or not.

⁶Interview with the author

⁷Interview with the author

Operational model

Climate Edge operates on a B2B model, selling services to companies, NGOs, and cooperatives. Their view is that the market isn't ready for B2C models just yet. As co-founder James Alden noted, "So much is being delivered for free that it's just expected farmers won't pay for this type of service."⁷

Revenue drivers

Climate Edge relies on a tiered subscription model. On the most basic end, they offer a free service that offers one-way bulk SMS, farmer data management, and the ability to sign up users. This costs roughly \$0.01 per SMS. Then, they offer a 'Growth' model, which is charged as a one-off fee of \$0.18 per new farmer (plus \$0.008 per SMS), which allows for the addition of surveys, weather forecast data, digital receipts and various customised integrations. Lastly, their 'Enterprise' service is charged on a monthly fee of \$0.07 a month per farmer (plus \$0.008 per SMS), and allows for dedicated account management and unlimited usage of services.

Cost drivers

As they rely on a subscription model without development fees, the company has all its sunk costs in developing its back-end technology and having the capability to translate information into local languages.

Impact data

– Scale

While the platform only launched in January 2021, they are already working with 40 clients, and 75,614 smallholder users.

– Sustainability

The company is still very young, so their long-term viability is not yet clear. However, their relationships with partners all exist on purely commercial terms.

– Farmer impact

Climate Edge have done one impact report with Producers Direct (formerly Café Direct) related to a campaign around crop diversification, and added in messaging around COVID-19. 20% signed up from those who went to workshops. Of those using the service, 78% said it was useful or very useful, while 6% said it was not useful

“ Climate Edge, as a genuinely private sector driven entity, highlights the importance of having commercial principles baked into the DNA of digital advisory firms in order to find revenue generating opportunities.”



Summary

Climate Edge is a new company even by the standards of a nascent ecosystem. However, it shows promise both in terms of its commercial viability, as well as its potential value to farmers by providing access to quality information. Founded by agronomists, they can provide quality assurance on information reaching farmers. The company should be able to carve out an effective niche but, as a B2B model in a crowded space, is unlikely to be able to scale rapidly. Their emphasis on engagement, scalable user insights, as well as accessibility, should be replicated by other models.

The key take-aways from Climate Edge’s work are to focus digital advisory less on a training mechanism, but as a tool to fill gaps that are difficult to plug with face-to-face training due to the cost, time, distance, etc involved. These could include insights into soil quality tied to actionable advice as with their partnership with CropNuts, or providing companies with useful insights into which farmers they are engaging with and how frequently. Furthermore, Climate Edge, as a genuinely private sector driven entity, highlights the importance of having commercial principles baked into the DNA of digital advisory firms in order to find revenue generating opportunities where models with smallholders as the primary client tend to fail.

Kuza Biashara

Bundling advisory and last mile services at scale

Overview of the model

Kuza is a social enterprise with a focus on agriculture, health, water and sanitation (WASH) as well as skill-building for young people. Its agricultural portfolio is focused on addressing poverty for smallholder farmers through the use of a rural agent model, which they call 'agripreneurs'. Kuza seeks to address two related issues with this model: that farmers are severely resource constrained and that unemployment amongst young people has increased over the past decade.

Value proposition

Kuza argues that current approaches to addressing smallholder poverty are not working. On the government side, extension services are not working due to limited funding, poor rural networks, and a limited use of digital solutions. Donors are working through unsustainable grants and private sector engagement is siloed and often focused on delivering one product or engaging in one value chain.

In response, Kuza has developed a youth-led extension network, which is meant to provide what they call 'agripreneurs' with jobs, community respect, and an income on the one hand, and farmers with good agricultural advice, leading to increased yields, income and a better quality of life on the other.

Operational model

Kuza's model works on a two-fold basis. Firstly, their Rural Entrepreneur Development Incubator (REDI) is tasked with incubating and launching new agripreneurs. This involves enrolment, capacity building, farmer engagement, and providing start-up support. These agripreneurs then become Kuza agents, working on a commission basis, as opposed to Kuza employees to reduce overheads. On the commercial side of their business is the One Network, which involves the agripreneurs providing advisory services as well as facilitating market transactions.

Advisory services are provided by the agripreneurs by organising small groups of farmers and showing them digital content developed by Kuza on a small projection screen. In this way their whole training system is fully digitised in a way that other models are not. A possible drawback is that agripreneurs are not agronomists and, while they are trained, may lack the requisite knowledge to answer tricky questions from farmers during these sessions.

