

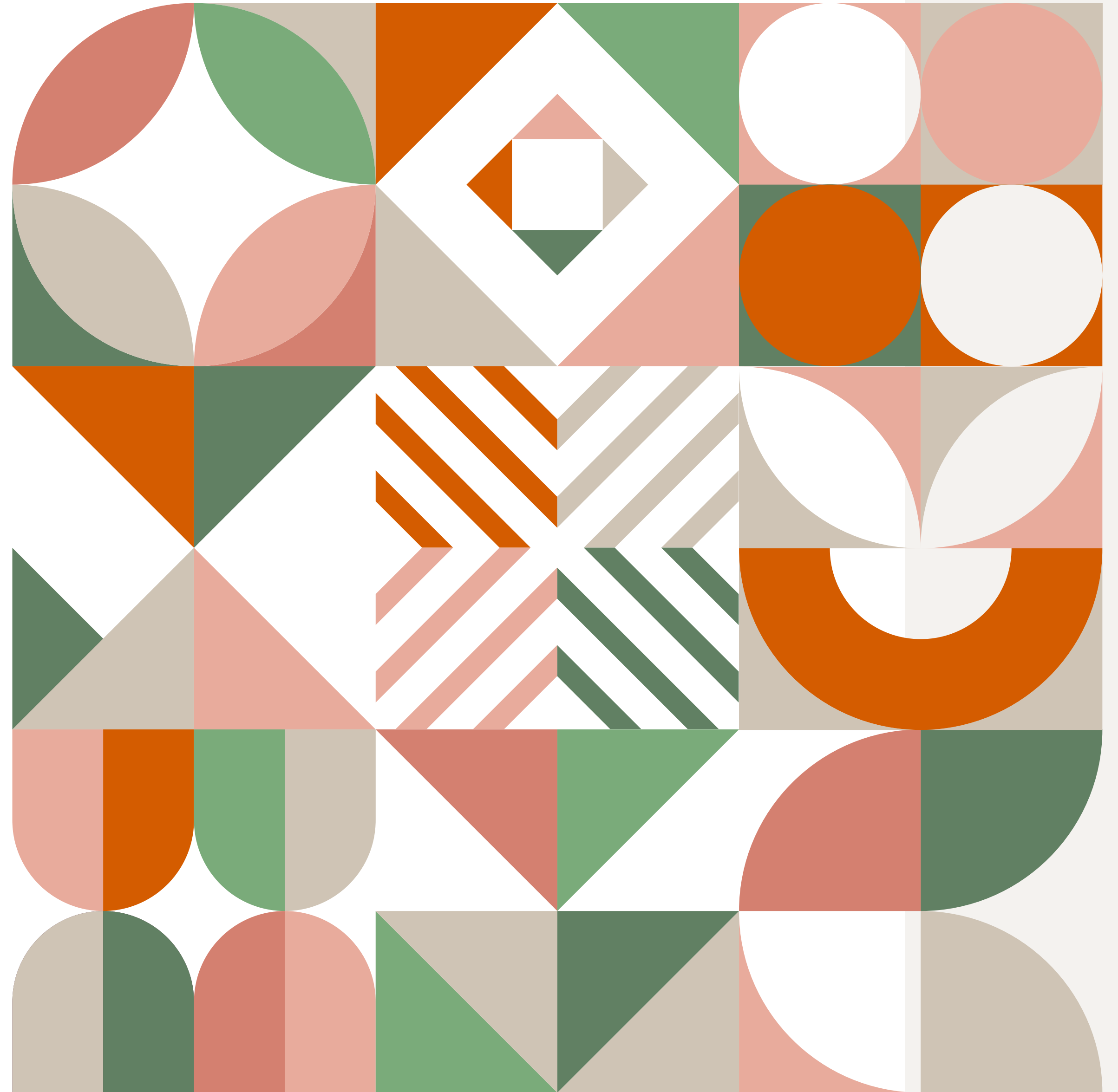


*The graduate school
of global affairs
at Tufts University*



BEYOND ACCESS: HOW DIGITAL TECHNOLOGIES POWER INCLUSIVE INNOVATION IN SMALLHOLDER FARMING

IDEA 2030 is supported by
the Mastercard Center for Inclusive Growth



ABOUT

Digital Planet

Digital Planet, an interdisciplinary research initiative of The Fletcher School's Institute for Business in the Global Context, is dedicated to understanding the impact of digital innovations on the world and providing actionable insights for policymakers, businesses, investors, and innovators.

Institute for Business in the Global Context

The Institute for Business in the Global Context (IBGC) connects the world of business to the world. It is the hub for international business at The Fletcher School, the oldest graduate school of international affairs in the United States. The Institute takes an interdisciplinary approach, preparing global leaders who can cross borders of many kinds and integrate business skills with an understanding of the geopolitical, legal, financial, security, macroeconomic, humanitarian, and environmental impacts on business. The Institute is organized around four core activity areas: education, research, dialogue, and a lab. Our degree programs—Master of International Business (MIB) and Master of Global Business Administration (GBA)—and leadership development programs are at the heart of the educational mission. These offerings, coupled with original research in multiple areas—inclusive growth, digitalization, innovation

and economic development at scale, sovereign wealth, and global capital flows, among others—facilitate a vibrant dialogue on contemporary global issues through conferences, symposia, and speaker events. The lab creates opportunities for student teams to take knowledge into the “field” to effect change through entrepreneurial startups and consulting projects. The Institute also houses the Council on Emerging Market Enterprises, a think tank comprising distinguished practitioner-scholar experts who collaborate with the Institute and The Fletcher School on a variety of initiatives, such as research programs, symposia, and conferences.

The Fletcher School at Tufts University

The Fletcher School of Law and Diplomacy at Tufts University is the oldest exclusively graduate school of international affairs in the United States, working to solve the world's most pressing problems through a collaborative, cross-disciplinary approach to research and education. Since 1933, The Fletcher School has prepared the world's leaders to become innovative problem solvers in government, business, and non-governmental organizations with strategic cross sector networks. Through our ongoing commitment and rigorous approach to advancing world knowledge through research and scholarship, The Fletcher School continues to inform and build bridges to meaningful global solutions.



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Inclusive Growth

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EXECUTIVE SUMMARY

The needs of the global sustainable development agenda are both broad and urgent, and innovation models are central to addressing them in a timely, efficient, and scalable manner, from promoting inclusive growth and ensuring the longevity of natural resources to addressing issues across the state of the human condition.

Inclusive businesses—whether they are large multinational corporations (MNCs), social enterprises, or impact investors—recognize that the private sector can play a lead role in solving problems and closing gaps to advance the objectives of global sustainability. Such gaps-closing can cost USD 3-5 trillion annually, according to some earlier estimates,¹ and those costs have gone up significantly in a post-pandemic world. The value that businesses can unlock while closing the gaps is estimated to be in the range of USD 12-15 trillion a year.² Ideally, thus, this suggests a macro-level argument for businesses pursuing an agenda of doing good even as they pursue profits and seek to do well.

While the macro-level argument provides a rationale for the private sector's engagement in addressing sustainable development challenges, it is also essential to consider a bottom-up perspective through an analysis of the business models of individual inclusive businesses. Such a perspective is even more critical as we consider the role that digital technology can play as a key component of the business model and as a force for inclusion. Against such a backdrop,

researchers at Digital Planet put a list of private enterprises that leverage digital technology to solve sustainable development challenges under a microscope—building a case study for each of them from a bottom-up perspective.

Through a case study approach, we hope to provide insights into an enterprise's journey and ask the question: how is a company in a particular part of the world taking on a sustainable development challenge and helping close inclusion gaps? In addition, in each case study, we use a novel "Nine A's Framework" to analyze the robustness of an enterprise's business model. In doing so, we hope to provide an outside-in evaluation of the company's strengths and weaknesses at the time of the drafting of this document and its potential to tackle its business problems along with the sustainable development objectives it was planning to address. Lastly, the compendium also facilitates a comparison of the enterprises' business models, deriving a few common themes and learnings that other business leaders, entrepreneurs, investors, and policymakers could consider for future actions.

In this first edition of the case compendium, we covered three enterprises in the food system, concerning the welfare of smallholder farmers in three distinct developing economies. Our estimates show that the three enterprises can collectively address a total market worth USD 130 billion in economic

value and help make advances towards many of the UN's SDGs, including but not limited to: SDG 1, no poverty; SDG 2, zero hunger; SDG 5, gender equality; SDG 8, decent work and economic growth; SDG 9, industry, innovation and infrastructure; and SDG 17, building partnerships for the goals.

Below is an overview of the three enterprises in the compendium:

AgroCenta in Ghana and Cultivando Futuro in Colombia are digital platforms that facilitate direct trade among stakeholders in the agricultural value chain. The innovations enable financial, educational, and informational access to previously excluded segments of the market and help disintermediate legacy institutions and other structural elements that act as barriers to change, providing customized interventions to cater to the needs of individual farmers.

Hello Tractor, a self-described "Uber-meets-Salesforce for tractors" company, is a digital farm equipment platform that connects tractor dealers and suppliers with smallholder farmer customers across sub-Saharan Africa. Digitally integrating the agricultural supply chain not only allows farmers to improve their mechanization rates to drive up productivity, but also offers equipment manufacturers opportunities to better manage their fleets and access a previously untapped market.

EXECUTIVE SUMMARY

Emerging Insights and Implications for Action

Looking across the three cases, some insights and learnings which emerged are:

1. **Building low-bandwidth and low-tech options as part of digitally enabled solutions**

Digitally enabled services are critical for scaling innovation and addressing the various development challenges, but it is not enough. Despite steps toward digital transformation, citizens in Ghana, Colombia, and countries across sub-Saharan Africa face significant barriers to realizing widespread digital access with uneven smartphone and mobile broadband usage across the board. Consider the fact that of the 600 million people worldwide living outside of mobile network coverage, 67% are in sub-Saharan Africa,³ and the percentage of those unconnected is disproportionately higher in rural and out-of-reach areas.

For inclusive technology-enabled business models to succeed, social enterprises need to consider these factors when developing their core businesses, accommodating users, and incorporating alternative means of access to the digital solution besides apps that might be accessible only on smartphones. In addition, there ought to be accommodations for situations where there is intermittent internet access or when the network is down altogether.

For example, Hello Tractor worked with experts specializing in a cellular internet of things (IoT) connectivity design for business and developed a telematics device, which can capture tractor usage and condition data, and store it locally when internet is unavailable. AgroCenta partnered with one of Ghana's largest mobile network companies, Vodafone, to provide free voice calls between farmers and discounted mobile devices and bundles.

2. **Deploying and maintaining a critical mass of field agents is crucial in bridging the trust gap and increasing reach. In addition, companies need to have a more comprehensive plan to ensure usage.**

Digitally enabled applications, whether through mobile-based platforms, mobile banking, or asset sharing, are critical for a company's success because they help the enterprise keep a lean organization while reaching a vast number of customers.⁴ One common theme we observed among the three cases as the core function of their businesses is that field agents are as important as the digital solution.

However, building trust and bridging the trust gap with customers tends to be sticky and requires flexibility and diverse strategies based on the local context. Many studies have cited farmers' lack of trust in phone-based transactions as a key barrier to the uptake of their market linkage solutions

in developing economies.⁵ The CEO of Hello Tractor has said that the booking agents' business component has proved to be challenging to replicate across countries because of the often-incurred high cost of transportation and human capital needed for trust-building in a particular community.⁶ AgroCenta and Cultivando Futuro also had similar challenges interacting with their existing and potential customers.

One solution is to build a lasting relationship with local communities and/or development organizations that work under local capacity to carry out farmer product demonstrations, product tryouts, and awareness activities across various farming communities. For instance, in Kenya and Nigeria, Hello Tractor's partnership with Technical Centre for Agricultural and Rural Cooperation (CTA), a development institution serving Africa, and the Caribbean and the Pacific, has shown promising usage increase and job creation results.

Time, investment, and consistency are vital in building trust in the long run. While maintaining a steady group of field agents is crucial to expanding visibility amongst hard-to-reach communities, it is difficult to sustain and scale long term and across expansion efforts. Devising strategies to build consistent demand is critical to making the leap from early adopters to the early majority and "cross the chasm" to diffuse widely across the intended market.



EXECUTIVE SUMMARY

3. Establish an international presence to attract investment and resources to keep operating costs low, manage risks, and make meaningful connections

A successful business needs resources and capital to be sustainable and scalable. Traditional investors perceive the classic “bottom of the pyramid” market segment to be high risk and low return. Therefore, looking for partnerships that could offer smallholder farmers financial access like microlending, and alternative risk assessment profiles that solve farmers’ low access to formal financial services, is crucial for cost and risk management. Hello Tractor’s partnership with the agricultural machinery giant, John Deere, aids the company in securing tractors and flexible financing opportunities for fleet operators. On one hand, AgroCenta’s collaboration with influential partners like mobile network operators, helps farmers save the cost of using mobile services. On the other hand, it helps the company deliver broad messaging campaigns to target customers.

Additionally, participating in events that offer broader exposure to wider audiences is a great way to build a business presence, attract funding, and increase the chance of forming a partnership with impact investors, philanthropies, large corporations, and multilateral organizations. All three companies in this compendium have won prizes on the international stage, increasing their chance of getting picked up by interested partners.

4. Invest in digital skills training and human-centered design to elevate users’ experience and ensure relevancy

Though mobile phones have become the primary tool to plug into the internet, digital literacy amongst many smallholder farmers remains low. Ensuring that farmers are provided with digital skills training to learn, assess, and implement agricultural best practices is crucial for an impactful agritech venture.

Such guidance and support are crucial to help inform end users and engender trust. Moreover, it is essential to make sure the user interface design is user-friendly and appropriate for the usage contexts. Examples include having the option of the local language, an easy-to-understand interface, and using messaging apps for timely communication.

5. Offer freemium or product tryout occasions to increase customer reach and usage at an early stage

The three companies in this compendium all rely on online platforms to deliver their core products and services to smallholder farmers and other stakeholders in the agriculture value chain. However, besides the trust gap mentioned above, the cost of using the app can also be a challenge that hinders adoption. While offering free usage of the app might

not be a financially viable option for many social enterprises, having an extended period of tryout options could help users experience the products and their benefits while helping the company build advocates and early adopters and leverage the network effect, attracting additional users and building a reputation in the market.

6. Expand with environmental sustainability in mind

Even though the amount of food provided for the world population has more than doubled over the past five decades,⁷ the food system remains vulnerable and prone to external macro phenomena such as climate change, deforestation, and dwindling natural resources.⁸ Improper cultivation of the crops can lead to environmental degradation and decreased soil health, further jeopardizing yields.⁹

As more farmers adopt digital technology, businesses need to incorporate environmental sustainability as part of their long-term strategy, besides increasing their reach and usage. Expanding the provision of educational materials and technical assistance to farmers regarding the proper application of chemicals, hybrid seeds, and environmentally sound growing practices will be crucial to preserving soil health and farmland productivity.

THE INCLUSIVE INNOVATION MODEL AND THE NINE A'S FRAMEWORK

We define “inclusive innovation” as a system of viable and scalable activities that bolster a firm’s competitiveness and further its strategic objectives. Such innovations can come in various forms—product, service, design, process, business model, and so on. Inclusive innovators tend to integrate a combination of these elements and secure competitive advantages while meeting their “inclusion” objectives by:

- Targeting low-income or other traditionally disadvantaged communities (e.g., women, unskilled youth, minority groups) and including them in the company’s value chain as consumers and as producers, entrepreneurs, or employees
- Developing approaches that sustain natural resources
- Filling institutional, contextual, and human capital gaps

The Nine A’s Framework: Innovating to Squeeze Value Out of the Business Model

For each case study, we use the “Nine A’s Framework” to help us analyze each enterprise’s business model, providing an outside-in evaluation of the company’s strengths and weaknesses as they relate to the business model’s potential to meet the inclusion objectives. The framework evaluates four core components—the value proposition, the process, resources, and profit formula of an enterprise’s business model using the following nine criteria.

For each of these nine criteria, we designate a value from five to one, where five is excellent, and one means that it needs attention, as Figure 1 demonstrates below. Using this simple framework, we can visualize a company’s strengths and weaknesses for each of the business model components and their contribution to inclusion at the time of writing this report.

- **Advantage:** How well a company ensures its value proposition is compelling, differentiated, and sustainable.
- **Affordability:** Increasing demand through low prices.

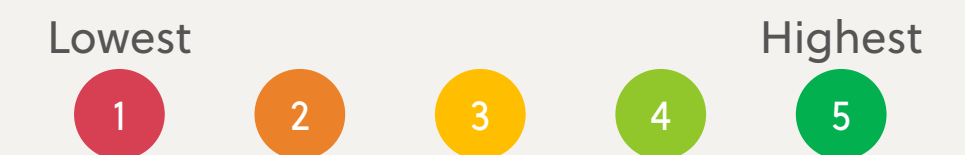
- **Accessibility:** Increasing the size of the addressable market while keeping distribution costs low.
- **Appropriateness:** Increasing demand through superior customer-centric differentiation, such as design thinking, user-led innovations, freemium pricing, experiential products, etc.
- **Additivity:** Closing key gaps in the value chain, such as connecting unmet needs with unused resources, correcting information asymmetry, or completing supply chain gaps by vertically integrating, etc.
- **Adaptability:** Building-in learning and pivoting to respond to uncertainties and unknowns.
- **Amplifiability:** Scaling up and looking for leverage points to enhance sales at all stages in the buyers’ decision-making process.
- **Authority:** Influencing and leading change across the value chain and key stakeholders.
- **Adjacency:** Whether the enterprise can solve an adjacent problem, a similar problem, such as using resources generated from one business to unlock value propositions in other areas.



