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Organization of the  
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A REVIEW OF EXPERIENCES

# Fintech innovation for smallholder agriculture



INCLUSIVE RURAL FINANCE





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# Fintech innovation for smallholder agriculture

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Required citation: Benni, N. 2023. *Fintech innovation for smallholder agriculture – A review of experiences*. Rome, FAO.  
<https://doi.org/10.4060/cc9117en>

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ISBN 978-92-5-138474-9  
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# Acknowledgements

This study was developed by the Rural Institutions, Services and Empowerment Team (RISE) of FAO, part of the Inclusive Rural Transformation and Gender Equality Division. It was authored by Niclas Benni, Rural Finance Specialist, under the supervision of Jun He, Policy Officer, and Azeta Cungu, Rural Finance Officer.

The study has developed organically from a series of articles on fintech innovation in agriculture that have been regularly published since 2020 on the Rural Finance and Investment Learning Centre website ([www.rfilc.org](http://www.rfilc.org)), a digital repository of knowledge material on various topics associated to the rural finance domain. This digital platform is managed by FAO's RISE Team, and it has been created in the frame of the programme of work of the CABFIN Partnership ("Capacity Building in Rural Finance"), a collaborative effort among leading development institutions in the rural finance domain (namely FAO, IFAD, the World Bank, UNCDF, GIZ and WFP).

Several contributors and reviewers have provided their invaluable insights and feedback to the development of this document: from FAO, the author would like to thank Adriano Campolina, Jun He, Azeta Cungu, Lixia Yang, Gerard Sylvester, Stuart Tippins, Ken Lohento, Claire Mason, Francesca Zoppi and Lourdes Marie Orlando. From the companies analysed in this study, the author would like to thank Jo Ryan from TruTrade Africa; Eduardo Souza from A de Agro; Rishi Raithatha, formerly of Pula Advisors; Benson Njuguna from ACRE Africa; and Aukrit Unahalekhaka from Ricult. Furthermore, many thanks go to Panos Loukos, Lisa Chassin and Jan Priebe of the GSMA, as well as John Kieti and Kevin Genga.

The editorial support provided by Pierluca Pucci Poppi and Agnieszka Gratza, as well as the graphic design and layout work provided by Maxtudio Roma, with the supervision of Francesca Zoppi with the support of Charlotte Sprengel from FAO, are duly acknowledged.

# Abbreviations

CABFIN	Improving Capacity Building in Rural Finance
CGAP	Consultative Group to Assist the Poor
DFS	digital financial service
DVA	DigiFarm Village Advisors
FI	financial institution
FSP	financial service provider
GIZ	German International Cooperation Agency
GSMA	Global System for Mobile Communications Association
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
ILO	International Labour Organization
LAC	Latin America and the Caribbean
MFI	microfinance institution
MMO	mobile money operator
MNO	mobile network operator
MSME	micro, small and medium-scale enterprise
NGO	non-governmental organization
OECD	Organisation for Economic Co-operation and Development
SSA	sub-Saharan Africa
UNCDF	United Nations Capital Development Fund
UN/DESA	United Nations Department of Economic and Social Affairs
USSD	unstructured supplementary service data
VA	village entrepreneur
VSLA	Village Savings and Loans Association
WFP	World Food Programme





# Introduction

The study is a result of the growing interest on the part of FAO in the analysis and use of **financial technology (fintech) applications as effective enablers of financial inclusion for smallholder farmers**, as well as that of other financially underserved actors active in the agricultural value chains of developing and emerging countries. Many of these countries have witnessed, in recent years, an exponential rise in the number and variety of fintech start-ups focused on the agricultural sector, which have emerged with the specific intent of seizing the enormous clientele segment composed of small-scale rural actors whose financial needs are not adequately serviced by traditional financial institutions (FIs), such as commercial banks, microfinance institutions (MFIs) and financial cooperatives. Fintech innovation is increasingly viewed in the rural finance domain as a critical instrument to address many of the most common (and pressing) constraints that limit the financial inclusion of enormous segments of agricultural populations in developing contexts, which include but are not limited to:

- the remoteness and fragmentation of large populations of rural clients;
- the weakness of the brick-and-mortar banking branch networks in rural areas;
- the scarce data available on agricultural value chain actors, their dynamics, as well as farm and crop features;
- the lack of conventional collateral on the part of farmers to back loan applications; and
- the absence of formal credit histories among farmers.

To mitigate these barriers, increasingly **more and more varied applications** of fintech for small-scale agriculture are being developed in emerging and developing countries: both digital versions of traditional financial products (e.g. credit, savings, insurance, money transfer), as well as innovative tech-enabled applications and models such as automated credit scoring, crowdlending, and multi-service digital platforms. Overall, digital finance in agriculture has been shown to carry a variety of advantages for providers and clients alike compared to traditional “brick-and-mortar” products, such as: lower transaction and administrative costs; better product terms; more transparent, efficient and secure know-your-customer (KYC) procedures; faster transfers, reimbursements and

payouts; granular, up-to-date information flows on clients (including their geolocation); and many more. Nevertheless, as it will be shown throughout this study, these products also present their own set of challenges and risks that complicate the issue of achieving safe and equitable access for large shares of marginalized, smallholder clients – and which require innovative solutions on the part of policymakers, FIs, fintechs, and other relevant stakeholders – in order to be overcome.

The **objective of this publication** is to analyse and illustrate some of the most interesting business models and innovations brought forward by fintech companies that have sought to address the common financing constraints associated with small-scale agriculture all around the world, showcasing in particular the challenges they have faced to become profitable and sustainable, the solutions they have found to overcome such challenges, the positive developmental externalities that they have generated through their activity, and the possible lessons that can be drawn from their experience that can inform further replications or adaptations of their specific model in other contexts.

Due to the rising number of successful fintech start-ups that have emerged in recent years, it was possible to screen and evaluate a large variety of interesting case studies for their possible inclusion in this collection. Nevertheless, the final choice of case studies was made on the basis of two, mutually exclusive factors:

- 1) Part of the case studies were selected because they showed an **already established track record of effective results and good sustainability**, and their analysis generated a series of insights and lessons learned that could potentially be leveraged by various stakeholders to possibly replicate their model. These stakeholders, who represent the core audience of this study, include not only representatives from the private financial sector, but also development agencies, non-governmental organizations (NGOs), public decision-makers and regulators (such as ministries and central banks), and international foundations. Examples of this category include the cases of Digifarm in Section 4.2 and Pula in Section 5.1.
- 2) Another set of case studies were selected because of their association with technologies and business models – currently in the start-up or early-growth phase- that carry a number of **innovative and unique features** which make them worthy of an in-depth analysis, despite the fact that they are still lacking an established track record of results and impact. The analysis of these types of case studies is also helpful to highlight and discuss the multifaceted challenges that a fintech start-up focused on smallholder agriculture encounters when attempting to grow to scale and achieve sustainability. Examples of this category include the cases of FarMart in Section 3.1 as well as A de Agro in Section 3.2.

The case studies analysed in this publication have been categorized according to the main type of fintech innovation they seek to drive forward in their service offer, i.e. the central axis upon which their business model revolves. With that being said, it must be remarked how this categorization is often **subjective**, as the majority of the companies analysed in this study consist in fact of complex platforms whose business models straddle multiple use cases.<sup>1</sup> An effort was made to ensure that

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<sup>1</sup> The case of FarMart, for example, illustrated in Section 3.1, is indicative of this concept. On the one hand, FarMart is a company that leverages a combination of alternative data sources to refine its credit underwriting process and offer more advantageous loan terms to farmers. This type of business model is analysed and presented in Section 3. On the other hand, the company also acts as an intermediary between farmers and other value chain agents (in this case, input providers), assisting them in doing business together through a dedicated mobile service. This type of service would fall in the category of companies tackling specific value chain dynamics, which are analysed in Section 1.

case studies were highly varied in terms of their geographic origin, in order to showcase how these different categories and models of innovation can be adapted to very diverse national contexts.

Each section is devoted to illustrating a different category of fintech innovation, analysing its implications, advantages, risks and the enabling elements required to make it effective as a tool for the promotion of smallholder financial inclusion. Following a general introductory analysis and overview, each section then focuses on two to three case studies of fintech enterprises that have developed products and business models based on these specific lines of innovation.





# 1. Fintech innovations tackling agricultural value chain dynamics

The fintech innovations illustrated in this section are all examples of companies that have managed to promote access to finance for smallholders by using digital channels to **establish new models of collaboration** between different actors in agricultural value chains, in an effort to both leverage and alter the dynamics that link together the value chain segments. Through the use of digital technology, these innovations seek to redress the power imbalances and reduce the information gaps that limit the establishment of effective and equitable partnerships among different actors, in both upstream (e.g. input providers, producers) and downstream (e.g. wholesalers, exporters) segments of agricultural value chains. These applications of digital technology allow for the development of **innovative financing arrangements** that can generate substantial value and profit not just for the value chain actors involved, but also for financial providers external to the chain (such as the fintech company itself or a conventional FI).

This premise explains why, in recent times, pioneering fintech companies have sought to assume **intermediatory and facilitating roles** between producers, financial institutions, value chain agents and end clients, relying on digital platforms as centrepieces of their system and the main interface for all parties involved. In some instances, these platforms have grown to become veritable digital **marketplaces** that enable a large part of the transaction flows taking place between various types of value chain agents in agricultural markets. In other cases, a company can also assume the role of a value chain agent itself, as in the case of MyAgro, in which the enterprise acts as a direct seller of agricultural inputs (see Section 1.2).

These digital platforms hold the potential to tackle one of the core constraints affecting agricultural markets of developing countries: **the lack of granular and regular flows of data** on the features, dynamics and specific needs that characterize different agri-value chain segments. This data gap



often leads to suboptimal scenarios where certain value chain agents exploit the information asymmetries and lack of transparency affecting value chain dynamics to impose one-sided, stringent conditions to other actors that do business with them. This happens, for example, when input suppliers (whether formal or informal) provide inputs on credit to smallholder farmers at **very disadvantageous terms**, relying on the fact that the farmers are not aware of any suitable financing alternative which they might resort to in order to obtain the credit they need. Another example, which is illustrated by the case of TruTrade in Section 1.3, is when traders exploit the gap (both in terms of distance and lack of communication) between smallholders and wholesalers/exporters to buy the farmers' produce at prices that are considerably below market rate. From the perspective of **establishing new funding channels** for farmers, redressing these imbalances allows to establish financing arrangements that: 1) are made more efficient, transparent and affordable by the use of digital technology; 2) reduce information asymmetries for all stakeholders involved in the scheme; and 3) encourage the participation of conventional FIs in the arrangement, thanks to the greater flows of data generated (and the substantial cost efficiencies achieved) in the frame of these models.

Despite the many advantages associated with the promotion of these models, it must be noted that one of the potential risks associated with this type of fintech innovations is the possibility **of generating, rather than mitigating, market distortions**. In agricultural markets characterized by strong information asymmetries and a lack of competition, a successful fintech company might leverage the dominant position it has achieved as a key service provider to impose unfair terms on the various parties that depend on its platform to do business, such as excessive fees, arbitrary prices, unwarranted threats of exclusion from the service, and so on. Nevertheless, this type of scenario is still quite rare in the agricultural sectors of developing countries, as the majority of fintechs are relatively new to the agri-finance market, and none have yet grown into a truly dominant position.



## 1.1 TruTrade Africa: Redefining the roles of traders in agricultural value chains

In most agricultural sectors of developing countries, small-scale producers and large wholesale buyers (such as supermarket chains) are dependent on informal traders and middlemen to keep the flow of products and payments going back and forth across the two extremes of the agricultural value chain. Middlemen exploit this situation by adopting a **buy-low-sell-high mentality** that maximizes their profits, but also constrains the growth of the value chain in question, as a whole. Another consequence of this “distance” is that farmers are unable to formalize (with a contract) their business relationship with the wholesalers, something which would strongly raise their appeal as potential clients in the eyes of formal financial institutions.

Digital technology can help to bridge the distance between these value chain segments, as in the case of TruTrade Africa, a social enterprise and trade facilitation platform active since 2015 in Uganda and Kenya. In these countries, vast (and fragmented) populations of small-scale farmers work in loose, unorganized value chains, characterized by poor logistics and scarce direct connections between producers and end-buyers. In this scenario, TruTrade has developed a mobile and online platform that allows for “collaborative supply chain management”, connecting together medium- and large-scale buyers in the value chain, such as wholesalers, middlemen and small-scale producers, in a user-friendly and transparent manner. By leveraging digital technology, TruTrade has sought to redefine **the role of traders and middlemen in the value chain**, as opposed to trying to disintermediate them completely from the equation.

In the frame of its model, TruTrade negotiates supply contracts with end-buyers, leveraging economies of scale and supply and demand dynamics to broker better prices for the smallholder producers it sources from. TruTrade works with a group of local middlemen affiliated with the company, called “TruTrade sourcing agents” who work on a commission basis and are tasked with sourcing the produce from their networks of smallholder producers. The smallholders bring their produce to a collection point set up and managed by the agent at the village level, where it can be checked for quality as per the specifications shared by the buyer. A schematic summary of TruTrade’s model is presented in Figure 1.

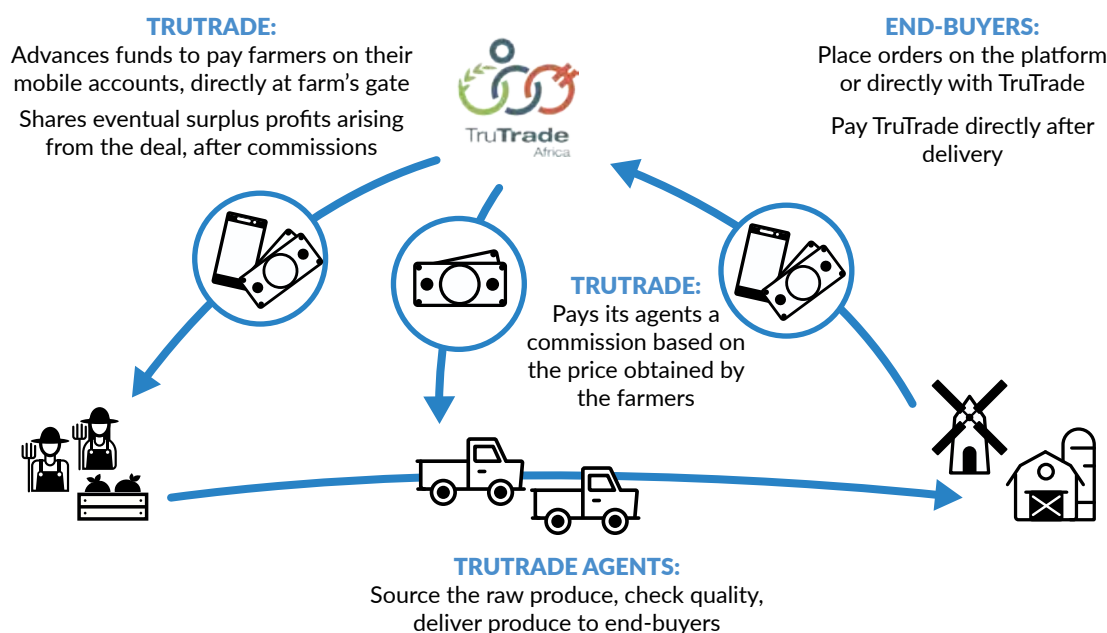
The TruTrade “agent” earns a commission once the aggregated produce has been delivered and sold to the buyer. This commission, interestingly, is actually based on the price that the farmers got for their crops, and not what was paid by the end-buyer. This effectively shifts the middlemen’s mentality from a buy-low-sell-high approach to one **that actually tries to deliver the best price for the smallholders** they are sourcing the produce from. The platform allows all actors to track the movement of the produce sold from collection up to delivery to the buyer, in the frame of each deal.

Most importantly, TruTrade allows farmers to be paid on the spot, i.e. immediately upon handing over their crops to the middleman. To do this, TruTrade advances the funds required to pay the farmer when the produce is sold to the middleman/agent, as well as to cover all transaction costs incurred by its agents: packaging, handling, storage, transport, taxes, and any value addition service up to delivery to the final buyer. Once an agent successfully collects the produce from each farmer, he or she triggers a payment from the TruTrade app (and TruTrade’s funds) directly (and within 15 minutes) to the farmer’s mobile money account.<sup>2</sup> Once the produce is sold to the buyer, TruTrade recoups the funds it had used to advance the whole process, earns a revenue, and pays the agreed commission to its agents.

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<sup>2</sup> Evidently, this is enabled by the high levels of mobile money penetration registered in rural areas in the two countries of operation: Kenya, and – to a lesser extent – Uganda.

**FIGURE 1.** Schematic summary of TruTrade's model



Source: Author's own elaboration

By following this model, TruTrade is capable of addressing a major challenge that is usually faced by smallholders in the two core countries of operation, i.e. the inability to be paid on the spot when selling their crops due to the middleman lacking funds. As a result, the farmer can avoid several of the common repercussions associated with being paid late by the middleman, such as not having enough cash to purchase seeds and inputs for the next planting season, or risk being scammed and they never get paid. Aside from this advantage, by joining the TruTrade model **farmers** can also gain access to better, more reliable market channels and higher prices for their products, and can also build up their trading record on the TruTrade app. **Buyers** gain access to a large and traceable supply chain of products, which adheres to a jointly agreed standard of quality. Middlemen are able to pay farmers immediately and do not risk that they side-sell their products to others, while also being covered for the various transaction costs they incur to deliver the raw produce to the final buyer. Security is also increased, as middlemen do not have to carry large quantities of cash to pay the smallholders, and can instead authorize payments through mobile channels. They also receive their commission on a mobile account. **TruTrade**, which acts as an overall trade facilitator in this process, earns a revenue on what it sells to the end-buyer.

There is a drawback to this model, which is arguably **the most pressing challenge** that TruTrade is currently facing as part of its operations. Although the company advances the money required to pay the farmers directly upon collection of the produce, the end-buyers it sells the produce to (especially medium-sized processors) do not always pay TruTrade immediately on delivery, as they are constrained by their own cashflow cycles which sometimes only allow them to make delayed or staggered payments. As a result, the company occasionally has to deal with liquidity shortages that risk compromising some of its current activities due to the tight margins it operates on, as it waits for the end-buyers to honor the sales contract.

As of 2020, TruTrade had registered more than 17 500 small-scale farmers (of which 64 percent in Kenya and 36 percent in Uganda), who were cultivating 2.8 acres of land on average. Between



2017 and 2020, the number of farmers registered on the platform had **at least doubled every year**. Almost 14 000 transactions had been executed through the platform between 2017 and 2020, enabled by a network of almost 400 trader agents responsible for sourcing the produce, checking and weighing produce, and triggering the payments to the farmers. As illustrated by TruTrade, each agent typically sources between 20 and 80 metric tonnes every season from 40 to 100 farmers, depending on the value chain in question, the area and the trader's experience. In 2020, almost 1 250 tonnes of produce were traded through the platforms, with 15 different types of crops being purchased and sold. The most common crops traded on the platform were soya beans, chia seeds, sesame and avocados (MercyCorps, 2020a; Busara, 2021a).

In 2020, TruTrade also launched a digital advisory service called **Agri-Advice**, aimed at supporting smallholders in increasing their productivity and the quality of their crops. The service provides farmers with customized text messages on good agricultural practices via their mobiles, as well as digital content on production and post-harvest handling standards that can meet buyers' specifications. The app is functional both in Kenya and Uganda, and it has been translated into seven different languages.

Almost 40 percent of TruTrade's farmers were women as of 2020, although a **considerable gender gap in active usage** was registered: only 23 percent of women farmers registered on the platform in Kenya had actually used it to trade in 2020. This was partially attributed to the COVID-19 pandemic, which resulted in the closure of air spaces in Kenya and a considerable reduction of exports in 2020. Consequently, large-scale offtakers were less able to purchase vast amounts of





produce. Overall, rates of active usage of the platform (among both men and women) dropped to their lowest in 2020 (Busara, 2021a).