Revenue drivers

Kuza's agripreneurs provide digital extension services to a cohort of up to 200 smallholder farmers for free and earn an income through inputs sales; aggregating farm produce for off-takers; providing specialised services like soil testing; proving post-harvest handling; selling other products like tarpaulins as well as facilitating credit for smallholders. The company is charging a license fees on its platform, which is paid by donor partners, NGOs, as well as national and regional governments. According to founder Sriram Bharatam, "We're able to provide donors with an exit option to traditional programmes."⁸ Going forward, the company plans to earn revenue through commissions on agripreneurs' input sales as well as sales of differentiated products (e.g. sanitary products) as the network expands. They also plan to bring credit providers into the One Network, but have not managed to do so as of writing.

Cost drivers

The Rural Entrepreneur Development Incubator (REDI) has been completely donor funded and the intention is that it will remain so for the foreseeable future. Another major cost driver for the business has been the development of content. Kuza has now digitised information on 42 value chains, including short video content of every phase of the agricultural lifecycle. The company has invested \$6 million+ to date in order to build up its network and all its content.

⁸Interview with the author

Impact data

– Scale

Kuza now has 4000 agripreneurs across its countries of operation and claims to have reached 575,000 farmers. In Kenya, these figures are 650 and 150,000 respectively, with ‘reached’ referring to farmers linked to an agripreneur and provided advisory services.

– Sustainability

Kuza has proven that it can generate revenue for its agripreneurs in its One Network, but has yet to take any commissions on sales to date. For Kenya, the total transaction value on the platform is \$23 million with agripreneurs having made \$1 million in commissions.

– Impact

Kuza has been able to demonstrate impressive impact on its agripreneurs. In a recent study (as yet unpublished) conducted by IPSOS on behalf of Kuza’s partner, the Farm to Market Alliance (FtMA), they found that they witnessed a 92% change in income over a two-year period, stemming primarily from increased sales of inputs and turnover in terms of the number of farmers served.

Kuza’s impact in terms of farmer behaviour change, yields and incomes, however, is less clear as of writing. In another impact assessment conducted by IPSOS on behalf of FtMA (also unpublished as of writing), they found mixed results in terms of agricultural productivity increases for farmers linked to agripreneurs, with soya farmers increasing production by 8.2% in 2020’s long rainy season and a 29% reduction in potato production over the same period. The latter reduction likely stemmed from potato cysts nematodes (PCN), which the FAO reports had hurt the potato crop across the country. However, this highlights the challenges involved in disaggregating impact in terms of providing farmers with advice and the extent to which this has any discernible impact of yields and incomes.

\$23m

For Kenya, the total transaction value on the platform is \$23 million with agripreneurs having made \$1 million in commissions.

Summary

Kuza’s focus on micro-entrepreneurs seems to have worked in terms of being able to drive revenue in Kenya (\$23 million in transactions with \$1 million in commissions for their agripreneurs), although it does not yet generate revenue for its management of the network. It resembles organisations like Farm Input Promotions (FIPs) and other micro-enterprise models we have previously covered in a study on last mile models (page 22 [here](#)). However, where Kuza are stronger than some of these previous models is that they are pushing towards commercial viability from the outset.

In sum, Kuza has a sophisticated network in place that is providing direct value to its agripreneurs, who in turn are providing some valuable information and services to farmers that they are willing to pay for. However, if Kuza starts taking further commissions, the margins for agripreneurs will fall, so further cost efficiencies and greater scale are likely to be needed to keep commissions small enough on each transaction.

5 Summary of the models

| Model | Access to information | Impact on yields or incomes | Signs of commercial sustainability | Evidence of reaching scale |
|--------------|-----------------------|-----------------------------|------------------------------------|----------------------------|
| Digifarm | ✓ | | ✓ | ✓ |
| eGranary | ✓ | ✓ | ✓ | |
| PxD | ✓ | ✓ | | ✓ |
| Climate Edge | ✓ | | ✓ | |
| Kuza | ✓ | | | ✓ |

What these cases highlight is that when it comes to access to services and information, some models have cracked part of the equation but there is not one model that has been shown to tick the three boxes of impact, sustainability and scale.

Sustainability

Three models – eGranary, DigiFarm and Climate Edge – all show promise in terms of commercial sustainability, albeit for distinct reasons. DigiFarm has been able to achieve commercial success based on its ability to leverage its existing network and brand via association with Kenya’s largest mobile operator, Safaricom. Climate Edge, alternately, is a small firm offering digital solutions to off-takers, input suppliers and specialised companies like Crop Nutrition Laboratories (CropNuts). Thus, commercial principles are baked into their operational model as they must rely on commercial clients to operate and do not have grant funding to fall back on. eGranary operates distinctly from either of these models, focused instead on providing a digital backbone to an established farmer-based network.