THE INCLUSIVE INNOVATION MODEL AND THE NINE A'S FRAMEWORK

Figure 1: *The Nine A's Framework Matrix*

VALUE DRIVERS	ADVANTAGE	AFFORDABILITY	ACCESSIBILITY	APPROPRIATENESS	ADDITIVITY	ADAPTABILITY	AMPLIFIABILITY	AUTHORITY	ADJACENCY
VALUE PROPOSITION	1	1	2	2	3	4	4	5	5
RESOURCES	1	1	2	2	3	4	4	5	5
PROCESS	1	1	2	2	3	4	4	5	5
PROFIT FORMULA	1	1	2	2	3	4	4	5	5



CASE STUDIES



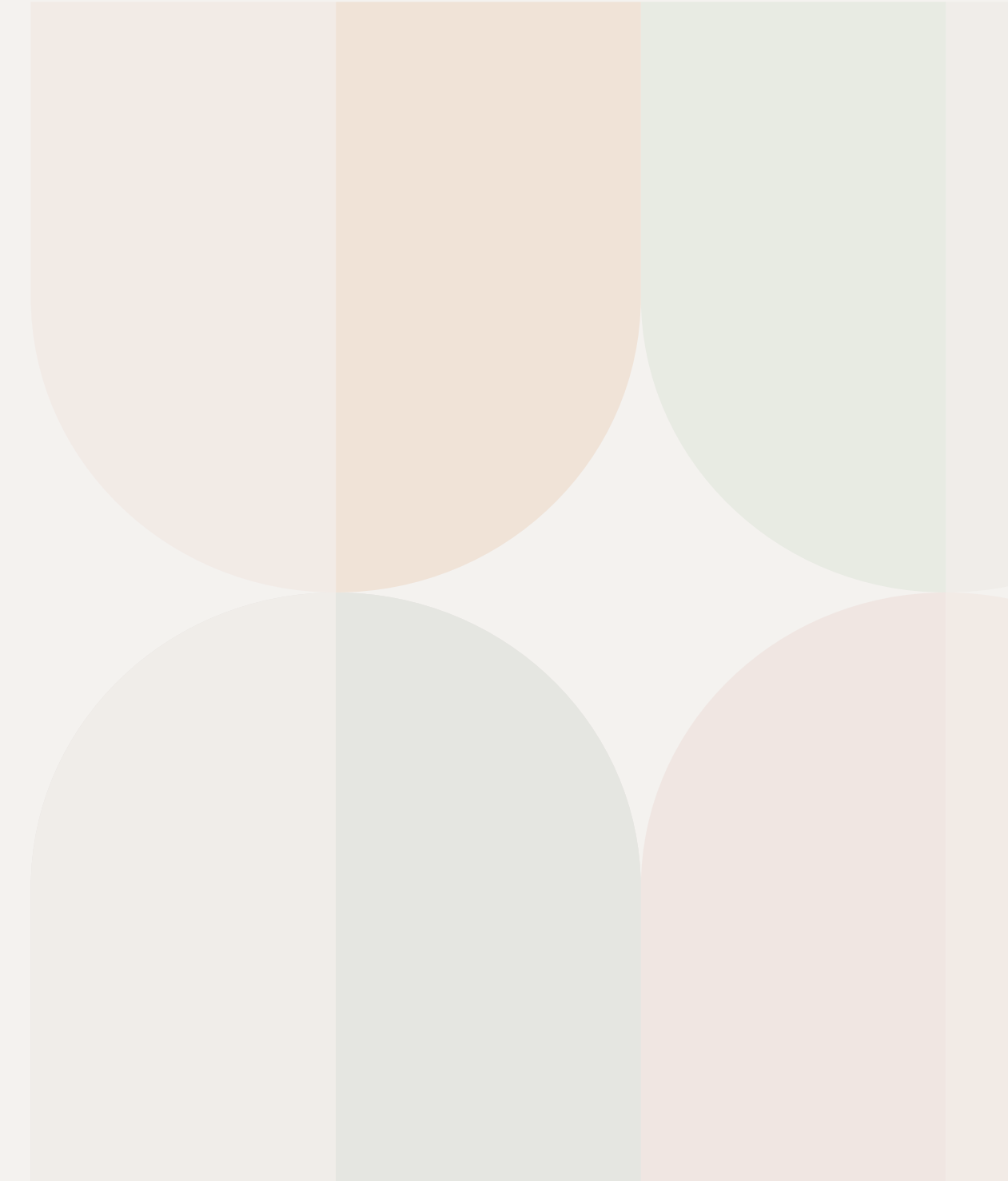
GHANA
AgroCenta



COLOMBIA
Cultivando Futuro



AFRICA
Hello Tractor



AgroCenta

Digital Platform to Offer Pricing,
Logistics, Market Access, and
Mobile Pay to Smallholder
Farmers in Ghana

Case
Studies

AgroCenta

Introduction

Business
Model

Strengths and
Weaknesses

Opportunities
and Challenges



INTRODUCTION

In an agricultural-dependent Ghanaian economy, AgroCenta is a digital platform that offers pricing, logistics, market access, and mobile payments to smallholder farmers. In doing so, this agritech firm aims to not only boost agricultural productivity that remains stagnant, but also increase farmers' incomes by replacing predatory wholesalers in the agricultural value chain who shave off the farmers' margins by exercising market power. With a young population that is increasingly digitally savvy, attracting the next generation of Ghanaians to agriculture and ensuring that working in the industry offers a sustainable source of income will be paramount to job creation and inclusive growth.

The Republic of Ghana, a lower-middle income country, is in West Africa in the Volta River Basin. Like many African nations, Ghana has experienced fast economic growth due to urbanization, industrialization, and technology adoption. Despite being one of Africa's fastest growing nations, agriculture still forms a significant part of Ghana's economic structure, employing about a third of the workforce and contributing about a quarter of the country's GDP in 2019.¹⁰

With 90% of farmers owning land smaller than two hectares,¹¹ much of Ghana's agricultural sector is driven by smallholder farmers. Compared to commercial and medium-sized farmers, smallholder farmers often lack access to key markets, face challenges transporting their crops given weak physical infrastructure, and suffer from information asymmetries that constrain their price-setting abilities.¹²

Consequently, middlemen form the crucial link between farms and markets. They tend to take exorbitant cuts at every stage of the distribution chain, leaving little for the smallholder farmers, who constitute the bottom of the economic pyramid. With significant knowledge gaps about market conditions and disconnected from formal financial institutions due to insufficiently documented credit history, smallholder farmers are not only left to accept the exploitative prices set by middlemen, they must also rely on them for loans to fund agricultural inputs.¹³

As a result of those factors, most smallholder farmers never make the jump to middle-level or commercial farming,¹⁴ contributing to the agricultural sector's missing middle. These issues combined have all but forced smallholder farmers to a harvest of weak productivity, decreased risk-taking, little investment, low incomes, and ultimately, a vicious cycle of poverty. The need for a more efficient, equitable, and innovative intermediary to help smallholder farmers address those challenges is urgent.

AgroCenta, a for-profit company founded in 2015, looks at providing smallholder farmers in rural areas in Ghana with improved market access and increased incomes by replacing predatory wholesalers in the agricultural value chain. AgroCenta operates primarily through two services:

- 1) linking farmers to markets through mobile digital technology and bypassing exorbitantly priced middlemen in the supply chain; and
- 2) hosting a platform that enables farmers to access digital financial services such as mobile money, micro-lending, crop insurance, and pension schemes.

As a result, the agritech company aims to improve the livelihood of smallholder farmers in rural areas, ensure sustainable food security, encourage equal access to land, and promote full and productive employment and decent work through increased access to finance.

INTRODUCTION

Some of the key challenges facing Ghana's agricultural sector and smallholder farmers that AgroCenta aims to solve

Poor market infrastructure and information asymmetry in the market value chain for smallholder farmers

In many rural areas in Ghana, smallholder farmers lack direct access to markets and must sell crops to opportunistic middlemen, who often collude in setting exploitatively low prices for farm produce.¹⁵ Over the years, some farmers have made efforts to work together, but because of limited financial resources and information, they did not gain bargaining power.

Absence of reliable transportation and storage facilities

Improper storage of produce can result in food safety and quality concerns. For farmers who are geographically distant from urban areas, the lack of access to transportation and logistical networks greatly impede their ability to access markets.

Insufficient financial resources and access to credit, leading to low agricultural productivity

Despite the availability of technology that can improve agricultural yields (output per hectare), such as hybrid seeds and fertilizer application, adoption rates have remained low in many parts of Ghana.¹⁶ Only 5% of farmers use hybrid seeds, and fertilizer application rates average 13 kg/ha, well below the Ministry of Food and Agriculture recommendation of 50 kg/ha. Such low adoption rate is primarily due to high input costs coupled with resource and credit constraints for smallholder farmers who often lack a formal financial history.^{17,18}

Figure 2: AgroCenta won the Seedstars World Competition in 2018 out of 65 finalists from around the world, receiving a \$500,000 investment.



Photo credit: Tech Gist Africa

BUSINESS MODEL

Value Proposition

The general imagery surrounding smallholder farmers in Ghana is one of struggle and regression. However, the founders of AgroCenta, Francis Obirikorang and Michael K. Ocansey, sought to re-design the narrative by bringing in more accessible and engaging mediums:

“Many young people move out of the farming communities to the cities to seek delusional greener pastures.... At AgroCenta, we are changing this by improving the financial livelihood of smallholder farmers, and also making agriculture sexier for the younger generation.”¹⁹

To carry out this mission, in 2015, Francis and Michael started AgroCenta, a digital platform to connect and facilitate trade among all stakeholders in Ghana’s agricultural value chain—from matchmaking to reducing transaction costs.²⁰

The company targeted “rural smallholder farmers and farmer-based organizations that have limited access to markets, logistics, or technology”²¹ and, at the time of this writing, focused on cereal crops that do not require cold storage: rice, maize, millet, sorghum, and soybean.²²

Their two product offerings, CropChain and LendIt, aimed to deliver higher and less volatile incomes to smallholder farmers by making previously inaccessible information visible and creating a marketplace model that allows buyer price comparisons. Additionally, AgroCenta provided ancillary services such as technical training, consulting services, and credit history building to improve smallholder farmers’ yields, financial position, and gross revenues.²³ By a mobile-friendly user experience (UX) design with components addressing the core needs of smallholder farmers, AgroCenta competed in the space with more well-known companies in the region such as Esoko and Farmerline.

Besides making agriculture services more attractive to the younger generation, AgroCenta also distinguished itself by focusing on building partnerships with the private sector to help supplement costs and mitigate the risks for its service. AgroCenta developed a more comprehensive stakeholder proposition, exploring partnerships with Ghana’s two biggest mobile companies Vodaphone and MTN.

Those partnerships helped the company supplement costs for technology development as well as leverage wide messaging campaigns to reach target customers.²⁴ Consequently, the AgroCenta internet-based and investment-backed platform helped keep its core value proposition and its beneficiaries highly visible at a regional and global level.²⁵

BUSINESS MODEL

Table 1: Key Facts about AgroCenta: Company Overview as of December 2020

Name of Enterprise	AgroCenta
Headquarters	Mauritius
Country Footprint	Ghana
Year Established	2015
Name of Founders	Francis Obirikorang and Michael K. Ocansey
Size of the Company	6 - 10 employees
Product/Service	Supply chain management platform and financial inclusion platform
Market Segment	Smallholder farmers
Use of Digital Technology	Digital platform, which includes an online marketplace, mobile payments, and financial services

Products and Services

AgroCenta provided two digital applications, which focus on "solving market linkage and financial inclusion problems in the agricultural value chain."²⁶

CropChain: A digital platform for facilitating trade between smallholder farmers and consumers or buyers. CropChain managed farmers, warehouses, logistics, and commodities.

LendIt: A financial inclusion platform, targeted at smallholder farmers in the agricultural value chain with a core vision of enabling financial freedom for farmers. It provided farmers with access to digital services such as mobile money payments for commodities sold, micro-lending/ input financing, crop insurance, and pension scheme for the informal sector, projecting them from subsistence agriculture into agribusiness.²⁷



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BUSINESS MODEL

Figure 3: CropChain's (formerly AgroTrade) Features²⁸



Profiling: Collect and interpret meaningful data about almost any player in the value chain — farmers, aggregators, input dealers and even truck drivers.



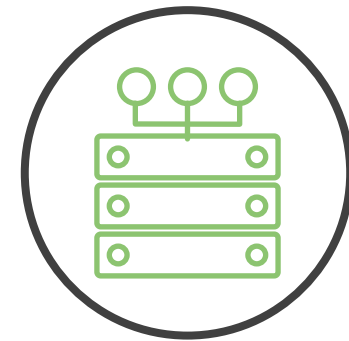
Apploader: This mobile app is the data entry point for all other apps. Typically used by field agents to collect data required by all other apps



Logistics: Kill two birds with one stone. Manage your fleet of trucks and get matched with goods that need carting by other users of the platform.



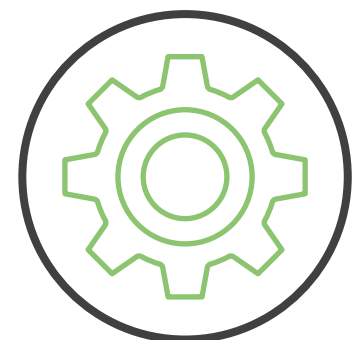
Traceability: With accurate tracing of crops right from when they are procured from farmers, it is now easy to identify the source of that bad nut.



Analytics: Our data analytics feature helps you stay on top of your operations with all the insights we provide. Your data suddenly makes more sense.



PlantRite: Effortlessly manage outgrower projects. From farmer profiling to enforcement of planting protocols, we get you closer to a good harvest.



Quality Control Digital Trade: Record and track the presence of moisture, aflatoxin and other foreign materials in commodities you grow or procure from farmers.



Digital Trade: Keep track of purchases you make from farmers. Coupled with inventory management, track how much you've received from offtakers



Sentinel: IVR and Voice Push. Disseminate information in multiple languages across multiple channels to your target audience.

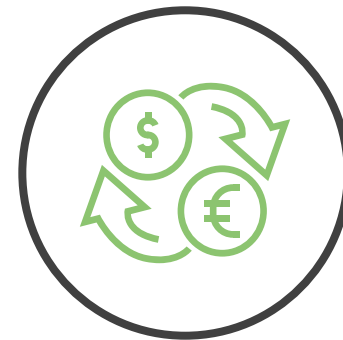
(Screenshot from CropChain's website)

BUSINESS MODEL

Figure 4: LendIt's (formerly AgroPay) Features²⁹



Digital Payments: Farmers are noted for receiving so much cash and yet have no financial trail of such funds received over time. Not anymore. Farmers now receive payments via mobile money. They can pay for inputs, rent tractors and save, all through the power of their mobile phones.



Micro Lending: Financial institutions with cash to disburse to smallholder farmers often don't know which farmers are credible enough to access the cash. We do! Input dealers willing to loan farmers input also are a bit skeptical about which farmers they can trust to pay back. We do!



Crop Insurance: With so many insurance companies and offerings out there, how can farmers access only those insurance services that suit their needs and pockets and we partner with the best in industry institutions to provide these services to our network of smallholder farmers.

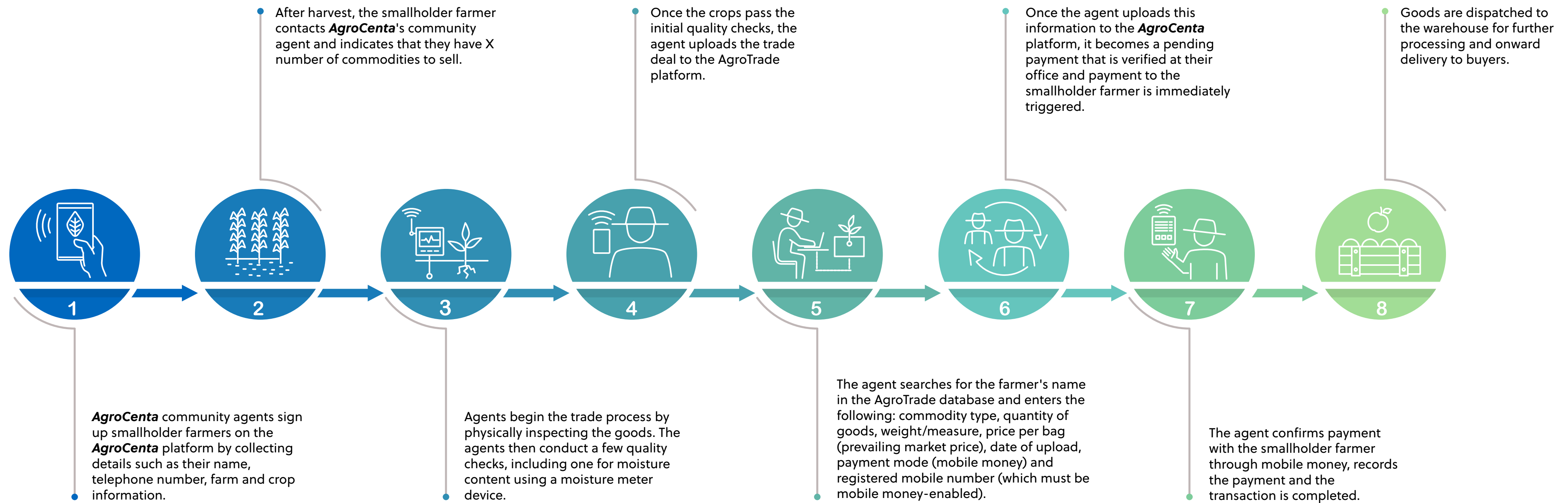


Pension: When you're old and can no longer make a living by growing your favorite crop on your farm, your pension can take care of you. LendIt's Pension Scheme enables smallholder farmers have a retirement package that keeps them smiling throughout old age.

(Screenshot from LendIt's website)

BUSINESS MODEL

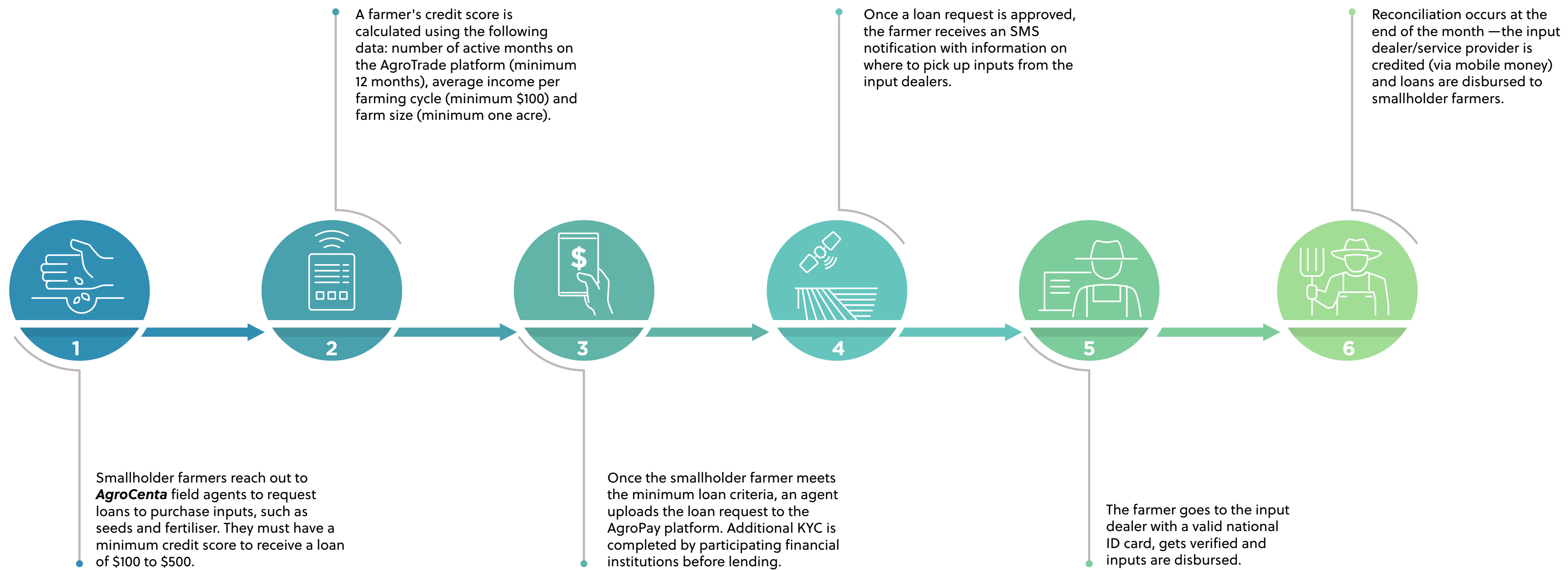
Figure 5: How CropChain (formerly AgroTrade) Works³⁰



(Chart adapted from AgroCenta's website)³¹

BUSINESS MODEL

Figure 6: How Lendlt (formerly AgroPay) Works³²



(Chart adapted from AgroCenta's website)³³

BUSINESS MODEL

Process

Besides its two core products AgroCenta offered, the company also built in the following core components as part of its solutions.

