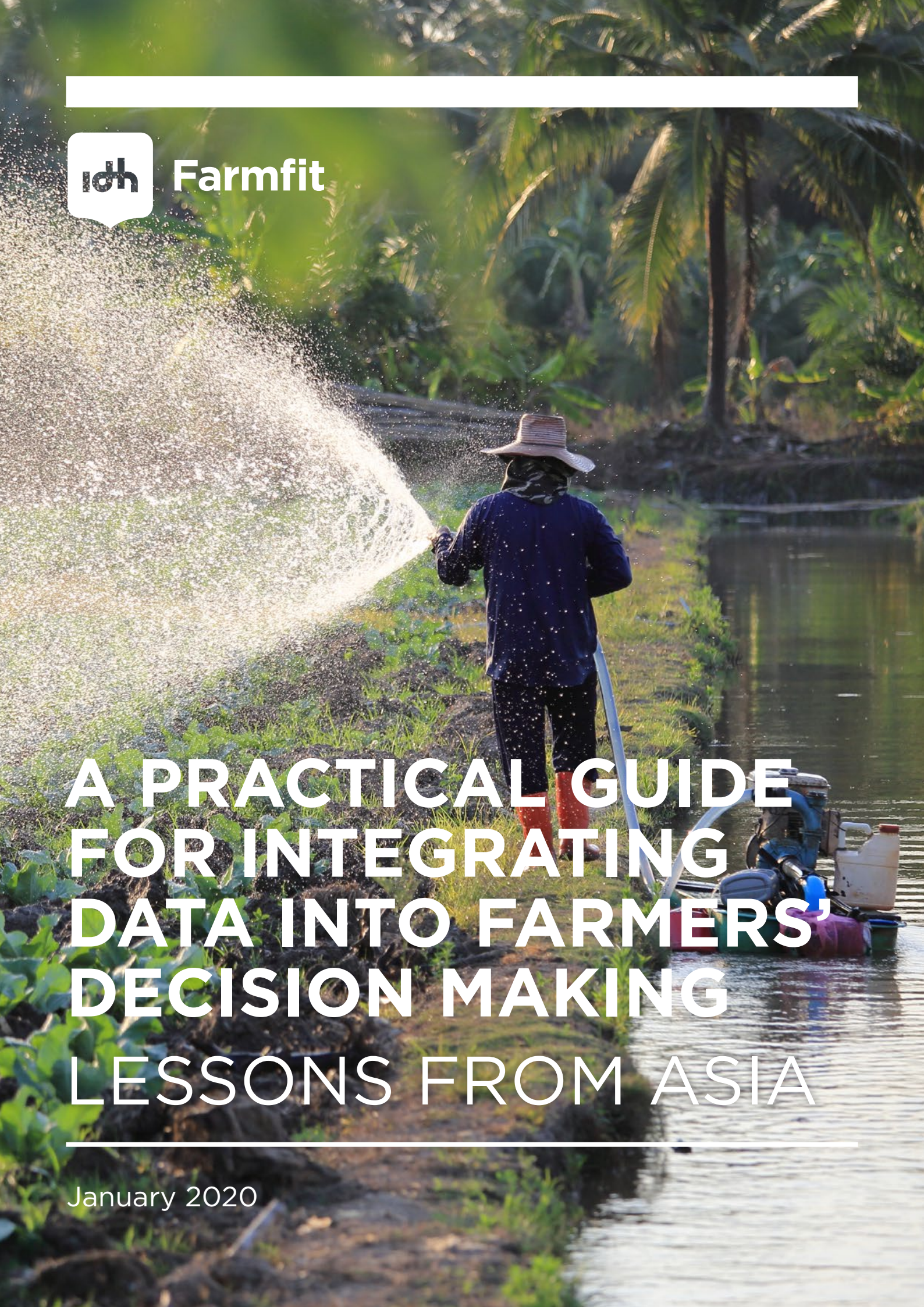

Farmfit

# A PRACTICAL GUIDE FOR INTEGRATING DATA INTO FARMERS' DECISION MAKING

## LESSONS FROM ASIA

January 2020

# 1.0
# INTRODUCTION

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## INTRODUCTION

**The benefits of data integration in agriculture/aquaculture greatly outweigh the costs associated with it, however, influencing smallholder farmers to adopt data-driven technologies continues to remain a critical challenge.** Since most farmers in developing economies are smallholders, low adoption is a result of underlying factors such as a limited ability and willingness to pay, poor receptivity of new technology, lack of trust and awareness, and an outlook for immediate gains. The difficulty of last-mile connectivity further amplifies the adoption challenge. As a result, only a few businesses have managed to scale while others still struggle with financial-sustainability. The ones that have scaled have incorporated strategies involving pricing, marketing, and distribution; an understanding of which is necessary for successful participation in this space.

