

LEARNING BRIEF 5

BIG DATA COULD MEAN BIG OPPORTUNITY

Why we should stay excited for data analytics in smallholder finance

1**EXECUTIVE SUMMARY**

At nearly USD 150 billion, the gap in smallholder financing remains wide, and financial institutions by and large continue to find smallholder farmers a difficult and costly segment to serve. The result is that far too many smallholders remain without access to the finance – particularly credit – they need to obtain critical inputs, make long-term investments, increase their productivity and ultimately improve their income and livelihoods. The narrative typically goes that the business case to serve smallholders is limited, driven by factors including a poor understanding of their needs and the economics of their farming activities, high costs to serve, and small transaction size and volume.

We believe there are ways to transform the underlying economics to serve farmers profitably and at scale – and that data and technology could be fundamental drivers of this shift.¹ There is already a lot of buzz about whether data analytics will be a game changer.²

¹ 'We' refer to the Mastercard Foundation Rural and Agricultural Learning Lab (the Lab).

² In this learning brief, data analytics refers to the process of capturing, analyzing, and harnessing traditional and alternative data on farmers such as mobile and social media data, psychometric and behavioral data, geospatial data, and value chain data.

Innovation has been taking place for several years, so we thought the time was right to step back and try to answer the question, "Is data analytics the game changer we need?" As this brief explains, early signs are good, but we are not there yet.

On one hand, the progress we are seeing is encouraging. The potential of some data analytic innovators is enormous, and we strongly support continued experimentation in this space. Here's why we are so positive:

- **The use of data analytics for credit scoring is maturing, and other use cases are emerging.** The industry is consolidating lessons on credit scoring, including the types of data that are most useful. At the same time, the industry is starting to test and develop new uses, like portfolio monitoring, customer segmentation, and product design. If financial service providers (FSPs) and data service providers (DSPs) make progress on these use cases, we could see meaningful declines in cost to serve, greater access, and improved products for farmers.
- **The value proposition for FSPs seems compelling.** Indicative calculations suggest that whether done in-house or outsourced, the overall cost is reasonable, especially compared to the potential upside. For example, an FSP serving 100,000 smallholder farmers could recoup a typical investment in data analytics through a small to moderate improvement in its customer

base, average loan size, or operating costs on the order of 15-30%. Under these scenarios, FSPs would not need to see a reduction in non-performing loans (NPLs), which in many cases are already low. The potential upside could be much higher, but we need more evidence from live examples to prove the value and convince FSPs.

- **We have better insight into what data is useful and what's not.** Innovators are beginning to understand which types of data are most useful and how to combine multiple sources of data for the greatest results. Agriculture-specific data—which can be captured in multiple ways—is succeeding in predicting yields and cash flows, and techniques such as psychometric analysis are enabling innovators to combine critical hard data with behavioral understanding of consumers. We've also learned which types of data are proving to be less useful. For example, cell phone data, or Mobile Network Operator (MNO) data, and social media data haven't lived up to the hype in the smallholder space. Knowing what's useful and what's not will enable practitioners to target their data collection efforts and use data analytics more cost-effectively.
- **Interest - and investment - in the sector remains healthy.** The rate of the experimentation is only increasing. Early-stage, impact-oriented capital is flowing into pioneering firms, and some are beginning to capture larger investments. For example, Tulaa in Kenya recently raised USD 627,000 in seed funding in a round led by one of Africa's largest impact-oriented venture capital firms. Another innovator, Gates Foundation-backed Ricult in Asia, raised UDS 1.85 million in seed funding. At the same time, investments in enablers like digital payments, digital ID, and distributed ledger technology are spreading.

While these are encouraging signs, the use of data analytics to expand access to credit for smallholders is still in its infancy. While several innovators were able to share exciting results, it is still early days and most are still experimenting and building their data analytics business models. The space still has some fundamental questions that we were unable to answer at this stage and

that we believe are key to unlock the potential of data analytics. These outstanding questions largely center on:

- Proving the nature and strength of the business case for FSPs to invest in data analytics, and its impact on smallholder farmers
- How FSPs can build the capabilities they need to leverage data analytics effectively
- How FSPs can gain access to useful data at a reasonable cost

The best way to advance this field is for FSPs and DSPs to work together on a commercial scale to prove the business case and develop blueprints of success, and donors can play a role in accelerating the process. While the sector is nascent, DSPs are actively innovating and FSPs are beginning to buy into the potential. Smartly deployed philanthropic funding can reduce cost and risk and help to mobilize private sector players.

To that end, we have developed this learning brief to

- **Provide a high-level understanding** of how data analytics is being used in smallholder financing. And highlight the types of data that are proving useful, particularly in credit risk assessment, portfolio monitoring, customer segmentation, and product design
- **Highlight some of the key innovators to watch**, from fintechs and/or farmer-support firms to data service providers to hybrids
- **Bring some transparency to the level of investment** that FSPs could expect to make in data analytics and potential returns
- **Share concrete ideas** that FSPs, DSPs, and donors could take on to accelerate progress

We expect this learning brief will help those who are new to data analytics in smallholder finance to better navigate the space, while enabling those who've already dived in to get a sense of the current state of the sector. We hope this learning brief demonstrates why data analytics continues to be an exciting space in which to invest and helps to frame discussions about how to capture its full potential to expand access to credit for smallholders.

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UNDERSTANDING THE “BUZZ” ABOUT DATA ANALYTICS FOR SMALLHOLDER FARMERS



“Data is the new raw crude oil and everyone is prospecting for reserves. But the real value is in the refined product. FSPs have a lot of mostly unrefined data on existing customers but need data on new customers. Those that can access data and apply sophisticated analytics to extract and apply insights will have the ability to reach more smallholder farmers more efficiently while maintaining portfolio quality.”

– Hillary Miller-Wise, Founder & CEO, Tulaa



Smallholder farmers, their families and communities are stuck in cycles of poverty, and one reason is a lack of access to finance – estimated at nearly USD 150 billion.³ Even when smallholders can access financing, existing products and services often fail to meet their unique needs, such as flexible repayment terms oriented around harvest schedules. As a result, they struggle to obtain critical inputs, make long-term investments, increase their productivity and ultimately improve their income and livelihoods.

The most important reason smallholders aren’t getting the financing they need is that FSPs don’t consider them attractive customers to serve. Small loan sizes make it difficult to justify the transaction costs involved. Agriculture is inherently risky, subject to drought, pests, and diseases. And smallholders often lack credit histories or formal collateral to pledge.

3 Dalberg Advisors, Institute for Smallholder Finance, Mastercard Foundation, and the Rural and Agricultural Finance Learning Lab. 2016. “Inflection Point: Unlocking Growth in the Era of Farmer Finance.” Online at <https://www.rafllearning.org/post/inflection-point-unlocking-growth-era-farmer-finance>. Figures exclude China, Central Asia, Middle East and North Africa, and Eastern Europe.