Marketing Strategy within the Local Context

Indigenous to the Ghanaian market, AgroCenta marketed its platform by leveraging an intimate knowledge of the African cultural context, empowering village chiefs to act as advocates or agents for the platform. Combined with field agents who spread the word and acted as roving marketers, AgroCenta also partnered with farmer-based organizations and collectives to reach smallholder farmers.

Connecting Agents to Clients

AgroCenta recruited and trained agents to directly work with smallholder farmers in various regions of Northern Upper East and Upper West Ghana.³⁴ The agents were primarily responsible for onboarding smallholder farmers onto the CropChain platform, facilitating trade deals on behalf of

smallholder farmers, and gathering market information and statistical data. These agents worked on sales commissions and were therefore given incentives to help the farmers increase their crop sales as much as possible. Moreover, AgroCenta also asked agents to collate data on market pricing for various commodities across major trading markets in the country. The pricing information was then shared with smallholder farmers in local languages on its platform.³⁵

Ensuring Supply for Large Off-Takers

Intending to build an integrated value chain, AgroCenta had identified and developed relationships with several large off-takers in Ghana's food and beverage industry, hoping to help stimulate rural supply production. For instance, AgroCenta had developed the PlantRite program, which provides training and in-kind loans of agricultural inputs with a right of first refusal to ensure consistent supply. Thus, AgroCenta's platform provides farmers with an all-in-one solution to connect to markets and smooth their incomes throughout the year.

Helping Smallholder Farmers Build a Credit History

The company also provides input credits to all farmers it works with (seeds, fertilizer, etc.), with professional aid from a technical lead that works on farms. Given that most smallholder farmers lack strong credit histories to access financial services, AgroCenta helped them build a unique credit score based on the farmer's active months on the platform, average income per farming cycle, and farm size.³⁶

BUSINESS MODEL

Resources

Staff

AgroCenta's core team consisted of project managers, agricultural experts and consultants, software developers, regional and district managers, and field agents.³⁷

Investors

AgroCenta was initially funded by family and friends, with the cofounders investing USD 20,000 to cover research costs, recruit and train staff, and build a minimum viable product. In 2016, GreenTec Capital Partners invested USD 10,000 into the company.³⁸ By 2018, AgroCenta had managed to raise over half a million dollars through various competitions, awards, and grants, including:

- Young Entrepreneurs Competition at the 2017 World Export Development Forum in Budapest, Hungary: AgroCenta won the grand prize of EUR 5,000;³⁹
- 2017 Fincluders Startup Challenge in Amman, Jordan: AgroCenta won the first place cash prize of USD 20,000;⁴⁰

- 5th edition of 2018 Seedstars Summit: AgroCenta was crowned the Seedstars Global Winner, taking home a prize of USD 500,000;⁴¹
- GSMA Intelligence Ecosystem Accelerator Innovation Fund: USD 250,000 grant received in November 2018 to further develop and scale AgroPay.⁴²

In February 2021, AgroCenta received USD 790,000 through a pre-series A investment round from AV Ventures, the Shell Foundation, the United Kingdom's Foreign, Commonwealth and Development Office, and Rabo Foundation.⁴³ As of June 2021, the company has raised a total capital of USD 2.2 million.⁴⁴ Its lead investors include SeedstarsWorld, NP Consulting, and GreenTec Capital Partners. Some of the other investors include GSMA Intelligence Ecosystem Accelerator, the Isabaltic Trust based in New York, Frontier Business Solutions based in Ghana, the SANAD Technical Facility in Jordan, and the World Trade Organization.⁴⁵

Partnerships

In recognition of the resources and capital the company needed to serve its targeted customers, AgroCenta established partnerships with a diverse set of actors and industry leaders in the field, ranging from mobile operators to financial service providers. Some key partnerships include:

- **Mobile operators:** AgroCenta set up a mobile money API integration partnership with MTN and Vodafone to enable its LendIt platform and ensure seamless and direct payments to its smallholder farmers. Both mobile operators also supported AgroCenta farmers with financial literacy training on the ground. In addition, the company had leveraged its partnership with Vodafone Ghana to allow AgroCenta farmers to access free voice calls between farmers as well as discounted mobile devices and bundles.⁴⁶
- **Large off-takers:** AgroCenta secured agreements to sell their crops digitally to large companies such as Nestlé Ghana, Guinness Ghana Breweries, and Diageo. The company at the time of writing supplied 80% of Guinness Ghana's sorghum requirements and was planning to become its sole supplier by 2022.⁴⁷

BUSINESS MODEL

- **Transportation organizations:** AgroCenta had “partnered with the Ghana Private Road Transport Union, a huge national organization of commercial drivers, to ensure that farmers can contact and book a driver quickly to get their goods to market.”⁴⁸
- **Financial service providers:** In 2019, AgroCenta “partnered with Pan African Savings & Loans (a subsidiary of Ecobank Group) to roll out input financing to 1,000 smallholder farmers. Additionally, the company locked in a partnership with Metropolitan Pensions Trust to administer pension premiums on behalf of smallholder farmers.”⁴⁹

Technology

Through AgroCenta’s partnerships and highly qualified staff, the company acquired the knowledge and tools necessary to build the infrastructure for two digital platforms (CropChain and LendIt) and maintain their daily operations. Some of AgroCenta’s technological resources included software algorithms for data mining and machine learning, SMS and voice services via mobile networks, API integration, internet capabilities, logistics management software, and a call center for customer account database and integration.

Distributors

AgroCenta integrated distributors in its system to help smallholder farmers—located in some of the most remote parts of Ghana—sell their produce at fair market prices by bypassing middlemen. Distributors could select from four different packages (Bronze, Silver, Gold, and Platinum) depending on the amount of capital and number of commodities they were willing to invest, store, and sell.⁵⁰ In addition, distributors would receive free setup, training, as well as 24/7 live support from AgroCenta. For Platinum Distributors (500+ bags of commodities), a client manager is assigned for additional support. It is estimated that distributors can make up to 30% profit margins per month.⁵¹



"20151116-OSEC-UNK-0001" by USDAgov is licensed under CC BY 2.0

BUSINESS MODEL

Profit Formula

In operating as a value chain integrator, AgroCenta had three distinct revenue streams.

- First, it generated revenue from the difference between purchase prices set by smallholder farmers and selling price for large off-takers.⁵² AgroCenta aggregated the production of crops from smallholder farmers and then facilitated offtake by industrial buyers, with farms being paid immediately at the time of collection,⁵³ taking a 30% margin on the crops' selling price.⁵⁴
- Second, LendIt operated using a licensing model, which had a flexible pricing structure for farmers to pick-and-choose the services they require.⁵⁵ Through LendIt, AgroCenta received annual subscription fees from service providers (e.g., banks, financial institutions, insurance companies) and commissions on transactions based on farmers' usage of their services.⁵⁶
- Third, the company charged a certain percentage of commission on technical assistance and consulting services provided to farmers.⁵⁷

For ICT-based agribusinesses, some estimates showed that 60-80% of a business's budget is spent on product development and overhead (i.e., health insurance, professional development, pension), and more than 70% of staff expenses are allocated to IT and software engineers.⁵⁸

AgroCenta's current operations were relatively lean. Yet, based on financial assumptions from their competitors Esoko and Complete Farmer, costs for developing software remain high (as well as for recruiting and maintaining a scarce pool of engineering talent). While net income for AgroCenta had grown exponentially like most software-as-a-service (SaaS) companies, historical data indicated that the company most likely held an average profit margin of 30%—lower than Complete Farmer's 58% and other ICT-based firms.⁵⁹

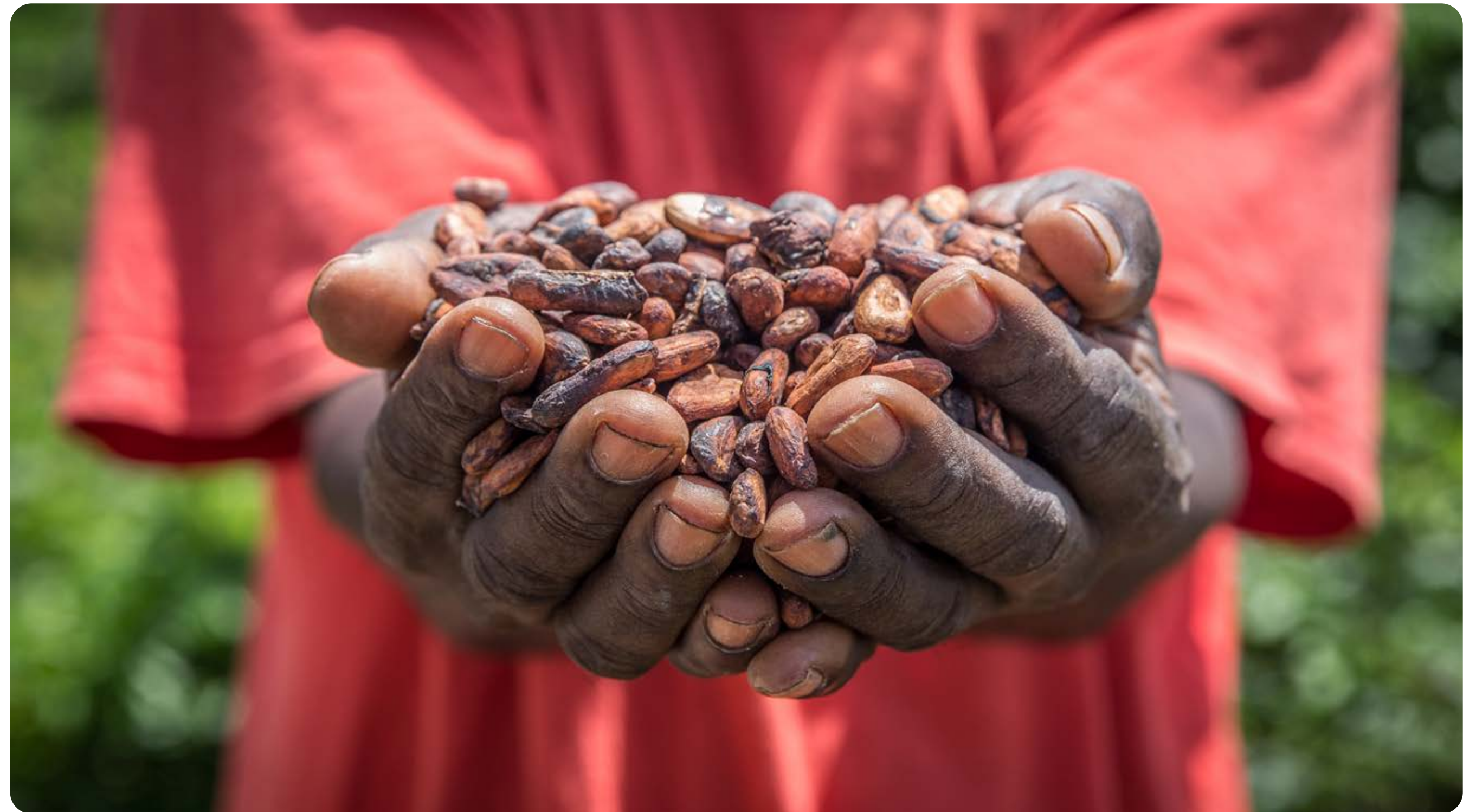


"Factory workers producing fresh fruit drinks at Blue Skies, in Nsawan District, Ghana" by World Bank Photo Collection is licensed under CC BY-NC-ND 2.0

STRENGTHS AND WEAKNESSES

Value Drivers Evaluation Using the Nine A's Framework

Using "The Nine A's Framework" and the information presented above, we now evaluate AgroCenta's core components within the business model in this matrix below. We designated a value from one to five for each of these 'Nine A's' elements, where one meant that it needed attention and five was excellent. Using this simple formula, we quantified AgroCenta's strengths and weaknesses in each component in its business model, as shown in the chart below.

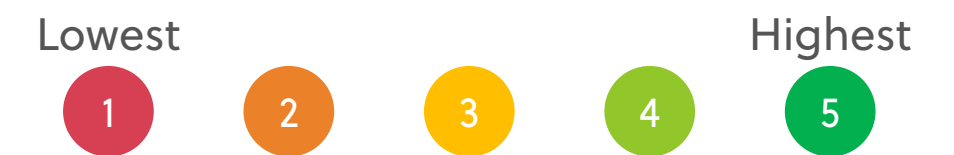


"Farmerline-CocoaFarmers-6" by KBF Africa is licensed under CC BY-NC-SA 2.0

STRENGTHS AND WEAKNESSES

Figure 7: AgroCenta's Nine A's Evaluation

VALUE DRIVERS	ADVANTAGE	AFFORDABILITY	ACCESSIBILITY	APPROPRIATENESS	ADDITIVITY	ADAPTABILITY	AMPLIFIABILITY	AUTHORITY	ADJACENCY
VALUE PROPOSITION	4	5	3	4	4	4	4	4	5
RESOURCES	4	3	4	4	5	3	3	3	4
PROCESS	4	4	4	4	5	5	3	3	4
PROFIT FORMULA	3	4	3	3	3	4	2	1	1



STRENGTHS AND WEAKNESSES

AgroCenta scored relatively well across Value Proposition, Resources, and Process on our **Advantage** metric. In Ghana, about 90% of farm holdings are less than 2 hectares,⁶⁰ and in Sub-Saharan Africa, more than 60% of the population is smallholder farmers. With the mission of serving smallholder farmers at the core of AgroCenta's business, the social enterprise was well-positioned to serve the vast under-tapped market in Ghana and the rest of the Sub-Saharan Africa countries⁶¹ by blending digital solutions with traditional on-the-ground operations in creating an integrated agricultural supply chain.

We were optimistic about AgroCenta's growth trajectory regarding maintaining its current market share and attracting future funding to grow its business in the coming years, especially after the enterprise's success in securing a USD 790,000 working capital and pre-series A funding round from AV Ventures, the Shell Foundation, the United Kingdom's Foreign, Commonwealth and Development Office, and Rabo Foundation.⁶²

On our **Affordability** metric, AgroCenta scored a 5 on Value Proposition and a 4 on Processes and Profit Formula. By providing a pay-as-you-go model, AgroCenta offered smallholder farmers the choice to only subscribe to the services they need, bridging the cost barrier for their consumers. As farmers increased their yields and incomes

rose, positive feedback loops incentivized customers to add on more product offerings as gains in productivity materialized. In addition, by integrating CropChain with LendIt, AgroCenta connected their existing network of smallholder farmers to financial and insurance institutions willing to lend, operating on annual subscription fees and commissions on transactions.

In terms of **Accessibility**, AgroCenta leveraged its agents and distributors to form the last-mile—interfacing with smallholder farmers, teaching them how to use the interface, connecting with farmer-centric organizations in rural communities, and facilitating trade deals with buyers on behalf of farmers.

In **Appropriateness**, AgroCenta again fared well, scoring 4s across the board and a 3 on the Profit Formula. In thinking through the context in which their consumers use the product and utilizing human-centered design methods, the company adapted to a customer base that may have little familiarity with technology, employing a network of local agents to offer training and onboarding services in-person. Moreover, information on market prices and weather advisories was delivered through voice technologies and text messages in local languages. AgroCenta may think about offering freemium pricing to entice smallholder farmers to experience the value proposition before committing.

STRENGTHS AND WEAKNESSES

AgroCenta excelled on our **Additivity** and **Adjacency** metrics as the product itself is inherently a vertical integrator across the agricultural supply chain in Ghana. By offering a matchmaking process between smallholder farmers and buyers, providing market access and information, and establishing a platform for mobile money and financial credit histories, AgroCenta helped correct issues such as information gaps and asymmetries, time and cost interacting with middlemen, and access to working capitals.

On **Adaptability**, AgroCenta incorporated human-centered design thinking into its products. The founders spent 8 months traveling across rural Ghana to understand smallholder farmers' needs and curated the platform design. Its user interface featured bold graphics, simple cues, and light text to accommodate users unfamiliar with technology or having low literacy. In doing so, the company's app was equipped to adapt and change with various market clusters, enabling access to a diverse group of consumers and leading to high adoption growth rates in the future.

On **Authority**, AgroCenta scored a 4 on Value Proposition and 3 on Resources and Process. The company is at the forefront of helping Ghana transform its agriculture sector by leveraging technology and innovative digital solutions. However, compared to the more established and larger competitors in the market, such as Esoko, AgroCenta might not have the power to change the landscape and convince other companies to conform to their practices at the current stage.

Lastly, AgroCenta faced the most challenges with regards to **Amplifiability**. With 48,000 smallholder farmers currently signed up, scaling up the innovation is the next frontier. Since AgroCenta's revenue streams were largely tied to a subscription-based model, generating enough users to leverage network effects has been crucial. Securing key partnerships with large corporations like Nestlé and Guinness may guarantee demand and help AgroCenta attract future consumers, but they might fall short on their proposition when scaling up because of the number of field agents needed throughout the process.

OPPORTUNITIES AND CHALLENGES

After a close look at AgroCenta's business model and the Value Drivers Evaluation analysis, we identified the following opportunities for growth as well as potential challenges AgroCenta could consider as it continues to grow its business.

Capitalize on mobile money's meteoric rise and continue to promote financial inclusion

With the government's emphasis on becoming a cashless society, AgroCenta has the opportunity to fast-track mobile money adoption in the agricultural sector. As of 2017, over 58% of Ghanaians are financially included—a 42% increase from 2014.⁶³ However, with a persistent urban-rural divide and the company's focus on smallholder farmers, AgroCenta should redouble marketing and information provision efforts through their network of field agents to explain and onboard hesitant farmers onto LendIt. Improving trust, communication, and security is paramount to reaping network effects through a large consumer base, and will boost the company's revenue streams that depend on commissions.

Increase local and international partnerships

AgroCenta has strong relationships with large off-takers such as Guinness and Nestlé. However, unlike competitors such as Esoko, AgroCenta has not taken advantage of the presence of international NGOs, government initiatives, and other actors who are investing capital, time, and energy into Ghana's agricultural sector. Doing so would give AgroCenta access to potentially large networks of farmers who are already working with these organizations and initiatives. Additionally, funding from these partnerships could subsidize the costs of using AgroCenta's services or providing inputs to farmers. Combining AgroCenta's model with the resources of these organizations could dramatically enhance AgroCenta's reach, affordability, and ultimately impact.

Implement standardization processes

AgroCenta's current model requires recruiting and training an extensive network of field agents, who are responsible for teaching farmers how to use AgroCenta's products, facilitating trade deals, and gathering information and statistical data for use by farmers. The digitization of some or all of these processes would empower farmers to take control of their product from field to market. Though the use of agents allows AgroCenta to reach rural farmers and onboard them successfully—an important consideration given the rural-urban divide—creating a more uniform, standardized process for onboarding farmers will allow AgroCenta to decrease costs (particularly as the customer base grows) and invest more heavily in other aspects of their business model.