With this background, IDH, with support from Intellecap, developed this practical guide for organizations seeking to integrate data into agriculture/aquaculture through Farm Management Information Systems (FMIS) in emerging economies. The recommendations included in the guide are an outcome of secondary research on 128 FMIS service providers and a deep dive with 21 shortlisted FMIS service providers operating in five countries of Asia: China, India, Indonesia, Thailand, and Vietnam[1]. **This document entails a summary of choices, considerations, and best practices for FMIS service providers in improving their business models and service offerings.**

*1. Please note: The study's scope is limited to agriculture and aquaculture and does not include other allied sectors. All references to farmers include individuals engaged in agriculture and aquaculture both.*

**Farm Management Information Systems (FMIS)** are Information Communication Technology (ICT) systems, that support farmers in making data-driven decisions about optimal distribution of farm resources, enabling them to enhance farm-level sustainability and profitability. By using an FMIS, farmers tend to see improvements across four dimensions:

a reduced costs of production,
b increased productivity,
c reduced vulnerabilities, and
d increased price realization.

**Several businesses in Asia are helping farmers to transit to data-backed agriculture through the use of Farm Management Information Systems (FMIS).** The use of such systems plays a key role in strengthening smallholder farmer livelihoods across developing economies and ensuring global food security. For instance, through IoT-enabled feeders, an FMIS service provider in Indonesia has allowed fish farmers to reduce input use by over 21%. Another FMIS service provider from Indonesia, through its sensors for water quality monitoring has helped shrimp farmers more than double annual profits. Similarly, farmers in rural India have witnessed increases in productivities of around 50% in just one cropping cycle since the use of an FMIS. In addition to core agricultural activities, some FMIS service providers leverage data to provide farmers with choices of credit, and thereby, reduce their dependence on informal money lenders.

Beyond farmers, agribusinesses have also gained from the use of FMIS through reduced farm management costs, alongside an improvement in quality and volumes of produce harvested. The use an FMIS can also drive environmental sustainability. In Vietnam, sensor-based irrigation systems have demonstrated a reduction in water use by 18%, energy savings by 16%, and labor savings by around 38%. While, these solutions can have some indirect costs such as the displacement of unskilled labor and local laboratories, most stakeholders engaged in agriculture including smallholder farmers, agribusinesses, and development-aid organizations consider FMIS to be a boon to the sector.

# 2.0
# KEY RECOMMENDATIONS

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**FIGURE 1: POTENTIAL BENEFITS FROM THE USE OF FMIS**

**Farmers**

- Reduced cost of production
- Increased productivity
- Improved price realization
- Reduced vulnerabilities

**Contract Farming Agencies**

- Standardized quality of output
- Increased harvest volumes
- Improved traceability
- Reduced farm management costs

**Financial institutions**

- Efficient lead generation
- Faster disbursement
- Reduced risk of lending
- Better repayment rates

**Buyers and exporters**

- Easier sourcing
- Improved traceability
- Better access to premium markets

**Donors and NGOs**

- Improved transparency in fund usage
- Better developmental outcomes
- Easier monitoring and evaluation

## KEY RECOMMENDATIONS

There are several factors that can influence the success of an FMIS service provider. These critical success factors can be analyzed and implemented across three broad themes: a) choice of service delivery model, b) efforts undertaken to influence adoption, and c) other success factors pertaining to the service provider. Each of these themes are discussed on the next pages.

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## CHOICE OF SERVICE DELIVERY MODEL

**The choice of a service delivery model has substantial implications on an FMIS service provider's ability to scale and succeed. Service providers should, hence, carefully scrutinize the merits and demerits of each model before making a selection**. FMIS service providers can use either one or a combination of three service delivery models: a) B2F (Business to Farmers), b) B2B (Business to Business) and c) B2B2F (Business to Business to Farmers).

**FIGURE 2: DESCRIPTION OF THE THREE DIFFERENT SERVICE DELIVERY MODELS**

| Business to Farm (B2F) | Business to business (B2B) | Business to business to farm (B2B2F) |
|---|---|---|
| FMIS provider directly markets and sells products to the end-consumers. Transactions happen between the FMIS provider and the consumer directly. | FMIS provider hosts a specific solution online and provides it to a range of businesses who then disseminate it to farmers. There is no direct interface between the FMIS provider and the end-users. | FMIS provider partners with another business to increase its outreach but ensures that the farmer is aware of the provider's brand and often interfaces with them directly. In most cases, the FMIS provider transacts with a business that eventually transacts with a farmer. |

Each of these models has its own sets of advantages and limitations which should be carefully considered while making a choice. The selection eventually impacts the FMIS service providers across four key dimensions:

I. **Adoption and scale:** Service providers who are following B2F model in developing economies should set aside resources for market building and adoption as the cost of customer acquisition is high. Besides this, these service providers may also begin with targeting large and progressive farmers. Service providers who are adopting a B2B or B2B2F approach should aim to partner with large businesses to scale faster. For example, there is ample evidence to suggest that service providers using the B2B model and the B2B2F model often provide SaaS solutions to MNCs to quickly scale their operations to new geographies.