Each of these models is unique, which suggests that there are multiple pathways to achieving commercial sustainability in advisory services. However, there are a few salient lessons that these cases highlight: (i) serving farmers directly with advisory services is not profitable in and of itself and is likely to remain a loss-leader for other services and/or impact targets; (ii) being tied to a major brand and reputation can only be useful in reaching a wide market segment; and (iii) being able to leverage on an existing network – either in terms of agents or farmer groups – is vital to the success of these models.

Impact

There were only two models studied that were able to highlight demonstrable impact in terms of changing farmer behaviour and/or having an impact on yields or incomes: PxD and eGranary. PxD has been able to do this by applying a ‘test, iterate and learn’ approach and embedding a learning from failure mindset into the DNA of their organisation. Unlike most of the other models we looked at, they publish rigorous, independent data on their website and share the results of randomised control trials of their work. This ability to learn from what is not working marks them out in an industry that tends to only publish stories of success. Likewise, eGranary has hired IDH to conduct a detailed assessment of its business model, and although it is too soon to tell if it will be impactful at scale, has shown early promise in terms of delivering impact for its members. This highlights the importance of good data to understand the impact of digital solutions on farmer behaviour, something that will require significant donor subsidy in providing.

Scale

Three models were operating at a significant (tens of thousands of farmers active) scale: Kuza, DigiFarm, and PxD. Two of the firms that were able to do this, PxD and DigiFarm, have done so through partnership with both government entities and the private sector. In DigiFarm’s case, this was done through its association with Safaricom and by linking to service operators like iProcure, as well as corporate input suppliers like Syngenta and Yara. In PxD’s case, their clients are 80%+ government entities, so they can leverage existing contact databases supplied to them by agencies that have been providing extension for years or, in some cases, decades. Kuza is different as it has been able to draw on donor support to bring their model to scale and applies an agent model to scale up quickly.



6

**Challenges to
rolling out models**

Challenges to rolling out models

6

The landscape for digital agricultural technologies is evolving rapidly, with exponential growth in the number of these business models coming online in recent years. However, no companies that we have identified operating in East Africa have been able to deliver substantial farmer impact at scale and with commercial sustainability.

The reasons for this are clear and relate to the general challenges of smallholder agriculture, namely that smallholders tend to be hard to reach, expensive to serve, have limited capital, and irregular income streams.

The challenges are all inter-related, as often farmers need to see real benefits before adopting or using a service, meaning that scaling up for digital service providers without an existing network takes time, but service providers need to reach scale in order to become commercially sustainable. This leads to what *ISF Advisors (2021)* have referred to as a 'chicken and egg' problem. To respond to this, they advocate for more patient capital. 'Follow-on commercial capital tends to be scarce and not especially patient, leading many platforms to run out of cash before they can bring enough users on board to trigger network effects and reach a critical mass.' Our suggestion that consolidation may be needed, together with independent information on what is and isn't working, also reflects this, as funding should support those platforms that have the right formula to deliver, but which need time to reach sufficient scale to become sustainable.

Fundamental issues with digital advisory services

Looking specifically at digital advisory services, which we have seen is a major function of most of the services on offer, researchers *Raissa Fabregas, Michael Kremer, and Frank Schilbach (2019)* point to three issues that hinder the commercial potential of these models: non-rivalry, non-excludability, and asymmetric information.

1. Non-rivalry: The authors argue that the creation of information involves fixed costs. However, once it has been created, it can be used by additional people at a minimal cost. Therefore, a firm using a pure subscription model would need to charge a higher fee than the price of distribution to cover the fixed cost of creating new content. As a result, some farmers tend to be excluded, meaning that these models will be challenged to reach the bottom of the pyramid.



6 Challenges to rolling out models

2. Non-excludability: Another issue is that once an individual has access to information, they can easily share it with others. While this is a good thing from a developmental standpoint, it directly reduces the number of potential customers for these models and may also reduce willingness to pay. Most experts we spoke to as part of this study suggested this is why direct service to farmer models cannot be viable for digital advisory services without being bundled with other services.

3. Asymmetric information: Buyers do not necessarily know the value of the information sold to them, and they may not trust sellers' claims about its value. Because agricultural production is highly variable and the profitability of recommended agricultural practices may differ from year to year, it may be difficult for farmers to assess the quality of advice, even after harvest.