Despite these pandemic-related challenges, it must be noted that TruTrade still provides a **unique service** that has few alternatives on the Kenyan and Ugandan agricultural markets. As shown by a survey evaluation carried out by Mercy Corps (2020a), 85 percent of farmers that used TruTrade in both countries were accessing this type of market access service for the first time, while 83 percent stated that TruTrade was the only digital market access service available to them in their context. Interestingly, on average 53 percent of the farmers' land was cultivated with crops that were subsequently sold through TruTrade, while half of the household income generated over a year among surveyed farmers came from selling crops to the platform. Close to 99 percent of farmers interviewed by Mercy Corps stated that their profits had improved by using TruTrade, mainly through an increase in volume of produce sold (73 percent) as well as in the price offered (53 percent). On average, the survey registered a 43 percent average increase in farmers' revenue derived from crops sold through the platform. Better results in terms of revenue increases were registered among farmers who had availed themselves of TruTrade for at least two years, which appears to imply that longer-term use of the platform translated into better confidence towards investing and producing more over time.

Nevertheless, 32 percent of farmers also reported facing **challenges** when using the platform, such as lower prices than what they expected, delayed payments, and especially the company refusing to buy produce due to **stringent requirements on crop quality**. Farmers stated that no prior training or communication was provided by TruTrade in terms of what standard of crop quality had to be reached in order for produce to be sold on the platform, which represents a notable bottleneck that the company could set about to solve. When asked what improvements could be made to the service, 32 percent of farmers stated that TruTrade should consider setting higher





prices to buy their produce, while 14 percent asked for training on the quality standards required to sell on the platform (Mercy Corps, 2020a).

Overall, the analysis of TruTrade's model provides a range of interesting lessons on how fintech innovation and mobile money solutions can be leveraged to create more transparent and efficient value chain financing arrangements, capable of addressing traditional imbalances and distortions that stem from widespread information asymmetries and the loose relationships that connect the various actors of the chain. These imbalances can result in excessive bargaining power being given to one or a few categories of agent, and risk constraining in the long run the development of the entire chain.

## 1.2 MyAgro: Input credit and mobile layaway accounts for smallholders

Smallholders (and especially semi- or non-commercial farmers) usually have very few financing options when they need to purchase inputs to start their agricultural cycle. They often rely on informal credit provided by the input supplier himself or by middlemen, which leaves them vulnerable to predatory lending. They might turn to family or informal credit groups, but these loans are usually too short-term in relation to the agricultural cycle, while funds are often lacking. This financially constrained scenario can force farmers to invest in lower quality inputs (which reduces yield and income), or – in the worst cases – have them eschew the agricultural cycle altogether. The MyAgro model was developed precisely to move beyond this scenario.



MyAgro is a social enterprise that sells agricultural inputs and tools to smallholders in Mali, Senegal and the United Republic of Tanzania, while also providing them with a mobile savings solution. It was launched in 2011 by Anushka Ratnayake, an entrepreneur who was looking to create a sustainable alternative to input credit for smallholders, by focusing instead on enabling them to save for inputs in a flexible and gradual manner. Due to its innovative mechanism and the results it has achieved, MyAgro has become a good example of the potential that digital technology can have in facilitating input savings. In 2018, MyAgro became the recipient of a Skoll Award for Social Entrepreneurship, granted each year by the Skoll Foundation to a select group of entrepreneurs whose innovations hold considerable potential to solve some of the world's most pressing social challenges.

The MyAgro system allows farmers to save small amounts of money throughout the year **in a mobile layaway account**, in micro increments, and at their own convenience. To send money to his/her mobile account, the farmer has to purchase a MyAgro prepaid scratch card, similar to those used to top up airtime, from a local vendor who receives a small fee for the transaction. Once they have collected enough, farmers can finally use the money stored in the account to purchase seeds and fertilizers from MyAgro, before the start of the planting season.

For the farmers, the advantages of using this system are several. First of all, they can save for inputs in a flexible manner, whenever they happen to have some extra money to devote to their goal. Moreover, the money is stored in a committed account, so they cannot be tempted to take it out for other uses. Finally, the system provides them with a **formalized, contractual linkage with an input provider** (i.e. MyAgro itself), which gives them more confidence that they will receive the correct amount and quality of the inputs they require, in a timely manner.

MyAgro is quite ingenious in how it uses a mechanism – the scratch cards – **that is already ingrained in farmers' habits** and their everyday lives. This contributes to overcome one of the most common challenges to digital financial inclusion, the low service uptake caused by a lack of familiarity – on



the part of the farmers – with a new technology. Furthermore, the fact that this service can be used even via a basic mobile handset strongly increases its accessibility for small-scale farmers.

There are also several advantages for MyAgro as an input provider: it can plan ahead the amount of inputs it will have to stock and provide to the farmers, by monitoring the number and growth of accounts; it can ensure the timely delivery of such inputs; and it can “lock-in” clients through the account, as they can only use the money to purchase inputs from the company. This last element, in fact, does raise a number of concerns, given that it effectively eliminates the farmers’ choice on who to supply from. Nevertheless, at this stage, no alternatives exist on the market for farmers that wish to save for inputs through a mobile layaway account. Together with its core product, MyAgro also provides farmers with **tailored technical support** aimed at improving productivity, such as trainings to strengthen financial literacy and small-scale mechanization to reduce labour. This is particularly important when considering that the target farmers receive, on average, very little support from public agricultural extension services (GIF, 2020).

In 2018, MyAgro began implementing a “**village entrepreneur**” (VE) model, in which former MyAgro customers in rural areas were hired to take up some of the responsibilities of MyAgro’s field staff. Equipped with smartphones, these agents were charged with onboarding new clients and facilitating payments, in exchange for a commission. These local agents can take a more proactive role than traditional vendors in enrolling new farmers in the system, by visiting them directly on the farm grounds, assisting them in selecting the right input package for their farms, and monitoring their progress towards their layaway goals. Thanks to the proximity and trust these agents have with their peers at the village level, this type of onboarding model has proven to be quite effective in reducing customer acquisition costs and expanding MyAgro’s client base, even in the most remote rural areas. The VEs use a smartphone app called MyAgro Connect that allows them to track enrollment and payment progress against goals in real time. Almost 2 000 agents of this kind had been hired as of 2020, 55 percent of which were younger than 35, while 24 percent were women. As of 2020, the average monthly income for a village entrepreneur was USD 60 (MyAgro, 2020).

The results of the MyAgro model have been noteworthy: as of 2021, almost 115 000 farmers in Mali, Senegal and the United Republic of Tanzania were owners of a MyAgro account (of which 60 percent were women). The company estimates that farmers have benefitted from a 176 percent average increase in harvest yield per hectare thanks to its services, compared to a control group, with an annual increase in net farming income of USD 197 per farmer (MyAgro, 2022; GIF, 2020).

MyAgro’s plans to scale up in the near future are also quite interesting, as the company’s explicit objective is to reach a customer base of 1 million farmers by 2025. Two very interesting strategic pathways for growth that MyAgro is currently using deserve to be mentioned:

- **Expanding partnerships with savings group networks:** MyAgro has made substantial efforts over the years to engage with large networks of savings groups (mostly composed of women) and have them act as distribution channels to market its mobile layaway product. This has been often done in partnership with non-profit institutions that work closely with savings groups, such as Oxfam, the Stromme Foundation and Catholic Relief Services. Working with savings group networks has allowed MyAgro to reduce the number of its own field staff, while also driving down costs related to customer onboarding.<sup>3</sup> The company plans to double down on this strategy to further expand its customer base in the near future (Varangis *et al.*, 2021).

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<sup>3</sup> As illustrated by Varangis *et al.* (2021), channeling its services through a savings group has been a key factor for MyAgro in driving down the field cost of service delivery from USD 200 per farmer in 2012 to USD 52 per farmer in 2018.

**Developing a fully digital layaway product:** With the support of the Aga Khan Foundation, in 2019 the company began to expand in the United Republic of Tanzania as its third country of operation, by carrying out an initial pilot of a mobile-powered layaway service, in partnership with local mobile money operators, which allowed maize and sunflower farmers to set money aside to purchase inputs and training packages in a fully digital manner and without relying on scratch cards. The selection of these two specific crops for the pilot was due to the expertise that MyAgro and the Aga Khan Foundation had with these crops. Furthermore, the decision to carry out the pilot in the United Republic of Tanzania was a consequence of the country's strong mobile money network and infrastructure. In 2021, 4 000 farmers were onboarded with this digital service, with a 124 percent increase in yield registered, compared to the control group. This service holds considerable potential to be replicated on a much larger scale, across MyAgro's spectrum of operations, once the product has been properly refined (MyAgro, 2022; Varangis *et al.*, 2021).

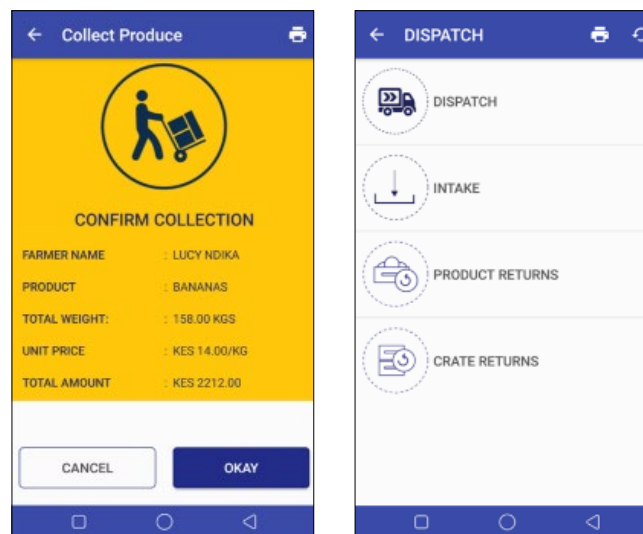
Overall, the case of MyAgro provides interesting insights on how to leverage mobile money solutions to strengthen farmers' savings habits and help them establish a capital base that they can use to pursue a range of goals related to both their professional and personal spheres, while also registering considerable additional benefits in terms of the increased convenience, security and accessibility associated with the MyAgro model.



### 1.3 Twiga Foods: Connecting urban vendors to small-scale rural producers

Twiga Foods is a business-to-business (B2B) marketplace platform that was founded in Kenya in 2014. It seeks to connect urban retail vendors and outlets with farmers (both small- and large-scale), in an effort to align supply and demand in the vast – but fragmented – Kenyan fruit and vegetable market. The platform is optimized for both mobile and web access. Through this digital marketplace, vendors can source fresh produce directly from the farmers, which is then delivered directly at their doorstep, while the app assists them in managing product flow and inventory.<sup>4</sup>

**FIGURE 2.** Snapshots of the Twiga app



Source: GSMA (Global System for Mobile Communications). 2018. Start-ups and mobile In emerging markets: Insights from the GSMA Ecosystem Accelerator. London, Ecosystem Accelerator GSMA. <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/03/Start-ups-and-Mobile-in-Emerging-Markets-Issue-2.pdf>

How does the system work? Farmers bring their products to sell in one of 16 Twiga collection centres, where prices for produce are posted daily. All purchase transactions between Twiga and the farmers are digital and carried out via mobile through the M-Pesa payment system, with the farmers being paid within 48 hours from delivery. The system works with feature phones and does not require a smartphone. From the collection centres, Twiga moves the products to a warehouse, where they are sorted, graded and packed into standardized crates for easier handling. From there, the crates are transported to a network of distribution depots, where they are finally delivered to vendors.

All vendors in the Twiga network are geo-tagged by the company during registration. When they need fresh produce, a vendor can place an order by calling a sales representative from Twiga, by

<sup>4</sup> In 2019, the company also began to connect vendors with manufacturers of consumer-packaged goods, moving beyond agrifood products, with the objective of becoming a one stop-shop that could cater to all the needs of informal urban retailers.



using a USSD (Unstructured Supplementary Service Data) service<sup>5</sup> on their feature phones, or through a smartphone app. Twiga's AI-powered distribution platform allows the company to see who is ordering, the location of the order, the conditions of the road to get there, and ultimately, what is the best way to organize deliveries to the vendor network in the most efficient manner. Twiga dispatches its distribution vehicles and guarantees delivery to the vendor within 24 hours from the order. Customer support is provided through a network of 500 field agents and a call center assistance.

This cost-effective model has allowed Twiga to grow relatively fast and benefit from substantial economies of scale as it kept expanding its customer base. By harmonizing demand and supply from a constellation of fragmented small-scale farmers and vendors, Twiga has strongly reduced the inefficiencies linked to the traditional middleman model, where traders would exploit the distance between producers and retailers, as well as the lack of transparency, to make a profit well over market rates (Tam and Mitchell, 2020).

Twiga Foods provides a range of digital services that are complementary to its main business line. Aside from the signatory marketplace app (*Soko Yetu*), Twiga also offers a **working capital loan** to vendors (called *Sokoloan*), which allows them to refill their stock through Twiga's service and pay later. The product leverages Twiga Food's ledger of digital transactions and vendor data to refine the credit scoring model to make loan decisions, and it increases the loan ceiling based on the amount of successful transactions carried out by the vendor. The actual liquidity for credit is provided by third-party financial institutions. Twiga also offers an e-wallet service through the app, that allows vendors to build a cash balance on the platform and use it to make purchases.

According to Twiga, as of 2022 more than 1 000 farmers were part of its supply network, with 2 000 metric tons of product being sold and delivered to more than 10 000 urban retailers every day across 12 cities and towns in Kenya.<sup>6</sup> Company data from 2020 shows that smallholders selling through Twiga Foods registered an average income increase of 30 percent and an 83 percent reduction in post-harvest losses, as the service allows to sell rapidly and avoid wasting a variety of highly perishable agri-food products (Tam and Mitchell, 2020).

As of 2021, Twiga had raised more than USD 150 million in both equity and debt financing from various investment rounds, attracting capital from a large number of African and international investment funds. The company announced in early 2022 that it was using this capital to expand to other East African markets, such as Uganda and the United Republic of Tanzania, by the end of the year, as well as to West African countries in the longer term. Furthermore, in early 2022, Twiga announced the launch of a commercial farming subsidiary company called **TwigaFresh**, with an initial capital injection of USD 10 million, with the objective of directly producing and selling Twiga-branded agrifood products – initially, domestic horticultural staples such as onions, tomatoes and watermelons (Kanali, 2022).

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<sup>5</sup> As illustrated by Earl Wells III (2020, p.1): "The USSD messaging protocol is part of the Global System for Mobile Communications (GSM) digital cellular standard. Like SMS and MMS, USSD facilitates communication without the need for a dedicated app. Unlike SMS, which is used for back-and-forth text messaging between two phones, USSD establishes a real-time connection between a feature phone and a mobile network or a server. USSD relies on codes made up of characters found on every mobile phone. [...] When a USSD code is dialed, the phone sends a request to a USSD network gateway, which routes the request to a web-based application. The network gateway then returns a text-based menu that can be used to interact with the app."

<sup>6</sup> A total of 140 000 vendors are affiliated to Twiga Foods, although the company services only a small share of this number on a daily basis see above.



The analysis of Twiga Food's case is quite interesting, as it showcases how the combination of automation, remote sensing and mobile money technology can be leveraged by an enterprising company **to align supply and demand** between thousands of fragmented small-scale rural producers and informal urban vendors, overcoming the inefficiencies generated in agricultural value chains by the traditional middleman-enabled model. This has resulted in the creation of new and transparent market channels for farmers, and a reliable source of quality and timely supply for vendors. For Twiga Foods, developing this model has unlocked considerable potential for rapid market growth, pioneering a system that holds considerable interest for future replication in other contexts.

Nevertheless, it must be emphasized that several factors which characterize the Kenyan context **have been key for the success of Twiga's model**. These include: the high levels of mobile money and mobile penetration, also in rural areas; the relatively high levels of familiarity associated to the use of mobile-powered services among all parties involved; and the considerable state of advancement of the digital financial ecosystem in the country. Any interest in a possible replication of Twiga Food's model thus needs to be carefully weighed against the concrete state of development of the digital financial ecosystem in a given context, as well as the level of readiness of the supply side (i.e. the vendors) and that of the demand (i.e. the farmers) where the uptake and use of mobile money services are concerned.









## 2. Crowdlending systems to finance small-scale agriculture

Crowdlending is an alternative financing mechanism by which a large number of retail investors pool together small amounts of funding and channel the resulting sum in the form of a loan towards a specific project.<sup>7</sup> Once the project reaps a profit and the borrower repays the loan, what is earned is shared among the retail investors according to their contribution. A crowdlending system usually relies on a **dedicated digital platform** that hosts a variety of projects that can be funded, for the investors to peruse. Borrowers that seek to raise financing from the investors' collective can upload their own projects, together with key information such as a detailed description of the business model, core investment risks, their track record of past projects already brought to completion, a projection of potential investment returns, and so forth. The **specific socioenvironmental impacts** that the project is expected to generate represent also a key data element that potential borrowers have an interest in providing, as many investors look for projects that pursue developmental gains in areas that matter to them (e.g. gender empowerment, climate resilience, education), besides an economic return.

These types of innovations can be a powerful tool to mitigate one of the most common bottlenecks in agricultural financing, which is the scarce interest and engagement of local rural lending institutions towards financing MSMEs across a variety of agricultural value chains – and the consequent supply gap. To overcome this, crowdlending platforms act as mediators and bridges between, on the one hand, an enormous demand for investment capital registered among

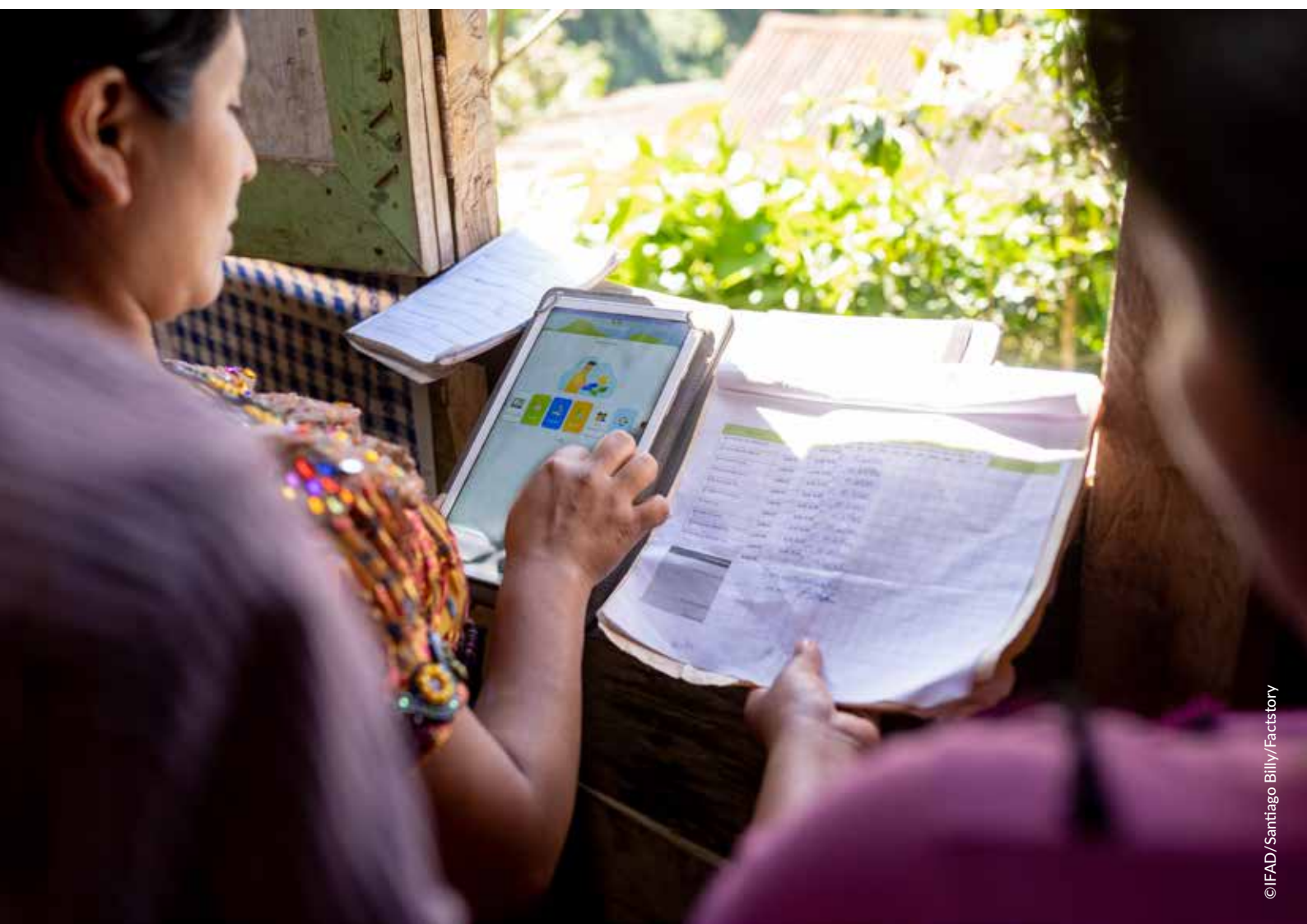
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<sup>7</sup> Crowdlending can be viewed as a form of debt-based “crowdfunding”, which is a general term that refers to the channeling of financing provided by a large and atomized group of retail investors, in various forms. Other arrangements are also possible, including (but not limited to) *equity-based crowdfunding*, by which investors purchase a share of the project/company, or *donation-based crowdfunding*, which is a form of grant provision that donors use to pursue development-related and non-economic returns in areas that matter to them, such as the environment or social justice.



agricultural MSMEs, and on the other, a large reservoir of untapped international capital (pooled from a vast number of small sources) that is looking for suitable destinations to be deployed. In this sense, the social and environmental character of the projects sponsored by the crowdlending platform has the same importance as potential economic returns, as these platforms usually try to appeal to a vast population of socially and environmentally oriented investors driven by a wide range of motivations and goals which are not strictly financial in nature.