II. **Leveraging data for alternate revenue streams:** FMIS service providers following the B2F and B2B2F models should aim to own data through contractual agreements with end users. This would enable them to create backward and forward linkages to help them generate alternate revenue streams. On the other hand, those following B2B model would have to settle for their customer businesses to own data and this may make it difficult, and at times impossible, to leverage data to diversify their revenue streams.

III. **Operational control:** Service providers who are offering SaaS and are following the B2B model need to guard against underutilization of the potential of their solution. This is important because their role is restricted to after-sales support only, with the customer business doing the heavy lifting on collection of farm data, its processing and providing advisory to the farmers..

### CASE STUDY

KOLTIVA

**CROPS/SECTOR**

Cocoa · Palm · Rubber · Patchouili · Seaweed · Vanillia

**TECHNOLOGY**

Apps · Farm-level data

**PHASES OF THE VALUE CHAIN**

Pre-production · Production · Post-production

**COUNTRIES OF OPERATION**

22 countries globally

**Koltiva** is an integrated technology and service company that offers customized sustainability management and product traceability software solutions to agribusinesses. The enterprise offers 8 applications and 4 associated solutions. It's applications, **FarmXtension** and **FarmCloud**, collect farm-level data in real time and offer support to farmers in order to improve productivity and reduce crop losses. At post production stage the applications also help farmers connect with buyers, while simultaneously establishing traceability. Until date, Koltiva's applications have impacted over 237,000 farmers and digitized around 6,50,000 acres of farm land.

In order to create an entire digital ecosystem for farm management, **Koltiva** has developed different applications for different categories of stakeholders. For instance, in the case of Cocoa, it has distinct applications for buyers, farmers, 'plant doctors' and input suppliers. While the applications are different, the data is integrated, and farmers can reach out to buyers, input suppliers, and support agencies through their application. In addition, **Koltiva** considers its field agents to be most critical to adoption. Even while using a B2B model, the service provider prefers to deploy its own field agents to ensure efficient implementation of its solutions. This prevents erroneous data entry to a great extent while also ensuring that **Koltiva** retains significant operational control.

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IV. **Operational costs:** FMIS Service providers following B2B and B2B2F models may choose to restrict their roles to just maintaining the solutions, thereby reducing their operational costs. In these models the FMIS service providers can transfer most of the operational costs to the businesses that they are selling to. In B2F models, however, service providers will not have this opportunity to transfer their operational costs as they need to pay directly to their field staff and subject matter experts in order to function efficiently.

## EFFORTS UNDERTAKEN TO INFLUENCE ADOPTION

**Interactions with farmers, field staff, and service providers suggest that the adoption of an FMIS solution is highly dependent on both Supply-side and Demand-side factors.** Supply-side factors include ease of use of technology, user interface, communication and relationship building efforts with target farmers, and the ability to leverage existing sources/technologies/agents to influence farmers. Demand-side factors include farmer demographics, their behavior, and their socio-economic profiles.

Some of the key supply-side factors and recommendations to enhance the same are:

I. **Technology being offered:** Since technology forms the crux of any FMIS solution, it has the capacity to influence adoption considerably and its design should be a key focus area for any FMIS service provider.

### CASE STUDY

SourceTrace.

**CROPS/SECTOR**

OVER 120 CROPS INCLUDING:

Cocoa · Chilly · Cotton · Fruit & Vegetables

**TECHNOLOGY**

Farmer-centric mobile apps

**PHASES OF THE VALUE CHAIN**

Pre-production · Production · Post-production

**COUNTRIES OF OPERATION**

28 countries globally

Established in 2007, SourceTrace Systems is a Software-as-a-Service (SaaS) enterprise that provides farmer-centric mobile applications to manage agriculture value chains at the last mile and to enable smallholder farmers to participate in global markets. The enterprise's application "DataGreen" helps in farm management through advisory services, certification and traceability mapping, supply chain management, and market linkage support. Until date, SourceTrace has impacted the livelihoods of over 1 million farmers and digitized over 2.4 million acres of farm land.

The organization uses a B2B approach with customized modules for different categories of stakeholders and across the agricultural value chain: from farm to fork. Their application is available in multiple languages and has both online and offline data entry modules. The application also supports the input of photographs and biometric signatures while also allowing integration with portable printers and digital scales which can be used at the farm gate. However, while SourceTrace provides the software which is used to digitize agriculture and collect data, their service also relies on the inputs from Subject Matter Experts and the value-chain understanding of their partner businesses.