Challenges in the enabling environment

While the ag-tech ecosystem has been commercially led in recent years, it requires government oversight. To date, however, policy has lagged behind innovation. Some issues, for example, relate to legal frameworks governing digital rights, taxation and the registration of innovations, tax incentives, and the limited number of incubator programmes and accelerators. As Ewart Salins, General Manager at Dry Associates Investment Bank, observed, "the technology scene in Kenya could be vibrant with multi-billion companies but there are policy gaps regarding access to capital, intellectual property, business literacy and the path to global markets." (Quoted in Horizon 2021)

As ISF Advisors (2021) also note, regulation becomes crucial as the market matures because 'as platforms scale, they often accumulate significant market power. Examples abound of the ways in which this power can lead to less competition, displacement of vendors and vulnerable small and medium-sized enterprises (SMEs), lower workforce protections, a more significant income divide with those users who cannot easily connect and data and security issues.' It will be important for national governments and donors providing funding into this space to keep an eye on this, ensuring that as consolidation happens, farmers are protected in terms of the quality of advice and cost of services. Similarly, as the market for digital advisory expands, it will be increasingly important for the public sector to play an oversight and enforcement role regarding the content that is being shared on digital platforms. There are also risks with one firm becoming overly dominant, with a monopoly on the provision of extension advice to farmers, as this would provide them with enormous market power over related services and inputs such as agricultural finance, inputs supplies, tractor services etc. This is an area that may well need regulating by the government, for instance to ensure that advisory services are required to provide links to multiple approved firms for each service rather than just recommending a preferred supplier.



7

**Summary and
recommendations**

Summary and recommendations

7 This report has highlighted that the ecosystem for digital advisory solutions has grown rapidly in East Africa over the past decade. There are promising models, but the space is still nascent and, as our case studies have highlighted, there is a real challenge of creating impact at scale on a commercially sustainable basis.

Below, we attempt to summarise the key points made throughout this report on the current state of play within this market, offering some recommendations for how the sector could move forward:

Key Take-Aways

- Independent evidence on the digital agriculture ecosystem in East Africa is scarce, so self-reported impact is something that needs to be scrutinised. For most digital models, there is very little published on 'active' users, so the number of farmers stated as using any platform is often inflated. As suspected, there is need for better, independent data on what is and what is not working in this space, particularly in an East African context. There is a role to play for development partners supporting these initiatives to seek independent evidence as well as national governments to compile this evidence in a more objective manner and share it widely as a public good.
- Digital advisory on its own is unlikely to be profitable at the current stage of market development in East Africa, even in Kenya which has the most developed rural agricultural markets. Thus, at the farmer level, services need to be bundled or advisory services need to be channelled through other businesses (like off-takers and input suppliers) already serving the smallholder market. Most sources point to the need for human interaction to accompany any digitally based model as a means of building farmer trust and delivering impact at scale.
- The sector is suffering from what one interviewee called 'pilot-itis'. Market consolidation is sorely needed as there are close to 100 models in Kenya alone, many of which have limited chance of success. As suspected, this seems to be driven by incentives to attract donor funding. Consolidation will be needed moving forward and further donor investment should be tied to the ability of digital entities to demonstrate impact, scale and sustainability with independent evidence.
- Based on this, market consolidation is needed. However, there are already clear challenges emerging in regulating the market to avoid commercial digital agricultural advice providers gaining monopoly power over millions of farmers. Unchecked, this power could lead to less competition across a wide range of agricultural inputs and services, with the displacement of vendors and vulnerable small and medium-sized enterprises (SMEs), lower workforce protections and a more significant income divide with those users who cannot easily connect.
- Regulation is going to be hugely important moving forward in order to protect farmers' interests, and this varies between the four countries. In an analysis of the national and regional policy gaps related to ag-tech firms in East Africa, [ODI \(2020\)](#) pointed out that 'regulatory preparedness varies significantly across countries, especially in terms of conversion of draft laws into implementable acts/laws or protocols.' There are a host of issues identified in their report, but some of the key issues include poor cyber-security and cyber-crime laws, a lack of payment systems laws, and a lack of clarity around how to regulate electronic transactions. Regarding digital advisory more specifically, there is currently limited oversight of the types of information being shared directly with farmers, with no effective monitoring of whether the information provided by various entities is 'correct' from the perspective of the latest agronomic science or is rather focused on selling specific products.
- One option might be to utilise a licensing model, which could be tied to a subsidy whereby digital advisory firms would be incentivised to update their curricula to reflect agronomic best practices. They would then receive a subsidy if their curricula is deemed to be acceptable, with laggards losing their licenses if they are deemed to be spreading outdated or poor information.

At a broader level, it is important to note that digital advisory, while showing promise in terms of reducing the costs of providing smallholders with access to information, should not be considered a panacea to unlocking agricultural productivity in East Africa. By helping to reach farmers with more, and hopefully better quality, advice, digital advisory can spur the uptake of good practices and the use of better quality and more appropriate inputs and services. Hence, we do see digital advisory as a major opportunity to catalyse wider agricultural productivity change. Assuring the quality of the advice, finding links to 'human' advisors in rural areas, driving sustainability by helping high potential firms reach scale, while starting to regulate the market power of major firms will, however, all be essential to ultimately deliver on this promise.

Annex: Key Informants

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