When it comes to financing small-scale agriculture, crowdlending can be a powerful instrument to compensate for the scarcity of conventional financing solutions in rural areas of developing countries. That said, it should be noted that agriculture remains a sector that carries substantial and varied risks when it comes to investing. In this frame, an individual retail investor is bound to have considerably less skill and experience in accurately evaluating **a range of factors that might impair the project's capacity to meet its goals** and reimburse the loan, compared to, for example, an FI that has long-standing expertise in agriculture. The role of the crowdlending platform is crucial in this respect: in order to be successful and sustainable in the long-term, the platform has to set and comply with very high quality standards in terms of the agri-investment projects it decides to sponsor, as reputation damage (e.g. sponsoring projects that are later found to have resulted in widely negative spillover effects on the environment) can result in a complete loss of investors' confidence in the system. Furthermore, keeping loan default rates to a minimum in the platform's portfolio of financed projects is critical to ensure continued buy-in with the model on the part of investors.



## 2.1 TaniFund: Combining crowdfunding with advanced digital credit scoring

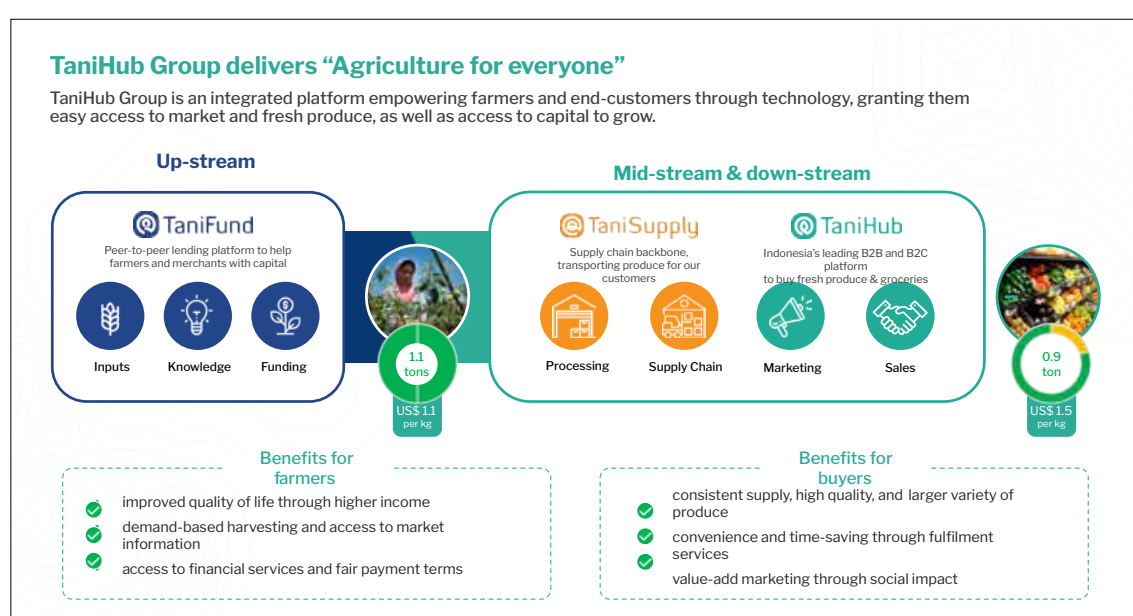
TaniFund is a fintech company that seeks to enable small-scale farmers in Indonesia to tap into alternative sources of financing through digital crowdfunding. Through its online platform, TaniFund allows farmers to raise capital from individuals and entities to finance specific agri-related projects. This represents a critical innovation in a context such as that of Indonesia, where access to quality loans for smallholders represents a major bottleneck, due to the scarcity of collateral, the absence of credit history, a bias against agricultural lending on the part of formal financial institutions, and many other factors. As a result, Indonesian smallholders are often forced to borrow from middlemen, with predatory interest rates of up to 200 percent per annum. Nevertheless, the untapped potential of filling the agricultural credit gap in the country is enormous: 85 percent of Indonesian farmers are smallholders. Agriculture representing the main source of income for 33 million people, contributing to 13 percent of the gross domestic product and 33 percent of employment. The agricultural sector attracts only 6.5 percent of the total credit provided by formal financial institutions (USD 26 billion in absolute numbers), and the vast majority of these loans go exclusively to the palm oil value chain (OECD, 2022; World Bank, 2022b).

The TaniFund e-platform allows investors to filter and select the projects they are most interested in, providing essential information for each project, such as: the amount of capital required; the estimation of returns; and calculations regarding production and harvest costs. Projects must be proposed by groups of farmers, not individuals, to ensure that group pressure plays a role in keeping farmers motivated to advance the initiative. Some projects might seek capital to market and sell agricultural produce, others might look for funding to establish new plantations from scratch. Once a specific project manages to obtain financing, the funds are provided to farmers on a weekly basis, both in the form of cash, and in-kind assets (e.g. fertilizers, seeds, farming equipment). TaniFund applies a **profit-sharing model to its projects** by which investors, farmers and TaniFund share the profits on a 40:40:20 basis (and bear eventual losses on the same basis). Returns are distributed monthly or annually, depending on the project, while the initial capital investment is repaid when the project ends. TaniFund mitigates investment risk by allowing on the platform only farmers that have a proven trading track record with TaniHub see below, as well as closely monitoring the advancement of each funded project. The TaniFund team carries out feasibility studies for the proposed business plans, and supports farmers in preparing the prospectus of the investment to upload on the platform.

TaniFund is a sister company to TaniHub, an e-commerce platform founded in 2016 that seeks to link together farmers and buyers (both individual and corporate). The objective of TaniHub is to streamline the distribution channels that link together farmers and buyers (such as restaurants, hotels, supermarket chains, grocery stores), reducing the overall dependency on middlemen and allowing farmers to earn more for their crops. When the harvest of a project financed through TaniFund has been completed, the agricultural produce is distributed and sold through the TaniHub platform, which ensures that there are already established market channels to reap a profit from the project (a considerable risk mitigation factor for investors). There is also another associated company, called TaniSupply, which is a logistics platform that operates six warehouses and processing facilities where harvested produce can be washed, sorted and packed rapidly, and then delivered to buyers by TaniHub's couriers or external logistics companies.

Together, these three companies compose the TaniHub Group, whose mission is to provide integrated solutions that can help Indonesian agriculture move beyond its current supply chain model, characterized by multiple layers of middlemen, low transparency, and considerable mismatches between supply and demand, which result in substantial market inefficiencies. As of 2021, **the Group had a network of more than 45 000 farmers and 350 000 buyers** (both individuals and corporate). Its gross revenue has grown by more than 600 percent in 2020, due in part to the increase in demand for home-delivered fresh produce. In 2021, the Group also raised more than USD 65 million in an investment round that saw the participation of various venture capital funds, which showcases the growing awareness on the part of international investors of the still untapped market potential of Indonesian small-scale agriculture.

**FIGURE 3.** The TaniHub Group family of enterprises



Source: TaniHub Group. 2020. Building sustainable agriculture supply chain in Indonesia through technology and innovations [slide presentation]. <https://olc.worldbank.org/system/files/TaniHub%20Final%20slide%20deck%20Aug%2013%202020.pdf>

The **digital credit scoring system** employed by TaniFund to assess the projects on its platform is based on three years of performance, the company’s agricultural value chain expertise, and the data leveraged from partnerships established with various financial institutions. As explained by Pamitra Wineka, CEO of TaniHub:

More than 100 data points are considered when doing the credit risk assessment. For example, for cultivation financing products, TaniFund tailors each credit scoring based on agriculture risks and market risk of each commodity, on top of the typical borrower E-KYC scoring and process. Beyond credit scoring, having TaniSupply and TaniHub as a standby buyer within the ecosystem also helps to mitigate risk of each loan. TaniFund aims to further boost its credit scoring system with smarter data processing and better machine learning models. (Shu, 2021, p.1)

Between 2017 and 2021 TaniFund helped farmers raise more than **USD 22 million in financing**, provided by more than 10 000 individual and corporate lenders. Farmers financed through the platform reported increases of over 30 percent to their average incomes and 30 percent increases in yields. In 2021, the company obtained a license from the Indonesian Financial Services Authority (OKJ) to act as a certified provider of peer-to-peer (P2P) digital credit. This would make TaniFund the only fintech company in the country – among the 68 which were granted a license by the OKJ – to provide P2P lending specifically to agricultural actors. This passage is expected to further cement the company's reliability as a financial provider, while strengthening overall customer trust.











### 3. Fintech solutions leveraging big data and automated credit risk assessment

One of the most popular types of innovation that have emerged in recent years in the fintech domain concerns the use of “big data”<sup>8</sup> to refine credit appraisal processes and provide farmers with loan terms and conditions that are, on the one hand, more closely tailored to their professional and personal needs, and, on the other, more competitive than those traditionally offered by conventional FIs. Fintech companies have sought to leverage the large datasets generated by their clients’ usage of both financial and non-financial services,<sup>9</sup> in combination with a range of alternative data sources, such as remote sensing, to overcome the information asymmetry that is inherent to agricultural value chains and their actors, with a view to developing services that are more automatized, precise, effective and profitable, and with the end goal of enhancing the competitiveness of financial providers in emerging agricultural markets. This has resulted in both the fintech companies providing financial services directly on more competitive terms on the basis of the client data generated by their platforms (in contexts where the enabling environment allowed fintechs to operate in this manner), as well as the data/credit profile analysis being sold

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<sup>8</sup> The term big data refers to processes that analyse and interpret enormous volumes of data, both structured and unstructured, with the aim of providing companies with a richer and more solid base for their planning and decision-making. The insights generated in this way allow, for example, to improve strategies and internal processes, to strengthen the company’s competitiveness, and to better understand client-related trends and behaviours, among many other applications (Da Silva, 2021).

<sup>9</sup> There are numerous examples of possible data points generated by clients’ activities on fintech multiservice platforms: credit repayment behaviour; production sales; existing assets; mobile money transactions and input purchases; payment flows; complementary, non-agricultural income sources; and many others. This platform-level data can be combined with the more “conventional” information obtained through the interviews that loan officers carry out directly with the potential borrowers.

by the fintech companies to conventional FIs (such as commercial banks), mobile money operators (MMOs) and other types of financial providers, mutually beneficial partnerships.

In the frame of a big data approach to agricultural lending, the multiple points of data acquired from prospective clients can be input into automated credit risk scoring systems to generate **extremely precise economic identities** of said clients, thereby strongly increasing the predictive capacity of the FI when it comes to loan approval decisions. As these automated credit risk scoring systems become more precise and reliable, the default risk associated to FIs' agricultural portfolios can be strongly reduced. As a result, providers become able to ease the traditional requirements that are usually demanded of farmers in order to provide credit (chiefly the demand for collateral), if not eschew them altogether, as well as offer loan terms that are both more affordable and better tailored to different clients' profiles.

Big data and automated credit scoring hold considerable promise to mitigate a range of key (and interrelated) bottlenecks associated with agricultural financing, including the high cost of credit, the strict guarantee requirements, the scarce flexibility of loan terms, and the long processes associated with loan approval and disbursement. Furthermore, these types of innovations can be critical in encouraging an institutional shift on the part of local FIs towards a greater engagement in agricultural lending (especially to smaller borrowers), as they can mitigate the **enormous data gaps** that traditionally characterize developing agriculture, which imply a scarcity of data on individual clients and businesses, as well as on the different value chain actors.

These types of innovations have registered a surge of popularity in the aftermath of the COVID-19 pandemic, which has resulted in an accelerated growth of the segment of fintech companies that employ a big data approach and leverage a range of alternative data sources to increase the precision of their loan approval decisions, as well as better adapt their loan terms to the needs of individual clients. On the one hand, conventional FIs in developing and emerging contexts were – as a general trend – forced to restrict their loan provision activities with the advent of the pandemic, as widespread economic disruptions and overall business restrictions threatened the solvency of their clients and increased portfolio default rates on average. On the other hand, fintech companies specializing in big data thrived on the influx of new clients looking for financial providers capable of attending them in **an entirely remote fashion**, while also benefitting from pandemic-induced changes in their clients' habits that resulted in large amounts of new data that could be collected and analysed (such as a higher tendency towards carrying out e-commerce transactions, due to the lockdowns).<sup>10</sup> Overall, the good results registered by several fintech companies in the frame of the pandemic appear to have encouraged a shift among conventional FIs towards **accelerating their process of institutional digitization** (both in terms of their product offer and internal processes), in an acknowledgment of the need to bring about these changes to remain competitive against a rapidly growing and agile fintech sector.<sup>11</sup>

Nevertheless, it is important to note that there are a number of key challenges linked to the growth of big data and automated credit scoring, especially in developing contexts where policies and regulations in this domain are either scarce or absent. One of the most critical issues is ensuring

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<sup>10</sup> Refer to Benni (2021a) for a more in-depth analysis of the overall phenomenon of accelerated digital financial inclusion brought about by the COVID-19 pandemic.

<sup>11</sup> According to a recent survey by the Economist Intelligence Unit (2021) carried out among 154 commercial banks, 98 percent of the CEOs interviewed stated that their institution had developed a digital transformation strategy, while half of the surveyed stated that they believed such strategy was at an advanced level of implementation. Moreover, 87 percent of those interviewed agreed that fintech companies were forcing commercial banks to drastically reconsider reconsidering their financial provision model, considering in particular the fintechs' capacity to leverage digital infrastructure to improve their operational efficiency, cut down on transaction and administrative costs, and reach new clientele segments until now financially underserved.

an adequate level of normative protection for what concerns **financial consumers' privacy** and the uses that are made of their personal data, especially as these innovations keep growing in popularity and a rising number of rural and agricultural actors (with low average levels of digital and financial literacy) are beginning to make use of these services. National policymakers have a crucial role to play in ensuring that there is an adequate financial consumer protection framework in place to balance, on the one hand, the need for fintech companies to gather and make use of clients' data to feed their credit scoring systems and, on the other, the need to protect old and new clients from privacy violations and abuses, both deliberate and unintended (such as a third party illegally gaining access to the data).

Another important risk has to do with **algorithm bias**, which implies that automated credit scoring systems that are poorly developed or based on incomplete/insufficient data can end up skewing, distorting and ultimately lowering the precision of client credit scores, as well as the associated loan approval decisions. As pointed out by Fernandez Vidal and Menajovsky (2019), proprietary algorithms reflect the data they are built on: the choice of assigning more or less importance to specific variables to generate the credit score, when designing the algorithm, can end up unfairly discriminating against subsegments of potential clients, even though in their case that specific variable might not actually indicate a higher or lower likelihood of loan repayment. A clear example in this respect has been given by Fernandez Vidal and Menajovsky (2019): in some credit risk scoring, algorithms set "stability" as a positive variable, i.e. how long a loan applicant has been working with his/her current employer or living in a formal residence. This type of variable can unfairly discriminate on forcibly displaced people, if not excluding them from credit access altogether, even though they might be perfectly capable of repaying a loan.<sup>12</sup> While it is true that conscious and unconscious biases have always been a part of the traditional credit risk assessment process, as loan agents can have their own subjective views that unduly affect the final result, the advantage with automated credit risk scoring systems is that they can be **monitored, reviewed and adjusted** to correct for discriminatory biases. Over time, allows to generate fairer, more comprehensive, and ultimately more efficient models (Fernandez Vidal and Menajovsky, 2019).

#### From Agritech to fintech

As pointed out by Loukos (2020), it is not an easy task for an agricultural data provider to make the leap to digital credit provider (i.e. from "Agritech" to strictly "fintech"). Becoming a stand-alone fintech focused on credit provision (by leveraging the remote sensing, data collection and data analytics capabilities developed as an Agritech) requires meeting various and costly requirements, including:

- gathering sufficient – and substantial – liquidity;
- hiring in-house expertise with a sizeable skillset on machine- and AI-powered credit scoring;
- developing an agent network for outreach and customer proximity, if not already present;
- more generally, attracting, attract banking talent that has considerable experience in

(cont.)

<sup>12</sup> World Bank (2020b) data shows that small-scale farmers in Brazil receive only 20 percent of the total credit amount destined by the formal financial sector for agriculture, mostly through short-term loans for working capital financing. Credit to agri-SMEs is mainly provided by public banks, while private FIs engage for the most part with large-scale players in the agribusiness sector.

designing tailored credit products based on the specific needs of small-scale agricultural actors;

- gaining recognition and clearance on the part of the regulator (which, if at all possible, implies fulfilling complex regulations on various aspects such as Know Your Customer, liquidity ratios, anti-money laundering); and
- depending on the context, having access to public financial support to grow operations to scale, such as public credit guarantee schemes or second-tier concessional credit.

Therefore, it is not surprising that most Agritech companies tend to opt for collaborative arrangements with traditional FIs, where the former provide the data gathering and – if feasible – the credit scoring capabilities, while the latter provide the capital for lending. The end of Section 3.2 provides a more in-depth discussion of the different modalities for collaboration and integration between FIs and Agritech companies.

### 3.1 FarMart: Digital input credit customized on the farmer's profile

In India, a rapidly expanding fintech sector is increasingly viewing small-scale agriculture as an appealing market segment that could be captured with an offer of innovative, disruptive and low-cost digital financial services. The latest national agricultural census indicates that India is home to approximately 146 million farming households, of which 86 percent are smallholders, while almost 55 percent of the Indian population depends on agriculture and related sectors (livestock, fisheries and aquaculture) for their livelihood. In 2019, agriculture and related sectors contributed to 16 percent of the country's gross domestic product (GDP) (Bera, 2019). **Around half of the 126 million Indian smallholders do not borrow at all**, neither from formal nor informal sources. The commercial and cooperative banking sector allocated only 13 percent of its gross loan portfolio to agriculture in 2019 (amounting to USD 168 billion), and directed it for the most part towards medium- and large-scale agribusinesses (Rabo Foundation, 2020).

It is evident, therefore, that there is a huge financially underserved market segment of small-scale agricultural actors that is waiting to be seized by entrepreneurial fintech and AgTech companies. These companies can either take it upon themselves to provide financing directly, or assist traditional FIs in filling common data gaps relative to this sector, for example by providing crop data at farm level, weather forecasting, soil quality, the expected use of inputs, farmers' credit profiles and behaviour, agricultural price prediction, and much more.

An interesting example of a disruptive Indian fintech company that focuses on smallholders is FarMart. FarMart is a digital leasing and credit platform launched in 2015, in Uttar Pradesh, by three entrepreneurs: Alekh Sanghera, Lokesh Singh, and Mehtab Hans. In its original concept, FarMart worked as a **leasing platform**, accessible through basic mobile handsets, that connected farmers looking for agricultural machinery (such as tractors and tillers) with other farmers who owned them and were willing to rent (Bera, 2019).

Over time, FarMart has evolved into an integrated app-based platform that seeks to connect a network of 60 000 agri-input sellers with 2 million farmers. The FarMart app allows the input sellers to register and track their clients, view past purchases and pending payments, plan for the upcoming season based on the demand they see for their products, as well as send messages to farmers in the network through the app to alert them of inventory restocking, new products and discounts, communicate with them and send them reminders, improve sales and offerings.