While there may always be some role for smart subsidy to help mitigate risk, more profitable business models are needed to close the smallholder financing gap.⁴

For the last few years, there’s been a lot of buzz about how big data and data analytics could be the game-changer we need.

Digital technology is making it easier and cheaper to gather a wide variety of data on smallholders. This includes agriculture-specific data, such as agro-ecological information about their farms to their sales track records, and non-agricultural data, such as psychometric test results. Box 1 summarizes the many data types and sources that digital technology is now making available.

The promise of these new data sources lies in their potential to cost effectively unlock access to credit for millions of smallholder farmers. Data analytics – the combination of traditional and alternative data with new analytical tools – has three key roles to play across the lending value chain:

- 1. In customer segmentation and product design:** increasing revenues by identifying customers ready to take on new or larger loans, highlighting potential new customer segments, and designing products to meet their needs
- 2. In credit risk assessment:** increasing revenues by acquiring new customers and increasing the lifetime value of existing customers, and reducing default rates and operating costs
- 3. In portfolio monitoring:** reducing operating costs and default rates by shifting from field visits to remote monitoring, and by intervening to mitigate identified risks

Each of these use cases has promise, and the combination could be especially powerful when it comes to reaching new farmers and enabling them to increase their productivity and incomes.

4 Smart subsidy is broadly defined as using public or philanthropic resources in a way that generates the highest impact for the dollar.

BOX 1: SMALLHOLDER DATA TYPES

Data Type	non-ag specific		ag specific	
	MOBILE AND SOCIAL MEDIA DATA	PSYCHOMETRIC AND BEHAVIORAL DATA	GEOSPATIAL DATA	VALUE CHAIN DATA
Examples	<ul style="list-style-type: none"> Breadth of network Frequency and depth of connection Frequency of phone and social media use Mobile money transactions 	<ul style="list-style-type: none"> Goal-setting abilities Measures of persistence Planning/budgeting habits 	<ul style="list-style-type: none"> Location Distance to water source, roads, markets Agro-ecology Farm size/herd size Weather patterns 	<p>PRODUCTION</p> <ul style="list-style-type: none"> Crops grown, yields, animal varieties, farm practices <p>FINANCIAL</p> <ul style="list-style-type: none"> Input purchases Crop sales In-kind borrowing and repayment Warehousing or other service purchases
Sources	<ul style="list-style-type: none"> Phone and mobile wallet records (telcos) Apps installed on smartphone (telcos) Public profiles 	<ul style="list-style-type: none"> In-person interviews Mobile-based surveys Technical assistance/extension providers Learning platform engagement patterns 	<ul style="list-style-type: none"> Satellite IoT (e.g. drones, soil sensors) Agricultural research institutes Meteorological departments GPS/geo-location apps 	<ul style="list-style-type: none"> Satellite Input suppliers Logistics providers TA providers/extension services Agribusiness/off-takers Specialized e-commerce platforms

Attracted by the market and impact opportunity, a range of innovators have emerged, experimenting with different business models.

As illustrated in Box 2, these include fintechs and farmer support firms that provide holistic solutions directly to farmers, from inputs on credit to advisory support, DSPs that provide data analytics services to FSPs, and hybrids, which work with farmers directly and through FSPs. Sometimes, these organizations also collaborate with impact investors, donors, and development organizations to share cost and risk, and gain access to technical assistance.

The following sections provide a flavor of what these innovators are doing, and what we have learned from their efforts so far—as summarized in Box 3. Each section discusses one of the three primary use cases, covering data analytics' value proposition, the types of data being used, and examples of the innovators involved. Here are the key take-aways:

- There are three primary use cases for data analytics: customer segmentation and product design, credit risk assessment, and portfolio monitoring

- Of these use cases, credit risk assessment is furthest along; the others are still emerging
- Across all three use cases, data analytics is expected to yield benefits on both the revenue and cost sides of the profitability equation
- Most innovators are using a combination of geospatial, value chain, and psychometric and behavioral data; agriculture-specific data is considered critical
- Innovators need more time to generate and share evidence of data analytics' impact, on both FSPs' bottom line and farmers

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“Data analytics is essential to bring down the loss costs and customer acquisition costs for FSPs, by assisting banks with data-driven loan allocation planning and credit policy establishment from portfolio level to customer level.”

– Prateep Basu, Co-Founder & Chief Strategy Officer, SatSure Analytics

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BOX 2: INNOVATION LANDSCAPE

	 FINTECHS AND/OR "FARMER-SUPPORT FIRMS"	 DATA SERVICE PROVIDERS (DSPS)	 HYBRIDS
BUSINESS MODEL	<ul style="list-style-type: none"> Lend to smallholders directly, typically as part of a package including some combination of inputs, agronomic advice, marketing and other services on credit These holistic solutions help smallholders increase their productivity and income, and in the process, their ability to repay These firms use data analytics to segment customers, design appropriate packages of inputs and advice, and assess credit risk, with some emerging work in portfolio monitoring They see the potential to offer B2B services down the road, but want to work directly with farmers first to prove the value of their approaches 	<ul style="list-style-type: none"> Provide data analytics services to FSPs that lend to smallholders, with a focus on credit risk assessment and in some cases portfolio monitoring (some also provide data analytics services to non-financial companies) Some organizations in this group support digitization more broadly as well 	<ul style="list-style-type: none"> These are intermediaries that finance smallholders directly or through FSPs and connect them with other businesses along the agricultural value chain, from inputs to offtake, through electronic platforms They use data analytics to assess credit risk, and in one instance, to offer customized agronomic advice
FEE STRUCTURE	<ul style="list-style-type: none"> Interest or fees based on the additional profit a farmer can be expected to generate 	<ul style="list-style-type: none"> Typically a subscription fee per farmer per year (although other fee structures such as pay per use or pay per module are also present) Some of these firms also charge variable up-front fees for software integration 	<ul style="list-style-type: none"> Typically charge FSPs a per loan fee, and charge other businesses fees and/or commissions as well
EXAMPLES			

Traditional FSPs, including banks and microfinance institutions, are also beginning to use data analytics to expand access to credit for smallholders. While some are working with DSPs, fintechs, and hybrids, others are forging ahead on their own, mining the data they already have and/or partnering with agricultural off-takers and other companies that transact with smallholders. FSPs forging ahead on their own tend to be larger, more sophisticated, and further ahead in the digitization process

Impact investors, donors, and development organizations are playing key roles in the use of data analytics to expand access to credit for smallholders as well, providing "open data," technical assistance, grants, and concessional finance

BOX 3: INNOVATING IN THE USE OF DATA ANALYTICS ACROSS THE AGRICULTURAL LENDING VALUE CHAIN

CUSTOMER SEGMENTATION AND PRODUCT DESIGN

VALUE PROPOSITION OF DATA ANALYTICS

Increase revenues by identifying customers ready to take on new or larger loans, highlighting potential new customer segments, and designing products that meet their needs