OPPORTUNITIES AND CHALLENGES

Invest in research and development

AgroCenta has developed a strong model for growing, storing, and transporting cereal crops, but it is limited to commodities that do not require cold storage. AgroCenta should explore how its model can be adapted to higher-value crops. For example, fruits and vegetables are the fastest-growing segments of the agricultural market in Ghana. Cultivating these higher-value crops can be profitable even at low levels of productivity, and there is considerable demand for these products among members of the middle and upper class in Ghana.⁶⁴ Developing inexpensive methods of cold storage and thus providing fruit and vegetable farmers with reliable access to markets and transportation will allow AgroCenta to take advantage of growing demand and higher profit margins.

While cocoa is one of Ghana's primary cash crops, providing the second largest source of total export earnings (about 30% of GDP),⁶⁵ it is highly regulated and subject to price controls by the government. Additionally, cocoa requires multiple processing steps, including cleaning, fermentation, drying, and storage. It is therefore unsuitable for AgroCenta's business model, which relies heavily on price competition and commodities which are inexpensive and simple to process and store.

Expand with a sustainable mindset and practice

Ghana's agricultural landscape has begun to shift in recent years, with farms increasing in size and improving efficiency through labor-saving technologies and chemical inputs. While farmers have improved labor efficiency through mechanization and other labor-saving technologies, yields remain low due to slow adoption of high-quality seeds and chemical inputs such as fertilizers. Additionally, improper cultivation of the crops (on which AgroCenta focuses) can lead to environmental degradation and decreased soil health, further jeopardizing yields.⁶⁶

The nascent startup scene in West Africa, especially Ghana, is growing fast, buoyed by young entrepreneurs developing innovative ideas to transform the industry. But the startups and business leaders must keep the environmental aspect in mind while scaling and growing their enterprises.

As AgroCenta aims to expand operations in countries such as Nigeria and other neighboring countries, it should expand its value chain to address the crop cultivation stage more comprehensively. Specifically, it should increase provision of educational materials and technical assistance to farmers regarding proper application of chemicals, use of hybrid seeds, and environmentally sound growing practices, which will contribute towards preserving soil health and farmland productivity.

Cultivando Futuro

Aggregated Information Sharing
Platform for Smallholder Farmers
and Wholesale Buyers in Colombia

Case
Studies

Cultivando
Futuro

Introduction

Business
Model

Strengths and
Weaknesses

Opportunities
and Challenges



INTRODUCTION

Cultivando Futuro is an online marketplace and digital information aggregation platform that tries to eliminate this gap. Essentially, it connects smallholder farmers in rural Colombia with wholesale and retail markets without additional charges from middlemen. By doing so, it aims to increase agricultural productivity, generate additional incomes for smallholder farmers, and improve the quality of publicly available information on fresh produce and other agriculture products. As Colombia moves towards improving financial inclusion as well as digital advancement, services provided by startups like Cultivando Futuro are crucial to scale agritech solutions, while enjoying the benefits that Internet of Things (IoT) brings to the various stakeholders involved across the value chain and the agriculture sector at large.

Colombia's latest agriculture census, Censo Nacional Agropecuario, was published in 2014.⁶⁷ Before that, there hadn't been an agricultural census in Colombia for 43 years.⁶⁸ In most countries, the most comprehensive and universal agricultural data are usually collected in the form of an agricultural census. Even so, most censuses are conducted every five to ten years, depending on the government's budget and capabilities. Thus, it becomes difficult for policymakers to pinpoint the redundancies in existing agricultural policies before the data itself becomes redundant. In Colombia, it is the smallholder farmers who face the brunt of old data and bad policymaking.

Small producers account for 94% of all properties in Colombia.⁶⁹ While a vast majority of these farmers produce mainly non-tradable goods for self-consumption, and consumption in urban centers, many also produce coffee and raw materials for food, such as oilseed, and cotton and tobacco.⁷⁰ These smallholder farms are between 5-12 hectares and produce a variety of products that make up more than 68% of Colombia's food supply.⁷¹

In spite of this, smallholder farmers in Colombia face many disadvantages. Often, they lack access to inputs, modern technology, and credit. They are also victims of asymmetric information regarding prices and marketing. Thus, although Colombia is a Latin American leader in financial inclusion,⁷² and an emerging regional hub of digital agriculture

innovation for smallholder farmers,⁷³ access to and usage of formal financial or digital financial services in rural regions of Colombia (such as credit) remains low. According to the Global Financial Index, approximately 46% of Colombian adults have a formal bank account.⁷⁴

It is under these circumstances that Cultivando Futuro (CF), a for-profit agricultural consultancy start-up, began providing digital assistance to farmers. Established in 2017, CF connects farmers directly with buyers by providing information about what crops are being grown where. CF's digital platform analyzes market trends by leveraging open data and provides key information to farmers, wholesale buyers, and organizations. In this way, it facilitates direct sales between farmers, buyers, and exporters by:

- 1) allowing farmers to register on its platform, creating a database of information including geolocation, family, mode of transport, smartphone usage, financial services, and farm infrastructure;
- 2) using this database to map the products, area, quantity, production, and demand, and helping to locate agricultural products;
- 3) providing farmers with real-time information about the agricultural industry; and
- 4) offering farmers technical assistance, loan assistance, legal assistance, and help with quality certifications.

INTRODUCTION

Some of the key challenges facing Colombia's agricultural sector and smallholder farmers that Cultivando Futuro aims to solve include:

Low public investment in smallholder farmers, leading to low productivity

For many years, the Colombian government has not invested adequately in public goods and services that would allow the agriculture sector to grow and compete globally.⁷⁵ Since the late 1990s, government expenditure in the agricultural sector has remained between 0.2 and 0.4% of the overall GDP, resulting in wide gaps with the allocation of public goods and services between urban and rural areas.⁷⁶ In turn, this has had an adverse impact on the growth rate of the agricultural sector, which has remained stagnant at between 1.5% and 2% per year.⁷⁷

Moreover, tax incentives and government subsidies benefitting large landholdings by well-off farmers have created land-market inefficiencies, resulting in unequal distribution of land rights.⁷⁸ Consequently, this has contributed to continuing socioeconomic disparity in rural Colombia.

Information asymmetry

Owing to low literacy rates⁷⁹ and lack of digital skills,⁸⁰ it is also challenging for farmers in rural areas to leverage technology for exchanging information and data on weather, market prices, nutrition, and best practices; all of which would help them improve productivity while also encouraging sustainability. These barriers to adaptability, standardization, and compatibility of digital technologies prevent smallholder farmers from accessing crucial information and services for market integration, such as irrigation, transportation, logistics, and e-commerce. Instead, farmers largely rely on traditional sources of information, such as family or neighbors, that may be unreliable.⁸¹

Food security in conflict impacted areas

Colombia also has the dubious distinction of having been in a deadly civil conflict from 1964 through 2016.⁸² Although the Peace Accord was signed in 2016, Colombia is still rocked by instances of violence and displacement. Per the FAO, there are still currently a total of 18 million people living in conflict-affected areas and 8 million people displaced, exacerbating an already precarious situation of food insecurity. An added complication is the deteriorating situation in neighboring countries like Venezuela, which affects the stability of rural communities because of the influx of migrants.⁸³

INTRODUCTION

Figure 8: Cultivando Futuro founders won the Thought for Food (TFF)'s Agri-Food-Tech innovation challenge in 2017.



(Photo credit: Thought for Food)

BUSINESS MODEL

Value Proposition

Cultivando Futuro works on building an aggregated, real-time, information sharing platform and digital marketplace to connect farmers directly with buyers, to provide information about what crops are being grown where. By providing these services, CF aims to provide better access, and timely information to people who are part of Colombia's agriculture value chain.

Much of the value that CF offers its clients, farmers, and wholesale buyers involves connecting unmet needs with unused resources to close information gaps and improve efficiency within the supply chain. Specifically, this means CF's dashboard helps farmers and wholesale buyers efficiently navigate the agricultural market, decreases the reliance on middlemen, and provides farming data to improve farming practices and minimize food waste.

Table 2: Key Facts about Cultivando Futuro: Company Overview as of December 2020

Name of Enterprise	Cultivando Futuro
Headquarters	Bogota, Colombia
Country Footprint	Colombia
Year Established	2017
Name of Founders	Carlos Castellanos, Dario Gonzalez, Eddison Aguilar
Size of the Company	7 – 10 employees
Product/Service	Fresh produce marketplace and agriculture production information sharing platform
Market Segment	Smallholder farmers specialize in growing fresh produce and wholesale buyers
Use of Digital Technology	24/7 cloud system dashboard platform

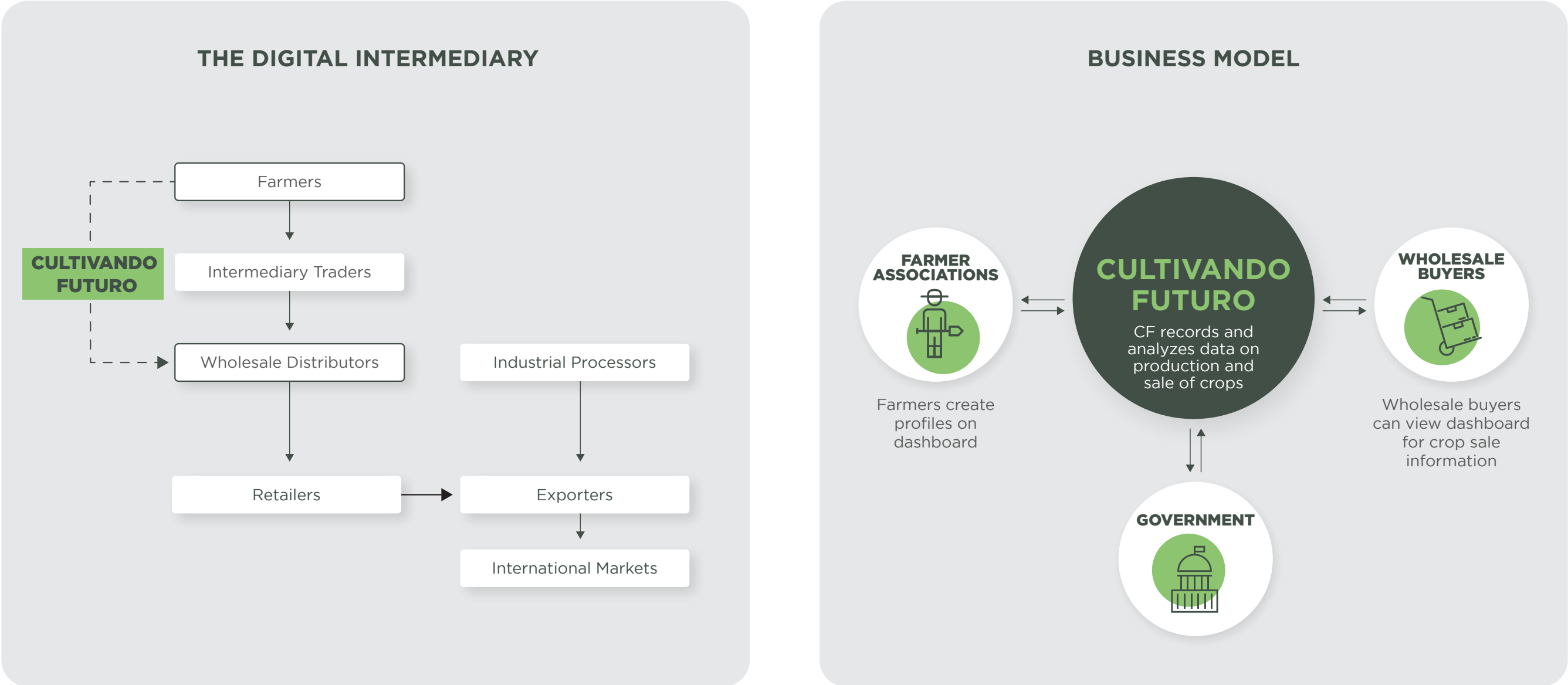
BUSINESS MODEL

Products and Services

Cultivando Futuro offers a 24/7 cloud system dashboard that facilitates coordination among the agricultural industry’s key players and aims to modernize the sector by leveraging data. The app is smartphone compatible, allowing farmers to easily access information, and communicate with buyers and other farmers through the chat function.

Users can access a wide range of data points, from farmer profiles to emission statistics, through this platform. Reports from this data create significant “additivity” value, as the platform aims to both improve efficiency in growing, selling, and purchasing crops, as well as provide data on the needs and opportunities that farmers might need to create customized strategies and partnerships.⁸⁴

Figure 9: Cultivando Futuro’s Process



BUSINESS MODEL

Process

CF started after a significant farmer strike in Colombia in 2013-14, where protestors demanded greater government attention for farmers going bankrupt. The three founders visited thousands of farms around the country, and used publicly available information (such as census data) to build their databases.⁸⁵

The company generates three data tools:

- a) a profile, where smallholder farmers fill in their personal information and register their geolocation, family, mode of transport, cell phone use, financial services, and infrastructure
- b) maps, which allow users to locate the products in an area as well as the quantity, production, and demand for each, and
- c) the real time analysis of the data that helps the farmers better understand the agricultural industry and its everyday changes.

CF also uses field research to identify gaps in the market and modify the dashboard based on data collected through such fieldwork. In 2017, CF sent its team to gather data specific to the farms surveyed in Colombia. The door-to-door visits covered approximately half of the country, and CF was able to gather data on about 60,000 farms along with their organizations and associations.⁸⁶

The founders of the company have also expressed interest in continuing this “boots on the ground” approach to collecting data from the remaining farmers from 2018.⁸⁷ This would help support the creation of maps which would allow sellers and buyers to locate products in any given area, their quantity, the production plan, and the price. By creating this online marketplace and data sharing platform, CF aims at making buying, producing, and managing the agriculture value chain more efficient at every stage.⁸⁸ As of October 2019, CF had over 3,000 farmers registered in 300 municipalities in Colombia.⁸⁹

In the long term, CF’s goal is to cover a wide range of clientele at various stages across the value chain and

deepen relationships with them to build partnerships— from wholesalers who use the platform to acquire fresh produce and farmers’ associations that use the dashboard to coordinate production and sales, to financial institutions that provide credit for smallholder farmers and municipalities which need data on the yearly volume of agricultural production and profits.

The figure below is a sample of CF’s online dashboard— clicking on a particular item would generate the number of providers, their locations, and their inventory.

BUSINESS MODEL

Figure 10: Cultivando Futuro's Dashboard⁹⁰



Screenshot from Cultivando Futuro's website

Cultivando Futuro's services started off via a simple web page, although in 2020, in response to the fact that 95% of its registered users used mobile devices to access its platform via web page, CF rolled out a new mobile application. The main purpose of this application was to reach specific niches of farmers and stay connected with each of them.⁹¹ The newly added mobile-friendly chat application allowed the sellers, primarily smallholder farmers, to distribute information with the same system filters, and contact and connect with each other to exchange key information on production activities.

BUSINESS MODEL

Resources

CF comprises a team of seven: three partners, two employees who work on marketing, business development, and investments, and two more who provide legal support. Further, being a farmer himself, Edison Aguilar, one of CF's founding partners, is able to offer a unique perspective to the problems that arise for farmers, and strives to design practical and efficient solutions for them.⁹²

Profit Formula

Cultivando Futuro's revenue comes from two main streams: 1) a monthly or annual licensing fee charged to individual users or organizations, and 2) a transaction fee if trades are made through the platform. The information below shows a sample of CF's pricing structure.

1. Organizations such as farmer co-ops pay a rate of USD 3.5 a month for a license for their member farmers to use the CF dashboard. Wholesale buyers pay between USD 7 and USD 10 a month for an annual license to use the platform for an unlimited number of purchases.⁹³
2. A small transaction fee of 1% is charged for each transaction that happens through the platform.

According to an internal document shared by CF from 2017, its monthly expenses equal USD 6,000, most of which is used to pay the core team members' salaries.

In 2019, CF signed its first contract with a local municipality for USD 20,000.⁹⁴ Since then, the company has been looking for more municipalities to work with, as a potential new pool of clients CF can tap into, given the local governments' need for better agricultural production data.⁹⁵ As of this writing, CF has won the Thought for Food (TFF) competition, which comes with an award of USD 10,000, and has received investments from The Good Kitchen and Singularity University.⁹⁶ Per interviews with its founders, CF has used these monies towards research and development, as well as towards improving their technological services.⁹⁷

STRENGTHS AND WEAKNESSES

Value Drivers Evaluation Using the Nine A's Framework

Using "The Nine A's Framework" and the analysis presented above, we now evaluate Cultivando Futuro's core components within the business model in this matrix below. For each of these nine elements, we designate a value from one to five, where one means that it needed attention and five denotes that it was excellent. Using this simple formula, we can quantify and visualize Cultivando Futuro's strengths and weaknesses in each of these categories.

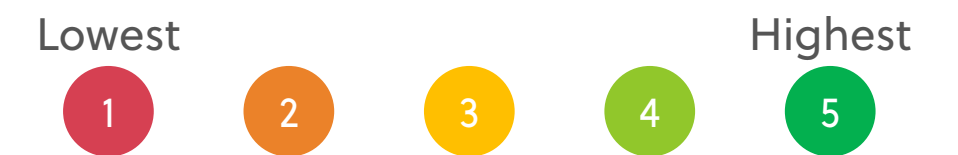


"Nespresso agro-forestry programme" by Nestlé is licensed under CC BY-NC-ND 2.0

STRENGTHS AND WEAKNESSES

Figure 11: Cultivando Futuro's Nine A's Evaluation

VALUE DRIVERS	ADVANTAGE	AFFORDABILITY	ACCESSIBILITY	APPROPRIATENESS	ADDITIVITY	ADAPTABILITY	AMPLIFIABILITY	AUTHORITY	ADJACENCY
VALUE PROPOSITION	●	●	●	●	●	●	●	●	●
RESOURCES	●	●	●	●	●	●	●	●	●
PROCESS	●	●	●	●	●	●	●	●	●
PROFIT FORMULA	●	●	●	●	●	●	●	●	●



STRENGTHS AND WEAKNESSES

As a social enterprise serving smallholder farmers, CF is well-positioned to address many persisting socio-economic issues, such as the rural-urban divide in Colombia. However, a limited team with under 10 employees makes their “boots on the ground” approach challenging. Other similar agritech firms in Colombia, such as Frubana, have over 100 employees, working across sectors like transportation, logistics, and banking assistance.⁹⁸ Therefore, even though CF scores relatively well on our **Advantage** metric, its current business model suffers because of its limited resources and lack of scalability compared to many other competitors in Colombia and the Latin America region.

On the **Affordability** metric, Cultivando Futuro charges a nominal fee to farmers’ associations and collectives, ensuring that access to their digital platform is affordable for most individual smallholder farmers themselves. According to one estimate, the living wage for the banana growing regions of Colombia is roughly USD 554 per month. CF’s subscription rate at USD 3.5 per month seems to be an affordable option for small farmers. Since most of CF’s work to date has been pro bono, expanding access to those who need it most through a freemium model has been beneficial to capitalize on network effects.