Farmers, on their side, have easier access to the agri-inputs they require, and can gain information about new products and their uses (EtTech, 2022; Kasera, 2020).

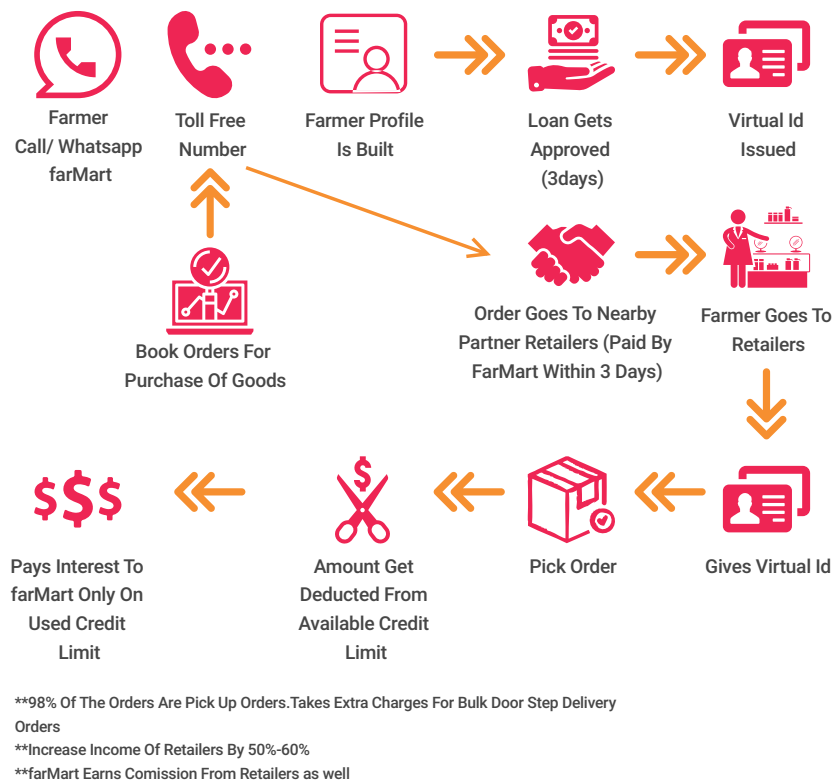
In April 2018, FarMart began piloting a **digital credit service**, specifically aimed at providing low-cost loans for financially underserved smallholders (with less than 2 hectares of land) who sought access to formal credit to purchase agricultural inputs. This service expansion was a direct result of the strong market potential that FarMart's founders saw in servicing the growing demand for small-scale agricultural credit in India, in a context where less than 20 percent of 430 million smallholders have access to formal financing, and the total annual demand for unserved credit is estimated at USD 200 billion. The entire credit application and disbursement process is carried out via mobile. While the service is also available through FarMart's app, it primarily uses WhatsApp and a missed-call system to connect with its client base of farmers, as these actors own, for the most part, either low-end smartphones or basic mobile handsets. Since it is not a financial company, FarMart had to partner with a range of financial institutions that provide the company with funds for financing, which FarMart in turn on-lends to farmers on their behalf (Catalyst Fund, 2020; Agarwal, 2019).

The proprietary credit underwriting algorithm developed by FarMart allows the organization to evaluate the creditworthiness of loan applicants **on the basis of 50 alternative soft and hard data points**, which considerably lowers the credit risk faced by the company when lending to a (perceived) risky sector such as small-scale agriculture. The data points are gathered along four main categories: farmers' personal information; supplementary income of the family; details of their agricultural profile such as the extent and ownership of the land; and income diversification. Credit amounts range from USD 130 to 670 and the loan lasts for one agricultural cycle (6 months), with loan approval times ranging from 1 to 3 days. Loans provided by FarMart are flexible, based on the specific agricultural cycle of the crops cultivated by the farmers, and offered with flexible repayment options – such as small, regular transfers in between agricultural cycles, or large bullet repayments (Bera, 2019).<sup>13</sup>

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<sup>13</sup> A bullet repayment is a lump sum payment made for the entirety of an outstanding loan amount, usually at maturity.

**FIGURE 4.** The mechanism underpinning FarMart's model



Source: Agarwal, M. 2019. Agri-Fintech startup FarMart looks to bring cashless loans to India's distressed farmers. *Inc42*, 30 May 2019. [Cited 12 April 2023]. <https://inc42.com/startups/agrifintech-startup-farmartbricashless-loans-to-farmers>.

When a credit application is approved, no amount of physical cash is actually handed by FarMart to the borrowers, which basically eliminates the risk of misuse and diversion of the funds provided. Farmers receive instead a **digital voucher on their mobile phone** (in the form of a 10-digit number) which they can use to purchase high-quality seeds, fertilizers and other inputs from a network of physical retail merchants. Figure 4 provides a more detailed explanation of how the FarMart input credit service works. Farmers benefit from this system by gaining access to low-cost credit to purchase high-quality inputs from a network of verified retailers (EtTech, 2022).

Results of the initial pilot of the credit service have been promising. In its first year of operations, the credit portfolio's non-repayment rate was less than 1 percent. FarMart has attributed this low default rate to the fact that its model allows to **mitigate two core aspects of loan default risk**: lack of credit information on clients and misuse of funds. An initial results' assessment saw farmers' productivity increase by about 15-20 percent thanks to the service. FarMart's objective is to scale up the product to a target population of 100 000 farmers, with USD 13 million in credit disbursed. One of the aims of the platform is to leverage its network of merchants to obtain better bargaining power with input supply companies, so as to secure bulk purchases at reduced prices.

Despite the good results achieved so far, there are several challenges that are bound to constrain the expansion of FarMart's digital credit model: the low levels of digital literacy among the rural clients it engages with, which discourages them from using the service; the low levels of smartphone penetration, which reduce its ability to enrich its services through a dedicated app; and the weak ICT infrastructure in the rural areas where FarMart is active with the credit product (Bera, 2019).<sup>14</sup>

<sup>14</sup> Note that, although the credit service is currently offered in the State of Uttar Pradesh, FarMart is seeking to expand it to other Indian states, such as Madhya Pradesh, Rajasthan and Bihar.





Beyond digital credit, the company is currently looking to evolve into a proper business-to-business food supply platform, which would aim to support businesses in sourcing fresh produce from FarMart's network of farmers. To this end, FarMart has managed to raise USD 32 million in 2022 in a funding round led by a US venture fund (General Catalyst), which saw the participation of Matrix Partners India and Omydiar Network. This latest line of funding will be used by FarMart to grow its digital distribution network across India and to export markets, in addition to making investments in research and development (R&D), as well as automation.

### 3.2 A de Agro: Remote sensing and artificial intelligence to unlock agricultural financing

Among Latin American countries, Brazil represents one of the most promising environments for the promotion of agricultural financial inclusion through fintech innovation. Some key data can provide an idea of the level of advancement (and speed of growth) of the mobile money and fintech sectors in the country:

- Brazil registers very high levels of both mobile penetration (96 percent of the population) and smartphone penetration (54 percent). Three out of four Brazilians have access to the internet, while slightly more than half of these access the web **mainly through their mobiles**. At the end of 2020, 67 percent of money transactions in the country were channelled through mobile money services (a number that increased greatly with the COVID-19 pandemic), while the number of active mobile money accounts stood at 198 million. The number of users in 2020 that utilized mobile money services to carry out most of their financial transactions was 76.3 million, more than double compared to 2019 (Deloitte, 2021; Lopez, 2019).

- Brazil's fintech sector is by far the largest and fastest growing of Latin America. fintech start-ups attract the highest amount of investment capital than any other sector of the Brazilian economy (USD 2.4 billion in the first half of 2021), and the number of such enterprises (498) is the highest in the region. The COVID-19 pandemic has also led to considerably higher levels of **collaboration between commercial banks and the fintech sector**: 60 percent of banks in 2020 were partnering with a fintech company to develop and offer digital financial services, almost double compared to the previous year (KoreFusion, 2020; Deloitte, 2021).
- Unlike most Latin American countries, there are quite a number of fintech companies in Brazil **that focus specifically on the agricultural sector**, and their number is growing at a fast rate. According to a recent report titled *Radar AgTech Brasil*, the number of fintech enterprises in the country that are engaged in this sector has grown from 24 in 2019 to 48 in 2020. This growth is an answer to the rising recognition – on the part of both traditional financial institutions and fintech companies – of the considerable market potential that could be tapped into by capturing the enormous segment of financially unserved Brazilians working in agriculture, through an offer of tailored, low-cost digital financial services. World Bank data from 2020 points to a USD 30 billion financing gap in unmet demand for agri-MSME credit in the country (Figueredo, Sakim and Sakuda, 2021).

In this scenario, there are several interesting examples of fintech companies that have emerged in recent years with the goal of capturing a sizeable share of the agricultural financial market through an innovative product offer. A particularly interesting case is **A de Agro**, a fintech start-up that seeks to act as intermediary between small- and medium- scale commercial farmers and traditional FIs, with the objective of providing these clients with **credit products tailored to their specific necessities**. The start-up was born in 2015 under the name Agronow (originally an AgTech company focused on providing satellite-based services for crop monitoring and forecasting), and rebranded itself as A de Agro in 2021 when it entered the agri-finance market. The goal of A de Agro is to capture the vast unattended segment of agricultural producers in Brazil incapable of accessing quality credit due to excessive bureaucratic and administrative requirements, while **bridging the information gap** that keeps formal FIs away from lending to small- and medium- scale agricultural actors.<sup>15</sup>

A de Agro employs a system to generate credit profiles of its potential clients that does not need any input from the producer, as it relies on remote sensing data and artificial intelligence to assess the state of the farm and cultivations without the need for a borrower to provide data. A de Agro's remote analysis is based on **eight factors**: farm extension; productivity; homogeneity of cultivations; relevance of specific crop in the region; soil quality; producer's experience; climate; and potential projected yield. The company can leverage a database of satellite data – built over seven years – of 138 million acres of cultivated land already analysed (Labs, 2021). At this stage, A de Agro only targets farmers cultivating soybean, sugarcane and corn, whose farms tend more towards medium size. A de Agro's algorithm-powered credit risk scoring system allows it to develop extremely accurate projections of a farmer's ability to repay, and it allows for considerably faster decisions on credit application approvals.

In the frame of this model, A de Agro provides its data analysis and credit profiling capabilities, while traditional FIs that have partnered with the company provide the capital for financing. By relying on the data collected by A de Agro, as well as its credit score analysis, it is possible for FIs to offer credit terms that **are more advantageous and better tailored** to the needs of each client

<sup>15</sup> World Bank (2020b) data shows that small-scale farmers in Brazil receive only 20 percent of the total credit amount destined by the formal financial sector to agriculture, mostly through short-term loans for working capital financing. Credit to agri-SMEs is mainly provided by public banks, while private FIs engage for the most part with large-scale players in the agribusiness sector.





farmer. The increased rapidity of the credit approval and payout process is also an important added advantage, as loan applications in Brazil can imply extremely long wait times for farmers. After a loan has been approved, the company continues monitoring the borrower's farm to ensure that the correct type and extension of crops have been planted, in order to mitigate the risk faced by the FI funding the loan. In the word of the company's CEO: "We assess what really matters, the producer's crop and not regional averages. Analyzing this information, we were able to improve pricing and offer a more attractive rate for the producer and a safer operation for the financier" (Labs, 2021, p.1).

One of the main challenges to farmers' access to finance in Brazil are the burdensome requirements, in terms of documentation (e.g. property documents related to the farm, ID documents), imposed by formal FIs to prospective customers applying for credit, which can imply a time and resource effort to collect all necessary documents, especially for farmers living in rural, remote areas. That is why A de Agro is also currently piloting a **Digital Hub**, i.e. an online database where farmers can upload all the documents that might be required in the frame of the loan application process. Through the Hub, A de Agro can also connect (with the farmer's consent) to a range of national digital databases from which the company can obtain other documents related to the farmer that might be needed for the loan application process. This represents a critical advantage for farmers, as it allows them to offload most of the bureaucratic hurdles associated with the loan application process – in terms of the documentation required – on to A de Agro. The farmer does not pay for this service, as A de Agro earns from the FI a share of the interest rate of the loan eventually enabled by the Digital Hub.

A de Agro's **profit margin** in its overall business model comes from two main sources: 1) selling their analyses of farmers' data to FIs, without using its credit risk scoring capabilities;<sup>16</sup> and

<sup>16</sup> Note that A de Agro provides analyses based on aggregated data to FIs, without sharing the personal data of individual farmers. Furthermore, according to Brazilian data privacy laws, farmers' consent is required for using their data in an aggregated analysis. This relates to the broader issue of onboarding the farmer on to the service and acquiring their written agreement to this.

2) enabling loans to the farmers on the part of FIs through its full credit risk scoring process. In the first case, A de Agro gets paid a lump sum based on the analytical work provided. In the second, A de Agro earns a margin on the interest rate that the FI places on the loan.

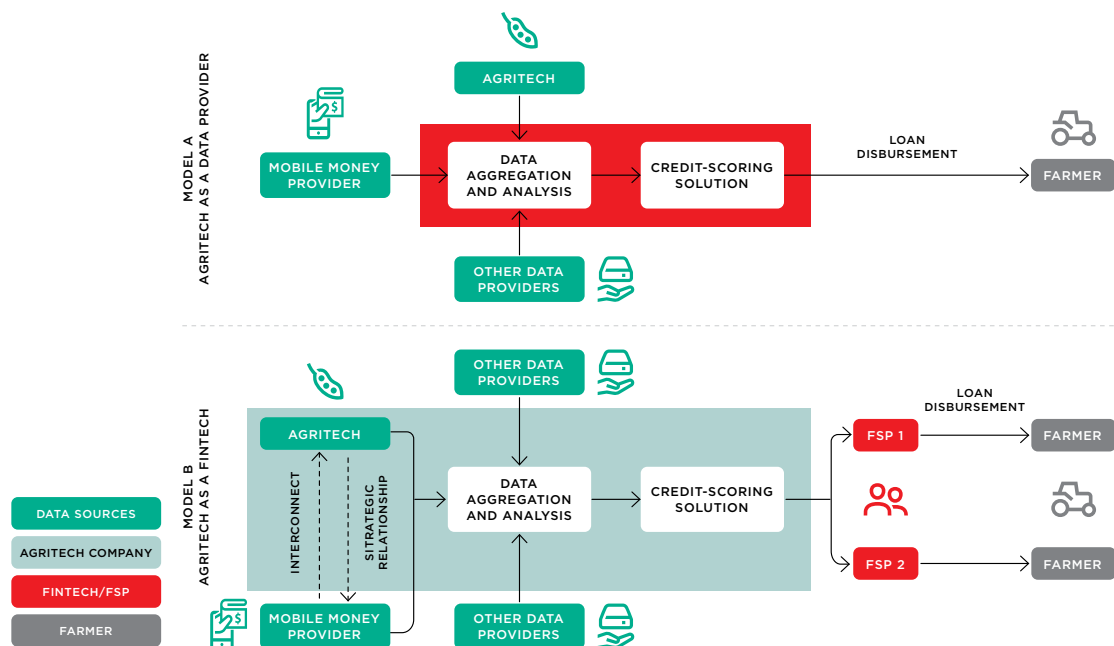
Among the main challenges faced by A de Agro in developing its business model, physically reaching the farmers to onboard them on the platform has been one of the main bottlenecks, together with building their trust in the service more generally. The company employs a network of field agents who are charged with reaching the farmers in their places of work and living, explaining the advantages that can be derived from obtaining loans through A de Agro, thereby establishing over time a provider/client relationship with them. Building this face-to-face relationship with the farmers is essential to ensure that they will feel comfortable later on interacting with the company via mobile channels. A de Agro has stressed that this physical agent network is critical for the uptake of the service, as well as word-of-mouth, i.e. existing customers recommending the service to their peers in the area.

In terms of plans for future expansion, A de Agro's objective is to become a **fully-fledged intermediary** of digital financial services for small-scale agriculture in Brazil, moving beyond credit provision to insurance and eventually to other financial services. In the frame of insurance provision, A de Agro's role would become similar to that of Pula (described in Section 5.1), i.e. an enabler of digital insurance services that employs its extensive data analysis capabilities to allow private insurance companies to successfully foray into the small-scale agriculture sector.

The case of A de Agro is a good example of how a fintech company can reap considerable profits in agricultural financial markets by "selling" its remote sensing and artificial intelligence capabilities to the traditional financial sector. This allows commercial banks and MFIs to obtain **granular data on small-scale agricultural clients** that can be fed into their credit appraisal systems, thus lowering portfolio risk to a point where targeting this financially underserved clientele segment – with a tailored offer of services – becomes a feasible and profitable proposition. Nevertheless, a core issue in this scenario lies with farmers' privacy, i.e. ensuring that potential clients understand the implications derived from agreeing to their personal data being used by financial institutions and fintech to develop and refine their credit scoring capabilities – as well as their overall credit offer for small-scale agriculture. While A de Agro has shown an extremely responsible approach to this issue, both due to its institutional approach and the Brazilian regulatory framework on clients' privacy, the recent surge of new start-ups employing big data and smart credit risk assessment systems in developing and emerging countries implies a considerable risk associated to these types of innovations moving forward, which in turn poses a challenge for local policymakers.

It is also worth emphasizing that A de Agro's example illustrates well the transition of a company's core business model from being only a provider of remote sensing data for FIs to actually using its data to carry out the credit scoring in-house. This links to recent research work by the GSMA (Loukos, 2020), which has identified two core models of collaboration between Agritech (agricultural technology) companies with traditional FIs, in the frame of using big data to refine credit scoring mechanisms in agriculture (see Figure 4). In the first model, the Agritech company acts as a data provider for the traditional FI, which uses it **as one of various data sources** that provide the information fed into the FI's credit screening systems. This was A de Agro's original business line, prior to 2021. In the second model, the company gathers and analyses the data by itself, completing the credit scoring process in-house and selling the resulting analysis to various financial service providers.

**FIGURE 5.** Two models of collaboration between Agritech companies and formal financial service providers



Source: Loukos, P. 2020. *Digital credit scoring for farmers: Opportunities for agritech companies in Myanmar*. London, GSMA. [https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2020/02/Digital\\_credit\\_scoring\\_for\\_farmers\\_Opportunities\\_for\\_agritech\\_companies\\_in\\_Myanmar.pdf](https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2020/02/Digital_credit_scoring_for_farmers_Opportunities_for_agritech_companies_in_Myanmar.pdf)

### 3.3 Ricult: fostering agricultural financing through machine learning

Ricult is a data analytics company based in the United States of America, founded in 2016 by two graduates from the Massachusetts Institute of Technology (MIT), which has evolved into an end-to-end platform that enables small-scale farmers in Thailand and Pakistan to access a combination of customized credit and inputs, together with agronomic advice and access to new market channels. The company relies on a combination of machine learning, artificial intelligence and satellite technology **to bridge the information gap** that keeps the formal financial sector disengaged from small- and medium-scale agricultural actors, leveraging a combination of data originating from different sources to improve the precision and prediction accuracy of its services.

**FIGURE 6.** Four data sources used by Ricult to refine its loan approval decisions



Source: USAID. 2018. *Digital farmer profiles: Reimagining smallholder agriculture*. Washington, DC. [https://www.usaid.gov/sites/default/files/2022-05/Data\\_Driven\\_Agriculture\\_Farmer\\_Profile.pdf](https://www.usaid.gov/sites/default/files/2022-05/Data_Driven_Agriculture_Farmer_Profile.pdf)

In Ricult's model for agricultural credit provision, a network of partner FIs provide the capital required for the loans, while Ricult's **proprietary credit risk scoring algorithm** allows for highly accurate loan application decisions, minimizing the rates of loan application rejection and loan default associated with the partner FIs' agricultural portfolios. At the beginning of the loan application process, the prospective client farmer meets a Ricult field agent and provides his/her ID information (which is then matched with information in national databases). Following that, the agent carries out a psychometric assessment of the potential client, with the help of a software on his/her tablet. This assessment is based on a range of psychometric variables developed by Ricult on the basis of cognitive analytics.<sup>17</sup> The result of the psychometric assessment determines a farmer's "willingness to pay" score, which gives Ricult an idea of the farmer's actual inclination towards repaying the loan. Together with the "willingness to pay" score, Ricult also assesses the farmer's "ability to pay", which is a more traditional assessment of the farmer's repayment ability that is in line with conventional credit risk analysis. The combined results of these two scores provide Ricult with an accurate estimation of the likelihood that the farmer will repay the loan.