TYPES OF ALTERNATIVE DATA BEING USED

- Mobile and social media data
- Psychometric and behavioral data
- Geospatial data
- Value chain data
- Other data, e.g. national smallholder survey



CREDIT RISK ASSESSMENT



TYPES OF ALTERNATIVE DATA BEING USED

- Mobile and social media data
- Psychometric and behavioral data
- Geospatial data
- Value chain data

VALUE PROPOSITION OF DATA ANALYTICS

Acquire new customers, increase the lifetime value of existing customers, reduce default rates and operating costs



zenvus

YAPU



INNOVATORS



PORTFOLIO MONITORING

VALUE PROPOSITION OF DATA ANALYTICS

Reduce operating costs and default rates by shifting from field visits to remote monitoring and by intervening to mitigate identified risks



TYPES OF ALTERNATIVE DATA BEING USED

- Geospatial data
- Value chain data



YAPU



zenvus



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SECTION 3: USE CASE CREDIT RISK ASSESSMENT

We begin by examining the use case for credit risk assessment that has seen the greatest level of innovation and development, followed by use cases for portfolio monitoring, and customer segmentation that are catching up.

3.1 WHAT IS THE VALUE PROPOSITION FOR DATA ANALYTICS IN CREDIT RISK ASSESSMENT?

Using data analytics to assess credit risk could help FSPs increase revenues and reduce costs. On the revenue side, it could help counter perceptions of risk and overcome a lack of credit history or collateral, a factor that has kept smallholders from accessing financing in the past – enabling an FSP to acquire new customers. On the cost side, data analytics could help reduce default rates by more accurately predicting willingness and ability to pay – and perhaps more importantly and more likely – reduce operating costs by automating credit decision-making.

Credit risk assessment is currently the leading use case for data analytics in smallholder lending. Credit risk assessment is a logical entry point because it is one of the most critical business challenges for FSPs serving smallholders, alongside high operating costs relative to transaction size. FSPs have succeeded in using data analytics to expand access to credit for urban borrowers, and innovators are trying to adapt the concept and lessons to smallholders.

Nevertheless, while credit risk assessment is the most popular use case for data analytics in smallholder lending, we still don't know much about the return on investment for FSPs. For some organizations it is confidential, and for many others, it is simply too early to tell. More data and more time are needed to train algorithms to predict credit risk more accurately than existing methods and to validate them. [CGAP](#) notes that data is needed from thousands of farmers to build a credit scorecard with reasonable predictive power.⁵

⁵ CGAP. 2018. "5 Insights into Credit Scoring for Smallholders." Online at <http://www.cgap.org/blog/5-insights-credit-scoring-smallholders>.

Many of the players have been at this for less than two or three years, whereas credit scoring models such as FICO in the United States have been refined over decades.

3.2 WHAT TYPES OF ALTERNATIVE DATA ARE BEING USED FOR CREDIT RISK ASSESSMENT?

When it comes to smallholder farmers – as compared to low-income borrowers in urban areas – agriculture-specific data appears to be promising. Players in this space are working to determine the specific combination of data points that will be most predictive and cost-effective. It's a long process for many. For example, [Harvesting](#), a fintech startup that uses a range of data – including financial, value chain and geospatial data, to predict farmers' creditworthiness – says it can take a few years to develop a reliable score card.

Agricultural value chain data is considered highly relevant for credit risk assessment, but many types of data in this category are challenging to obtain. Crop yield and crop sale prices are especially important indicators of ability to pay. Inputs and other purchases can help flesh out an understanding of cash flows. Organizations that facilitate connections between smallholders, input providers, and off-takers can easily collect such data through their platforms. Others may find it necessary to build bilateral partnerships to obtain this data. Asking farmers an expanded list of questions during the loan application process is also an option, but it is time consuming and subject to error.

Geospatial data is also considered highly relevant, but some forms, such as satellite and drones, can be costly to use. A smallholder's productive capacity, market potential, and ability to pay back loans can be significantly influenced by historical weather events and farm characteristics including size and location, distance to the nearest water source, road, warehouse, or market, and climatic zone.⁶ In some instances, fintechs use Internet of Things (IoT) devices, such as drones, to gather geospatial data.

⁶ There is a movement to make many years of historical agricultural research data more available for practical use, through initiatives such as Global Open Data for Agriculture and Nutrition (GODAN) and the CGIAR Platform for Big Data in Agriculture, but models for using that data for financing haven't been developed yet.

Drones can bring the same insights as satellites, but with much better spatial resolution, for cases when precise information is needed on a farm. However, innovators in this space have been less enthusiastic about drones due to their limited geographic coverage – around 200 ha/day/drone for example – compared to satellite. They are not economical to use on a large scale since a mid-size drone can cost \$25,000 and is at risk of crashing, thus requiring replacement.⁷

Psychometric and behavioral data can improve predictive power of traditional scores, but administering the test can be operationally challenging and FSPs should have a clear use case for employing psychometric credit scoring.

Players like Tulaa – a mobile commerce platform that provides farmers with end-to-end solutions from input loans to market linkages – use psychometric data to supplement their understanding of smallholder farmers. While agricultural value chain data and geodata speak to a smallholder’s *ability to repay* a loan, psychometric assessments focus on understanding character and likely behavior patterns, and therefore help organizations understand *willingness to pay*.

Psychometric testing has been shown to improve predictive power of traditional credit scoring tools. In Kenya, for example, microfinance institution Juhudi Kilimo partnered with LenddoEFL to pilot psychometric testing with 6,000 smallholder clients through a Mastercard Foundation Fund for Rural Prosperity (FRP) grant. The objective of this pilot was two-fold: First, to increase the number of borrowers Juhudi Kilimo approves without taking on more risk. Second, to reduce the turnaround time on loan decisions. [A new case study](#) on the use of psychometric assessments in financial services by the FiDA Partnership, found that the LenddoEFL credit scoring model increased Juhudi Kilimo’s acceptance rate by 5% and improved their ability to predict client’s repayment rates and borrowing behavior. Juhudi Kilimo was also able to increase the maximum loan amount available from 67% of collateral to 100% of collateral for high-scoring individuals, and new high-scoring clients were able to increase their loan size on average by \$40.

However, Juhudi Kilimo faced a number of challenges in rolling out the new credit scoring tool and reducing turnaround time on loan decisions.

Juhudi Kilimo had to make structural, operational and technical changes to deploy the psychometric credit scoring model, including: recruiting new staff, revising their loan policy, building new infrastructure, training test administrators and loan officers, and sensitizing loan applicants to the technology. Long test times and the use of tablets to administer the tests introduced a number of operational challenges. The pilot also found that the test did not perform as well with illiterate clients that had difficulties understanding the questions. Juhudi Kilimo and LenddoEFL tested SMS as an alternative channel for administering the test. While SMS is cheaper compared to tablets, it can be difficult to verify who is taking the test and does not address the challenges around illiteracy. Some fintech players like Ricult are opting for outbound voice calls to address the challenge of illiterate farmers that require support to complete tablet or SMS-based surveys.