Though CF has leveraged key partnerships with wholesalers, urban supermarkets, and development institutions, the company still has room to improve in **Accessibility**. With an extremely small core operating team that has not yet made concentrated efforts with respect to marketing or outreach, CF has been unable to expand its addressable market. Tackling this challenge will be critical if CF intends to serve as an aggregator platform for the entire agricultural sector.

CF scores second-highest on **Appropriateness**, with its product uniquely tailored to Colombia’s agricultural challenges, as both a digital intermediary and a marketplace. Colombia has become an emerging innovation hub for smallholder farmers in Latin America⁹⁹ due to a variety of factors, such as an increasing demand for Digital Financial Services (DFS), rising size of the middle class, an enabling regulatory framework, and a robust start-up culture.¹⁰⁰ However, compared to Brazil, which is home to more than half of the total number of agritech startups in the region,¹⁰¹ CF is well positioned to grow in the agritech startup economy system in Colombia, and also potentially expand to other LAC markets like Peru, Nicaragua, and El Salvador, which also have a large smallholder farmer presence.¹⁰²



"Off to sell cocoa beans" by USAID_IMAGES is licensed under CC BY-NC 2.0

STRENGTHS AND WEAKNESSES

CF scores the highest on our **Additivity** metric, demonstrating that the enterprise is well-positioned to fill a significant service gap in Colombia's digital development in agriculture. According to an OECD estimate, only 17% of vegetable producers in Colombia act as their own intermediary. This means that more than 80% of smallholder vegetable producers rely on middlemen to reach wholesalers, mostly due to insufficient storage facilities and poor infrastructure.¹⁰³ Though it is unrealistic to assume that digital intermediaries like CF can eliminate the existence of middlemen, even replacing a small fraction of that 80% with CF's digital platform would help improve the efficiency of the agricultural sector.

With respect to **Adaptability**, CF faces numerous challenges. Though the enterprise has a database of farmers' needs, and can target new strategies to alleviate some of farmers' core concerns, it is unclear if CF has built-in modular approaches. While CF is working on evaluating farmer needs on an individual and granular basis through its data collection activities, acting on these needs will require immense capacity and a collaboration between the public, private, and nonprofit sectors and will yield results only over a long time horizon. Further, such an endeavor is highly dependent on the political stability of the country and the political will of the

people in the government - which sets up CF to advocate for addressing a lot of contextual-readiness gaps.

In terms of **Amplifiability**, CF has not been able to scale up rapidly, owing to their product's complexity. Additionally, while their boots-on-the-ground approach of data collection serves as a great user-centric process, building reliable data collection capabilities that depend enormously on resource investments in technology, time, and personnel would prevent its product achieving scale in a short time frame.

On **Authority**, CF's range of influence remains limited with potential to expand. As of 2017, there were 1200 registered farmers, while the market size in Colombia is nearly one million. CF needs to expand its operations to reach more farmers and wholesale buyers, and scale its government contracts to more municipalities. If their contract with the municipality, as mentioned above, proves successful, it would provide a model based on which the business model can be scaled.

Lastly, regarding **Adjacency**, CF scores well on **value proposition**, and **process**. Its holistic approach could potentially offer solutions to improve smallholder farmers' production planning, usage of resources, and reducing food waste. However, due to its current reach and small operation team, many of these benefits won't realize until it scales up.

OPPORTUNITIES AND CHALLENGES

Cultivando Futuro provides unique digital services for both smallholder farmers as well as buyers and exporters to engage in exchange of information and transactions through their app. The Value Drivers matrix and analysis of Cultivando Futuro's business model can help us identify the implications for Cultivando Futuro for the future.

Improving amplifiability through expanding smallholder farmer outreach and deploying digital field force workers to train and build trust with smallholder farmers

Cultivando Futuro needs to improve outreach within small rural communities. Compared to the regional benchmark of having 10,000 active users as a threshold of being a popular app,¹⁰⁴ the current 1200 smallholder farms CF's current client base of 1200 smallholder farms leaves it much room to grow to meet that target for the network effect to work. Since CF communicates directly with local farmers for data collection, they need to commit sufficient resources and personnel to bring these farmers onto the CF platform and build digital maturity trainings into their service offerings to bridge the trust gap through the human connection component. While much of using the platform is intuitive, if farmers do not understand the benefits of doing so, the company will continue to face problems with expanding its user base.

Improving adaptability through personalized user experience and strong customer support

Cultivando Futuro should focus on improving the compatibility and complexity of the product by prototyping new features and connecting other critical services like storage facilities, transportation, and farming tool providers to its users. This can be done by offering free personalized services to users through the platform in the initial six months to discover and learn users' needs. Adding on to the information gathered, CF can also consider different models to integrate other critical service providers to its platform.



"Fruit Market in Bogota" by Michael Tieso is licensed under CC0 1.0

OPPORTUNITIES AND CHALLENGES

Improve accessibility through SMS-enabled app function to accommodate for a lack of ICT infrastructure

According to OECD, from 2012 to 2018, mobile broadband subscriptions in Colombia rose from 13.7 to 52.1 per 100 inhabitants, representing a growth of 281%.¹⁰⁵ In 2017, the Colombian Ministry of Telecommunications (Mintic) reported that more than 70% of municipalities had access to 4G mobile connection. However, the real picture of mobile internet connection and usage is uneven. The latest GSMA Intelligence Consumer Survey conducted in Colombia underscores that mobile internet usage in urban areas is 22 percentage points higher than mobile internet usage in rural areas, leaving more than half of the rural consumers not actively using mobile internet.¹⁰⁶ The gap could be even higher in much of Colombia's hard-to-reach areas.

Given the significant yet uneven growth in Colombia's mobile broadband subscriptions in the recent years, Cultivando Futuro should ensure that their dashboard can be optimized for low-internet connectivity, with an option to store data in an offline cloud, and the ability to link the chat function to SMS.

Increasing profitability by considering adopting a pay as you go (PAYG) model without having the mandatory subscription fee to amplify the network effect

As one of the biggest sources of revenue for CF is the fee per transaction, the company should focus its attention on increasing the volume of trade, waiving monthly subscription fees for individual farmers or farmers' associations to get as many active users on the platform as possible. CF could even consider waiving the transaction fees for a certain number of trades each year, making the product more "trial-able" for people to understand its purpose and benefits.

Ultimately, CF needs to ensure it expands its customer base, attracts more funding, and continues to innovate and adapt to move to the next stage of the start-up cycle.

Hello Tractor

Driving Access to Mechanization
for Smallholder Farmers in
Sub-Saharan Africa

Case
Studies

Hello
Tractor

Introduction

Business
Model

Strengths and
Weaknesses

Opportunities
and Challenges



INTRODUCTION

As a self-confessed “Uber-meets-Salesforce for tractors”¹⁰⁷ company, Hello Tractor is “disrupting and reshaping a complex and antiquated ecosystem (agricultural mechanization) by driving efficiencies through technology.”¹⁰⁸ Across 13 diverse markets in sub-Saharan Africa (SSA), Hello Tractor’s digital solutions expands access to tractor services for smallholder farmers by connecting end-users with tractor dealers and suppliers. By increasing mechanization rates and driving up agricultural productivity through a digital platform that integrates the supply chain and provides data-driven insights, the company ensures it creates social value for millions of smallholder farmers across the region.

World food production needs are expected to increase by 26 to 70% to cover global food demand by 2050. Africa’s population alone will double by then, reaching around 2.5 billion.¹⁰⁹ In SSA, a region that accounts for two-thirds of the global extreme poor and where 40% of the population lives in poverty,¹¹⁰ rural economies remain highly reliant on agriculture. On average, the agricultural sector employs 53% of the population¹¹¹ and contributes 15% of the region’s GDP.¹¹² Agricultural production depends largely on smallholder farms—defined as five hectares (ha) or less— which represent 80% of all farms in SSA and contribute up to 90% of the production in some SSA countries.^{113,114,115}

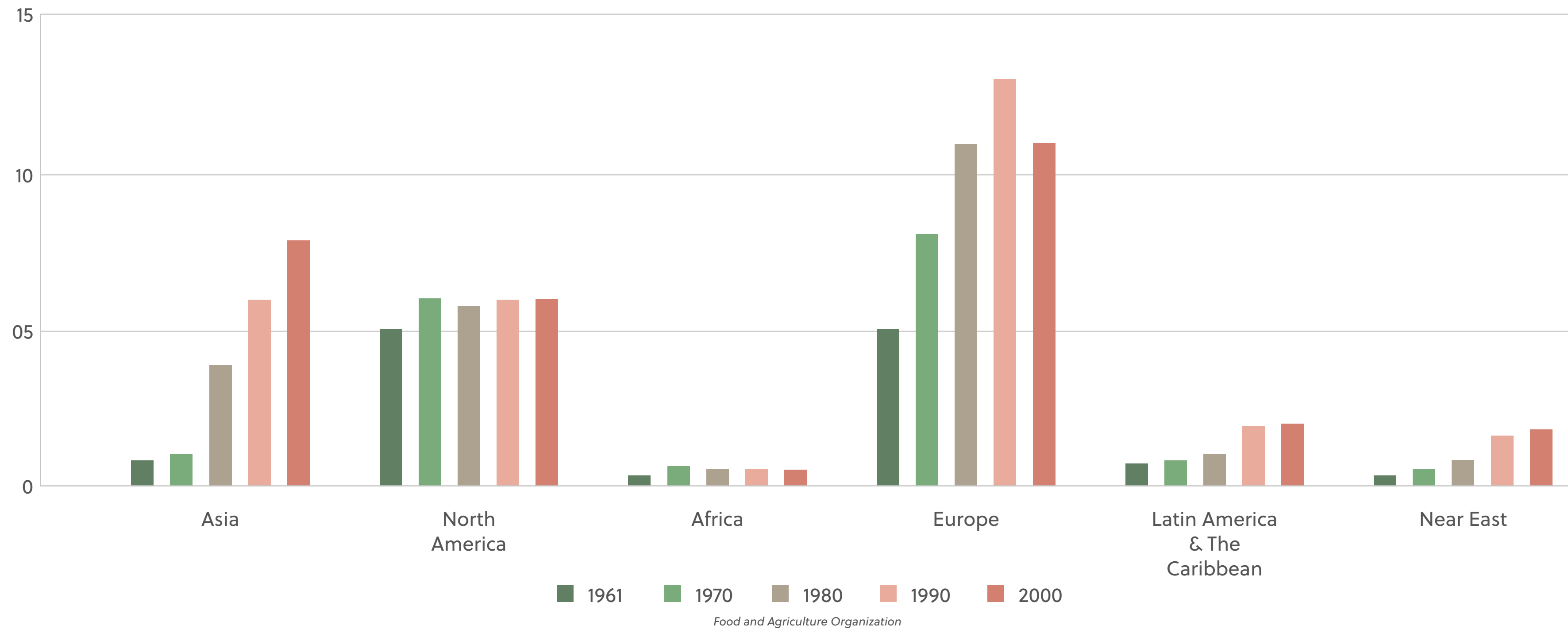
However, SSA is the least mechanized agricultural region in the world with less than two tractors per 1,000 ha of cropland, compared with 10 tractors per 1,000 ha in South Asia and Latin America.¹¹⁶ As Figure 12 demonstrates below, in Asia, Latin America and Near East, tractor use has grown consistently since the 1960s, but the trend in Africa is very different: the continent saw an anemic growth trajectory for tractors until 1990 and then a decline in the number of tractors over the following decade. In 2000, 70% of the tractors in use in Africa were concentrated in Nigeria and South Africa. Today, excluding South Africa, 80% of cultivated land is worked over manually; draft animals are used on another 15%, and tractors are used on the remaining 5%.



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INTRODUCTION

Figure 12: Global Tractors in Use by Region (1961-2000)¹⁷, in millions



INTRODUCTION

In many areas, tractor service markets are hindered by high transaction costs associated with searching, bargaining, and enforcing costs related to setting up contracts. In the absence of service facilitators, tractor owners are unwilling to provide services to smallholder farmers. As such, one way to facilitate transactions is through digital tools.¹¹⁸

Enter Hello Tractor: a for-profit software-as-a-service (SaaS) venture founded in Nigeria in 2014, with a mission to “improve farmers’ lives with the best agricultural services platform.”¹¹⁹ Through its digitally mediated farm equipment marketplace, Hello Tractor connects smallholder farmers seeking machinery with fleet managers looking to improve their tractor service delivery, unlocking value across the supply chain by promoting mechanization.

We recognized there were many factors affecting a country or a region’s agriculture mechanization use and development. In this case study, we focused on highlighting some of the key challenges facing agricultural mechanization in SSA that Hello Tractor can potentially help address, including:

Low productivity and uncultivated land

While Africa has the highest area of uncultivated arable land (202 million ha) in the world—50% of the global total—¹²⁰ its productivity lags far behind other developing regions as yields are only 56% of the international average.¹²¹ Improving food production in Africa is therefore not only crucial for supporting the livelihoods of smallholder farmers and keeping pace with food demand driven by population growth and rapid urbanization in Africa,¹²² but is also indispensable in attempting to reduce the region’s substantial food imports, which amounted to USD 35 billion in 2015.

Unrealized agriculture potential

At current productivity levels and average farm size, agriculture in SSA is economically impoverished and technically unsustainable.¹²³ However, the high amount of uncultivated land resources and unrealized productivity gains have the potential to secure future supply and stability for food and industrial agricultural markets. Smallholder

production growth without major increases in labor inputs will require smallholder farmers to increase their own productivity through increased capital investments and adoption of mechanized technologies.¹²⁴ Some estimates had shown mechanization by the introduction of tractors could transform unused agriculture land, increase the timeliness and efficiency of cultivation, reduce human capital labor, and increase farm productivity by an average of 29%.¹²⁵

Tractor underdevelopment and underutilization

Agricultural mechanization in Africa is widely viewed as an urgent matter and indispensable pillar for reaching the Sustainable Development Goal (SDG) 2 of Zero Hunger. However, one of the key challenges tractor mechanization programs have faced is an inability to achieve the expected high utilization rates, stemming from the difficulty to carry out rapid repairs. This is largely because of a persistent lack of repair shops and unavailability of spare parts.

INTRODUCTION

Figure 13: Hello Tractor Founder and CEO Jehiel Oliver spoke at the 2018 Global Entrepreneurship Summit in Nairobi, Kenya with former U.S. President Barack Obama



(Photo credit: Hello Tractor)

BUSINESS MODEL

Value Proposition

After spending several years working in global finance and agriculture with exposure to frontier markets, Cleveland, Ohio-born Jehiel Oliver founded Hello Tractor in 2014 to increase mechanization among Nigerian smallholder farms because of the vast untapped opportunities and urgent needs in the SSA market.¹²⁶ The majority of smallholder farmers Hello Tractor engages have difficulty finding a suitable alternative to the company's solutions. Before Hello Tractor introduced its solutions to the markets, farmers typically:

1. Used similar services provided by local government, farmer co-operatives, and NGOs (43%)
2. Borrowed equipment from friends or neighbors (30%)
3. Rented equipment from the local market (12%)¹²⁷

Other African startups with shared economy mechanized equipment rental models include TroTro Tractor in Ghana, E-Tinga and FarmAll in Kenya, and Kobiri in Guinea. Another notable arrival in Africa was Mahindra's Trringo solution, which had launched operations in Tanzania and had several thousand farmers using the service. Trringo was established in 2016 and had operated in five Indian states, with 1.5 million farmers registered for mechanization services. This was an indicator of the potential for the scalability of such solutions in Africa.

However, these competitive models tended to focus more on digitizing the shared economy elements of mechanization rather than the B2B fleet management and IoT dimensions, in which Hello Tractor specialized.¹²⁸

In the field, tractor fleet operators could purchase the company's IoT-enabled telematics devices (fitted with GPS and an international SIM card) and subscribe to its cloud software, which allowed them to monitor usage levels, prevent misuse by contractors, and make timely repairs to their equipment. This novel data, easily accessed on the tractor owner app and stored locally if no mobile connection

exists, helped operators and investors upstream decide whether and when to purchase additional tractors. The app also included tools such as service request management, tractor and fleet management, operator performance, and activity tracking.

Downstream, entrepreneurial booking agents and corporate reseller partners utilized Hello Tractor's integrated booking app to drive up demand for tractor services. They connected fragmented smallholder farmers with the closest available tractor equipped to handle their specific need at an affordable rate relative to the high cost of tractor ownership. As more farmers book services with Hello Tractor, network effects increased the profit motive for fleet owners to add additional tractor capacity. In CEO Oliver's own words, fleet operators "come for the IoT fleet management, [and] stay for the network."¹²⁹

According to CEO Oliver, Hello Tractor's goal was to deploy its solutions across all emerging agricultural markets within the next 10 years.¹³⁰ In the meantime, it also aimed to provide mechanization access to 15 million farmers by 2022.¹³¹

BUSINESS MODEL

**Table 3: Key Facts About Hello Tractor:
Company Overview as of April 2021**

Name of Enterprise	Hello Tractor
Headquarters	Three offices in Abuja, Nigeria; Nairobi, Kenya; and Washington, DC, USA
Country Footprint	13 emerging markets: Angola, Ethiopia, Ghana, Ivory Coast, Kenya, Malawi, Mozambique, Nigeria, Senegal, Mali, Rwanda, Tanzania, Uganda
Year Established	2014
Name of Founders	Jehiel Oliver
Size of the Company	26 employees
Product/Service	Tractor fleet management platform
Market Segment	Smallholder farmers
Use of Digital Technology	Digital platform, which includes an online marketplace

Products and Services

Hello Tractor offered three primary products:

Telematics device: This low-cost monitoring device is installed on tractors and connected to the Hello Tractor cloud for remote data tracking and analytics. It is fitted with an international SIM card for higher connectivity, but can also store activity data locally if no connection exists. Tractor fleet operators purchase the monitoring device and an annual subscription to access Hello Tractor's software and suite of applications, including the tractor owner app.

Tractor owner app: This app allows fleet operators to manage fleets, review operator performance, monitor maintenance needs, and access service requests from booking agents. Hello Tractor offers a basic package that covers tractor monitoring, as well as a premium package with a full suite of software services to drive additional revenue and optimize the tractor service business model.¹³²

Tractor booking app: This free app facilitates rural entrepreneurs' important liaisons between farmers in need of tractor services and fleet operators. Farmers pay only for the services they need and utilize at a price that is a fraction of the cost of manual labor. Hello Tractor provides booking agents with training on identifying and building demand and collecting farm-level data

BUSINESS MODEL

Process

SaaS model

According to CEO Oliver, when Hello Tractor first launched in Nigeria, its signature product was an “affordable, ultra-low horsepower, two-wheel tractor fitted with a GPS monitoring technology.”¹³³ But by 2017, after a two-year recession in Nigeria that doubled the price of the tractors, and a realization that the company’s competitive advantage lay more in technology than manufacturing, Hello Tractor pivoted to a SaaS model that would allow the company to scale more effectively.¹³⁴ The suite of applications had since been developed, including the owner app, booking app and cloud finance tool. It represented an ecosystem approach to improving the provision of tractor services, as it aimed to address multiple friction points across the value chain. It also allowed the company to respond to changing market conditions more nimbly.

Last-mile coordination & booking agents

Aggregating demand for tractor services among fragmented smallholder farmers was critical to the viability of Hello Tractor’s business model.