To carry out these assessments, Ricult leverages four sources of complementary data:

- 1) **expected crop revenue:** a projection of expected harvest revenue at farm level;
- 2) **reputational profiling:** this profile is built by interviewing the applicant farmer's neighbours and peers in the vicinity, and asking them to rate the applicant's trustworthiness. The results of this exercise are used as a complementary data source to calculate a farmer's willingness to pay score;
- 3) **soil fertility:** assessed on the basis of satellite data; and
- 4) **social collateral:** this applies to group-based loans specifically, in the frame of which the peer pressure that is created among the various borrowers in the group acts as an additional incentive towards having everyone collaborate in repaying the loan.

**FIGURE 7.** Snapshot of Ricult's satellite imagery data



Source: USAID. 2018. Digital farmer profiles: Reimagining smallholder agriculture. Washington, DC. [https://www.usaid.gov/sites/default/files/2022-05/Data\\_Driven\\_Agriculture\\_Farmer\\_Profile.pdf](https://www.usaid.gov/sites/default/files/2022-05/Data_Driven_Agriculture_Farmer_Profile.pdf)

<sup>17</sup> Examples of questions that could be asked as part of this assessment include: "How do you normally spend your income after harvest?", "Do you usually pay your utility bills on time?" and "How do you normally spend your free time?"



Ricult plays the role of **intermediary and enabler** between the network of formal FIs and the farmers, using its data analytics capacity to enhance the profitability and success of FIs' agricultural credit portfolios, while allowing financially underserved farmers to access formal credit at terms that are considerably better tailored to their own individual situation (in terms of repayment flexibility, interest rates, duration, and so on). Ricult facilitates both individual and group-based loans for farmers, preferring to directly provide inputs on credit rather than cash to farmers, as it lowers the risk of the loan being used for non-farm related purposes (WIPO, 2020; Joiner and Okeleke, 2019).

Aside from credit provision, Ricult purchases quality inputs in bulk – at negotiated terms – from both international and local input suppliers, to ensure that its client farmers are able to receive the most appropriate combination of inputs for their crops. The farmers can download a free app on their phones, the **Ricult Farmer app**, to access the services. Afterwards, they can upload a map of their farm, as well as its GPS location, which Ricult uses to obtain satellite imagery for the area in question. The Farmer app provides a range of services to the farmer: weather forecasts (daily, weekly and monthly); **satellite imagery of the farm** (both standard photos and NDVI), which the farmers can use to identify issues with their crops;<sup>18</sup> record keeping; and agronomic advice. In regard to this last service, the Ricult algorithm – using the same data sources as for the credit application process (i.e. satellite data, agronomic data, farmer profiles) – suggests **an optimal combination of inputs** that is the most appropriate for the local conditions of the farm, and can be effective in improving crop productivity. If the farmer decides to purchase these inputs (either through personal funds or a Ricult loan), they are delivered on the farmer's doorstep by Ricult within 24 hours. Overall, the combination of these services is extremely useful for the farmers **to identify and tackle potential issues with their crops** well before they become visible to the naked eye, as well as plan for harvests in a more scientific and accurate manner.

The company follows the farmer throughout the agricultural cycle, providing **tailored agricultural advice** through the app, based on local conditions at farm level. There is also a **market access service** that Ricult provides to its clients: through the data it gathers, the company knows when a farmer is ready to harvest, using this information to facilitate a more advantageous sale of the crops directly to a network of processors and wholesalers, without a need for traders/intermediaries. The Ricult Farmer app also facilitates mobile money payments between farmers and buyers; the farmers are paid within 48 hours from the sale of their produce, following the verification of the sale – a notable improvement in a context where late payments from wholesalers and aggregators are a common occurrence (USAID, 2018).

As can be inferred from the above, Ricult makes use of a wide combination of different data sources to offer its services, including psychometric data, satellite imagery, interviews with peers, as well as banks and input suppliers' data. It is interesting to note that **the majority of the data that Ricult employs is gathered remotely**, without a need to interview the farmers directly or receive information from them. As explained by USAID (2018, p.3): “most of the data Ricult needs to develop farmer profiles can be collected remotely through APIs<sup>19</sup> that connect Ricult with other information databases. Ricult wants to know as much about the farmer and his or her needs as possible, before asking unnecessary questions”.<sup>20</sup>

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<sup>18</sup> The Normalised Difference Vegetation Index (NDVI) is a graphic indicator that measures the “greenness” of vegetation over a particular area, as it appears in a satellite image, based on the concept that plants reflect red and infra-red light differently, depending on whether they're healthy or decaying. In this manner, it is possible to obtain an indication of vegetation density and health over a particular area.

<sup>20</sup> Application programming interfaces (APIs) are, simply put, a set of functions and procedures that allow different, unrelated applications to share information.

<sup>20</sup> In this sense, it should be noted that Ricult complies with all measures related to clients' data privacy and protection that the Government of Thailand has imposed, since mid-2022, on the basis of the Personal Data Protection Act BE 2562.



One defining feature of the machine learning approach employed by Ricult is that the company's proprietary algorithms are able to “learn” from their past predictions and results, adapting and improving over time, and thus **strengthening the predictive accuracy and the precision** of the services they offer (e.g. not only credit scoring, but also the selection of input combinations and agricultural advice). An example of this is the algorithm that predicts the farmers' willingness to pay, based on psychometric variables, which have become increasingly more precise over the years by taking into consideration prior predictions and results. As a result, Ricult has gradually managed to lower both the loan rejections rate and the default rate associated to the agricultural portfolios that use its credit scoring model, relying on machine learning to improve the precision of its predictions. As illustrated by an USAID (2018, p.5) assessment carried out two years after the start of Ricult's operations:

during the first lending season, Ricult rejected 97 percent of its applicants and experienced moderate defaults. The algorithm used these outcomes as input for the next lending season, resulting in fewer rejections (91 percent) and near zero defaults. In time, this advanced and real-time use of results from more lending cycles will undoubtedly continue to improve the lending process.

Since that statement was made, the rejection rate of Ricult's portfolio has been steadily declining and over the years, thanks to the continuous improvement and retrofitting of its credit scoring model.

One of the main challenges that Ricult has encountered in expanding its business model has been **adapting to new crops and their markets**, i.e. updating and refining their algorithms and services on the basis of the specific agricultural cycles, farmers' needs and value chain dynamics, that characterize different crops and the contexts in which they are grown. In short, adapting to a new crop requires considerable investment and effort on the part of the company, especially with crops

that have longer agricultural cycles, and – as a consequence – more complex cash flow needs on the part of the farmers that plant them. While the company has begun its operations in 2016 by working with maize and rice, which have shorter agricultural cycles, it has since expanded to crops whose cycles are considerably longer: sugarcane and cassava. In relation to this, Ricult also insisted that it was facing a challenge in adapting its psychometric assessment model to the different client segments it works with, as it has to properly take into consideration the socioeconomic differences registered in the two contexts where the company is active (i.e. Thailand and Pakistan), as well as the **different sociocultural profiles** of subsegments of farmers growing different crops.

As of 2022, the company was servicing a **customer base of more than 587 000 farmers** in Thailand and Pakistan, basing its analyses on satellite data encompassing more than 5 million acres of land. Its credit scoring services have enabled its client base of farmers to access more than USD 500 000 in loans, provided by formal FIs. Through an impact assessment carried out by Ricult in 2019, the company found that its services had improved the average farm productivity of its clients by 22 percent and average profits by 17 percent. The company ensures its sustainability through **a variety of income sources**: commissions on the loans successfully repaid to partner FIs; commissions on farmer inputs sold through the platform; fees paid by crop buyers who use Ricult's platform; ads placed on the app; sale of aggregated client data to commercial banks and large agribusiness firms; as well as capital from investment funds which is used to develop and fine-tune Ricult's model.

As far as Ricult's **plans for future expansion** are concerned, it must be noted that in 2021 the company managed to raise a total of USD 6 million in funding from different impact investors from Japan and Switzerland, which will be used to expand its presence on the Thai markets and those of Pakistan. Ricult has also recently begun to make inroads into the Vietnamese market, providing its services to one of the largest sugarcane mills in the country.









## 4. Multiservice platforms targetting rural and agricultural clients

The fintech companies analysed in this section have evolved over time to provide an ample combination of both financial and non-financial services to their clients. As they straddle multiple use categories, it is challenging to pinpoint one single type of fintech innovation that acts as the foundation upon which these companies have built their business model.<sup>21</sup> It might be argued, in fact, that the provision of a large bundle of financial and non-financial services represents the core business line of such companies, as **the synergies that are generated between the different services offered** provide substantial benefits to the company in terms of greater flows of data generated on every client, a constant refining of each service's efficiency, and considerable cost savings. Furthermore, as will be discussed in more detail in the DigiFarm study, there are considerable synergies that can be generated by combining the provision of different services through one single aggregating platform, such as when offering a credit/insurance bundle. Clients, for their part, gain the considerable convenience of accessing a multitude of services through one single digital platform which acts as a one-stop shop capable of meeting their varied business-related demands, and they can benefit from substantial savings in terms of both the time and resources required to meet these necessities.

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<sup>21</sup> This point is extremely important, as it can be argued that most of the fintech companies illustrated in the previous sections also provide more than one service as part of their model. What distinguishes the companies presented in this section, however, is that no single service can be said to be the "core" business line of the company in question, while the other services act as complements to the main offer. The concept of a comprehensive, multi service offer stands at the core of the innovation category described in this section, with the synergies and cost efficiencies created by the different services acting as fundamental enabling factors for the profitability and sustainability of the business models analysed here.

From the perspective of small-scale farmers, multiservice platforms allow them to fulfil at the same time several different business-related needs that they commonly face, obtaining access to: new market channels; financing; quality inputs; insurance; agronomic advice, and much more. The ability to tackle these various needs at the same time is a crucial advantage offered by these platforms, as the different constraints farmers face in their business **are usually interrelated** and tend to amplify each other. For example, farmers who cannot prove to a formal FI that they have a contractualized linkage with a recognized market buyer (e.g. a processor or wholesaler) may see their chances of obtaining a loan reduced. Without such loan, they may be unable to purchase higher quality inputs, which could result in a higher quality harvest and a better chance of finding a stable market channel to sell it. This is just one example of the many ways in which these various access-related constraints can feed into each other and exacerbate the challenges faced by small-scale farmers in developing contexts. By tackling simultaneously these different pain points, multiservice platforms can help farmers to unlock considerable opportunities for business growth and expansion, resulting in notable, positive impacts in a range of both enterprise- and livelihood-related indicators. Furthermore, there's a considerable benefit for farmers in terms of **convenience**, as being able to access a variety of services that are crucial for their business through one single platform can save a lot of time and resources.

Despite these advantages, it must be noted that one of the most critical issues associated with the increasing popularity of these platforms is that of **data privacy and data protection**. The business models of these platforms depend on the sharing of large quantities and different types of data on individual clients across various services and service providers, which are used to strengthen and refine these services' precision and effectiveness. This raises a series of key questions for regulators:

- How to ensure that the data acquired will not be shared (or sold) outside of the service network, for commercial purposes (or otherwise) that the customers hadn't agreed to in the first place?
- How to guarantee that only the most essential data required to enable service provision will be collected?
- How to ensure that customers properly understand the direct and indirect consequences of agreeing to sharing their data? (This is particularly important when considering that these platforms seek to work with large segments of the rural population that might not have the financial education or the awareness required to understand the implications associated with freely sharing their data with service providers).

There is a pressing need for sophisticated policy reforms that can ensure **the protection of digital financial consumers**, while also setting sensible limits to the leeway so far given to financial providers and data aggregators in terms of the collection, sharing and use of consumers' data. There will also be a need for large-scale awareness-raising campaigns aimed at sensibilizing all individuals (and especially the most financially marginalized ones) as to the risks, responsibilities and benefits associated with sharing their personal data. It should be noted that these types of policies represent a pressing need necessity for most countries, nowadays, **regardless of their level of economic development**.

Another important aspect to consider when analysing these types of platforms relates to issues of **fair competition and possible monopolies**. When multi-service platforms begin to grow substantially in the market for financial and non-financial services directed at small-scale agricultural actors, there is a risk that smallholders' extreme dependency on such platforms will result in a crowding out of other, alternative service providers that are not part of this system. As

multiservice platforms rely on the complementary, organic action of different service providers, there is no space in this model for external agents that do not coordinate with the platform's participants. This is particularly relevant in many developing countries, where the range of options available to a smallholder in terms of service providers can be quite limited, and once a multiservice platform has established itself, it can be hard for other companies to find and build the necessary market space to become effective competitors.

Nevertheless, it must be noted that this risk is merely theoretical at this stage in most developing and emerging countries. In these countries' agricultural sectors, at present there is still **considerable space for agri-focused fintech solutions to grow and evolve**, with plenty of room for different platforms to coexist and compete on fair ground. DigiFarm and Apollo Agriculture, both multiservice platforms currently active in Kenya and discussed in this section, are a good example of this: smallholders' demand for services in the country – such as the ones these companies offer – is vast, and nowhere close to be fulfilled in the current scenario. Of the examples presented in this section, only MYbank in China can be said to present a risk of becoming an unfair monopoly, and – as will be seen in the next section – the regulator has cracked down hard on the company in 2021 to discourage this eventuality.

#### 4.1 MYbank: An ecosystem of services providing granular data on clients

According to China's State Administration for Market Regulation, as of 2018 there were 73 million micro-, small- and medium-scale enterprises (MSMEs) in China, accounting for 60 percent of the country's GDP, half of its tax revenue, and 80 percent of employment. Only 14 percent of these enterprises, however, had access to loans or a line of credit (BusinessWire, 2019). These low levels of financial access can be explained by the traditional set of constraints affecting MSMEs (especially in rural areas), such as the lack of conventional collateral, high costs for obtaining loans, insufficient loan sizes and complex application processes.

The experience of MYbank, a fully digital bank that was created in 2015 by the Ant Group,<sup>22</sup> shows that the rising levels of digital penetration in China's rural areas, the leveraging of "big data", and the automation of the credit approval and provision processes, have made it possible to overcome several of the traditional barriers to financing rural enterprises, including customers' fragmentation, scarce collateral, and a lack of granular knowledge on customers' financial behaviour and creditworthiness. MYbank's experience has showcased a new, groundbreaking approach towards digital financial services provision for small enterprises in rural areas, which has shown enormous potential as well as presenting its own unique set of risks and challenges.

As a completely digital bank, MYbank resides entirely on the cloud and does not manage any physical branches, offering its services only online and via mobile. The key to its strategy for managing credit risk is its ability to track and analyse a vast amount of data related to its rural MSME clients (and all the other actors that these clients interact with), **which is generated by the ecosystem of different digital services** that belong to the Ant Group.

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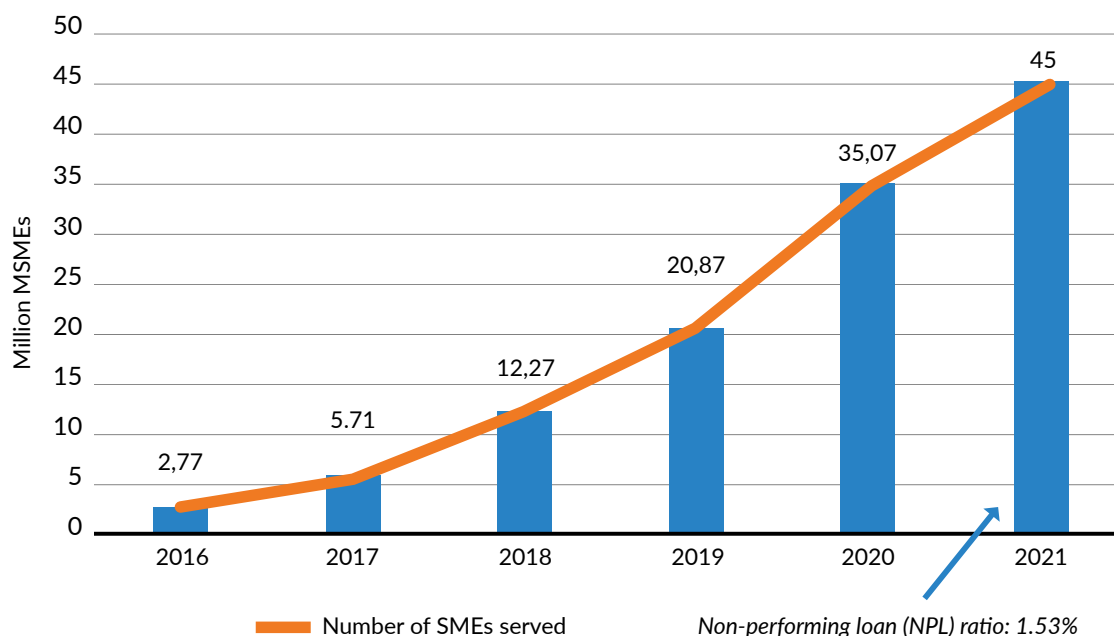
<sup>22</sup> Ant Group is the world's largest fintech company, affiliated to the AliBaba Group of e-services. It provides its client base of 870 million people with a host of digital financial services, which include online lending, e-insurance, mobile wallets, fund management, financial risk management, infrastructure-as-a-service (IaaS), payment processing, among others. It manages Alipay, the world's largest mobile and online payments platform, as well as Yu'e Bao, the world's largest money-market fund.

How does this work? The small business owners that are clients of MYbank make use of a combination of several different e-services through their phones and computers, as part of their daily activities: for example, they use Alipay to transfer their funds and store them in a mobile wallet, as well as the online market platform Taobao to sell their products. The triangulation of the various sources of data generated on clients' financial behaviour allows MYbank to make very precise and insightful predictions on their capability to repay MYbank's loans, by leveraging proprietary AI and risk management technologies.

MYbank uses an automatized, AI-powered credit scoring system (the "Zhima credit evaluation system") to analyse the massive amount of information it has on every loan applicant. The use of big data – and the very precise client evaluation process it enables – allows MYbank to eschew the need to ask for conventional collateral of its clients, thus making such loans considerably more affordable and helping to provide credit to rural clients who previously had no chance of receiving it.

MSME owners can submit a loan application to MYbank entirely online. As of 2019, the average loan amount provided by MYbank was USD 1 100, while 45 percent of its loans were under USD 700. In terms of the timing for loan approval, MYbank follows the "3-1-0 model": 3 minutes to apply from a mobile phone, 1 second to approve, and 0 seconds of human intervention. Although loan purposes can be quite varied, MYbank mainly provides credit to satisfy working capital and short-term investment needs for agricultural activities (BusinessWire, 2019).

**FIGURE 8.** Growth in the number of MSMEs served by MYbank (in millions)



Source: Adapted from BusinessWire. 2021. MYbank aims to bring Inclusive financial services to 2,000 rural counties by 2025. BusinessWire, 30 April 2021. [Cited 30 November 2022]. <https://www.businesswire.com/news/home/20210430005190/en/MYbank-Aims-to-Bring-Inclusive-Financial-Services-to-2000-Rural-Counties-By-2025>



As can be seen in Figure 8, as of 2021 MYbank had provided loans to more than 45 million MSMEs across 750 counties of China,<sup>23</sup> with competitive interest rates (ranging from 6 to 16 percent annually), that are substantially lower than those offered by brick-and-mortar branches in China (which range from 20 to 40 percent). More than 80 percent of MYbank's MSME clients in 2021 **were first-time borrowers**, which showcases the importance of MYbank's work for the financial inclusion of marginalized individuals. Moreover, roughly half of all enterprises financed by MYbank had less than five employees, and a similar share consisted of small family-owned businesses. The non-performing loan (NPL) ratio of MYbank's lending to small businesses has been considerably lower (around 1.53 percent in 2021), which is a testament to the effectiveness of the bank's screening system, especially when considering that the NPL ratio for SMEs in China stood at an average of 2.9 percent as of June 2020, according to public data. The kind of unsecured lending that MYbank provides to small rural enterprises can also be very profitable, considering the higher amount of risk involved: the bank's net interest margin is 3 to 5 percent, which is considerably higher than that of China's biggest commercial banks<sup>24</sup> (BusinessWire, 2022 and 2021).