A key learning from this pilot is that FSPs should have a clear use case for employing psychometric credit scoring, and make sure that the tool helps them solve a real business challenge in their current credit appraisal process. FSPs should also understand that psychometric scoring is not a one size fits all approach and models may need to be customized to fit different contexts and customer segments.

The full FiDA Partnership case study titled “Delving into human consciousness: using psychometric assessments in financial services,” will be published on the [FiDA Partnership website](#) in late September 2018.

⁷ Lifespan of a drone ranges from around 200 to 1000 hours. Source: Expert interview.”

3.3 WHO'S INNOVATING IN CREDIT RISK ASSESSMENT?

HARVESTING: ASSESSING COFFEE FARMERS' CREDITWORTHINESS



HARVESTING

Data service provider, [Harvesting](#), uses alternative data and machine learning to help financial institutions make and manage loans to farmers. In 2018, CGAP partnered with Harvesting to pilot a new credit risk assessment system for PRIDE Microfinance Limited, Uganda's largest microfinance institution. PRIDE is seeking to expand its current base of coffee farmers by using data analytics. Harvesting plans to use a range of data for credit risk assessment which will be collected in phases. This includes financial data (e.g. savings behavior), value chain data (e.g. coffee sales), farm-level data (e.g. irrigation and fertilizer use), and geospatial data (e.g. distance to roads and markets). With support from CGAP, Harvesting is working with PRIDE to digitize its paper-based loan application process. Digitization will be critical to streamline the collection and processing of data and improve the predictive power of Harvesting's algorithm. Harvesting also expects to use value chain data from off-takers to feed into its algorithms.

TULAA: COMBINING PSYCHOMETRIC TESTING AND TRANSACTION DATA FOR INPUT LOANS



[Tulaa](#), a mobile commerce platform, offers Kenyan farmers an end-to-end solution from inputs on credit to market linkages, working in partnership with financial institutions, input providers, and commodity buyers. It uses a smartphone app to automate the collection of loan application data by last-mile agents such as agro-vet retailers. Partner FSPs obtain a potential borrower's M-Pesa mobile payment records and credit bureau records where available. Tulaa also sends potential borrowers a psychometric test developed by a third-party provider via SMS to determine willingness to pay. This data is all combined with Tulaa's proprietary data, which includes farmer profiles as well as their input purchases, loan approvals, cash collateral, and sales, to develop a credit score for each applicant. The financial institution then approves and disburses the input loan – USD 200 to USD 600 in value – over the Tulaa platform. Tulaa recently raised USD 627,000 in seed funding in a round led by one of Africa's largest impact-oriented venture capital firms.

RICULT: USING SATELLITE DATA TO ASSESS AND SUPPORT FARMERS



Currently operating in Pakistan and Thailand, [Ricult](#) offers an integrated technology solution to serve smallholder farmers. Ricult provides farmers with inputs on credit, customized agronomic advice, and connections to buyers. It assesses farmers' willingness to repay loans using a psychometric test that is administered through outbound voice calls. Once a farmer passes this test, Ricult collects additional data through field agents and through APIs that connect Ricult's platform to other databases. Ricult also uses public and private satellite data to estimate historical yields of potential borrowers. This information, along with weather data, is then used to predict yields for credit risk assessment. All transactions data – e.g. KYC and value of inputs extended – are recorded using a distributed ledger, which enables Ricult to lend from a USD 1 million fund capitalized by private investors. Ricult is also beginning to provide data analytics services for portfolio monitoring to banks. Backed by the Gates Foundation, Ricult recently raised USD 1.85 million in seed funding.



"Data analytics helped Ricult improve our credit default rates from 66% to 0% over the course of 10 months, i.e. two crop cycles. This was made possible by analyzing a wide range of non-traditional data specific to smallholder farmers. This helped us in increasing the loan size [inputs on credit] by a factor of two for farmers whose creditworthiness improved across the duration of the loan. The overall end-to-end intervention helped farmers increase yield and incomes by 27%."

– Usman Javaid, Founder & CEO, Ricult

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SECTION 4: USE CASE PORTFOLIO MONITORING

4.1 WHAT IS THE VALUE PROPOSITION FOR DATA ANALYTICS IN PORTFOLIO MONITORING

Data analytics can help FSPs lower their cost of monitoring smallholder farmers as well as reduce the likelihood of default through more frequent, but remote, oversight. Using geospatial data to monitor crop performance can help reduce the number of field visits an FSP needs to conduct during the term of the loan. For players like Babban Gona, which has an ambitious goal of serving one million farmers by 2025, efficient, remote monitoring with more targeted use of field officers could become an integral part of their scaling strategy. At the same time, data analytics can enable FSPs to intervene to mitigate risk or help identify the impact on their smallholder portfolios when catastrophic events occur. Innovation in this space is largely led by data service providers and hybrids that are leveraging geospatial data – mainly from satellite, Internet of Things (IoT) devices such as farm cameras, and meteorological departments.

The use of data analytics for portfolio monitoring – using both public and private satellite data – is demonstrating a return on investment for FSPs that are serving hundreds of thousands to millions of farmers in India, and broader uptake may occur as satellite costs decline in the next few years. This will enable FSPs with smaller customer bases, and in other markets, to benefit from data analytics solutions that leverage high resolution satellite data. Reducing the cost of IoT devices – and some of their technical shortcomings – could create additional possibilities.

4.2 WHAT TYPES OF ALTERNATIVE DATA ARE BEING USED FOR PORTFOLIO MONITORING?

Both geospatial and certain types of ag value chain data – for example crops grown, input purchases, sales contracts – are useful in portfolio monitoring. Agricultural value chain data is difficult to obtain from value chain players such as agribusinesses and extension providers, however, as it requires partnership-building.

Instead, where possible, innovators are collecting data on crops grown and production patterns through satellite imagery. They also seek to gather this information from farmers through the standard loan process.

Several organizations are using geospatial data, but the means of gathering it vary in terms of cost and complexity. Geospatial data that is valuable for portfolio monitoring includes current and forecasted weather as well as information about how much of which crop is growing where, when a crop was sowed, and how well it is growing. This information can be detected through a range of sources from satellite imagery to IoT devices such as drones and farm cameras. For example, Zenvus, a Nigeria-based company, uses electronic sensors to collect soil data (moisture, nutrients, and pH level) and cameras to analyze crop health and detect stress while SatSure, an India-based company, is focused on using satellite data, which offers greater economies of scale than IoT data, to reduce the high rates of NPLs in India.