Over the first few years of operation, Hello Tractor observed that farmers were hesitant to conduct sizeable transactions through the mobile app, instead opting for human interaction. Hello Tractor looked to integrate tech and human components to build the trust between farmers and their digital solutions, offering tractor suppliers and farmer customers the opportunity to speak to specialists over the phone, via WhatsApp, or in-person. CEO Oliver said customer acquisition through agents is slower but far more sustainable: “Trust matters.”

For this purpose, the company partnered with community-based booking agents across Nigeria and Kenya, serving as “boots on the ground” who arrange payments, schedule services for farmers, and help with other logistics such as ensuring that farmers’ roads are accessible—though it had difficulty scaling the model elsewhere. Typically, the agents were young people recruited from local or nearby communities and would be paid commissions to organize and cluster farmer demand so that transactions happen at economies of scale. “As different farming seasons approach, the agent would book the farmer’s field for service. Once that booking occurs, the platform connected that request to the nearest available tractor with an applicable implement,” CEO Oliver explained. “We don’t really talk to the farmers about apps, because they connect through the booking agents who use our apps to register them.”¹³⁵

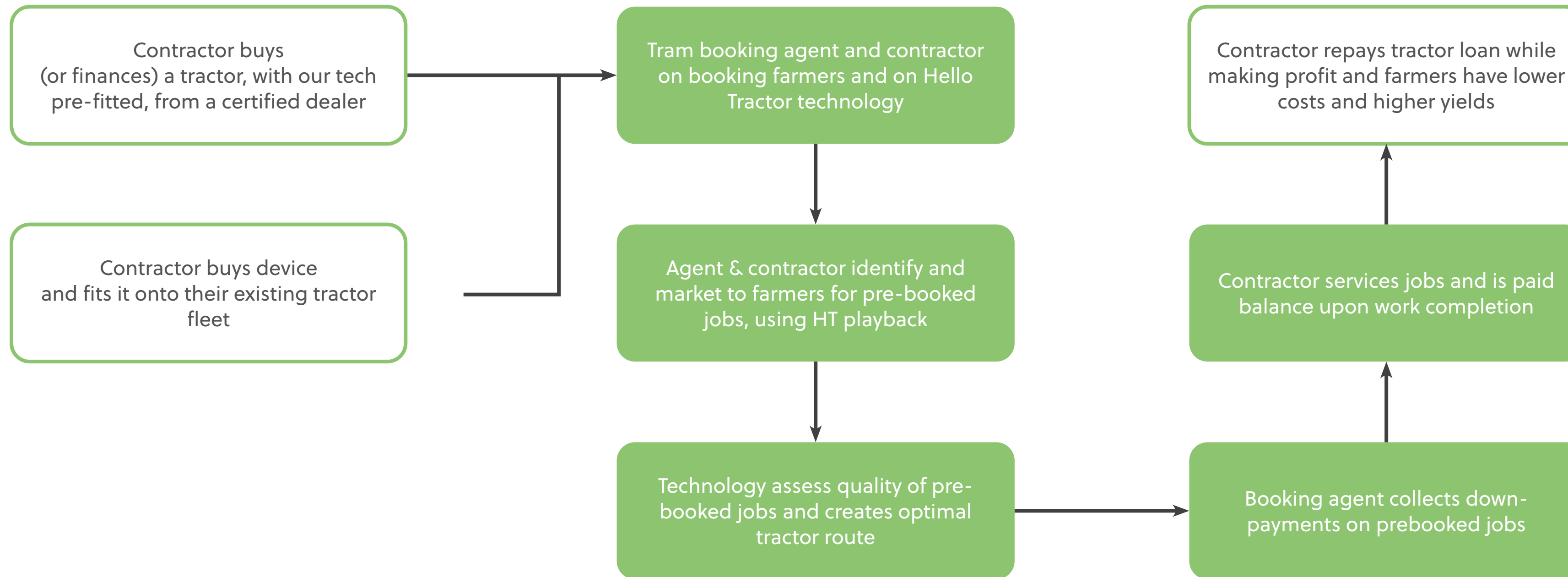
Figure 14 provides an overview of the various steps and stages for one transaction flow.

Reseller partners

Beyond its core tractor sharing business, forging strategic partnerships with tractor dealers is a crucial pillar of Hello Tractor’s expansion strategy. For example, Hello Tractor had partnered with CMC, a dealer of tractors and other agricultural equipment in Kenya, to test the leasing of unsold and unused tractor inventory to new tractor owner customers to immediately monetize assets. Hello Tractor’s technology and network of booking agents ensured tractors were properly maintained by operators and utilized throughout the planting season. The company’s booking agents engaged farmers to organize demand, coordinate service deployment, and ensure proper delivery.¹³⁶ Another Hello Tractor reseller partner was Lonagro, the official dealer and service partner of several international machinery brands, including John Deere, in eight African countries (Angola, Burundi, Malawi, Mozambique, Rwanda, South Sudan, Tanzania and Ethiopia). Lonagro offered its customers Hello Tractor telematics kit installation when they purchased equipment from one of its dealers.¹³⁷

BUSINESS MODEL

Figure 14: Transactional process flow¹³⁸



BUSINESS MODEL

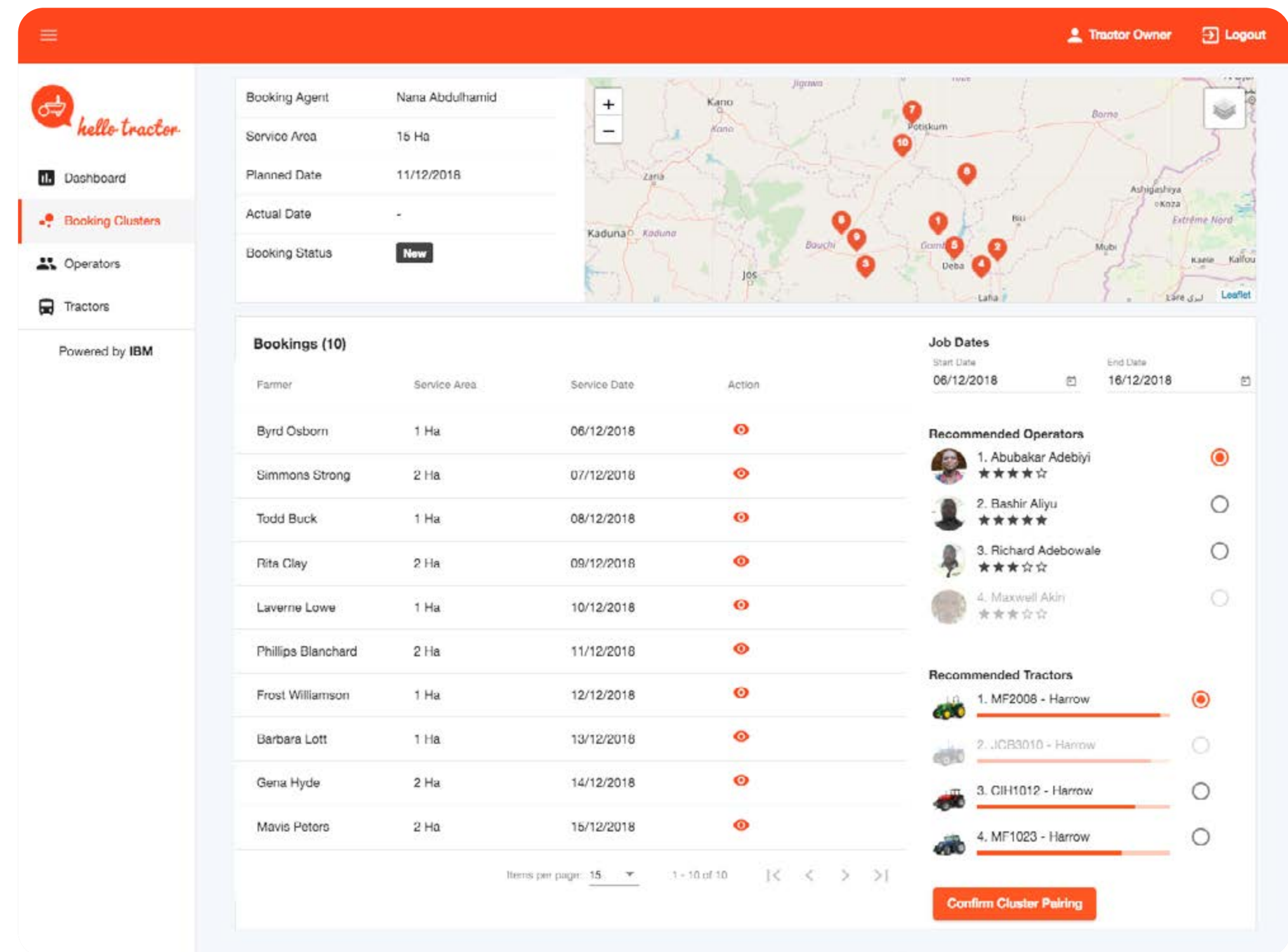
Resources

Technology

The entire system works with digital mobile applications for tractor owners and booking agents to pair tractor supply with tractor demand. The Tractor Owner App incorporates a number of tools to enhance a tractor owner's business and operations, including:

- **Accessing New Customers:** Tractor owners can view farmers' requests for tractor services, including the date, time, and implement required, and schedule their fleet's activities accordingly.
- **Increasing Efficiency Fleet management:** Tractor owners view the location of their tractors and manage their fleet remotely, through Hello Tractor's mobile and web platforms.
- **Tractor management:** It enables monitoring of tractors' active engine hours to predict maintenance needs and match fuel consumption to service delivery.
- **Improving Oversight Operator performance:** Tractor owners review operator ratings and feedback compiled based on farmers' satisfaction to ensure high quality service delivery.
- **Daily activity reports:** This provides access to custom activity reports available to understand utilization rates and improve operations.
- **Weather forecasting:** Tractor owners access geo-targeted weather forecasts to better plan planting times, tractor service deliveries, and avoid delays.

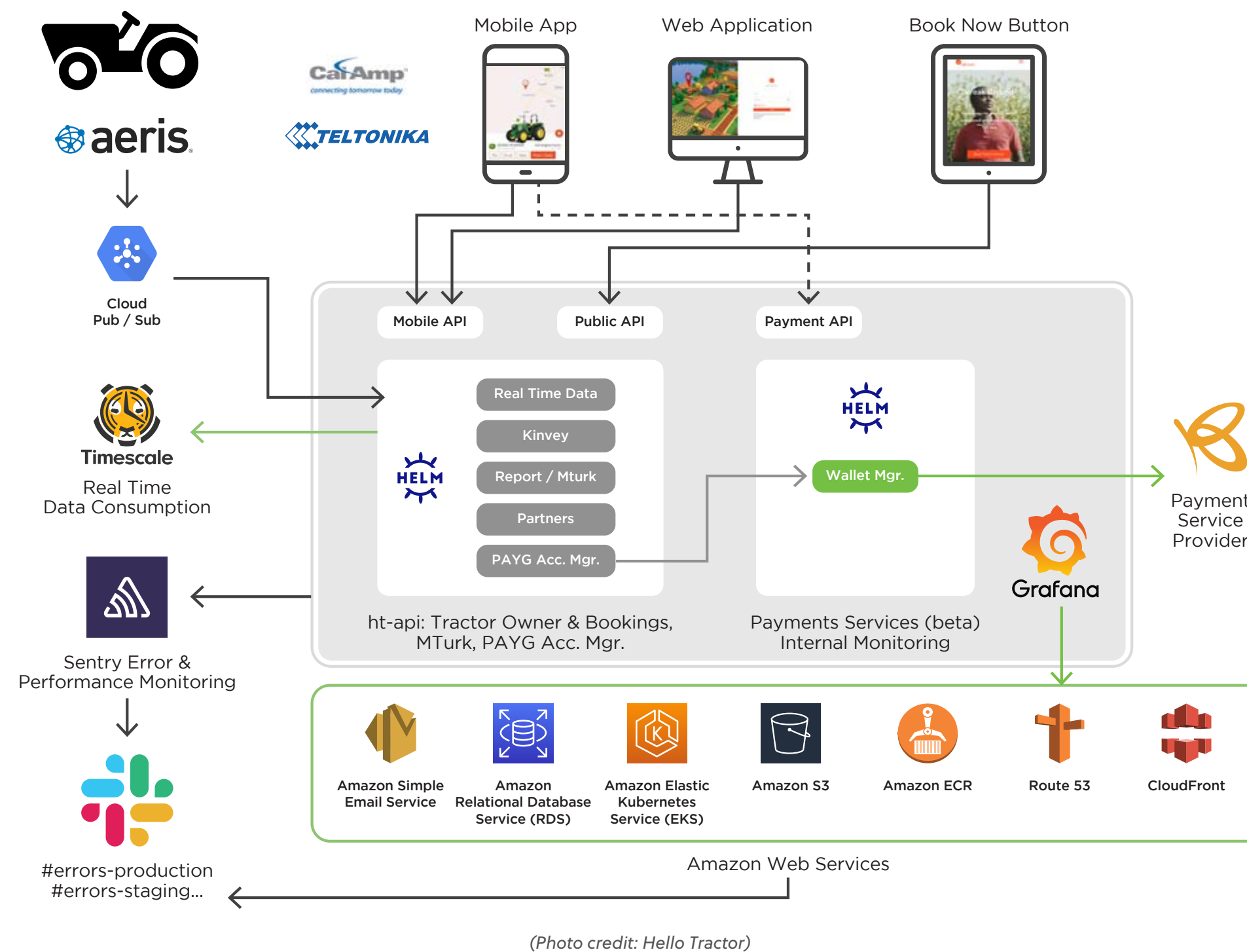
Hello Tractor's Booking Agent App integrates seamlessly with the Tractor Owner App, aggregating the service requests entered by each agent and pairing them with the appropriate tractor owner. Once a booking agent submits a request, the platform routes it directly to an available tractor owner nearby.



"Hello Tractor" by IBM Research is licensed under CC BY-ND 2.0

BUSINESS MODEL

Figure 15: System Architecture at Hello Tractor¹³⁹



Telematics Device

To develop a smart asset management system based on an IoT solution, Hello Tractor engaged the company Aeris, a tech company specializing in IoT solutions for businesses, which provided Hello Tractor with access to multiple carriers and connectivity at a workable price, as well as access to low-cost devices and sensors that produce insights on tractor movements.

For a region like SSA, in which only 26% of the population are connected to the mobile internet,¹⁴⁰ Hello Tractor's offline compatibility is crucial and beneficial in bridging the connectivity gap.

Furthermore, there are often sources of interference on farms, such as crops, canopies, and other physical barriers, which can disrupt connections and communications to the cloud. These factors drive up the costs of data transmission and have traditionally been responsible for the slow uptake of precision technologies in agriculture.¹⁴¹

In addition, Hello Tractor had been able to deploy pre-certified subscriber identity modules (SIMs) on tractors providing extensive roaming capabilities, which helped the telematics device find the strongest signal and eliminate the problem of unreliable connections and missed data. Additionally, offline capabilities allowed the IoT system to capture data and store it locally until the device reconnects with the Hello Tractor cloud.¹⁴²

BUSINESS MODEL

Partnerships

Hello Tractor's mission is to create the largest technology services marketplace for agricultural equipment contracting in the developing world based on multiple partnerships: technology partners, mechanization service providers, manufacturers, input providers, and farmer organizations that ultimately can provide reliable, accessible, and affordable services to farmers and unlocks value across the entire supply chain.¹⁴³

John Deere

In February 2020, Hello Tractor and one of the world's leading farm machinery makers, John Deere, announced a partnership where Deere would supply tractors equipped with Hello Tractor's technology throughout SSA and eventually to contractors across the entire continent.

For Deere, Hello Tractor's technology provided a solution for strengthening their penetration of the SSA market, which had proven difficult due to the low purchasing power of smallholder farmers in the region.¹⁴⁴ Deere's annual revenue of approximately USD 40 billion had been dominated by the Americas and Europe. While the company didn't break out numbers for Africa, combined revenue from Africa, Asia, Australia, New Zealand and the Middle East totaled USD 3.9 billion in 2019.¹⁴⁵

For Hello Tractor, the partnership with Deere unlocked new growth opportunities as the company expands across Africa and Asia. Hello Tractor had positioned itself as Deere's telematics partner for Africa with direct access to their dealer networks,¹⁴⁶ as its technology had already been tested on around 400 tractors in Kenya and Ghana to help dealers and fleet operators provide tractors for hire as opposed to outright ownership.¹⁴⁷

Finance Opportunity with IBM, Mastercard, and John Deere

Furthermore, in partnerships with Deere, IBM, and Mastercard, Hello Tractor developed a pay-as-you-go financing model for tractor ownership that could provide farmers and fleet operators with flexible financing to buy equipment. The tractor data collection could be utilized to create a type of financial statement to inform loan decisions and encourage investment from financial institutions that previously struggled with investing in agriculture due to a lack of transparency and data to make informed risk assessments.¹⁴⁸

Together with scientists at IBM, Hello Tractor developers had started working on a blockchain-enabled and AI-based decision support platform that captures, tracks, and shares data to create trust and transparency for all parties involved across the agribusiness value chain.¹⁴⁹ In August 2020, Hello Tractor entered a finance project with Mastercard to use

Mastercard's banking partners to launch the tractor finance product.¹⁵⁰ Deere had been supporting the process since this finance solution could extend their growth in the region.

Development organizations

Hello Tractor's robust engagements with multilateral development organizations helped keep the company at the forefront of addressing changing agriculture dynamics in SSA. In 2020, after consultation with the FAO, the Alliance for a Green Revolution in Africa (AGRA), and the World Bank, Hello Tractor aimed to coordinate tractors for land preparation and ground insecticide applications. It pledged to use its network of contacts to help organize farmer networks on anticipated labor shortages related to COVID-19, insect control experts on locusts and fall army worms, and public and private sector organizations working on these issues across the last mile.¹⁵¹

BUSINESS MODEL

Staff

Hello Tractor employed 26 full time staff, with about half of the team focused on technology development: software, hardware, data analysis, and backend engineering. There were two Customer Success Managers who were responsible for account management and liaising with the sales and marketing teams to grow new business.¹⁵² Hello Tractor also relied heavily on their network of booking agents as travelling marketers, customer on-boarders, and relationship managers.

Investors

Since its founding, Hello Tractor received investment and monetary grants from development agencies (e.g. USAID), multilateral organizations (e.g. UN World Food Program), private corporations (e.g. Bosch Africa), and institutional investors (e.g. Stanford University).¹⁵³ As of 2020, the company received around USD 3 million in startup funding.¹⁵⁴ Some of their notable successes include:

- 2016 Global Innovation Challenge: Hello Tractor was crowned as the winner of the Global Innovation Challenge, an interactive pitch competition hosted by USAID at South by Southwest, and received \$150,000 from USAID's Global Development Lab;¹⁵⁵

- Presenting at the 2018 Global Entrepreneurship Summit in Nairobi, Kenya, co-hosted by former U.S. President Barack Obama and Kenyan President Uhuru Kenyatta;¹⁵⁶
- Joined Mastercard's Start Path engagement program in 2020 as one of eleven global startups;¹⁵⁷
- Selected as one of the World Economic Forum's UpLink Circulars Accelerator cohort in 2021, an initiative led by Accenture in partnership with Anglo American, Ecolab and Schneider Electric, and designed to support social enterprises with mentorship from industry experts and circular economy leaders.¹⁵⁸

Of the total grant funding received, the majority was used for sub-grants to local partners for training, market development, and other ecosystem building activities. The total grants received translated to an average operating budget of less than USD 500,000 per year.¹⁵⁹ CEO Oliver noted the venture and angel agritech investor class was not as well developed in countries such as Nigeria as it had been in more mature markets.¹⁶⁰ He explained that "there's not a lot of money going into the venture space in Africa. As a result, entrepreneurs go through too much due diligence for relatively small raises."¹⁶¹ In the beginning, CEO Oliver infused significant personal savings in the venture, and the company had invested retained earnings in growth.¹⁶²

Profit Formula

Hello Tractor had two main revenue streams: (1) annual SaaS fees and (2) a 5% transaction fee on all services completed and booked via the Hello Tractor app or Hello Tractor booking agent. Hello Tractor also sold the telematics device close to cost, rendering margins through this revenue stream negligible.