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**Recommendations on technology design:**

- In cases where farmers are expected to enter data into the FMIS platform, ensure that data entry fields are restricted to simple parameters such as crop/variety sowed and sowing date.
- When an FMIS provides diagnostic care, incorporate a module which allows farmers to upload photographs to identify pests/diseases through the application.
- Visual representation of data is essential for farmers; avoid text descriptions when possible.
- In case the technology uses a mobile or web application to create forward and backward linkages, ensure that the farmer can connect with concerned vendors or buyers through the application itself.
- Farmers should be able to communicate with customer support through the technology; in case messaging is integrated, the choice of platform is very critical. While WhatsApp may work better in certain contexts, WeChat or SMS services might work better in other settings.
- Multiple languages are a key factor influencing adoption; even technical terms should be translated to the best possible extent.
- Besides core advisory services, farmers are also influenced by pre-loaded videos on best production practices which are made available on the application.
- In case of hardware technology, to make the equipment affordable to farmers, it is necessary to make them portable. This incentivizes sharing economies.
- Offline and low-bandwidth data entry mode are essential in emerging economies.
- In B2B and B2B2F solutions, ensure that the services provided are customizable so that price differentiation strategies can be applied based on the customer's requirements.

## CASE STUDY

CROPS/SECTOR

Aquaculture

TECHNOLOGY

AI for pond-level data

PHASES OF THE VALUE CHAIN

Pre-production

Production

Post-production

COUNTRIES OF OPERATION

50 countries globally

Established in 2012, **XpertSea** is an FMIS service provider focused on the aquaculture sector. XpertSea has developed several technologies to help aquaculture become more efficient and sustainable. XpertSea's core platform, the Growth platform uses AI to capture, store, and process pond-level data to provide actionable insights to farmers. They also have an IoT-based devise called **XperCount** which uses cameras and machine learning to count, size, weigh and image animals in seconds.

In order to influence adoption, **XpertSea** representatives go to the fields, showcase the product, and conduct training using videos and other tools to explain the benefits to the farmers/farmer groups. The enterprise also provides regular support through WhatsApp, WeChat, and email. Besides, their platform is available in 7 different languages and quoted to be easy-to-use, further influencing adoption. In 2018 alone, **XpertSea's** platform processed over 2.3 billion animal data points and uploaded over 1 Mn counting and sizing sessions to its data portal.



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II. **Efficacy of Field Agents:** Most FMIS are largely dependent on field agents (also called as extension officers) for not only collection and verification of data, but also to maintain relationship with farmers and influence adoption. Hence, they form a critical driver for the success of any FMIS.

**Recommendations on field agents:**

- Field agents should be selected based on the locations where they would need to operate. Locals can prove to be really efficient as they understand contexts and gain trust easily.
- High touch support is essential during the initial phase of adoption; field agents should accommodate at least 3 to 4 days of visits in the first month of adoption, the number of weekly visits can be reduced gradually as adoption and usage picks up pace.
- Field agents which have experience and expertise in value chains in which they are working are seen to be more effective than field agents who are new to a particular sector. The former allows for faster relationship building.
- While commission-based models work, ideally field agents should receive a fixed compensation along with commission-based incentives. While the former guarantees job security leading to lower attrition, the latter incentivizes efficiency.
- Trainings provided to field agents should extend beyond technology usage. Trainings should include technical aspects of community mobilization.
- The most efficient field agents are those that have an already established influence; farmer champions and existing local influencers should be incentivized to participate as field agents.

## CASE STUDY

CROPS/SECTOR

Over 200 crops

TECHNOLOGY

IoT enabled systems

PHASES OF THE VALUE CHAIN

Pre-production

Production

Post-production

COUNTRIES OF OPERATION

38 countries globally

High focus on China

Guangzhou based **XAG** is an Unmanned Aerial System (UAS) manufacturer and smart agriculture solution provider. The enterprise uses IoT enabled systems to provide land planning and pesticide-spraying services. **XAG** also leverages AI and Big Data to support productivity enhancement of fields in China. The main products of **XAG** include plant protection UAS, surveying UAS, and field monitor.

**XAG** reaches out to its customers through a dedicated sales team. This team comprises mainly of intermediaries that meticulously understand the benefits of **XAG's** technology and are also responsible for deploying the solutions on-the-ground. Besides these intermediaries, **XAG** also works through smaller businesses that own **XAG's** drones. Until 2019, **XAG** had impacted 4.74 million farmers of which 90% are in China. Its plant protection UAS's operation efficiency can reach up to 14ha/hour, which is equivalent to the work of 100 farmland laborers. Hence, while reducing human exposure to pesticides, **XAG** helps address one of the key challenges in the agriculture sector of China: shortage of labor.

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III. **Payment Models:** Farmers in developing economies are often characterized by a limited ability to make up-front payments. Hence, the choice of a payment model can also play a critical role in influencing the adoption and eventually success of an FMIS service provider.