Geospatial data helps FSPs identify the impact of big stressors such as a late monsoon or a pest infestation on their smallholder portfolios in specific geographies. Another benefit of geospatial data is that it offers early detection of agronomic problems. This can reduce the risk of a farmer defaulting on a loan if timely technical support is provided to help him or her course correct. However, FSPs would need to work with partners – from either the public or private sector – to facilitate timely extension support.

4.3 WHO'S INNOVATING IN PORTFOLIO MONITORING?

SATSURE ANALYTICS: REDUCING NPLS AND SUPPORTING LOAN RECOVERY



SatSure provides FSPs in India with data analytics services – drawing on geospatial and value chain data – to assess and monitor risk in smallholder lending to reduce the high rate of nonperforming loans in the country. It monitors the performance of both individual smallholder farms and loan portfolios at a district or state level, with a focus on climatic zones. SatSure can detect which crops are being grown, which shows whether loans are being used for their intended purposes. It can also determine when crops were sowed, how well they are growing, their harvest readiness, and estimated yield. SatSure predicts farm yields with 85-90% accuracy for farms up to one acre across several major crops. This helps banks with remote monitoring of smallholder portfolios, enabling them to send field agents out at the right time to recover loans. SatSure also gauges the impact of adverse weather events on a bank's portfolio through its agro-meteorological models. In addition to banks, SatSure offers services for insurance companies in India and is beginning to serve other agricultural value chain players such as logistics and input providers and off-takers. SatSure has assisted public and private banks to monitor portfolios of one million smallholder farmers.

Using data analytics for loan recovery assurance, an Indian bank was able to increase its book size by 2% and achieve a reduction of 1.5% in nonperforming assets during a single season. SatSure's role included analyzing the probability of crop-specific loan defaults and developing a harvest readiness timeline for farms in the bank's portfolio. This helped the bank to assess early on whether farmers in certain locations would be able to pay back their loans or require waivers, as well as to better plan field-level loan recovery operations as harvest time approached.

SatSure has received several awards, including being named a top three award winner at the Global AgTech Pitch organized by the Government of Andhra Pradesh in India and the Bill & Melinda Gates Foundation in 2017. It is also advising the Government of India on using satellite-based data science models for agri-finance policy making.

YAPU SOLUTIONS: ASSESSING VULNERABILITY TO CLIMATE IMPACTS



YAPU Solutions provides software solutions that enable institutions serving smallholder farmers to digitize their processes. YAPU combines self-reported farmer data – such as crops grown, farm size, input use, and farming practices – with public data to leverage its proprietary algorithms to generate automated financial statements as well as productivity, climate, and environmental scores for farmers. In the area of portfolio monitoring, YAPU offers a climate scoring model – which is in the early stages of development – to assess an FSP's vulnerability to climate risk, a significant issue in financing smallholders, and provide an early warning system.

YAPU leverages public satellite data on soil texture, topography, temperature, and precipitation as well as public maps on protected or disaster inflicted areas. It also uses crop data from the FAO Ecocrop database – which provides minimum and optimal rain, soil PH, and temperature requirements for specific crops – to feed its algorithms that predict smallholders' vulnerability to natural disasters. YAPU's solutions reduce loan origination and portfolio monitoring costs, while also providing insights for FSPs to take preemptive action to support smallholders with climate change mitigation and adaptation, including through new loan products.

Zenvus offers smallholder farmers in Nigeria the ability to capture and share their data with FSPs. It uses electronic sensors to collect soil data such as moisture, nutrients, and pH level, as well as farm cameras to determine the vegetative health of crops and detect stress.

And the company’s mapping tool enables farmers to plot their farm boundaries, addressing a critical financing roadblock for tenant farmers who farm different plots each year. Zenvus reaches smallholders through cooperatives that purchase its IoT devices in bulk. Cooperatives also use Zenvus’ platform to gather data from these devices, which is then analyzed by Zenvus and shared with FSPs in aggregate. However, individual farmers need to release their data – such as crops grown, historical yields, and incomes – to FSPs through Zenvus’ platform if they wish to obtain a loan from an FSP through a cooperative. Zenvus supports FSPs with portfolio management by providing aggregated and anonymized data to monitor performance of smallholder farmers. Data on individual farms can also be provided, if desired, and with a farmer’s consent.

Zenvus is working with the Central Bank of Nigeria and the Bank of Agriculture to reach millions of farmers in Nigeria. The company’s founder was recognized by CNBC Africa as Innovator of the Year in 2018.

BOX 4: WHAT TYPES OF DATA ARE MOST USEFUL FOR WHAT PURPOSES?

This box provides a quick overview of the types of data being used in credit risk assessment and portfolio monitoring, as well as the perceived value of and ease of access to those data. Perceived value means how good a job the data does for a particular use case – including predictive ability for credit risk assessment, for example. While ease of access considers both the complexity and cost of accessing and using that data. The third use case discussed in this brief, customer segmentation and product design, is not included as limited experience to date has not yet generated sufficient insight.

Alternative Data Type	Perceived Value		Ease of Access
	Credit Risk Assessment	Portfolio Monitoring	
 MOBILE AND SOCIAL MEDIA HISTORY			
 PSYCHOMETRIC AND BEHAVIORAL DATA		N/A	 1
 GEOSPATIAL (SATELLITE)			 2
 VALUE CHAIN (PRODUCTION DATA)			 3
 VALUE CHAIN (FINANCIAL DATA)			 4

1. Administering the tests using field agents and tablets is operationally challenging, long test times can be burdensome for the applicant, and the test does not perform as well with illiterate applicants. SMS is another viable option, but does not address the illiteracy challenge. Some organizations are testing outbound voice calls.

2. Varies based on source from relatively straightforward from GPS/geolocation apps to more difficult from sensors, meteorological departments, and satellite.

3. Can be relatively easy to obtain through farmer surveys but is more difficult to get through third parties such as extension providers.

4. Is generally difficult to obtain since it requires partnerships with offtakers, but organizations that offer end-to-end solutions to farmers—from inputs to offtakers—can more easily collect this data.



5

SECTION 5: USE CASE CUSTOMER SEGMENTATION AND PRODUCT DESIGN

5.1 WHAT IS THE VALUE PROPOSITION FOR DATA ANALYTICS IN CUSTOMER SEGMENTATION AND PRODUCT DESIGN?

Data analytics generates consumer insights that could help FSPs increase revenues by offering new and improved products and expanding their customer base. For example, data analytics could identify existing customers ready to take on new or larger loans, highlight underserved customer segments such as women, or reveal potential new segments an FSP could target. It could also help FSPs design products that fit smallholder farmers' irregular cash flows and meet their diverse agricultural financing needs, including in new areas such as climate change mitigation and adaptation, further helping to acquire new customers. **Though it could help FSPs achieve scale, the use of data analytics for customer segmentation and product design appears to be in earlier stages than for credit risk assessment or portfolio monitoring.** This may be because FSPs consider more accurately and cheaply assessing risk and monitoring their portfolios to be bigger barriers to serving smallholders profitably. When those barriers come down, we may see more happening in this area. Right now, we see some FSPs using data analytics to segment their existing customers and offer them new products, which could increase the lifetime value of those customers. In some cases, FSPs are partnering with donors and development organizations to do so. Donors and development organizations are also promoting the use of data analytics to identify opportunities to serve new customers, for example using open data sets.