As reported by the IFC (2020), MYbank's credit scoring approach **favours women-led MSMEs to a particular degree**, as these entrepreneurs carry lower levels of credit risk than men according to MYbank's data on its platform users (an average of 33 percent lower credit risk). As of 2020, MYbank had provided credit to more than 8.2 million MSMEs owned by women, for an average loan amount of USD 5 700 and a total amount of USD 46.7 billion in loans. Roughly half of MYbank's borrowers are women. To promote the upskilling of its women clients, MYbank also launched the "Mulan Community" in 2020, a digital platform for women entrepreneurs that provides three main services: a hotline for business advice; a virtual "Mulan University" with more than 100 courses on various aspects of finance and tech; and a digital chatroom to exchange business ideas (Ant Group, 2020).

MYbank's approach to rural lending also carries its own sets of challenges and risks. The first, and most important, has to do with **data privacy**. MYbank's model is effective because it is able to leverage massive amounts of data on a wide variety of aspects of the loan applicant's professional and personal life. The **bank's structure**, completely "on the cloud", also implies some constraints. Given that it does not have any physical branches to accept its clients' deposits, MYbank has to rely on borrowed funds from other lenders on the interbank market, which are substantially more expensive compared to normal deposits. In fact, 60 percent of MYbank's total liabilities are due to interbank funding. Nevertheless, this hasn't stopped the bank from developing a cheap and highly competitive digital offer of credit, thanks to its big data approach and informational advantages.

It has to be said that MYbank's model is **hardly replicable** at the moment in the majority of developing and emerging contexts around the world, given the wide combination of enabling factors in the Chinese context that allow its strategy to be successful (such as high levels of digital penetration, a constellation of e-services belonging to the same group, still evolving regulation, just to name a few). Nevertheless, it is interesting to analyse this case as an example of what the future could hold in terms of innovative solutions to overcome the traditional financing gap

<sup>23</sup> Although data on total loan amount provided by MYbank in 2021 is not available, as of mid-2019 the bank had provided a total of USD 290 billion in credit to 15 million MSMEs (BusinessWire, 2019).

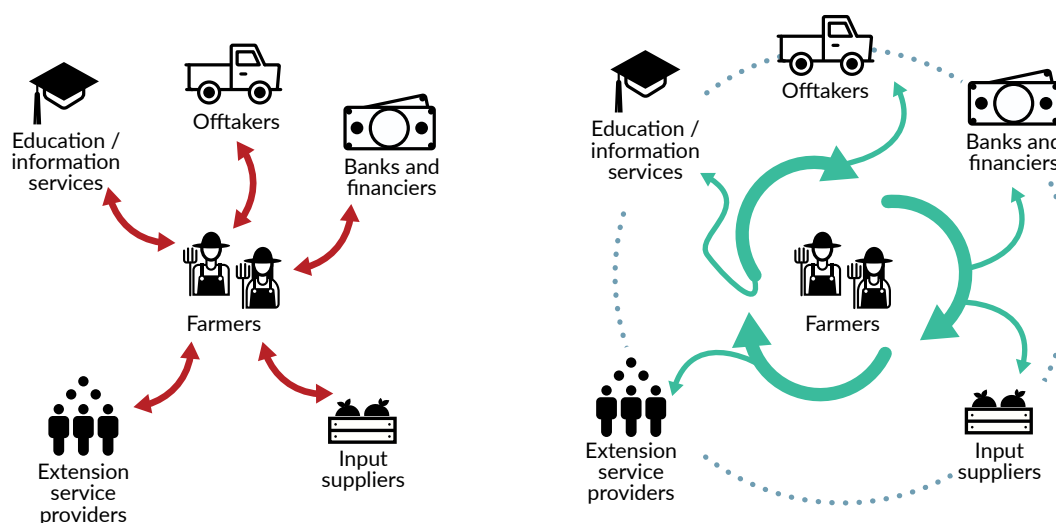
<sup>24</sup> Despite these excellent results, it must be noted that MYbank has recently run afoul of the national financial regulator: in February 2022, the bank was fined for USD 3.52 million by the Hangzhou branch of the Chinese Central Bank for breaching regulations on credit scoring management, failing to follow KYC regulations, and not reporting suspicious transactions adequately.

affecting small enterprises in rural areas, provided that adequate regulatory, political and financial oversight is developed around these new, groundbreaking models for financial provision.

## 4.2 DigiFarm: A one-stop shop for financial and non-financial services in agriculture

As demonstrated by Mercy Corps (2019a), emerging experience is repeatedly showing that the most effective digital innovations for agripreneurs are those **that bundle financial and non-financial services together on a dedicated platform**, acting as one-stop shops for agriculture-related services in the digital market, with a view to increasing impact and scale. As can be inferred from Figure 9, in a conventional farming ecosystem agri-entrepreneurs have to engage with service providers on their own through multiple contacts and intermediaries - an approach that can be quite costly and inefficient. A digital platform can bring together multiple providers into one synergic relationship with the farmer, improving efficiency and reducing costs through aggregation and cross-subsidization (Benni, Berno and Cungu, 2022). The case of DigiFarm in Kenya is a good example of a successful application of such a model.

**FIGURE 9.** Traditional ecosystem vs platform-based ecosystem to provide digital services to agri-entrepreneurs



Source: Adapted from Mercy Corps. 2019. *AFA case study: Digital pathways for youth in agriculture*. Portland, USA. [https://mercycorpsagrifin.org/wp-content/uploads/2018/12/230118\\_afa-youth-final-vF-compressed.pdf](https://mercycorpsagrifin.org/wp-content/uploads/2018/12/230118_afa-youth-final-vF-compressed.pdf)

DigiFarm is an integrated mobile platform launched in early 2017 by Kenya's largest MMO, Safaricom, in collaboration with **Mercy Corps' Agrifin Accelerate** programme. Its goal is to leverage technology to enable small-scale agripreneurs to become wealthier in a commercially sustainable way, by tackling in a holistic manner a range of barriers (including access to finance) that limit their productivity and profitability. The mobile platform acts as a **one-stop shop** to provide farmers with a number of services, including direct input purchase (e.g. seeds, fertilizers, agro-chemicals), input credit, harvest cash loans, crop insurance, business training, access to soil testing, customized

information on agricultural best practices, and linkages to market channels. This last service was introduced in early 2018 as a “digital marketplace” (DigiSoko) for registered farmers, connecting them with a range of major processors and wholesale buyers.

The platform can be accessed through a **basic mobile handset**, as it does not require an app installed on a smartphone to be used (in fact, only 22 percent of DigiFarm customers owned a smartphone as of 2020). The platform can be accessed by dialing a specific USSD number.<sup>25</sup> From there, a menu opens that presents a range of services and options. All payments made on the DigiFarm platform rely on the M-Pesa mobile money system. Aside from remote interactions, a network of 1 500 ground-level agents called **DigiFarm Village Advisors (DVAs)** is tasked with assisting prospective and current clients in registering to the platform and learning how to use it, as well as supporting them with making best use of the variety of services offered on the platform. What is more, the agents also coordinate input distribution among the contracted farmers. The DVA network was rolled out in 2018, in collaboration with the Kenya Livestock Producer Associations (KLPA) (Busara, 2021a).

**FIGURE 10.** DigiFarms’ network of services



Source: Adapted from Shrader, L. 2021. Agrifin brief: DigiFarm presentation [slide presentation]. <https://www.giz.de/expertise/downloads/AgriFin%20DigiFarm.pdf>

As can be seen in from Figure 10, DigiFarm’s model is centred on a **network of partners** responsible for providing its wide range of services, which have kept expanding over the years as the platform adds more functionalities:

<sup>25</sup> Please refer to Section 1.3 for an explanation of what USSD technology consists of.

- **Training and education:** different interactive services provide DigiFarm users with a range of learning materials on a variety of agri-related topics. **Arifu** is a personalized learning platform that provides agronomic advice and financial skills training to farmers via interactive SMSs. **ICow** is a similar application focused on dairy farmers. **IShamba** is a call center of agricultural experts to which farmers can send SMSs with any agri-related question they might have, or call in to ask for assistance. It also sends weather information via SMS, as well as alerts on farming-related events such as shows and trainings.
- **Input purchase:** the agricultural supply chain platform **iProcure** enables this component, which allows farmers to purchase high-quality, certified inputs from a network of 26 trusted suppliers at an affordable price.
- **Input credit:** DigiFarm offers this service to its customers through a range of partner FIs that provide the funding for the loans, such as Stanbic Bank and Equity Bank. An agricultural data analytics company called **FarmDrive** collects and aggregates the constant stream of data generated by the clients' use of the platform's services to build a reliable credit score for potential loans, as well as the mobile transactions data provided by Safaricom. The amount of agri-related data generated on each user by the combination of the platform's services allows DigiFarm to refine its credit scoring capacities and provide loans at competitive rates, while reducing default rates. The credit is provided in the form of a code that allows to purchase inputs directly on the platform (and only from it). A 20 percent deposit is required to access input credit on the platform.
- **Access to market:** market linkages are provided through DigiFarm's digital marketplace (DigiSoko), as well as other partners such as UNGA Group Ltd., East African Breweries, Capwell Industries, which are agricultural holding companies focused on the manufacture and distribution of various consumer goods.
- **Insurance:** this product is provided by two private insurers that have partnered with DigiFarm: **Pula** and **ACRE Africa** (see Section 5 for a more in-depth analysis of these companies). The insurance product is bundled with the input loan also provided by DigiFarm. Nevertheless, it must be underlined that this particular product so far has so far been characterized by a low uptake rate among farmers, with less than 12 percent of farmers on the platform having used the service, according to a 2021 evaluation. Lack of knowledge of the product was emphasized as being a main constraint to uptake (Busara, 2021b).
- **Soil testing:** this service was added in 2020 through a partnership with **AgroCares**, an Agritech company based in the Kingdom of the Netherlands. DigiFarm's **SoilCare Adviser** is an app that allows to generate soil testing reports rapidly, providing information on soil status, suitable crop type, and advice on which fertilizer to employ. The testing is done by using dedicated scanners that are made available to farmers through the DVAs.

According to a recent evaluation by the Busara Center for Behavioral Economics, input credit and the Arifu learning service were the **two most popular services** on the platform as of 2021. As pointed out by Busara (2021b, p.22):

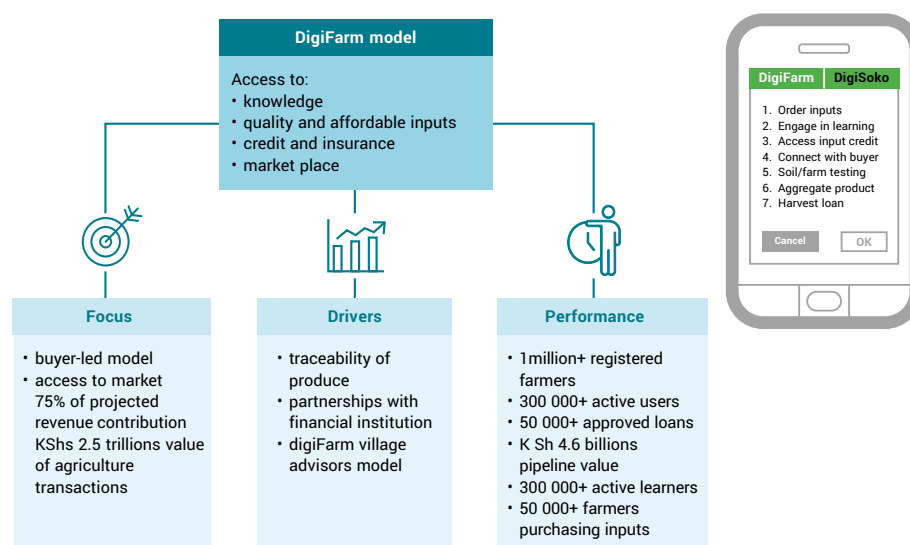
Services that address the users' urgent needs or daily needs are more likely to attract users and retain them such as inputs and input credit during planting season. The flexible and convenient learning experience with Arifu is highly valued. Farmers suggested including in-person contact to facilitate the learning process, such as calls to experts and in-person training for farmers with limited literacy.

As can be seen from Figure 10, as of 2019 the DigiFarm platform had registered over 1 million farmers, with more than 300 000 of them being regular users. In the same year, the average age of DigiFarm customers and 39 years, with 38 percent of them were women. Approximately



60 000 input loans had been approved through DigiFarm with a repayment rate of approximately 90 percent, for a pipeline value of K Sh 4.6 billion (USD 42 million). As borrowers keep coming back to obtain more loans and strengthen their credit histories, DigiFarm has been working to increase the individual loan amounts up to K Sh 28 000 (USD 254). As of 2020, the platform hosted more than 310 000 active learners engaged with its partner educational services, while more than 50 000 farmers had purchased inputs through the platform (Dalberg and Busara, 2021; Mercy Corps, 2019b).

**FIGURE 11.** DigiFarm's strategic model and a sample interface of its mobile platform



Source: Mercy Corps. 2019. *ACRE Africa farmer insights – Kenya*. Portland, USA. <https://acreafrica.com/wp-content/uploads/2021/01/60dB-ACRE.pdf> and Busara. 2021. *DigiFarm panel study – Aggregate report*. Nairobi, Busara Center for Behavioral Economics. [https://www.mercycorpsagrifin.org/wp-content/uploads/2021/05/DigiFarm-Impact-Study-Panel\\_Aggregated-Report-1.pdf](https://www.mercycorpsagrifin.org/wp-content/uploads/2021/05/DigiFarm-Impact-Study-Panel_Aggregated-Report-1.pdf)

In terms of the positive results generated by DigiFarm for its end clients, the following insights can be mentioned, drawn from a 2021 survey carried out by the Busara Center for Behavioral Economics (Busara, 2021b).

- Approximately 90 percent of users agreed that DigiFarm had strengthened their capacity by providing them with better farming knowledge and information.
- Approximately 80 percent of users agreed that DigiFarm had made them better prepared to deal with external shocks and risks.
- Almost all users agreed that their levels of income and farm production had improved thanks to DigiFarm.

Aside from these positive results, it must also be mentioned that DigiFarm has a strong focus on **women as a critical client segment**. As illustrated by a recent gender impact study carried out by Dalberg and the Busara Center for Behavioral Economics, although only 36 percent of farmers registered on the platform were women as of 2020, the gender gap in the active use of DigiFarm's services is considerably narrower, and has been moving towards parity over time. Input credit was only slightly more used by men (52 percent of total loans), and average loan amounts were similar

for both genders. The access to markets service was actually used more by women than men, with a 6 percent difference in favour of women (Dalberg and Busara, 2021).

The same impact study shows that DigiFarm has had **several positive effects** on its women clients: an increase in yields and farm productivity, especially thanks to better access to inputs and input credit; an increase in income and generation of additional income streams; better education on good agricultural practices and effective use of inputs; increased financial decision-making power and control over own finances; better capacity to hire extra labour and save time for other activities; a boost in self-esteem and confidence thanks to their entrepreneurial success; and better food security and nutrition.

Despite these promising results, the same study also underlines that DigiFarm still has to deal with a wide set of barriers when it comes to **reaching female clients adequately and effectively**, in terms of delivering the product to their places of work and living, as well as ensuring a smooth registration and utilization process:

- **Limited mobility and time constraints**, due to household responsibilities, which limit women's opportunities to be exposed to DigiFarm and become aware of the platform. These time and mobility constraints can also force women to sell more of their products to door-to-door traders and middlemen that are outside of the DigiFarm network, because they cannot incur the time and transportation costs associated with bringing their products to DigiFarm-linked aggregation points or offtakers (thereby missing the better prices that would be offered by the platform). Dalberg and Busara have recommended that DigiFarm should attempt to reach female clients with a more targeted awareness-raising effort, by advertising the platform's services in their usual places of congregation (e.g. markets, churches), and by being more gender-inclusive in its media outreach.



- **The sociocultural expectation** by which prospective female clients need to ask permission from either their husband (if married) or their parents (if unmarried) before registering to the platform. Furthermore, the higher, socioculturally induced risk aversion that characterizes women in some contexts, when compared to men, might lead them to consult many people to gather more information on DigiFarm before agreeing to register. All of these are factors that can slow down the adoption process considerably. One recommendation to overcome this challenge has been to engage “gatekeepers” directly, by raising awareness on the platform among husbands or parents during house visits or group meetings. This also includes providing gender-sensitivity training to DVAs that can help them navigate the onboarding process in a way that is respectful of the challenges faced by women in terms of household-related dynamics.
- **Lower levels of digital literacy**, as well as functional literacy in general. Women interviewed during the assessment stated that they faced considerable challenges in understanding how to connect to the platform on their phones. Moreover, they also stated that the language used by the platform was sometimes too technical for them to understand properly. Recommendations to overcome this barrier include adapting training materials for women on how to use the platform’s services, for example by leveraging commonly watched shows on farming to increase knowledge on DigiFarm’s functioning, or sending SMS or voice-based messages to female farmers with suggestions and reminders on what they can do with the various DigiFarm’s products.
- **Excessive reliance on DigiFarm Village Advisors.** Low levels of digital literacy and high risk aversion lead women to use mostly products and services of the DigiFarm platform that have been suggested to them by DVAs and on which they have received direct support. As such, there is little self-initiative on their part to try and use the other services provided by the platform, which limits the impact the platform can have on these clients. A recommendation to overcome this challenge has been to train DVAs so that they are more thorough in illustrating and explaining the full range of DigiFarm’s uses to female clients. This can include creating a standardized checklist to be followed when engaging new female clients, which DVAs should go through during the onboarding process.

To conclude, it must be emphasized that the DigiFarm model is an excellent example of how multi-service platforms can tackle in a **holistic manner** the multiple, compounding constraints that agripreneurs can face when seeking to kickstart and expand a business idea. Often, one or two crucial constraints (such as, for example, lack of access to quality inputs) can spell the failure of a potentially viable business which holds all the other required enabling factors to succeed. DigiFarm’s approach allows to intervene strategically to fill these specific gaps, providing regular and diversified support even in contexts marred by multiple structural and regulatory constraints that limit agri-enterprises’ growth from a variety of angles. Although such a model requires some vital enabling elements to be replicable in other contexts, chiefly a sophisticated digital financial regulatory framework (which includes financial consumer protection regulation), its undeniable results should spark the interest of policymakers and angel investors, with an eye to replicating its approach in other developing countries.

### 4.3 Apollo Agriculture: Unlocking farmers' potential through service bundles

Apollo Agriculture is a Kenyan fintech company founded in 2016, which seeks to provide farmers with a bundle of services that includes credit, input provision, advisory services and insurance. The objective of the company is to boost smallholders' production and income generation capacities, with a view to supporting their transition from subsistence-based to commercial agriculture. Farmers interface with the Apollo platform either via an app or an SMS, depending on whether they own a smartphone or a basic mobile handset.

Apollo's **credit provision process** begins with a farmer applying for a loan through his or her phone, which leads to one of Apollo's agents visiting the farm to verify the data provided in the application and geotag the farm's location. The resulting information is fed into Apollo's credit appraisal system (which employ machine-learning technology) and it is complemented with satellite imagery of the farm in question. The loan provided is normally dependent on the size of the farm. If it is approved, the farmer receives a voucher code via SMS which can be redeemed at a network of Apollo-certified agricultural input dealers disseminated across the country, which supply the farmers with a combination of quality seeds, fertilizers and pesticides tailored to the size of the farm in question.

The dealers can use the Apollo app to see which inputs have been approved for each farmer and, after the delivery has been completed, they can receive an instant payment from Apollo via the M-Pesa mobile payment network. Afterwards, the loan is repaid by the farmers once the produce has been harvested and sold (also via mobile), although Apollo also requires farmers to put down in advance a deposit of 10 percent of the total amount of the inputs they buy. Apollo encourages its clients to carry out small, regular payments after harvest to reimburse the loan, although due dates for final repayment can be adjusted without penalties if the harvest is delayed because of bad weather or other conditions (Murthy, Fernandez Vidal and Faz, 2019). The entire system is mostly automated, which helps in cutting down costs linked to onboarding new clients and servicing them, thereby strengthening the sustainability and profitability of Apollo's model.

The company can leverage a network of 5 000 agents and 1 000 retail input suppliers, to ensure an adequate outreach of its services towards its customers. The agent network is composed of a mix of commission-based field agents, tasked with carrying out on-farm assessments and acting as in-person contact points for customer relations, and call centre agents that provide remote assistance and advisory services (Pothering, 2022; Private Equity Wire, 2021).