**Recommendations on payment models**

- When hardware solutions are involved, rental models (Internet-of-Things enabled devices) and pay per use (Drones, satellite imagery-based consulting) are seen to have higher uptake than up-front payments. When software solutions are involved, its best to keep the software cheap or free for farmers while diversifying into alternate revenue streams.
- In case of hardware solutions, while free trials have been experimented with, they may not be a suitable option as there is callous usage which leads to sub-optimal results. This may actually impact the perception of the technology amongst a farmer's network.
- Price differentiation is key to revenue sustainability in the B2B model. Through customizable solutions, FMIS service providers can offer different services at different prices. Revenue can be optimized by charging higher for price-inelastic services and vice versa.
- An effective alternate payment model is subsidizing initial off-take using philanthropic funding, followed by an annual subscription fees once the farmer is convinced of the efficacy of an FMIS solution.

## CASE STUDY

eFishery

CROPS/ SECTOR

Aquaculture

TECHNOLOGY

IoT enabled systems

Apps

Farm-level data

PHASES OF THE VALUE CHAIN

Pre-production

High focus on Production

Post-production

COUNTRIES OF OPERATION

Indonesia

With pilots in:

Vietnam Thailand india Bangladesh

**eFishery** offers an Internet of Things (IoT) solution and a data platform to shrimp and fish farmers with the aim to improve their productivity and efficiency. Their smart feeder device, allows farmers to monitor and automate feeding using a smartphone app. The enterprise also collects data on feeding, production, water quality and other parameters to provide predictive insights for farmers. By using **eFishery's** feeders, aquaculture farmers have been able to reduce one cultivation cycle from 120 days to 90 days. This is an additional benefit besides a substantial reduction in feed input by 21%. Until November 2019, 3,000 feeders from **eFishery** were being used by 1300 fish farmers.

To make its hardware more susceptible to adoption, **eFishery** has different payment models for different segments of farmers. It allows farmers to rent IoT enabled auto-feeders for a cost of about 300,000 rupiah (US$ 22) a month while the selling price of the unit is around Rp 5.8 to 7.8 million (US$ 414 to US$ 558) (depending on the feed capacity). While larger farmers prefer a one-time-payment, the smaller farmers prefer to rent eFishery's hardware.

In addition to the supply side factors, demand-side factors also influence adoption.



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IV. **Personal Characteristics:** An understating of demand-side factors is also critical to creating farmer profiles and customizing adoption strategies for different clusters of users. For instance, the older generation is more skeptical towards adoption of newer technologies, while educated and progressive farmers are the early adopters of technology and have a very strong demonstration effect that can be leveraged to influence other potential users. Additionally, farmers belonging to well-functioning social groups or collectives are more open to new ideas, information exchange, and technology and are likely to be the *"low-hanging fruits"* that need to be targeted.

**Recommendations to leverage demand-side factors to influence adoption:**

- Profiling end-users is key to success. These profiles should be leveraged while entering into new geographies, so that the low-hanging fruits can be converted first, followed by using their *demonstration effect* to convert others.
- Celebrating successful adopters is a key method being used to influence adoption amongst potential users. Early adopters should be made to speak about their experience in public forums.
- Targeting farmer collectives can enable higher outreach; other channels to approach farmers are through local influencers or village level committees.
- To incorporate gender into FMIS service delivery, the first steps include: a) collecting gender disaggregated data and profiling early adopters, b) encouraging women participation in initial trainings and demos, and c) have women-field agents to cater to the needs of women farmers.
- FMIS that tend to listen to the voices from the ground and adapt themselves to the needs of farmers are likely to get better traction than those trying to 'make one size fit all'. It is recommended that solutions are not created based on theory but should be human centric in their design from the start.The same solution may have to change its business model when replicated from one context to another.

## CASE STUDY

mimosatek

CROPS/SECTOR

Cantaloupe Rice Vegetables Coffee Pepper

TECHNOLOGY

IoT based software and hardware solutions

PHASES OF THE VALUE CHAIN

Pre-production Production Post-production

COUNTRY OF OPERATION

Vietnam

**MimosaTEK** supports farmers in managing inefficiencies in agriculture in Vietnam, such as wastage of water due to over-irrigation and over-use of fertilizers. It provides both software solutions (advisory through its mobile application, MGreen), and hardware solutions in the form of IoT based irrigation and fertigation equipment. In order to establish relationships with their users, the service provider also supports farmers over phone and through in-person training sessions. The use of **MimosaTEK's** precision irrigation solutions in coffee farming have resulted in a reduction in water use by 18%, energy savings by 16%, and labor savings by around 38%.