[CGAP's Smallholder Families Data Hub](#) is one promising tool that hopes to catalyze improved products for farmers; it has over 300,000 data points on smallholders' agricultural and financial lives that organizations can download in raw or visualized forms to identify new market opportunities. For example, agricultural input distributor Positive International Limited in Tanzania has worked with the Grameen Foundation to use CGAP data to design and pilot a mobile layaway service.

5.2 WHAT TYPES OF ALTERNATIVE DATA ARE BEING USED FOR CUSTOMER SEGMENTATION AND PRODUCT DESIGN?

Because the primary focus at this stage is on segmenting and offering new products to existing customers, traditional data – rather than alternative data – appears to remain the most relevant. This includes repayment history, if available, as well as withdrawal, deposit, and balance information. This information is relatively easy to work with if an FSP is digitized, through analysis and visualization.

A range of alternative data types could help FSPs serve existing customers even better, as well as identify new customers and design new products. Agricultural value chain data, geospatial data, mobile and social media data, psychometric and behavioral data, as well as other data e.g. from national smallholder surveys or consumer research work could all help to provide a better picture of farmers' agricultural and financial lives, aspirations, and attitudes. "Open data" sources like CGAP's Data Hub have potential here, but for the most part, the link between open data and smallholder financing is only just beginning. And at the present time, there is insufficient experience with data analytics for customer segmentation and product design to generate concrete insights on which types of alternative data are most useful.

5.3 WHO'S INNOVATING IN CUSTOMER SEGMENTATION AND PRODUCT DESIGN?

BABBAN GONA: PROVIDING PROFESSIONAL MANAGEMENT AND ACCESS TO FINANCING FOR SMALLHOLDER FARMERS



In Nigeria, [Babban Gona](#) offers end-to-end services to smallholder farmers, and financing is an integral part of the package. At the start of the planting season, a customized package of inputs and services, from seeds to bags to threshing to transport, are provided to the farmers on credit. At harvest time, the farmers' grains are transported to Babban Gona warehouses, where it is stored for 6-9 months so as to take advantage of higher commodity prices than would be achieved at harvest time later in the year. On receipt of the grains, the company also issues harvest advance loans to the farmers, providing cash at a time of year when household finances are most stretched. As the grain is sold throughout the year, the farmers can potentially make additional profits. To date, Babban Gona has served 18,000 farmers with a 99.9% repayment rate, while helping to increase their net incomes to more than three times the national farmer average.

For Babban Gona, data analytics is critical to driving operational efficiency, for example by using GIS mapping to optimize route planning for field staff. The company also uses data analytics to track certain information about its members, including productivity and repayment history, with the highest-performing farmers becoming eligible for additional loans—for example, to utilize tractor services. Babban Gona has also experimented with the use of satellite data to target and reduce the overall frequency of field visits for portfolio monitoring purposes, a possible source of operating cost savings that could reduce the amount of human capital needed to scale and reach its ambitious goal of one million smallholders by 2025.

Babban Gona has raised UDS 8 million in debt to date and won the Skoll Social Entrepreneurship Award in 2017.

APOLLO AGRICULTURE: USING GEOSPATIAL DATA TO CUSTOMIZE PACKAGES OF INPUTS AND ADVICE ON CREDIT⁹



[Apollo Agriculture](#) offers a customized package of seed, fertilizer, insurance, and advice on credit to smallholder farmers, and allows customers to repay slowly until they harvest their crops. Key to Apollo's model is the ability to operate with minimal field staff using a combination of mobile technology and independent agents and distributors. Farmers sign up via mobile phone and Apollo then gathers an array of data about each customer, including satellite data, which they use to build a detailed picture of each farmer's agricultural and economic life. This includes insights like farm and house sizes, crops planted, and yields produced, which are combined using machine learning to assess credit risk. Independent retailers distribute the inputs to customers, and advice is delivered over the course of the season through mobile phones. In the future, Apollo also plans to use data analytics for product design, as it gains the ability to further customize its input recommendations and advice for each unique customer.

Apollo recently secured an additional USD 500,000 in funding from the Dutch Development Bank FMO and Rabobank.

.....
"Our approach generates large volumes of data about each unique customer -- including remote sensing data of customer fields, communication preferences, inputs used, harvest quality, etc. Ultimately, this data can help us customize both the type of input packages we recommend as well as the way we engage and communicate with each customer."

– Eli Pollak, CEO, Apollo Agriculture

⁹ For a detailed discussion on Apollo Agriculture see Partnership for Finance in a Digital Africa, "[Case Study: Launching into space: using satellite imagery in financial services](#)," Farnham, Surrey, United Kingdom: Caribou Digital Publishing, 2018.

6

UNDERSTANDING THE POTENTIAL RETURN ON INVESTMENT IN DATA ANALYTICS

Over the last few years, stakeholders have innovated considerably in the use of data analytics to expand access to credit for smallholders—and yet we still have a lot to learn. This field is still in its infancy, and while several innovators have shared exciting progress, most are still in the process of developing and refining their algorithms and business models. There is very little evidence to demonstrate why FSPs should invest or how they can get started. Pioneers stress the importance of organizational readiness, and many FSPs still need to digitize and take other fundamental first steps before they can make the most effective use of data analytics (see Box 5).

Perhaps the most important question relates to the nature and strength of the business case. As the industry begins to demonstrate a positive return on investment in data analytics, FSPs will jump on board in larger numbers, the market will develop faster, operational best practices will emerge, and smallholder farmers will gain access to the credit they need on a greater scale.

Because the business case is so fundamental, and evidence so scarce, we decided to run a simple “thought experiment” to explore what would have to happen for an FSP’s investment in data analytics to pay off (see box 6). In a nutshell, our thought experiment suggests that the value proposition for data analytics seems compelling and we have good reason to believe that as the quality of insights we generate from data analytics improves, the potential upside will continue to grow.

The first step in our thought experiment was to get a sense of the size of the typical investment in data analytics. Our interviews with sector experts and practitioners suggest there are three major categories of cost when it comes to using data analytics to expand access to credit for smallholders:

1. Digitizing operations. This includes investment in a core banking management information system, digitizing paper records, front-end

software and hardware (such as tablets or mobile phones for collecting farmer data), and cloud storage in some cases.