Through internal calculations, Hello Tractor's gross margin in year one was 48%, which could reach 54% by year five—slightly under what successful SaaS companies needed to sustain, a margin of over 70%.¹⁶³ For more detail on the calculations, please see Table 4 – 8 in the Appendix section at the end of this case study.

STRENGTHS AND WEAKNESSES

Value Drivers Evaluation Using the Nine A's Framework

Using "The Nine A's Framework" and the information presented above, we now evaluate Hello Tractor's core components within the business model in this matrix below. We designated a value from one to five for each of these 'Nine A's' elements, where one meant that it needed attention and five was excellent. Using this simple formula, we quantified Hello Tractor's strengths and weaknesses in each component in its business model, as shown in the chart below.

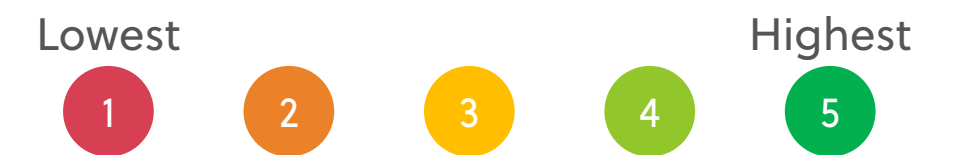


"Tractor on the field" by IBM Research is licensed under CC BY-ND 2.0

STRENGTHS AND WEAKNESSES

Figure 16: Hello Tractor's Nine A's Evaluation

VALUE DRIVERS	ADVANTAGE	AFFORDABILITY	ACCESSIBILITY	APPROPRIATENESS	ADDITIVITY	ADAPTABILITY	AMPLIFIABILITY	AUTHORITY	ADJACENCY
VALUE PROPOSITION	4	3	2	3	4	4	3	3	1
RESOURCES	3	4	2	4	4	4	2	4	2
PROCESS	2	4	2	2	3	4	2	4	2
PROFIT FORMULA	2	2	2	2	3	2	1	0	1



STRENGTHS AND WEAKNESSES

On our **Advantage** metric, Hello Tractor fared well, delivering on its value proposition to connect farmers in need of mechanization with tractor dealers and suppliers. Their notable partnerships with leading development organizations and strong public profile placed the company in a strong position to attract future investment. While its commission structure for booking agents offered youth and local communities to participate in the business and low capex model ensures future growth, uncertain tractor supply, a lean and tech-heavy team, and the seasonal nature of agriculture could be limiting factors.

In terms of **Affordability**, Hello Tractor clearly provided tractors for smallholder farmers at much cheaper rates than outright ownership. The partnership with a low-cost telematics developer as well as pay-as-you-go features facilitated in tandem with local financial institutions and Mastercard ensured that the company could continue to innovate and bridge the cost barrier for their consumers. However, Hello Tractor had limited control over the price of tractors sold, which impacted the fixed 5% transaction fee. With farmers' low cash flow, some users may be hesitant to take risks and buy into mechanization efforts. Education campaigns to teach farmers about the benefits of agricultural mechanization, integrated government support and incentives, and freemiums would be crucial to sustaining long-term product adoption.

On **Adaptability**, Hello Tractor, as a software-as-a-service company, allowed for tweaks to respond to customer demand. The company also maintained close relationships with multilateral organizations on evolving agriculture issues, ensuring it could stay up to date on changes in the policy environment. The company also demonstrated its pivot from solely offering smart tractors to integrating a whole suite of services to best serve their tractor dealers and customers alike. The 5% transaction fee and annual subscription fees could be easily adjustable in the future as well.

With respect to **Appropriateness**, Hello Tractor performed well as it successfully disrupted the status quo by providing an e-marketplace where demand was aggregated, and tractor owners were able to better manage and monetize their equipment and connect to more farmers. Existing solutions to enhance mechanization, 'for example, the government taking money from development institutions to provide farmers with tractors' had proven to be inadequate in addressing the issue of low supply. Similarly, manufacturers or dealers of individuals that lent tractors to farmers demanded vast collateral to guarantee payback, thereby adding to farmers' economic strain.

Hello Tractor scored the highest on our **Additivity** metric, given that it helped bridge the mechanization gap by providing smallholder farmers with machinery that would

STRENGTHS AND WEAKNESSES

otherwise be out of their reach owing to the high costs involved in purchasing and maintaining tractors. In SSA, Hello Tractor projected immense potential to increase agricultural productivity and farmer incomes towards a more secure food system as there were only 13 tractors hectare of arable land, according to some estimates.¹⁶⁴

Hello Tractor had room to improve on our **Accessibility** metric. According to a company impact report from 2019, one in six farmers surveyed found it difficult to access Hello Tractor's services in their time of need, citing delays in finding a tractor and request fulfillment.¹⁶⁵ While booking agents could improve accessibility for some hard-to-reach customers and provide a touch component to an otherwise digitally-mediated process, they were not located in all areas, limiting access for some smallholder farmers. SMS-functionality, along with mobile and web interfaces catered to consumers across varying levels of digital maturity, but digital trust obstacles must be overcome if Hello Tractor is to ensure consistent and long-term demand to make the transition from early adopters to early majority.

The company also faced challenges on **Amplifiability**. While low mechanization rates across SSA provided ample motive for Hello Tractor's expansion in the region, its reliance on reseller partners, limited corporate presence, and difficulty scaling its booking agent model outside of Nigeria and Kenya may hamper customer acquisition in other countries. A lack

of growth capital may also constrain the company's ability to deploy additional resources in these markets.

On **Authority**, Hello Tractor scored well on our metric owing to the fact that since its inception, the company had expanded its services to a total of 16 markets across the continent and reached well over 500,000 smallholder farmers and the various market participants associated with them. As per the CTA report, Hello Tractor was cited as the "best-established example" of a sharing-economy business model combining with technology to solve farmers' problems and setting an example for agritech companies worldwide.

Lastly, on **Adjacency**, Hello Tractor's current value proposition was limited to tractor services. Aside from piloting a pay-as-you-go finance product with external partners, Hello Tractor does not seem to have meaningfully explored adjacent areas where it may be able to leverage the farm-level data it has accumulated and the ecosystem of stakeholders (dealers, fleet operators, smallholder farmers) it has nurtured. Exploring adjacent opportunities could be critical to diversify and bolster the balance sheet, particularly as Hello Tractor's growth is heavily dependent on the entry of new tractors in SSA.

OPPORTUNITIES AND CHALLENGES

Hello Tractor has built a viable business venture that relies on data-driven technology to connect smallholder farmers with tractor services in SSA. The company added value at nearly every point in the tractor services value chain, from reducing original equipment manufacturers' barriers to entry and providing innovative tractor management applications to fleet operators, to aggregating fragmented smallholder farmer demand through a last-mile booking agent model.

The Value Drivers Evaluation, analysis of Hello Tractor's business model, and a discussion of country-level agricultural and digitalization challenges provided insights into the following opportunities for growth and potential challenges for Hello Tractor's future action.

Improving the data that drives tractor finance

In the absence of an expansion into adjacent agriculture areas, Hello Tractor's growth will depend largely on increased imports of tractors into SSA countries. Limited access to tractor finance in the region remains the greatest source of hesitation for OEMs assessing further investment in SSA. Hello Tractor should allocate significant resources, including increased R&D outlays, to improving the technology that provides potential financiers with the most accurate information about the productivity and physical state of tractor assets. Given that our internal calculations projected an increase in margins over the next five years at the time of writing, Hello Tractor was expected to have the room to increase R&D for this purpose. Simply put, data facilitates financing and financing facilitates investment.

Specifically, CEO Oliver describes how the pilot pay-as-you-go model, developed with Moody's and MasterCard, relies on an analysis of the repayment rate where the user pays according to the depreciation of the asset, which is computed

using GPS data that translates tractor movements into how much work it is doing. Hello Tractor's ability to increase the accuracy and read on the depreciation for the loan repayment formula will be critically important if the company wishes to bring more financing partners on board and bolster OEM confidence.

Discussing the partnership with Hello Tractor in an interview with Reuters, Jack Taylor, Deere's Head of SSA, agreed that "the biggest challenge at this stage is to justify the capital investment in agriculture and financing linked to that."¹⁶⁶

By focusing on data accuracy, Hello Tractor will reinforce the value proposition to fleet owners, decreasing risk and further enhancing consumer buy-in and adoption rates. As adoption rates continue, the volume and quality of data will increase, providing another potential revenue stream for Hello Tractor.

OPPORTUNITIES AND CHALLENGES

Strengthening demand drivers to aid in 'crossing the chasm'

In terms of OEMs and fleet operators, Hello Tractor's competitive advantage lies in its data collection and analytics capabilities. In order to build the necessary databases and thereby its value proposition, the company has to aggregate demand among the smallholder farmers. Maintaining and strengthening its downstream "stickiness" among farmers will also help insulate Hello Tractor from competitive threats.

Demand generation will heavily rely on Hello Tractor's ability to market its services in the farming communities. To build relationships that could translate into Hello Tractor's desire to build a community around their services, the company must continue to educate farming communities about the benefits and economic advantages of mechanization. Due to no comparable competition in SSA, Hello Tractor's position is currently uncontested. Therefore, the greater the perceived relative advantage of Hello Tractor's mechanization service compared to risks, the more rapid rate of adoption and enhanced ability to cross the chasm from the early adopters to the early majority.¹⁶⁷ Specifically, much of the use of Hello Tractor's services and technology also depends on

overcoming digital barriers, risk attitudes, the level of trust held by the farmers, and pricing accuracy.

Overcoming digital barriers and scalability challenges

While internet access in SSA has grown rapidly in recent years, access rates remain well behind the rest of the world.¹⁶⁸ A report estimates that 24% of the population in SSA are mobile internet subscribers compared to 47% globally. The region also accounts for 40% of the global population not covered by a mobile broadband network.¹⁶⁹ Though Hello Tractor has implemented low-tech solutions through SMS-enabled features, a stark lack of access to devices, internet, and financial services remain as significant adoption barriers.

Additionally, the Technical Centre for Agricultural and Rural Cooperation (CTA) points to end-user digital literacy as one of the main barriers to adoption and use of inclusive digital agricultural solutions.¹⁷⁰ Tractor hiring requires the recording of additional data (i.e., plot sizes, type of equipment, land conditions), some of which cannot easily be aided by visual tools.

Another barrier is farmer trust in digital content. Businesses around the continent cite farmers' lack of trust in phone-based transactions as a key barrier to the uptake of their market linkage solutions. Unenforced or non-existent data privacy laws have eroded their trust in these solutions.¹⁷¹

Agricultural technology lacks governing data standards and principles, rules around data sharing and selling, informed consent, data security, and mechanisms for accountability. This brings unique risks to farmers, particularly in less stable political climates. Farmers can face risks ranging from unscrupulous business practices to violence. According to CTA, such standards and policies must be prioritized more quickly, particularly given the vulnerability of smallholder farmers and the risks of losing their trust should data or security breaches occur.¹⁷²

Few smallholder farmers in Nigeria trust mobile services sufficiently to make business transactions, such as hiring tractors, via an application if this includes an up-front payment.¹⁷³ Low levels of digital literacy and comfort among farmers and agricultural agents constrain demand, adoption, and use of digital tools for tractors.¹⁷⁴

Reliance on booking agents to book farm jobs decreases Hello Tractor's ability to scale into the mainstream market. Many farmers do not know how to use the app, so Hello Tractor needs to focus on developing its app as an easy-to-use, easy-to-adapt model. The company can focus on working with booking agents to teach users how to use the app and build trust among users who are new to using digital platforms. Hello Tractor can also use the booking agents as a great data source and learn where users are having issues and frustrations to identify customer pain points.

OPPORTUNITIES AND CHALLENGES

The mainstream market does have a high-risk tolerance, and lack of application use provides further adoption risk. To compensate booking agents for commission lost due to increased application use among farmers, we suggest a geographical incentive structure where agents are paid for jobs booked in their area instead of direct commission for jobs booked.

Addressing trust and risk attitudes

Oliver describes that the booking agents' business component has proven to be challenging to replicate across countries.¹⁷⁵ Hello Tractor should consider if there are other ways it can amplify its presence in the communities to reach more farmers.

A recent study found that Hello Tractor's booking agents are not always trusted by farmers. Only a few booking agents are located within the farming communities and levels of trust are particularly low when booking agents come from outside. Because of their distant location, they incur a high cost of transportation in accessing farming communities, which can discourage agents from going to areas with limited infrastructure.¹⁷⁶ Hello Tractor has partnered with the CTA on a project, where it provided the booking agents with more intensive and tailored training and connected them

to each other via a WhatsApp group. This led to an overall engagement level increase, and confidence to enter new communities and speak with farmers.

The booking agents could have a more proactive role in Hello Tractor's sales and marketing strategy to educate and aggregate demand among smallholder farmers. In the partnership with CTA, Hello Tractor carried out farmer product demonstrations and other awareness activities across various farming communities in Nigeria and Kenya. Farmers were educated through demo days on how mechanization can boost their productivity as well as reduce their costs, and practicalized its usage on the farm, comparing the time it took to complete a harrow job with a tractor to the time it takes animals to complete the same job. During this period, the number of farmers requesting services increased specifically during the dry season. This was especially important since requests for tractor services had a tendency to decline during dry seasons as farmers relied more on animal labor, believing that they were cheaper compared to the use of tractors.¹⁷⁷

Increasing pricing accuracy

Structured pricing and trial periods may lead to increased consumer adoption. To create incentives for consumers to buy in, Hello Tractor could offer a promotional price, increasing the adoption rate and consumer buy-in with little risk. Potential models include a promotion of services, or trial periods for first time fleet owners and first time farmers. Hello Tractor could potentially partner with companies, such as MKopa and BanQ, to offer financing for tractor services and create credit for consumers.

OPPORTUNITIES AND CHALLENGES

Exploring adjacent areas— input support & pricing index

Considering the adjacent needs of Hello Tractor's farmer network will aid the company's product development, increasing their "stickiness" and strengthening the community they are building would be beneficial for the company's growth. One possibility for an adjacent service relates to the procurement and delivery of farm inputs. According to a Hello Tractor impact report, 87% of farmers anticipate input prices being high and as a result the majority are concerned about access to fertilizer and pesticide in the next six months. These worries were more pronounced in the context of COVID-19.¹⁷⁸

An additive solution would entail collecting information from farmers on the Hello Tractor platform regarding the inputs they need, and then leveraging that feedback to organize a bulk purchase of that input on behalf of the farmers to help drive down the cost to each individual farmer. In facilitating this purchase, Hello Tractor could take a percentage

commission significantly lower than the fees typically imposed by input brokers, thus providing an immediate financial incentive for the company while demonstrating its commitment to affordability. In reducing the cost of farm inputs, Hello Tractor would also be indirectly increasing the affordability of its tractor services, as farmers would have more money to spend elsewhere.

Another service Hello Tractor could offer as an add-on product for its dealer and fleet operator customers is a pricing index that provides insights on how different tractor services are being priced in different areas, and presents a visual representation of how the pricing/demand relationship has evolved over time. The company could offer a "lite" version of this product to smallholder farmers as well, including a feature that shows how much farmers in their area are paying for comparable services through Hello Tractor. This would have the benefit of improving pricing transparency and fostering greater trust in the company's solution.



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APPENDICES

The values calculated for the total addressable market estimates are just that—estimates. These are preliminary estimates to offer a directional view of the size of the overall opportunity.

Appendix 1: Market Value Potential for AgroCenta

Ghana's land area spans 238,535 km² and 10 climatic regions. Approximately 65%¹⁷⁹ of land in Ghana is agricultural, most of which is smallholder, traditional, and rain-fed.¹⁸⁰ AgroCenta primarily operates in the Northern, Upper East, and Upper West Regions of Ghana, which contain approximately 41% of Ghana's agricultural land.¹⁸¹

Approximately 6.7 million people are directly affected by the intervention, based on the share of employment in agriculture, with the population of smallholder farmers estimated to be 6 million.¹⁸² Smallholder production of rice, maize, millet, sorghum, and soybean in Ghana account for a total value of about USD 1,789.7 million, about 15.1 % of total net output of the agriculture sector¹⁸³ and 2.7% of Ghana's total GDP in 2019.¹⁸⁴

To arrive at this market value potential, our team determined the quantity of smallholder agricultural land under cultivation in Ghana devoted to growing rice, maize, millet, sorghum, and soybean, respectively.¹⁸⁵ Based on the assumption that the share of smallholder land used for cultivating rice, maize, millet, sorghum, and soybean is 90%¹⁸⁶ of the total agricultural land producing those crops in Ghana (2.3 million hectares),¹⁸⁷ we can estimate the quantity of these five crops produced by smallholder farmers in Ghana. We then determined the revenue generated from the sale of these crops based on nominal June 2019 consumer prices. Multiplying quantity by price, we obtain a total market value from the Ghanaian smallholder production of rice, maize, millet, sorghum, and soybean of USD 1,789.7 million.



APPENDICES

Total Addressable Market: Farmers

Table 4: Market Size of Population Directly Affected by Intervention

Population (as of 2019)	Value	Percentage
Population of Ghana, Total	30.4 million ¹⁸⁸	100%
Population of Ghana, Ages 15-64	18.1 million	59.54% ¹⁸⁹
Share of Employment, Agriculture	5.4 million	29.75% ¹⁹⁰

Total Addressable Market: Land Area

We determined the quantity of smallholder agricultural land under cultivation in Ghana devoted to growing rice, maize, millet, sorghum, and soybean, respectively. Tables 5, 6, and 7 outline our calculations.

Table 5: Market Size of Land Area Under Cultivation

Land (as of 2019)	Value (ha) ¹⁹¹	Percentage
Total Land Area	23.9 million	100%
Agricultural Land Area	13.6 million	56.9%
Agricultural Land Under Cultivation	6.7 million	49.26%



APPENDICES

Primary Crops Targeted

Based on the assumption that the share of smallholder land used for cultivating rice, maize, millet, sorghum, and soybean is 90%¹⁹² of the total agricultural land producing those crops in Ghana (2.3 million hectares), we can estimate the quantity of these five crops produced by smallholder farmers in Ghana.