**MimosaTEK** initially used to appoint temporary field officers to initiate the outreach process in each region. The enterprise has now shifted to acquiring the customers through demo days. According to the service provider, in the FMIS space, customer profiling is core to influencing adoption. Through customer profiling exercises, **MimosaTek** is better able to adapt its marketing strategy for different customer segments and target the "low-hanging fruits" first. This is especially important for the service provider while expanding to new regions.

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## OTHER SUCCESS FACTORS

I. **Technology Development:** The choice of in-house development of software and manufacturing of hardware can play a key role in determining an FMIS service provider's success.

**Recommendations on technology development:**

- In case the software is core to an FMIS, it is best to not outsource it; this is especially important in case of B2B solutions as customizations and troubleshooting might be required on a day-to-day basis.
- In geographies that do not have comparative advantage in manufacturing hardware, once prototypes have been tried and tested, manufacturing should be outsourced to geographies that have a competitive advantage. In geographies that have comparative advantage, organizations having in-house capability since their inception, should adopt in-house manufacturing.

II. **Efficiency in data collection**: In order for an FMIS solution to succeed with advisory and predictive capabilities, the volume and quality of data that is being recorded is a key parameter, and hence, data collection should be easy yet efficient.

**Recommendations on data collection:**

- Geotagging can be leveraged to issue data entry locks, allowing users to input data only when he/she is in a particular geography. However, this feature should only be used when the service provider is confident about internet connectivity in the geographies that it is servicing.

### CASE STUDY

AQUA CONNECT

**CROPS/SECTOR**

Aquaculture

**TECHNOLOGY**

App Farm-level data

**PHASES OF THE VALUE CHAIN**

Pre-production Production Post-production

**COUNTRIES OF OPERATION**

India Indonesia

**AquaConnect** through its mobile application and field agents provides water quality monitoring, advisory support, and access to markets to shrimp farmers. Their application **'FarmMojo'** can be used to record data on parameters related to water quality, feed input, and health of shrimps which is then analyzed by the enterprise to provide timely recommendations to farmers. By November 2019, the enterprise had already automated 800 farm ponds, benefitting 3000 farmers in three states of India. It is currently expanding its operations to Indonesia.

**AquaConnect** seeks to provide their application for free to smallholder farmers, while targeting commissions from successful market linkages as revenue. Initially, while it faced resistance from middlemen, the enterprise started integrating middlemen in its business model as field executives. Since **AquaConnect's** revenue is largely dependent on market linkages, in order to avoid erroneous data entry, it encourages its own field agents to record pond-level data, instead of relying on farmer entries. Through a recent investment, **AquaConnect** is also planning to introduce an image recognition facility, through which even if a farmer notes down information physically, it can be synced into **FarmMojo** through a phone camera. This innovation is likely to impact ease of data entry significantly, making their application more amenable to adoption.



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- In cases where an FMIS service provider earns revenue through commission-based models based on data-sharing, ensure that either sensors or dedicated field agents are responsible for data collection. False data entries can impact strategic partnerships.
- Data being generated through an FMIS should be reviewed frequently in the initial days of data entry for any discrepancies; SOPs for entering data should be developed in local languages and circulated amongst end-users.

III. **Diversifying revenue base:** Leveraging data for developing alternate revenue sources has been highlighted as a key success factor for business sustainability in the FMIS space.

**Recommendations on diversifying revenue streams:**

- In case the FMIS solution provider owns the data generated by consumers, potential partners who can leverage the data should be identified and approached with a well-articulated value proposition.
- Data is valuable across the agriculture sector and its usage needs to be evaluated for different stakeholders. While data ownership may be a constraint in a B2B model, even anonymised data can be monetized by providing data analytics and other value-added services.

### CASE STUDY

Cropin

**CROPS/SECTOR**

384 crops and 3860 crop varieties

**TECHNOLOGY**

App Farm-level data

**PHASES OF THE VALUE CHAIN**

Pre-production Production Post-production

**COUNTRIES OF OPERATION**

47 countries globally

Founded in 2010, **CropIn** offers Software-as-a-Service based agri-solutions with a vision to 'maximize per acre value' and a mission to 'make every farm traceable'. The enterprise collects farm- level data through a B2B business model and offers data-backed advisory support to farmers through a mobile application called **SmartFarm**. In terms of technology, **CropIn** uses big data analytics, AI, remote sensing, and machine learning to offer its advisory services. Until November 2019, **CropIn** had impacted over 2.1 million farmers and digitized over 5.6 million acres of farm land in 47 countries globally.

While **CropIn** started its journey using a B2F model, given the challenges associated with serving fragmented smallholder farms in developing economies, it gradually transited to a B2B model. Through the farm-level data that **CropIn** has collected through the years, it has developed value propositions and digital tools to serve a wide range of stakeholders such as contract farming institutions, agribusinesses, financial institutions including banks and insurance companies, governments, and development finance institutions. For instance, using crop-signature data and machine learning, **CropIn** has developed a product called **SmartRisk** which helps financial institutions and insurance companies mitigate risks while also helping them design more effective products. **CropIn's** Farm Management application is also used by R&D departments of seed and other input companies to test their products, giving them the flexibility to compare results with a 'control group' digitally.