- 2. Staffing and training.** This includes hiring new staff, such as a Chief Technology Officer and IT support, as well as training existing staff, such as loan officers, in how to use the new technology.
- 3. Data analytics.** Data analytics itself can be done in-house, with programmers, data analysts, and even data scientists working with an FSP’s own data, free third-party data, or data purchased or acquired through partnerships (for example with agricultural off-takers). Data that is purchased may cost anywhere from USD 50,000-100,000 per year for mobile network operator data and USD 64,000-400,000 per year for satellite data. In addition, using satellite data requires skilled data scientists and analysts as well as infrastructure to store data, which are high-cost line items.¹⁰

DSPs are charging anywhere between USD 0.50 and USD 4 per farmer per year, depending on the level of complexity of the service provided. Pricing can be a function of scale, for example, the USD 4 per farmer fee above, for a relatively complex service, is based on a customer base of ~100,000 farmers. While subscription fees are a common pricing model, some DSPs charge on a per loan basis (e.g. 1-3% of loan value). These fees are evolving and negotiable, as DSPs figure out what the market will bear. In some instances, FSPs can also expect up-front fees for software set-up and integration with their core banking systems.

The next step in our thought experiment was to make some key assumptions. Our analysis is based on an FSP that serves 100,000 smallholder farmers with a 5% net interest margin and 3% in loan loss provisions.

¹⁰ For a detailed discussion on satellite data in smallholder financing see, Partnership for Finance in a Digital Africa, “[Case Study: Launching into space: using satellite imagery in financial services](#),” Farnham, Surrey, United Kingdom: Caribou Digital Publishing, 2018.

We ran the analysis on commercial export-oriented farmers in tight value chains (assuming average loan size of USD 500 and two loans a year) and on commercial farmers in loose value chains (with average loan size of USD 250 and one loan a year).¹¹

This gave us high and low-end estimates of the operational improvements that FSPs would need to realize in order to break even on their investments in data analytics.

The results, in Box 6 below, show that an FSP could recoup a typical investment in data analytics through a small to moderate improvement in its customer base, average loan size, or operating costs, or more likely through more modest improvements in each. Under these scenarios, FSPs do not even need to see a reduction in NPLs, which in many cases are already low.

¹¹ These assumptions draw on figures for the financing needs of smallholder farmers in tight and loose value chains in “Inflection Point: Unlocking growth in the era of farmer finance”. The assumptions used in the calculations for this brief are more conservative than [Inflection Point](#).

The potential upside could be much higher – for example, if the use of data analytics enabled an FSP to reduce loan loss provisions – but we need more evidence from live examples to convince FSPs.¹²

This analysis, is of course, theoretical in nature and is meant for illustrative purposes. In reality, such investments would be made alongside broader analytical investments and costs would be shared across multiple departments or groups. Still, isolating the costs and impacts is a useful (and conservative) way to understand what the minimum returns would need to look like. Going forward, FSPs will need to better understand the implications of conducting data analytics operations in-house versus outsourcing them, as well as the complexity of integrating data analytics into their operations.

A majority of respondents in an MFI survey believe that digitization and data analytics can make the loan assessment process more efficient and reduce risk - YAPU Solutions.¹³

¹² RAF Learning and Dalberg Advisors 2018, [RAFLD DA Excel Tool](#), The ROI of Data Analytics.

¹³ Findings from a 2018 YAPU Solutions survey of 167 MFIs worldwide.

BOX 5: CHECKLIST FOR SUCCESS: 5 STEPS TO TAKE BEFORE INVESTING IN DATA ANALYTICS

Pioneers stress the importance of readiness to make the most effective use of data analytics to expand access to credit for smallholders:

- 
COMMITMENT Build buy-in for data analytics throughout the organization, from senior leadership to product and risk team managers to loan officers
- 
DIGITIZATION Switch from analog to digital lending processes
- 
PROCEDURES Ensure standard operating procedures are set up to maximize collection of quality data
- 
CAPACITY Recruit or train staff to analyze data or work effectively with data service providers
- 
CULTURE Promote openness to innovation and trust in technology, and address fears about redundancy or losing the human touch

BOX 6: THE MATH BEHIND THE THEORY: WHY WE BELIEVE DATA ANALYTICS IS A WORTHWHILE INVESTMENT FOR FSPS¹⁴



IS THE INVESTMENT IN DATA ANALYTICS WORTH IT? THE MATH SUGGESTS **YES**

In fact, there are more sources of value than we think. The upside for FSPs could be in the millions, with limited investment and a shift in thinking about how to derive value from data analytics

THAT SAID, INVESTING IN DATA ANALYTICS ISN'T CHEAP

DATA ANALYTICS REQUIRE FSPS TO MAKE A MEANINGFUL UPFRONT AND ONGOING INVESTMENT, WHETHER CONDUCTED IN-HOUSE OR OUTSOURCED

For example, an FSP serving
100K SMALLHOLDER FARMERS



Could be looking at making an investment in the range of
USD 500K-750K+¹⁵

Our analysis suggests the **greatest value of data analytics** may not just be about cutting costs and risk mitigation but also—if not more—**about generating additional revenues**



For an FSP serving 100,000 smallholders, we see at least **three separate outcomes** that make the **investment worthwhile**

1

Small to moderate increase in farmers

15-25% increase in a customer base of 115k-125k smallholder would result in the same net profitability for the FSP

Data analytics would help FSPs reap these benefits by allowing them to better identify and segment farmers, thus reaching new customers that would have otherwise gone unnoticed



2

Growth in average loan size

A 15%-30% jump in the average loan size for smallholders would result in a similar outcome as generating new customers

FSPs can use insights from data analytics to continually improve their understanding of their farmer profile and—over time—offer higher loan amounts to their customers, increasing their value



3

Lower operating costs = increased net interest margin

By **cutting operating costs by 15-30%**, it would effectively increase the net interest margin from -5% to 5.75% or more

This would be based on reductions of staff time in the field, more effective monitoring, etc.



FSPs will likely get the most returns from a combination of the three outcomes and their returns could be even greater if they account for reduced risk

14. These assumptions draw on the financing needs of smallholder farmers in tight and loose value chains in “Inflection Point: Unlocking growth in the era of farmer finance”. The assumptions used in the calculations for this brief are more conservative than Inflection Point. Online at: <https://www.rafllearning.org/post/inflection-point-unlocking-growth-era-farmer-finance>. The figures here are meant to help understand what you would have to believe for an FSP to at least breakeven from their investments in DA and different ways of getting there. Think of the math here as “back-of-the-envelope” calculations.

15. Estimated annual investment in data analytics for a 100K smallholder farmer portfolio. Assumes a series of upfront and ongoing costs. Upfront costs include: digitizing operations and workflow (investment in core banking MIS, digitizing paper records). Ongoing costs include: cloud storage for SHF data, salaries for IT support staff, and cost of data analytics (which could be in-house or outsourced). Upfront costs are amortized conservatively over 15 years while ongoing costs are calculated annually. Lower end assumes data operating costs are outsourced while higher end assumes data operations are developed in-house).