As far as insurance is concerned, Apollo offers weather index insurance bundled with its loan and input provision services, with the objective of protecting farmers' incomes from extreme events such as drought, flooding and pests, which could impact harvest. In recent years, to make this service possible, Apollo has partnered with Pula (see Section 5.1), an Insurtech company that develops innovative insurance solutions for agriculture, and the Kenya Agriculture Insurance Group (KAIG), a network of private insurance companies. In addition, Apollo Agriculture provides capacity building via **pre-packaged audio trainings**, translated in different local languages and accessible via phone calls, on different topics: good cultivation practices; pest control; and proper credit repayment habits, among others. This type of training material was developed in recognition of the fact that Apollo's average client is 50 years old and considerably less at ease with receiving remote training via SMS.

As of late 2021, Apollo Agriculture was working with more than 70 000 small-scale maize farmers across 8 of Kenya's counties, a considerable increase from the 1 000 clients it used to have about



five years before, at the start of its operations. In particular, the platform has grown rapidly in 2020, triplicating its customer base. Six out of ten customers that registered to Apollo came through **referrals**, which shows the importance of word-of-mouth and good reputation at community level to ensure buy-in of the product. The choice of focusing on maize farmers, according to Apollo, was due to the large diffusion of this crop in Kenya, although the company has recently launched pilots involving a range of high-value crops, such as tomatoes, potatoes and onions (Pothering, 2022). In terms of impact, a recent sample survey showed that 89 percent of Apollo farmers reported some increase in productivity as a result of using Apollo's services, while 71 percent stated that their productivity had in fact "very much increased" (Triodos Investment Management, 2022).


Rather than partnering with formal financial institutions that could provide the liquidity required to sustain the lending operations, Apollo has so far opted to raise capital from international investors and lend off its own books. In early 2022, Apollo raised USD 40 million in an investment round led by SoftBank Vision Fund 2, which the company aims to use to double the number of clients it currently reaches, expand in more countries, and refine its products and technology. The company has also managed to raise USD 1 million in debt financing from the Agri-Business Capital (ABC) Fund in 2021, as well as USD 6 million in equity financing in 2020 from a group of investors led by the Anthemis Group (Njiraini, 2022).

The analysis of Apollo Agriculture's case is useful to illustrate how cost reductions and operational efficiencies achieved through automation and machine learning can lead to the creation of a sustainable, scalable model for smallholder credit, which – when bundled with a range of additional services – supports the transition of these actors from subsistence to commercial farming. The model is underpinned by the combination of a mobile-enabled, automated transaction system and the physical proximity to customers achieved by Apollo's agent network. The balance between these two components allows Apollo Agriculture to carry out business in an efficient, cost-effective manner, while ensuring that client satisfaction and trust in the system is kept high as grievances and complaints are addressed by live agents. It must be noted, however, that the very advanced state of development of Kenya's mobile money ecosystem (from a regulatory, infrastructural, sociocultural perspective) plays a critical role in ensuring the feasibility of Apollo's model. Thus, the potential for full replicability for this model in other contexts is limited, at this stage, to those developing and emerging countries where mobile money services register considerably high levels of uptake and outreach, in both urban and rural areas.









## 5. Insurtech companies focusing on small-scale farmers

The term **Insurtech** refers to the use of digital technology to develop innovative and sustainable insurance solutions. It represents a small but growing subdomain of fintech that holds critical opportunities for the field of agricultural insurance, whose effective implementation in developing countries has historically proven to be an extremely challenging endeavour, especially when it comes to covering small-scale farmers against extreme natural events, such as drought, floods, hail and hurricanes.<sup>26</sup> **A wide variety of constraints** limits the affordability and sustainability of insurance products for smallholder farmers (and agribusinesses in general), affecting both the side of the demand for insurance (i.e. the farmers themselves) and that of the supply (i.e. the insurance companies):

- The inherent **systemic risk** associated with the agricultural sector, which forces local private insurers to transfer some of the risk they shoulder onto large-scale, international reinsurance companies. This issue is coupled with the lack of market appeal that the coverage of small-scale agriculture holds for the reinsurance sector.
- The **lack of awareness and familiarity** on the part of smallholders and other agri-value chain actors on insurance as a financial instrument, which strongly limits uptake and proper use of these products. This also encompasses what is a common cognitive bias: farmers tend to be very well aware of the common risks threatening their production but, nonetheless, tend to underestimate the likelihood of an extreme natural event, and hence their need for insurance.

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<sup>26</sup> Note that a detailed analysis of the constraints and opportunities associated to the provision of climate risk insurance to smallholder farmers goes well beyond the scope of this study. For a more in-depth discussion on the topic, please refer to Benni (2021b), Raithatha and Priebe (2020), and ISF Advisors (2018).

- The **lack of granular and up-to-date information** (such as socioeconomic or behavioural data) on small-scale agricultural actors and the value chains they are active in, in rural areas of developing countries.
- The **scarce knowledge and expertise** on the part of private insurance companies of the specific dynamics that underpin agricultural production and agricultural value chains, which limits their capacity to develop agriculture-specific products.
- In many developing countries, the **absence of an enabling and sophisticated legal framework** that regulates the provision of insurance to small-scale agricultural actors.
- The **weakness of infrastructure** in rural areas of developing countries, which can encompass a wide variety of areas: the road infrastructure; the weather data-gathering infrastructure; the agricultural extension network; the physical network of insurance companies' branches; and so forth.

Due to these various constraints, **achieving scale** in agricultural insurance provision has proven to be a particularly complicated endeavour in developing contexts, especially when the core client segment for the insurance provider is composed of a multitude of small-scale actors spread over large, remote areas. As a result, it is extremely challenging to provide affordable insurance coverage to smallholders, especially in the absence of considerable external support from public agencies or donors (e.g. premium subsidies; support for covering administrative costs; public research and development of effective insurance provision models).

To partially mitigate these constraints and develop more sustainable insurance provision models, several stakeholders have experimented in recent years with business models that involve agri-insurance services being provided **through mobile channels** (whether basic cellphones or smartphones), which has been proven to be one of the most game-changing lines of innovation in the Insurtech domain. The following are some of the advantages associated with leveraging mobile technology in order to provide agri-insurance:

- It allows for the **centralization and more effective management** of the collection of data on clients' identities and activities, while substantially reducing administrative and operational costs.
- It facilitates **registration** and significantly expands distribution channels, allowing providers to reach a large population of smallholders based in remote areas that are completely disconnected from brick-and-mortar banking and insurance services.
- It significantly **reduces the time required to apply for a policy**, settle claims and communicate with clients.
- It allows for easier **bundling** of insurance with other financial and non-financial services, as they can all be channelled through the same platform. The increased flow of data on clients generated by the provision of this bundle of services allows to flexibly and improve the terms and conditions of the services themselves.
- Most importantly, in the context of disaster risk management, **the rapid provision of payouts** following an extreme natural event, facilitated by mobile technology, represents a particularly critical advantage.

Despite these advantages, it must be noted that the uptake and sustainability of digital insurance solutions remain predicated on the presence of **a strong enabling ecosystem** at national level (in terms, for example, of infrastructure, regulation, sociocultural readiness to uptake) that requires

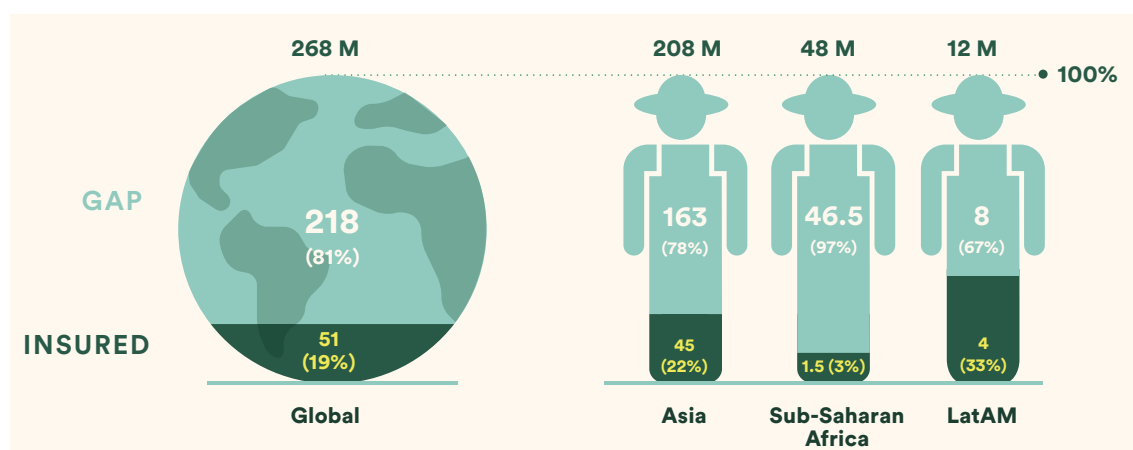


substantial public investment to be developed. This includes ensuring an appropriate balance in the levels of regulation (neither too stifling, nor too lax), adequate network coverage, sufficient levels of mobile penetration and digital literacy, financial consumer protection, an efficient mobile agent network, and several other elements.

While mobile insurance for agriculture is still a very nascent technology in most developing and emerging countries, there has been in recent years a rise of pilots and programmes that have sought to leverage these types of solutions to **mitigate the insurance coverage gap** among small-scale agriculture actors. These initiatives have been driven by different stakeholders: governments; Insurtech start-ups; mobile network operators (MNOs); private insurance companies; and others. The potential for mobile insurance in agriculture is enormous, in terms of the possible commercial returns associated with capturing **a vast unserved segment of small-scale farmers** with this technology, as well as the developmental impact these solutions could have on farmers' resilience, food security, productivity and a host of other indicators.

In this respect, it would be useful to provide a rough idea of the actual extent of the insurance coverage gap in developing agriculture. In 2018, ISF Advisors carried out an in-depth analysis of the rate of access to agri-insurance coverage for the combined population of smallholders in developing markets.<sup>27</sup> According to their estimates, **only 19 percent of the target population of 268 million smallholders** currently has access to agri-insurance coverage, which translates into 51 million covered farmers (see Figure 12). In sub-Saharan Africa specifically, this number is less than 3 percent. Furthermore, of the total covered population, 30 million of those smallholders are based in just one country: India.

**FIGURE 12.** Overall and regional gaps in smallholder insurance coverage across regions



Source: ISF Advisors. 2018. *Protecting growing prosperity: Agricultural insurance in the developing world*. New York, USA, ISF Advisors. [https://isfadvisors.org/wp-content/uploads/2020/06/sep\\_2018\\_isf\\_syngenta\\_insurance\\_report\\_final.pdf](https://isfadvisors.org/wp-content/uploads/2020/06/sep_2018_isf_syngenta_insurance_report_final.pdf)

This leaves an **81 percent gap in insurance coverage** in the developing world, accounting for 218 million smallholders, of which 74 percent (173 million) are based in South Asia and South-East

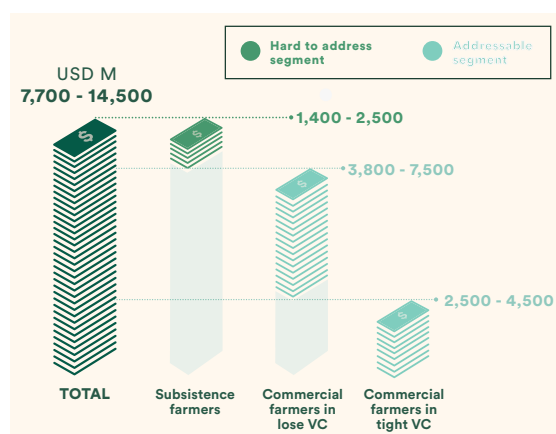
<sup>27</sup> The regions covered included Latin America, sub-Saharan Africa, South Asia and South-East Asia (China was excluded). Note that in this study, in terms of farm size, the definition of "smallholder" refers to a farmer who works on up to 10 ha of land.

Asia. ISF Advisors estimates that a total amount of USD 60–80 billion in insured value coverage (an annual premium value of roughly USD 7.7–14.5 billion) would be required to extend access to the entire smallholder population in the developing world.

As can be seen from Figure 13, USD 1.4–2.5 billion per year in total premium volume<sup>28</sup> would be required to **ensure coverage for subsistence farmers** in the developing world, who represent an estimated 60 percent of the total smallholder population. This is a segment that is unlikely to be reached and served with an adequate offer of agri-insurance anytime soon, unless product models and their related distribution channels undergo substantial innovation and adaptation to meet its specific necessities, or if these farmers are supported in “graduating” from their current condition (i.e. strengthening their livelihoods so that they are able to afford such products). Furthermore, as can be seen in Figure 14, Asia has the highest level of requirements in terms of the total premium volume needed to provide coverage to the smallholder population, with USD 6–11 billion required on an annual basis.

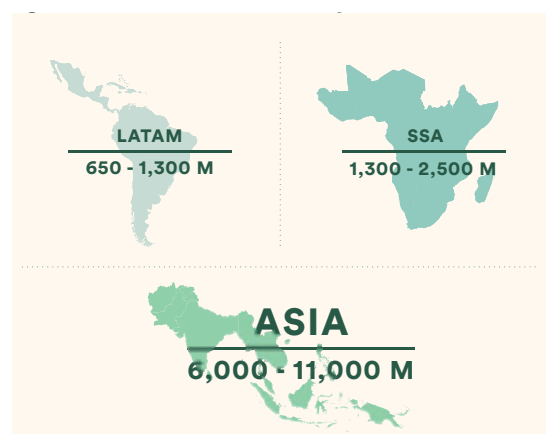
While this data points to the vast amount of work that still needs to be carried out in developing and emerging contexts in order to expand agricultural insurance coverage to all farmers (and especially the most marginalized), it also showcases the enormous potential of mobile solutions to capture this enormous segment of unserved clients, and the positive implications that fostering this type of access could have in terms of financial inclusion, as well as the promotion of farmers’ businesses and livelihoods, in the face of the rising effects of climate change.

**FIGURE 13.** Premium volumes required to ensure smallholder coverage on an annual basis, by farmer type



Source: ISF Advisors. 2018. *Protecting growing prosperity: Agricultural insurance in the developing world*. New York, USA, ISF Advisors. [https://isfadvisors.org/wp-content/uploads/2020/06/sep\\_2018\\_isf\\_syngneta\\_insurance\\_report\\_final.pdf](https://isfadvisors.org/wp-content/uploads/2020/06/sep_2018_isf_syngneta_insurance_report_final.pdf)

**FIGURE 14.** Regional breakdown of total premium volumes required annually to ensure coverage



Source: ISF Advisors. 2018. *Protecting growing prosperity: Agricultural insurance in the developing world*. New York, USA, ISF Advisors. [https://isfadvisors.org/wp-content/uploads/2020/06/sep\\_2018\\_isf\\_syngneta\\_insurance\\_report\\_final.pdf](https://isfadvisors.org/wp-content/uploads/2020/06/sep_2018_isf_syngneta_insurance_report_final.pdf)

<sup>28</sup> Total premium volume refers to the aggregate premium generated by policies written by insurance companies over a certain area/sector and over a specific period of time.

## 5.1 Pula: Making digital insurance sustainable by building ecosystems of collaboration

Founded in 2015 in Kenya, Pula Insurance Advisors is an Insurtech company which focuses on developing digital parametric insurance products destined for small-scale farmers in contexts affected by climate change. Although mainly active in sub-Saharan Africa, where Pula is present in 13 countries,<sup>29</sup> in 2021 the company has begun expanding its model to other countries, outside of the continent, such as Cuba, Indonesia, Pakistan and the Philippines. The analysis of Pula's business model is particularly interesting as it shows how an Insurtech company can support "traditional" insurance providers, as well as other types of distribution partners, in developing a more profitable and sustainable offer of agri-insurance services in developing and emerging countries.

The *modus operandi* of the company consists in establishing end-to-end partnerships with a wide range of stakeholders, such as traditional insurance companies, Agtech companies, commercial banks, governmental entities, development agencies, agri-input dealers and other service providers, in order to create **an ecosystem of collaboration** that is meant to bridge critical demand- and supply-side gaps that normally prevent insurance for smallholder farmers from being a sustainable proposition. These institutions are the main clients and purchasers of Pula's insurance services, as the company does not sell insurance directly to individual farmers. So far, the company has offered its technology and products to a network of 90 private insurance companies, as well as 70 distribution partners of other nature. Together with product design, the company is also responsible for actuarial modelling, pricing the insurance products, carrying out payout determination, as well as collecting and analyzing data (which is mainly a combination of satellite, ground-level data and direct interviews with farmers).

Over the years, Pula has developed a range of different index-based insurance products. The core product sold by Pula, and which composes roughly 90 percent of its offer, is an area-yield index insurance. The company also provides weather-based index insurance; hybrid index insurance (weather-based index combined with area-yield); and livestock insurance (based on satellite data). The combination of Pula's insurance products can provide smallholders with a comprehensive coverage against environmental risks, which includes drought, floods, hurricanes, as well as pests and diseases. Crops covered include rice, wheat, sorghum, maize, cotton, peanut, cassava, potato, ginger and sesame.

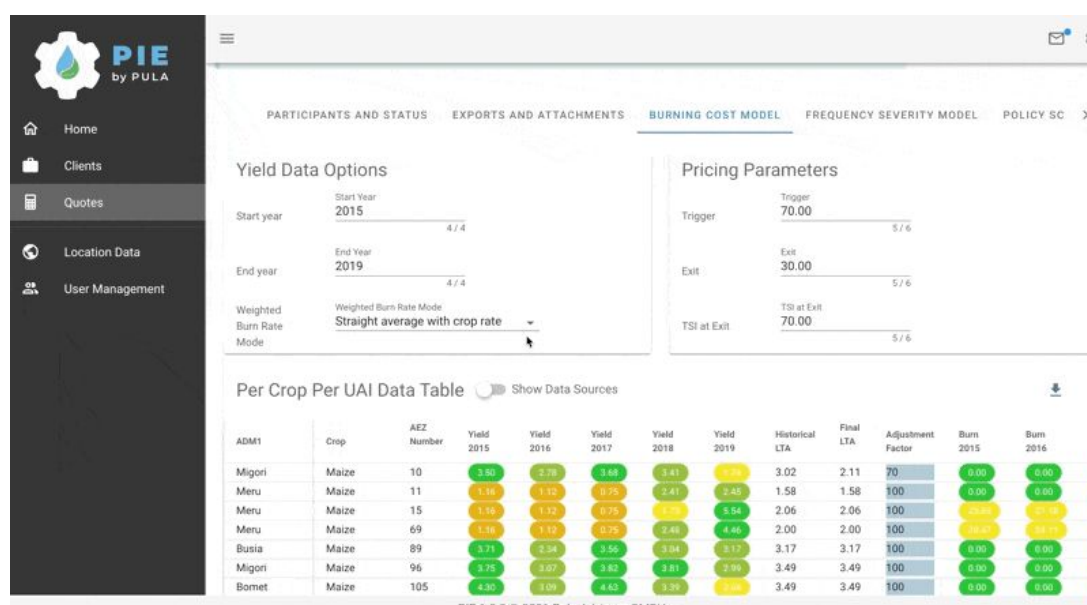
One of Pula's core objectives is to develop insurance products that are commercially viable. As it stands, Pula's average premium cost is USD 10 per farmer to provide coverage for a planting season. The average farmer insured by Pula cultivates 0.9 hectares of land, generating a yield of 2 metric tonnes per hectare. To achieve a balance between profitability and affordability in its offer of insurance, Pula employs several instruments. First, it makes use of mobile-based registration systems (both app- and SMS-enabled) that allow to register new users in a rapid and efficient manner. Second, it leverages automatized learning algorithms that can group together agricultural producers whose farms share similar features. Finally, it uses digital tools to automatically evaluate reimbursement claims from the field, greatly increasing efficiency and ensuring that payout claims are settled and delivered to the farmers within a time frame of 5 to 7 weeks. Compared to most traditional index-based insurance schemes, this represents a significantly short settlement period.

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<sup>29</sup> Namely: Côte d'Ivoire, Ethiopia, Kenya, Madagascar, Malawi, Mali, Nigeria, Rwanda, Senegal, Togo, the United Republic of Tanzania, Zambia and Zimbabwe.