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IV. **Establishing strategic partnerships:** Given the infancy of the FMIS ecosystem, service providers are offering distinct solutions to farmers; often in silos. In order to succeed in deploying solutions and making impact, service providers should collaborate to create an ecosystem of support for farmers.

**Recommendations on strategic partnerships:**

- While providing advisory services, identify the set of stakeholders that may be required for a farmer to successfully deploy the advice provided, be it finance, inputs, or market linkages. Approach these stakeholders for potential partnerships.
- While establishing backward linkages, it is best to be unbiased and avoid being loyal to a specific brand. Farmers should be advised on products instead of brands, as brand loyalty amongst FMIS providers can sometimes offset goodwill.
- Besides including strategic partners into an FMIS service provider's value chain, also leverage on strategic partnerships for marketing of the FMIS. Farmers have often been seen to adopt a specific technology if he/she has been advised to do so from their neighbourhood input supplier.
- Ensure a dichotomy between the FMIS service provider's operations and that of the partners. Users should not feel that it is the same entity as it increases the accountability of the FMIS solution provider on actions from its strategic partner.
- As an FMIS service provider scales, it should explore developing different applications for different partners. This can lead to additional streams of data being recorded that can be leveraged to further stimulate the agricultural ecosystem.
- Potential partners that FMIS service providers should explore include a) financial institutions (credit providers, crop insurance agencies, and guarantee funds), b) input providers, c) traders and buyers, d) DFIs and donors, e) telecom service providers, and f) weather data providers.

## CASE STUDY

ricult

**CROPS/SECTOR**

Corn

**TECHNOLOGY**

App

Tool to analyze farm data

**PHASES OF THE VALUE CHAIN**

Pre-production

Production

Post-production

**COUNTRIES OF OPERATION**

Pakistan Thailand

**Ricult** offers a tool that deploys machine learning to analyze farm data collected through field agents and satellite imagery. The data allows farmers to better predict crop yields, manage pest and disease outbreak, and allow effective fertilization and harvest planning. It also offers farmers to access a discounted input marketplace and sellers based on an individual soil test. Ricult has also partnered with financial institutions to provides access to credit to its user-farmers.

Of **Ricult's** partners, one of the key stakeholder group are telecom service providers. The enterprise works with them to on-board farmers and to influence adoption. While the farmers get **Ricult's** application for free, it is only available to those who use **Ricult's** partner telecom's network. This creates customer stickiness for the telecom service provider while significantly reducing **Ricult's** marketing costs.

# 3.0
# CONCLUSIONS

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## CONCLUSIONS

**The FMIS ecosystem is growing in Asia while currently, only a few service providers operate at scale.** This sector has witnessed tremendous traction in the last five years, there are several startups entering this space now. Since the sector is highly data-dependent, FMIS service providers will grow their predictive capabilities as and when more data is accumulated. This will have an inherent impact on smallholder farmers across the globe. Additionally, while stakeholders in this space are currently experimenting with technologies such as blockchain, robotics, and AI, in the near future, a better understanding of use-cases of these technologies is likely to further enhance the capabilities of FMIS service providers.

**In order for FMIS service provider to scale, they will often need to revisit their technologies, celebrate successes and forge unlikely partnerships.** Of the millions of rural poor across the world, only a few farmers that are involved in offtake agreements with agribusinesses, progressive farmers, and the occasional youth have started to see the value of adoption. Most of the marginal farmers are still unaware of such solutions and are unlikely to see the value proposition. FMIS service providers will need to market their solutions by revamping them to meet the needs of a broader majority of farmers, celebrate successful adopters, and develop revenue models that can cross-subsidize the cost of services to target farmers. Additionally, the success of this sector hinges on partnerships, and FMIS service providers will need to look out for avenues to collaborate, even if it is with businesses or other FMIS providers that they perceive as future competitors. At the current stage, for efficient market building, all stakeholders will have to work together rather than in silos.

**Donors and DFIs have an important role to play by creating an entry point to encourage behavioral change**. While service providers continue to experiment with technologies and revenue models to make their technology more attractive to smallholder farmers, donors and DFIs will need to help drive behavioral change and incubate newer enterprises. Service fees may need to be subsidized for first-time users until and unless they grow dependent on the solution and understand the value proposition. Grant-based CSOs will also need to play a critical role in taking technologies to small farms, meeting farmers, and educating them. This is essentially important as the FMIS service providers have a different set of expertise which normally does not include community mobilization and behavior change.