We are optimistic about the potential of data analytics to help FSPs operate more cost-effectively, reach greater scale, and increase their impact on smallholder farmers.

The use of data analytics for credit scoring is maturing, and other use cases are emerging. Our thought experiment suggests that the value proposition for FSPs could be compelling. We have better insight into what data is useful and what's not. The interest and investment in the sector is healthy, with increasing experimentation and early-stage impact-oriented capital flowing.

While we believe data analytics can be a game changer in helping FSPs develop sustainable models to lend to smallholders, it isn't changing the game as fast as we might have hoped.

Our experience suggests there are several roadblocks that are constraining faster progress. Fundamentally, they are about proving why FSPs should adopt data analytics in smallholder financing, and how best to do it. The most important include:

- **What is the business case for FSPs to invest in data analytics?** What is the nature and strength of the business case for FSPs to invest in data analytics, and what is its impact on smallholder farmers? At present, while the economics seem promising, there is insufficient quantitative evidence on the actual returns achieved by those that have invested in data analytics. Until the sector is able to prove a positive business case, FSPs and private investors will struggle to buy in.
- **How can FSPs build the capabilities they need to leverage data analytics effectively?** Legacy, often analog systems and lack of data-skilled staff, means many FSPs are still ill-equipped to benefit from even the most basic data analytics innovations. In addition, the lack of consistency across FSP operating systems means many integration processes require customization, increasing the upfront cost and complexity of digitization and data analytics. Building FSP capabilities will require understanding what to digitize first,

how much it will cost and who to work with, finding smart ways to fund the investment in digitization and data analytics, and developing the staff capabilities and culture that FSPs will need to operate digitally and turn data into insight that add business value – either on their own and/or in collaboration with DSPs. A robust ecosystem of off-the-shelf technology providers that meet the needs of FSPs and enables mass digitization must also be in place.

- **How can FSPs gain access to useful data at a reasonable cost?** For many FSPs, accessing new data types can be challenging. Increasing access to useful data will require understanding when it makes sense to collect it internally (e.g. by adding a couple of high impact questions to an existing digital form), when is open source data effective, and when is data from private sources needed. It will also require a better understanding of how to forge effective partnerships with data holders and of the implications of those partnerships for data privacy. Lessons on what's working and what's not are missing.

The best way to answer these questions and advance the field is for FSPs and DSPs to work together, with catalytic support from donors.

FSPs and DSPs will have to take the lead: they are the ones lending to smallholders and providing data and analytics services to support the process, and ultimately stand to gain commercially. At the same time, there is still an important catalytic role for donors to play. The use of data analytics to expand access to credit for smallholders is still in its infancy. To grow, more FSPs need to buy in. To buy in, they need proof points. Establishing those proof points requires FSPs and DSPs to collaborate, innovate, and adapt their approaches.

This type of early-stage, technology-based innovation is inherently risky. Smartly deployed philanthropic funding that directly supports the cost of experimentation or reduces risk through, for example, first loss guarantees can make it easier for for-profit players to participate in innovative solutions and fuel broader industry growth. Donors can help build the market for affordable, off-the-shelf digitization solutions that FSPs can

easily integrate, by collaborating with established technology vendors and digital platforms to support them in reaching and effectively meeting FSP needs. Donors also have a role to play to actively capture and share lessons learned.

Finally, donors can make sure that the data analytics innovation wave doesn't leave behind marginalized segments such as subsistence, women, and youth farmers.

Working together, FSPs, DSPs, and donors can accelerate progress toward a functional, vibrant market of data analytics solutions that enables FSPs of all kinds to reach millions more smallholders – including women and other underserved groups – with financial services that transform their productivity, incomes, and standards of living.

In Box 7, we highlight some key initiatives FSPs, DSPs, and donors could undertake on the three priorities highlighted above. This list is not meant to be comprehensive. We know there are many things that need to be done. But we hope these ideas will trigger discussion and action that turns data analytics into the game-changer we believe it can be.

PRIORITY	KEY INITIATIVES FOR SECTOR STAKEHOLDERS		
	For FSPs	For DSPs	For Donors
BUILDING THE BUSINESS CASE FOR DATA ANALYTICS	<ul style="list-style-type: none"> Align with peers on KPIs to measure ROI of data analytics use cases and data types Be open to experimenting with data analytics by allocating specific parts of the lending portfolio to data analytics pilots 	<ul style="list-style-type: none"> Track KPIs demonstrating impact on key FSPs' business drivers and farmers¹⁶ Sharpen the pitch by publishing success stories for FSPs and farmers 	<ul style="list-style-type: none"> Share the cost and risk of data analytics pilots to support experimentation and establish proof points Require FSPs and DSPs working on donor-funded pilots to share results and share returns expectations with the broader FSP community
STRENGTHENING CAPABILITIES	<ul style="list-style-type: none"> Make digitization a strategic priority and invest in it Recruit or train skilled staff (e.g. CTO, data analysts) and develop an organizational culture that supports digitization and data analytics Map data that is already digitized and identify gaps 	<ul style="list-style-type: none"> Develop diagnostic tools to help FSPs get started with digitization and data analytics¹⁷ Support FSPs with digitization by providing technology integration services or through links to third parties 	<ul style="list-style-type: none"> Build the market for affordable, off-the-shelf digitization solutions that FSPs can easily integrate, by collaborating with established technology vendors and digital platforms to support them in reaching and effectively meeting FSP needs Offer digitization and data analytics grants for the most resource-strapped FSPs, particularly those reaching underserved segments Fund a playbook, webinar series, and/or other capacity-building resources that compile lessons learned and help guide FSPs in their digitization and data analytics journeys
DEVELOPING COST-EFFECTIVE DATA SOURCING MODELS	<ul style="list-style-type: none"> Pilot partnerships with offtakers, extension providers and other data holders to access external data Be open to sharing lessons on data sourcing partnerships including operational challenges, revenue sharing agreements and implications for privacy, and exclusivity 	<ul style="list-style-type: none"> Work with governments to create policies that can enable effective data sourcing and address issues around privacy, anonymity and ethics 	

16. Such KPIs could include increase in number of farmers served (including increase in loan approval rates), increase in average loan size, decrease in average cost to serve farmers, and decrease in portfolio at risk.

17. Diagnostic tools could, for example, help FSPs identify gaps in current capabilities (infrastructure and staff skills) and how to get started.

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ABOUT THE LAB

The Rural and Agricultural Finance (RAF) Learning Lab, is an initiative of the Mastercard Foundation's financial inclusion portfolio implemented jointly by GDI and Dalberg Advisors. The Lab's mission is to foster learning and collaboration among Foundation partners as well as the broader RAF community to support innovation and scalability of financial services for rural customers, specifically smallholder farmers.

Learn more at www.rafllearning.org



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