Pula relies on a proprietary platform called the **Pula Insurance Engine (PIE)** to simplify insurance policy quote calculations, replacing the conventional spreadsheets typically used by insurers (see Figure 15). The PIE also streamlines workflow processes, replacing lengthy message chains between insurers and reinsurers. As of 2021, approximately half of the insurance companies in Pula's network were utilizing the PIE in their work.

**FIGURE 15.** A snapshot of the interface of Pula's insurance engine



Source: Pula, 2021. Agric insurance – Transcaucasia & Pula: Introduction [slide presentation]. [https://www.munichre-foundation.org/content/dam/munichre/foundation/publications/inclusive-insurance/2021-learning-sessions/ceet/2021\\_CEET\\_S3\\_Janardhanan.pdf/\\_jcr\\_content/renditions/original./2021\\_CEET\\_S3\\_Janardhanan.pdf](https://www.munichre-foundation.org/content/dam/munichre/foundation/publications/inclusive-insurance/2021-learning-sessions/ceet/2021_CEET_S3_Janardhanan.pdf/_jcr_content/renditions/original./2021_CEET_S3_Janardhanan.pdf)

The company has achieved considerable success in **bundling its insurance products** with other financial instruments. An example of this is the collaboration between Pula and groups of local commercial banks, which bundle the loans they provide to smallholders with Pula's insurance products. Together with the loan, the banks pay the insurance premium on behalf of each farmer at the beginning of the agricultural season. At the end of the season, the price of the premium is added to the amount that the farmer has to repay to the bank. Aside from local banks, Pula also partners with local agricultural input dealers, embedding its insurance products in the inputs delivered to farmers (e.g. seeds and fertilizers) as well as the input loans eventually bundled with these sales (IFAD, 2021).

As far as collaborations with other **fintech companies** are concerned, in Kenya Pula has partnered with DigiFarm (Section 4.2) as well as Apollo Agriculture (Section 4.3) to offer its products as part of the bundle of financial and non-financial services offered by these large mobile platforms.

Pula also delivers insurance in the frame of **governmental support programmes** directed at farmers. Governments, in fact, are some of Pula's most important clients. In Zambia, for example, Pula provides both hybrid weather index insurance and area-yield index insurance through the Farmer Input Supply Programme, a national government scheme that seeks to support more than a million farmers per year through subsidized input provision (which is bundled with Pula's insurance



product). In Kenya, Pula has provided area-yield index insurance to smallholders cultivating maize, Irish potatoes and pulses, in the frame of a governmental scheme in which ACRE Africa has also participated (see Section 5.2). Half of the premium cost for this insurance has been subsidized by the government (WSBI, 2021; Raithatha and Priebe, 2020).

In terms of collaboration with **development agencies**, Pula has partnered with the World Food Programme (WFP), in the frame of the latter's Rural Resilience Initiative (R4 programme), to bundle its index insurance product in the package of services provided to smallholder farmers in various sub-Saharan African countries. In the frame of R4's Risk Reduction component, farmers participate in a wide range of long-term risk reduction activities that can help in reducing the impact of climate shocks on food production and livelihoods, such as land rehabilitation, compost pit making, constructing small dams and cultivating vegetable gardens. Access to index insurance is conditional on farmers setting a set number of days aside for their participation in these asset-producing activities as their contribution to the premium.

Together with insurance, Pula also provides a range of complementary services in collaboration with local service providers. These services vary depending on the context at hand, and include the provision of agricultural inputs (e.g. seeds, fertilizers), as well as digital advisory services on good practices related to agricultural production and climate-resilient agriculture. These advisory services leverage a **considerable amount of data** collected on – and from – Pula's clients (e.g. meteorological and agronomic data, remote interviews) to provide remote recommendations and suggestions on how to improve agricultural production, which are tailored to the specific situation faced by each farmer. Over time, Pula has managed to create a network of 50 such service providers.

As of mid-2023, Pula had insured 9.1 million farmers, for a gross premium of USD 69.1 million, ensuring coverage for approximately 4.4 million hectares of land across 17 countries. The coverage provided by Pula resulted in payouts being delivered to 755 000 farmers as of mid-2023, with a total of USD 27.1 million in claims being disbursed. Pula's approach of combining insurance with agricultural advice has shown impressive outcomes, with clients registering increased investments in their farms by up to 16 percent and significant yield improvements of up to 30 percent.

Pula's case is an interesting example of how an Insurtech company can make smallholder insurance sustainable in developing contexts by creating ecosystems of collaboration that involve a wide variety of stakeholders (e.g. service providers; value chain agents; insurers; FIs; government entities). That said, the same model on which Pula's business is established constitutes the **greatest hurdle for its replication and expansion in other contexts**, as Pula needs to build a new partnership network in every country and market it wishes to enter, to reach and sustain a sufficiently high level of sales so that such partnerships and engagements remain worthwhile for all the stakeholders involved (IFAD, 2021).

Pula's model has been widely acknowledged for its effectiveness. In 2020, the company has won the "Insurtech Company of the Year" at the African Insurance Awards. The growth of the company has been supported by development agencies such as the World Food Programme (WFP) and the International Fund for Agricultural Development (IFAD). Pula also launched an investment round in 2021 to attract the capital required to expand its operations to Asia and Latin America. This round, which was led by the venture capital firm TLCom Capital and saw the participation of the non-profit organization Women's World Banking, has managed to attract USD 6 million (Mbamalu, 2021).

## 5.2 ACRE Africa: Enabling climate risk reduction through mobile insurance

As climate change increasingly threatens the livelihoods of smallholder farmers, development agencies are strengthening their focus on disaster risk insurance as a powerful – yet technically challenging – tool to mitigate the economic and social consequences of natural catastrophes on smallholders' lives. In the frame of a climate-smart and farsighted approach to agricultural development, climate risk insurance can be a game-changer, allowing governments, development agencies, and other public/private stakeholders to establish effective safety nets for smallholders that can ensure the stability of their livelihoods in the aftermath of extreme natural events.

That said, climate risk insurance comes with its own set of challenges when it comes to design, implement and uptake: high administrative and transaction costs; low awareness on the part of farmers; and a weak national infrastructure for the gathering of climate data. These are only a few of the barriers to overcome in order to ensure that disaster risk insurance can be made effective and brought up to scale. Nevertheless, as will be seen from the following case study, digital technology – and especially mobile technology – can play a crucial role in mitigating many of these constraints.

The Kilimo Salama (“safe agriculture” in Kiswahili) programme was launched in 2009 as a collaboration between the Syngenta Foundation for Sustainable Agriculture, the insurance group UAP Holdings and the Kenyan telecom operator Safaricom. It offered index-based micro-insurance coverage to Kenyan farmers (based on weather and area-yield indexes) with the aim of protecting them against the effects of drought and excess rainfall. This has proven to be a critical service in a country, where the agricultural sector employs at least 56 percent of the total labour force, while contributing to 25 percent of the country's GDP.

In 2014, the Kilimo Salama programme became a fully-fledged commercial company called ACRE Africa, expanding in the following years to offer a wide range of products that went beyond index insurance, such as multi-peril crop insurance (against drought, storms, pests and diseases), agricultural portfolio coverage for financial institutions, replanting guarantees and livestock insurance for dairy cows. ACRE is mainly active nowadays in three countries: **Kenya, Rwanda, and the United Republic of Tanzania**, although it also carries out projects in Ghana, Malawi, Mozambique, Senegal and Uganda.

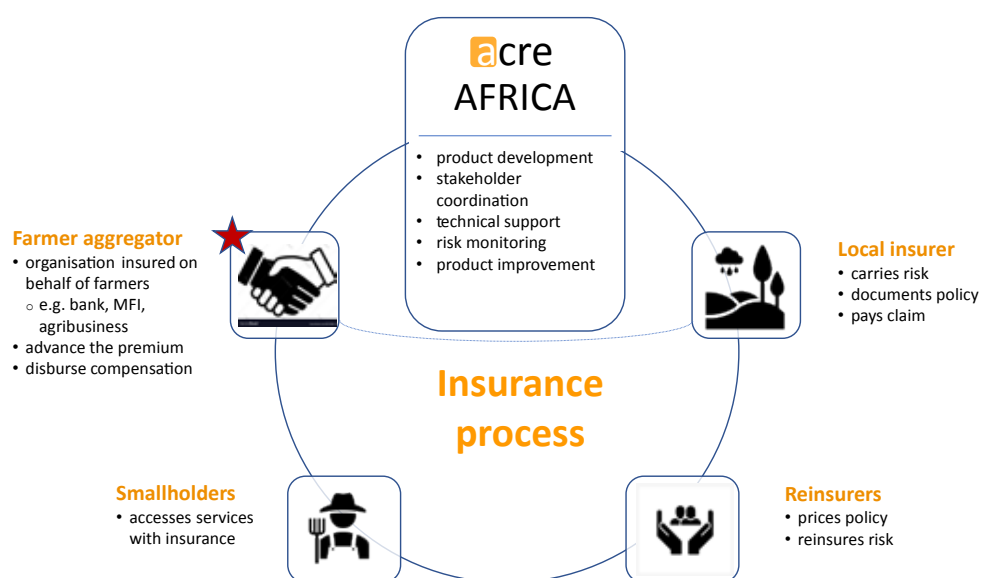
More than a direct insurance company, ACRE is a fee-based service provider and facilitator that partners with several organizations in the financial and agricultural sectors (such as commercial banks, local insurance providers, seed companies, input dealers, processors, farmers' cooperatives) to enable the development and provision of customized agri-insurance solutions for small farmers. ACRE acts as an intermediary between insurance companies, reinsurers and aggregators (such as agri-input suppliers), facilitating the design and the delivery of insurance to small-scale, financially underserved actors.

As pointed out in a recent FAO and AFRACA publication (2021, p.105):

*As an insurance intermediary, ACRE Africa works with many local insurers in East Africa and international reinsurers who do the underwriting. ACRE Africa also has its own actuarial team with the capacity to ability to develop products and their terms, coverage, and pricing with the local underwriters and reinsurers as well as the insurance aggregators for distribution.*

In the frame of these activities, and as can be seen in Figure 16, ACRE is responsible for guiding the development of the specific insurance products (in collaboration with key partners), coordinating the various stakeholders involved, providing technical support and advice to insurers and aggregators (leveraging especially to its strong agronomical expertise), monitoring portfolio risk, and constantly fine-tuning the insurance products to ensure that underlying costs are kept as low as possible.

**FIGURE 16.** Model of collaboration involving ACRE and key partners



Source: FAO & AFRACA. 2021. *Agricultural value chain finance innovations and lessons – Case studies in Africa* Rome, FAO. <https://www.fao.org/3/cb4776en/cb4776en.pdf>

To deliver its products, ACRE leverages what is arguably the best-known mobile money platform in the developing world, Safaricom's M-Pesa, which can boast over 30 million users in 10 countries (18 million just in Kenya). Relying on such a large mobile money network carries several advantages for ACRE in terms of: improved collection and management of client data; easier client registration; improved outreach, especially in rural areas; more efficient processes (e.g. policy applications, claim settlements, client communication); easier bundling of insurance with other financial products; and faster payout provisions in case of extreme natural events that trigger the policy. As illustrated by Hazel, Jaeger and Hausberger (2021), the company has also recently been piloting an innovative blockchain-based solution that would allow farmers to receive insurance payouts on their mobile money accounts with minimal waiting times.

A core mechanism of ACRE's work is a mobile-enhanced insurance delivery system called **Bima Pima**, which ACRE provides to smallholders in collaboration with local input dealers. A farmer can buy a Bima Pima scratch card in together with a bag of seeds or fertilizer at the beginning of the agricultural season. Back at the farm, the farmer can activate the scratch card through his phone, with an initial premium cost of 50 Kenyan shillings (USD 50 cents) and possible later top-ups via SMS that increase the level of insurance coverage granted. Once the farmer activates the card, ACRE is able to geo-tag the farm through the mobile localization service. Based on the specific features of the index-based product used in that area, a combination of satellite and/or weather station data will then help determine whether the farmer is bound to receive a payout – directly on his mobile money account – in case of drought or excess rain on his land. The farmer is then

able to use the payout to re-purchase quality inputs and replant, possibly in the frame of the same harvest season. As illustrated by an analysis of ACRE Africa carried out by the World Bank (2022, p.1) : “The pricing model ensures that most farmers [...] can afford insurance. A premium of KES 50, for instance, has a potential payout of 10% which is equivalent to KES 500 and would be enough to buy a bag of seedlings”.

The Bima Pima model is a good example of how a **combination of smart design and digital innovation** can be used to deliver insurance products to farmers in a convenient and accessible manner, providing them with various benefits: the convenience to buy the scratch cards at local agri-dealers; the relative ease of use of the system, which fits into farmers’ existing habits and routines; the rapid payouts through mobile; the capacity to buy additional levels of coverage (by topping up); and the possibility to pay for the premium in small amounts and over time.

Between 2014 and 2020, ACRE supported a cumulative total of 1.65 million smallholders in obtaining insurance (mainly index-based products) for a total insured sum of over US 159 million, protecting them against various weather risks. Of this cumulative number of covered farmers, 57 percent were residing Kenya, 23 percent in Rwanda, and 10 percent in the United Republic of Tanzania. Crops covered were wheat, maize, legumes, sorghum, potatoes, coffee, tea, sunflower and cashew nuts. As of 2021, the company was collaborating with 8 insurance companies, 2 reinsurers, 17 aggregator agribusinesses, 10 FIs and 2 mobile network operators (FAO and AFRACA, 2021). Furthermore, according to a survey by the Busara Center for Behavioral Economics, as of 2020 almost 90 percent of farmers registered with ACRE **were accessing insurance for the first time**, and for 87 percent of them ACRE was the only good alternative for accessing insurance in their context (Busara, 2020c).

Overall, ACRE has developed **three core insurance products**. The main one is a pure weather-based index insurance product, which makes use of satellite-based rainfall data and allows farmers to cover either specific growing phases of their cultivations or the entirety of the growing season. The second product is a hybrid multi peril crop insurance product that combines elements of index-based insurance (covering risks such as excessive or scarce rain) and traditional indemnity-based insurance (providing multiperil coverage against risks such as hail, frost and forest fires), thus enabling a more extensive coverage against different types of risks. The third product is indemnity-based insurance for livestock (dairy cows), covering risks associated with pregnancy and other losses (Hazel, Jaeger and Hausberger, 2021).

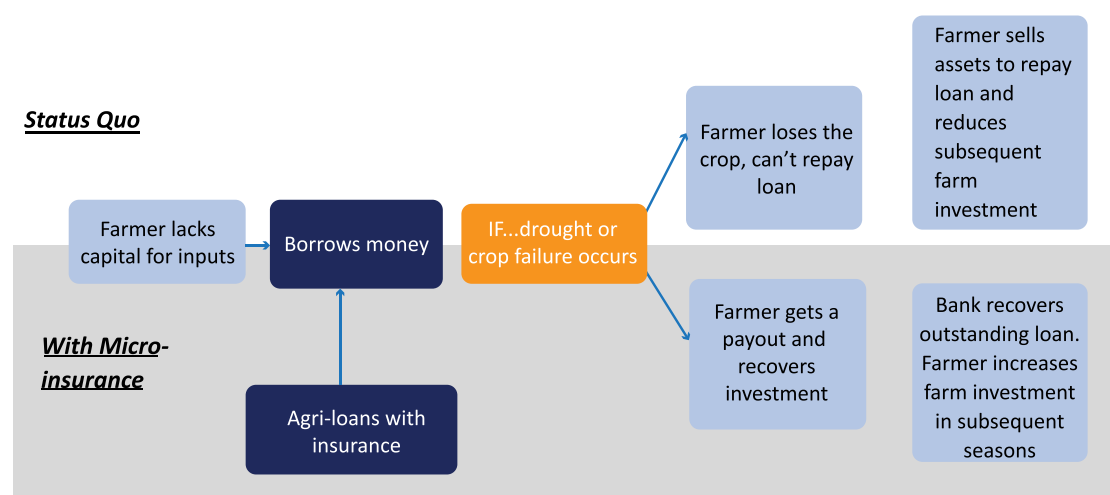
The fee that ACRE asks of its partners for the combination of its services (i.e. leading the structuring of the insurance product, capacity development and intermediation) is 15 percent of the final premium rate of the product. Aside from this, ACRE has also built a second revenue stream in the form of “consultancy/advisory services for product development, training and capacity building, risk and loss assessment in various countries” (FAO & AFRACA, 2021, p.102). The average premiums associated to ACRE’s insurance products are 10 percent for Kenya and the United Republic of Tanzania and 7 percent for Rwanda, although it should be stressed that these values can vary depending on the target value chain and the insurance provider commercializing the product.

The company also has had considerable success in commercializing **an insurance product bundled with credit**. A core component of the model is the partnership between ACRE and two key agents, the insurance company and the credit provider (such as an FI or an input supplier), in which ACRE leverages the flows of client-specific data coming from the two partners **to refine the model and lower the cost of the bundled insurance product** (which is hybrid, mixing index-based and indemnity-based coverage) for the client farmer. The main benefits that can be derived from such



a bundled product are schematized in Figure 17. In the frame of this model, ACRE is responsible for validating claims, through a mix of field inspections, index measurements carried out thanks to a network of weather stations and satellite data, and USSD-based geolocation. While the credit partner manages the farmers' applications for the bundled product, the local insurer is responsible for handling claim applications and providing payouts. Interestingly, an essential value added for the farmer in this product is a complementary funeral insurance coverage embedded in the bundle, which covers the cost of the borrower's funeral in case of death, and represents an added feature meant to incentivize farmers' uptake of the product (FAO and AFRACA, 2021).

**FIGURE 17.** Benefits of ACRE's credit/insurance product bundle, compared to business-as-usual



Source: FAO & AFRACA. 2021. *Agricultural value chain finance innovations and lessons – Case studies in Africa* Rome, FAO. <https://www.fao.org/3/cb4776en/cb4776en.pdf>

At the end of 2019, ACRE's portfolio for this specific product comprised more than 70 000 insurance policies delivered through 20 aggregator partners in Kenya, for an annual insured amount of USD 10.87 million. The product has been gaining ground rapidly, which has positive implications in terms of policy price reduction. The bundled credit/insurance portfolio by ACRE was projected to break even by 2021, and to attain market-level returns by 2024 (with over 150 000 active policies and USD 24 million in annual value insured) (FAO and AFRACA, 2021).

Despite the notable overall results achieved by ACRE, it must be mentioned that a recent survey carried out by Mercy Corps (2020b) has highlighted **several challenges and roadblocks** that farmers have encountered when trying to make use of ACRE's services. These challenges, when not properly addressed by the company, can negatively impact uptake and use of the service, as well as overall trust (especially as they encourage negative word-of-mouth among farmers). According to the survey, 52 percent of farmers interviewed mentioned facing at least one of the following issues with the service:

- **non-payment of claim:** by which ACRE did not compensate the loss incurred by the farmer (26 percent of all respondents);
- **lack of regular communication with the company:** despite efforts on the part of the farmers to get in contact with ACRE (21 percent of all respondents); and

- **lack of regular follow-ups on the part of the company:** representatives from the company did not carry out follow-up visits to the farms, especially to assess the situation following a calamity and assist the clients accordingly (10 percent of all respondents).

Compounding these challenges, the survey paints a scenario by **which only a share of ACRE's client base has managed to concretely benefit from its services**. According to the survey, 40 percent of farmers reported having registered an increase in farm production thanks to ACRE's services. Within this group, 72 percent of farmers reported having achieved this increase without cultivating additional land, which appears to imply an increase in productivity. One farmer in three reported an increase in their agri-related revenue thanks to ACRE, mainly due to an increase in the volume of produce sold. Approximately half of all farmers reported an improvement in their farming practices due to the training and education received by ACRE, mainly due to: 1) improved knowledge on better cultivation methods; 2) using a larger variety of seeds and fertilizers; and 3) being better informed on land preparation methods (Mercy Corps, 2020b)

This appears to imply a scenario where there is still considerable potential that could be unlocked in terms of increased benefits for farmers (both those who already registered as well as prospective clients), which also translates into a considerable opportunity for growth in the agri-insurance market that ACRE has not yet seized. Nevertheless, in order to achieve this, ACRE will need to intervene effectively on the set of challenges and bottlenecks noted above.

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Food and Agriculture Organization of the United Nations

ISBN 978-92-5-138474-9



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CC9117EN/1/12.23