**Takeaways for service providers:**

- Understand the end-consumers and design their product as per farmers' needs and comforts;
- Establish strategic partnerships that can help them increase outreach;
- Diversify their value proposition to provide farmers with more than just advisory support;
- Diversify revenue streams with the data available to them.

**Takeaways for government agencies, impact investors, and donors**

- Channel efforts toward market building;
- Subsidize first-time users;
- Fund research and development to prototype and pilot new data-backed interventions.

**Takeaways for government agencies and CSOs**

- Support in driving the behavior change required to take innovations from cities to the millions of smallholder farmers across developing economies.



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## FMIS SERVICE-PROVIDERS INCLUDED IN THESE FINDINGS

A sample of 128 enterprises in the FMIS space highlights that the sector is relatively nascent with more than 70% of the FMIS service providers being established after 2014 and still in their early stages. However, a few enterprises in this space have managed to scale and offer learnings. This report draws its insights from interactions with some of these successful FMIS solutions from across Asia and is grateful for their support. The FMIS service providers that have been covered include:

### AgroStar

AgroStar delivers end-to-end technology solutions directly to farmers for better farming. It also provides a choice of agricultural inputs through a mobile application and (missed) calls.

### AquaConnect

AquaConnect through its tech based software, FarmMojo, provides a real-time water monitoring solution and advisory support to shrimp farmers. It also provides access to inputs, traders, and export markets.

### CropIn

CropIn offers SaaS-based agri solutions with a vision to 'maximize per acre value' and mission to 'make every farm traceable'. The enterprise collects farm level data through a B2B business model and offers data-backed advisory support to farmers through mobile applications.

### eFISHERY

eFishery offers an Internet of Things solution and a data platform to shrimp and fish farmers with the aim to improve their productivity and efficiency. Their smart feeder device, allows farmers to monitor and automate feeding using a smartphone app location.

### FarmERP

FarmERP provides comprehensive software solution to stakeholders working with farmers/ farmer groups. Through the mobile applications FarmERP and FarmGYAN the company collects, integrates and analyses farm level data to support decision making.

### Farmforce

Farmforce is a mobile and web-based technology solution developed to link farmer groups to high value formal markets. Farmforce assists these farmers adhere to traceability and other compliances -one of the key requisites of many buyers in formal markets.

### HARA

HARA acquires farm level data such as land size, weather, production, productivity, etc to facilitate finance to smallholder farmers.

### HF-MLOG

HF-MLOG is one of the leading agriculture insure-tech provider in China. It uses meteorological and agricultural data to facilitate insurance to farmers.

### I-Seed

I-Seed provides a plethora of services across the value chain, including a standard SAAS solution for seed tracing which is used by companies to trace the origin and authenticity of products. It also has a WeChat based application to help farmers publicize and sell their products.

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## JALA

JALA offers shrimp farmers a device to monitor water quality of their ponds remotely. The device is integrated with an online management system that helps farmer access accurate data for each pond remotely.

## Koltiva

Koltiva is an integrated technology and service company that offers customized sustainability management and product traceability software solutions to agribusinesses.

## McFly

MCFLY is an AI and big data service provider, focused on smart agriculture. It uses drones for spraying of pesticides, fertilizers and fungicides.

## MimosaTEK

MimosaTEK provides both software solutions (advisory through mobile application mGreen), and hardware solutions in the form of sensors, and fertilization management machinery to help improve farm productivity.

## mKrishi

mKrishi is a for-profit rural mobile services platform , developed by TCS innovation labs. It uses ICT to deliver agro advisory, best practices, alerts, weather forecasts, and market linkages to farmers on their mobile phones.

## Nanjing Luhui

Nanjing Luhui is one of the most recognized FMIS service providers in China. It has developed a device called YU2LE (Fishjoy in English) which is an integrated smart management system for aquaculture.

## Ricult

Ricult offers a tool that deploys machine learning to analyze farm data collected through field agents and supported by satellite imagery. The data allows farmers to better predict crop yields, while supporting effective pest and disease outbreak, effective fertilization, and harvest planning.

## RT Analytics

RTA is a research & consulting firm based out of Vietnam that provides survey and analytics services across sectors including agriculture.

## SourceTrace

SourceTrace Systems is a Software As A Service (SaaS) enterprise that provides farmer-centric mobile applications, which in turn help manage agriculture value chains at the last mile and enable smallholder farmers participate in global markets.

## VerifiK8

VerifiK8 is a data driven real time performance and risk measurement tool. It is a farm management tool for farmers, and traceability, compliance and report tool for processors and buyers.

## XAG

XAG uses Internet of Things (IoT) enabled system to provide land planning and pesticide-spraying services to farmers across 50 countries.

## XpertSea

XpertSea is an aquaculture technology enterprise that has developed technologies to help aquaculture become more efficient and sustainable. XpertSea's platform uses AI and computer vision to counter and size aquatic organisms such as shrimp, fish and live feeds.

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