Table 6: Quantity of Rice, Maize, Millet, Sorghum, and Soybean Produced by Smallholder Farmers (2019)

Crop	Yield (kg/ha) ¹⁹³	Total Land Area (ha) ¹⁹⁴	Total Smallholder Land Area (ha) Assume 90%	Total Smallholder Production (kg)
Rice	2,879.7	0.32 million	0.29 million	835.1 million
Maize	1,945.9	1.42 million	1.28 million	2,490.8 million
Millet	1,003.8	0.19 million	0.17 million	170.6 million
Sorghum	1,155.0	0.30 million	0.27 million	311.9 million
Soybean	1,680.7	0.10 million	0.09 million	151.3 million
Total	8,665.1	2.33 million	2.10 million	3,959.7 million

After identifying the quantity of smallholder production, we then determined the revenue generated from the sale of these crops based on nominal June 2019 consumer prices in Accra. Multiplying quantity by price, we obtain a total market value from the Ghanaian smallholder production of rice, maize, millet, sorghum, and soybean of USD 1,789.7 million.

Total Valuation

Table 7: Valuation

Value	Price (GHC/kg)	Quantity (kg)	Total Revenue (GHC)
Rice	4.60 ¹⁹⁵	835.1 million	3,841.5 million
Maize	1.60 ¹⁹⁶	2,490.8 million	3,985.3 million
Millet	3.08 ¹⁹⁷	170.6 million	525.4 million
Sorghum	2.43 ¹⁹⁸	311.9 million	757.9 million
Soybean	3.30 ¹⁹⁹	151.3 million	499.3 million
Total Value (GHC)			9,612.1 million
June 2019 Exchange Rate (USD/GHC)	0.186 ²⁰⁰		
Total Value (USD)			1,789.7 million



APPENDICES

Appendix 2: Market Value Potential for Cultivando Futuro

Although agriculture constitutes over 6% of Colombia's GDP, and is only expected to grow from there, the agriculture supply chain is mostly informal. Only one percent of Colombian farmers use the mandated "certified seeds", and only around 17% of the farmers directly sell to wholesalers. Everywhere else, there is a reliance on intermediaries to help bridge the gap between farmers, suppliers, and consumers.

Here, digital platforms like CF act as a technology-driven, formal, efficient, and transparent intermediary between wholesalers and farmers. To estimate CF's total market potential in Colombia, we have calculated market size using data from the wholesale centers in Colombia which CF business targets. Due to limited data on the number of farmers' associations and individual farmers trading in those wholesale distribution centers, as well as the small revenue stream from farmers' association and individual subscriptions, we have focused on our estimation on CF's market value potential vis a vis the transaction fee and subscription revenue from the wholesalers.

There are 13 wholesale distribution centers in Colombia, serving roughly 40 million residents living in and near the urban centers, and moving 52% of agricultural production every year.²⁰¹ Colombia's top five wholesale distribution centers (Corabastos, CMA, Centroabastos, Barranquillita, and Canvasa) serve more than 20 million people and account for about two-thirds of Colombia's agriculture production.²⁰² Based on an estimate by MarketLine, an industry research firm, the market value of Colombia's agriculture products in 2020 was USD 12 billion.²⁰³ Given that 52% of the agricultural production moves through wholesale centers, we were able to estimate the total sales from wholesale distribution centers equal to be around USD 6.2 billion. The authors' analysis shows that roughly 7,400 wholesalers trade actively from the top five wholesale distribution centers.²⁰⁴ With a monthly subscription fee of USD 8.5, the revenue from wholesaler subscriptions is equivalent to USD 750 thousand each year.

Though Colombia has made significant progress in adopting digital payments, many merchants and consumers still rely on cash transactions.²⁰⁵ According to the latest World Bank Findex data, more than half of the Colombian population does not have a bank account.²⁰⁶ Assuming only 45% of the transactions happen through a digital intermediary like Cultivando Futuro, CF's annual revenue potential is estimated to be nearly USD 28.8 million.

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Table 8: Total Addressable Market Potential in Colombia: Wholesale Distribution Centers Transaction and Wholesaler Subscription Fee

Total Annual Market Value from Wholesale Distribution Center	
Total Agriculture Market Value in 2020 (USD)	12 billion ²⁰⁷
Annual Agriculture Market Share from Wholesale Distribution Centers (USD)	52 % ²⁰⁸
Annual Agriculture Market Value from Wholesale Distribution Centers (USD)	6.2 billion
Fee Per Transaction	1%
Total Transaction Fee (USD)	62.4 million
Share of Transactions via Digital Payments	45 % ²⁰⁹
Total Transaction Fee via Digital Platforms (USD)	28.1 million
Total Annual Market Value from Wholesaler Subscriptions	
Number of Wholesalers from the Top Five Wholesale Distribution Centers	7400 ^{210,211}
Wholesale Subscription Fee Per Month (USD)	8.5
Annual Wholesale Subscription (USD)	754,800
Total Market Revenue Potential (USD)	28.8 million



APPENDICES

Appendix 3: Market Value Potential for Hello Tractor

Total Addressable Market

After introducing Hello Tractor's asset sharing and management applications, we estimate a total market value potential of USD 149 billion for tractor services in SSA. Our internal calculations rely on data from the FAO, World Bank, UN, IOPScience, and the article by S.R. Verma of the Punjab Agricultural University, titled, Impact of Agricultural Mechanization on Production, Productivity, Cropping Intensity Income Generation and Employment of Labor.²¹²

Total ha of agricultural land in SSA (Table 9)

In 2018, the World Bank estimated that SSA's landmass was 23 million square kilometers, equivalent to 2.38 billion ha.²¹³ From there, the World Bank states total agricultural land in SSA accounts for 43% of total land, so we multiply the percentage of agricultural land by total SSA land to arrive at 1.0 billion ha of total agricultural land in SSA.²¹⁴ For the purposes of our market sizing model, we do not further break down total ha into ha occupied specifically by smallholder farmers. According to an FAO mechanization report, mechanization efforts are most successful when adoption is spread across all farm sizes. In Asia, the mechanization of large and medium farms increased accessibility and economic demand for agricultural equipment broadly.²¹⁵ We assume Hello Tractor's SaaS technology can successfully penetrate 100% of the agricultural land in SSA, given that the company's existing partnerships with both fleet managers and individual tractor owners demonstrate its ability to accommodate all farm sizes.

Total hg/ha for top five crops in SSA (Table 10)

To estimate the current income derived from crops across SSA, we consulted the FAO database for annual crop volumes. Given the FAO does not provide reports specific to SSA as a region (e.g., average price, production, or volume), we assume the top five crops in the continent of Africa are consistent across SSA: cassava, maize, millet, rice, and sorghum.²¹⁶ We assume Kenya, an SSA country where Hello Tractor operates, provides a reasonable proxy for the average USD/ton derived from each crop in the region in 2015:

- Cassava: USD 236/ton
- Maize: USD 293/ton
- Millet: USD 831/ton
- Rice: USD 551/ton
- Sorghum: USD 527/ton



APPENDICES

FAOSTAT data provides the total hectogram (hg)/ha for each of the top five crops across Africa. With this information, we collect the total hg/ha per crop in Africa in 2015. Given our units of measurement are USD and tons, we convert hg/ha to tons/ha. Total tons ($\text{hg}/10000 = \text{tons}$) are recorded as such:

- Cassava: 8.8 tons/ha
- Maize: 2.0 tons/ha
- Millet: 0.7 tons/ha
- Rice: 2.2 tons/ha
- Sorghum: 1.0 tons/ha

Pre-intervention revenue from crops (Table 11)

Data is not readily available for average USD/ha income in SSA, so we assume the average percentage of land occupied by the top five crops in Africa is representative of the breakdown of top crops in the SSA region, too. From here, we portion out land by crop:

- Cassava: 16.6%
- Maize: 33.3%
- Millet: 15.7%
- Rice: 11.4%
- Sorghum: 22.8%

To calculate total ha per crop in SSA, we multiply the percentage of land occupied per crop by the total SSA agricultural land.

To calculate total pre-intervention revenue from these crops, we multiply total SSA land per crop by the average price per ha to arrive at our total revenue for all five crops, which equals USD 451 billion pre-intervention in SSA.

Post-intervention revenue from crops (Table 11)

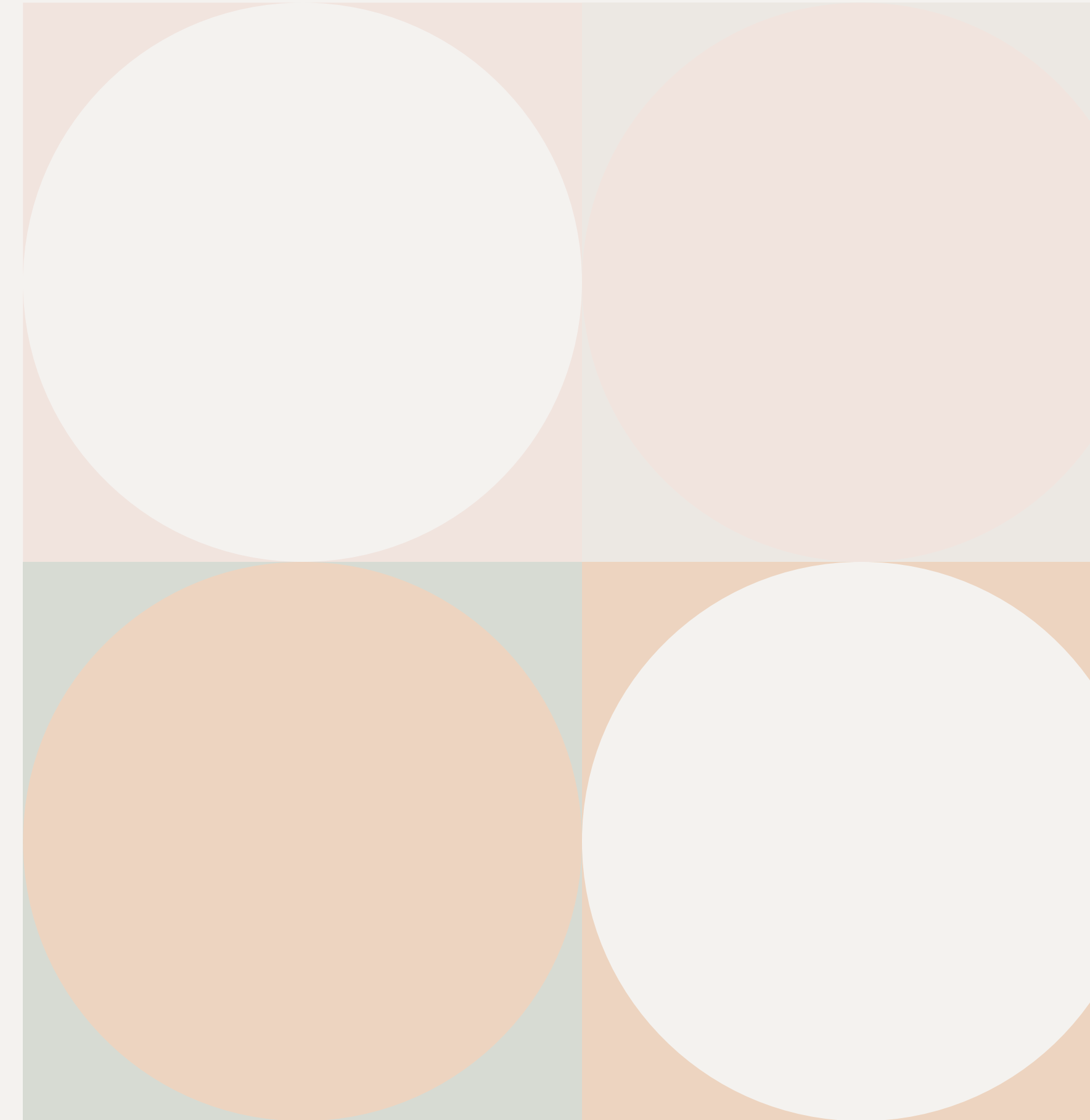
We assume a productivity increase due to tractor power mechanization based on figures presented in the Journal of Sustainable Development (2012), which states tractor mechanization increases productivity by 29%.²¹⁷ Assuming a 29% increase in productivity in SSA, we multiply the total pre-intervention revenue by the total productivity increase [$\text{USD } 451 \text{ billion} * (1+0.29)$] to arrive at our post-intervention revenue of USD 578 billion. We calculate the post-intervention gain by subtracting the pre-intervention revenue from the post-intervention revenue ($\text{USD } 582 \text{ billion} - \text{USD } 451 \text{ billion}$) to arrive at a net gain of USD 131 billion, which is equivalent to USD 131/ha.

It is reasonable to expect the SaaS market for tractor services will capture part of the total productivity gain calculated at USD 131 billion, given that farmers' willingness to pay for mechanization is expected to increase as a result of higher incomes.

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Table 9: Market size (ha)^{218, 219}

Variable	Value (ha)	Percentage	Source
SSA total land area (ha)	2.39 billion	100%	World Bank
SSA agricultural land area (ha)	1.0 billion	43%	Calculation total land area * % agricultural land in SSA (% from World Bank)



APPENDICES

Table 10: Valuation of top 5 crops in SSA^{220, 221}

Crop type	Average USD/Ton	Ton/ha	Total ha per crop in Africa	% total land per crop	Total land (ha) per crop in SSA
Cassava	\$236	8.8	19 million	16.6%	167 million
Maize	\$293	2.0	38 million	33.3%	333 million
Millet	\$831	0.7	18 million	15.7%	157 million
Rice, paddy	\$551	2.2	13 million	11.4%	114 million
Sorghum	\$527	1.0	26 million	22.8%	228 million
Total			114 million	100%	1.0 billion

Table 11: Post-intervention gain^{222, 223}

Crop type	Total land (ha) per crop in SSA	Average price (USD) per ton	Total revenue per crop
Cassava	167 million	\$236	\$40 billion
Maize	333 million	\$293	\$98 billion
Millet	157 million	\$831	\$130 billion
Rice, paddy	114 million	\$551	\$63 billion
Sorghum	228 million	\$527	\$120 billion
Total pre-intervention			\$451 billion
Total increase in productivity due to mechanization			29%
Post-intervention revenue			\$582 billion
Total gain post-intervention			\$131 billion
Average gain per ha			\$131



APPENDICES

Hello Tractor's Profit Formula Estimation

Hello Tractor's business model is unconventional relative to competition. Trringo, the India-based tractor company, operates on a franchisee-based model incurring royalties and commissions for tractor services.²²⁴ On the other hand, Hello Tractor's business model generates fees on a fleet style, business-to-business (B2B) basis, with fleet owners and operators ranging in size from 1-200 tractors.

The evolution of Hello Tractor's product offering from an affordable, low-horsepower tractor to tractor bookings and tech services transformed Hello Tractor's business into a low-asset expenditure model. As an asset-light company, Hello Tractor incurs most of its expenses through overhead costs. Based on financial assumptions for a SaaS company, we break Hello Tractor's cost estimates down as follows:²²⁵

- 52% to salaries
- 6% to office rent
- 25% to research and development (R&D) costs
- 5% to marketing
- 12% to miscellaneous expenses
- research and development (R&D) costs

Based on current rental market proxies, Hello Tractor's office spaces in Kenya, Nigeria and Washington D.C. cost USD 30,000 per year. The "last mile" booking agents are paid based on services completed, eliminating booking agent employment costs from the profit formula. Given that Hello Tractor already invested significantly in technology development and its core applications are up and running, we assumed R&D costs would remain steady with R&D allocation shifting to other business areas. If R&D costs remained flat, and sales increase, margins were projected to increase. Please find the details of our calculations from Table 12 to Table 16 below.

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Table 12: Profit formula inputs

Market Potential	
Total ha of land in SSA	2.39 billion
Total agricultural land in SSA	1.0 billion
Total smallholder farms in SSA	3.300 billion
Average ha per smallholder farm in SSA	1.50
Smallholder farmers farmland total hectare	2.2 billion
Total agriculture market value	NA
Annual market value from wholesalers	NA
Number of tractors	230,000
HT SaaS Yearly Transactions	\$200
Usage % for wholesale subscriber	NA
Willingness to pay per ha for Tractor work	\$147

Table 13: Revenue stream inputs

Fees	Value
SaaS Subscription per Year	\$200
Per Job completion fee	5%
Selling technology hardware	0.00%

**Table 14: Average yearly growth breakdown
(assume the annual growth rate stays constant)**

Growth Projections	Annual % Increase
SaaS Subscriptions	20%
Job Completions	20%
Other Tech equipment	20%



APPENDICES

Table 15: Profit formula calculations

Cost Assumptions			Notes	Source
	% of total cost	US\$ amount		
Total Salaries	0.52	\$278,200.00	Includes customer support (10%); selling cost (20%); marketing management (5%); SG&A (17%)	
Average computer technician Salary			The average salary for a computer technician in Nigeria is NGN 257,000 per month	http://www.salaryexplorer.com/salary-survey.php?loc=158&loctype=1&job=849&jobtype=3
Average Salary for Customer Service Manager			The average salary for a Customer Service Manager in Nigeria is NGN 453,000 per month	http://www.salaryexplorer.com/salary-survey.php?loc=158&loctype=1&job=221&jobtype=3
Average salary for Data Analyst			Data Analyst NGN 316,000 per month	
Average Salary for software engineer			Software Engineer NGN 333,000 per month	
Average of all salaries		\$10,700.00		Average calculation
Number of employees		26		Given by HT
Total Office Rent	5.61%	\$30,000.00	2 in Africa; 1 in US	Calculated from below
Office in DC		\$15,000.00	Price office DC 140 sq ft \$1250 per month / \$15,000 per year	https://liquidspace.com/us/dc/washington/metro-offices-one-metro-center/metro-center-office-for-2#wp-monthly
Office in Kenya		\$8,400.00	Average office rent in Kenya is KSh 76,500 per month / \$8,400 per year	https://kenyapropertycentre.com/for-rent/commercial/offices/nairobi/showtype
Office in Nigeria		\$6,600.00	Average office rent in Nigeria NGN 2,500,000 (annual) / \$6,600 per year	https://nigeriapropertycentre.com/for-rent/commercial/offices/showtype



APPENDICES

Table 15: Profit formula calculations

Cost Assumptions			Notes	Source
	% of total cost	US\$ amount		
R&D Cost	25%	\$133,750.00	Avg. of 25% of total SaaS costs	https://www.saas-capital.com/blog-posts/spending-benchmarks-for-private-b2b-saas-companies/
Marketing	5%	\$26,750.00		
Other Costs	12%	\$66,300.00		Total Costs - all cost categories = 100%
Total Annual Costs	100%	\$535,000.00	\$535,000.00	Inverse of 52% for salaries = total cost of \$535K



APPENDICES

Table 16: Pro forma financial statements, years one to five

Projected Income	Year 1	Year 2	Year 3	Year 4	Year 5	Calculation Notes
Sales	\$1,020,000	\$1,224,000	\$1,468,800	\$1,762,560	\$2,115,072	Internal Calculation
SaaS Tractor Subscriptions	\$3,000	\$3,600	\$4,320	\$5,184	\$6,221	Increased by 20% YOY
SaaS Premium Subscription \$200	\$600,000	\$720,000	\$864,000	\$1,036,800	\$1,244,160	(# Subscriptions *\$200)
Average Revenue per tractor, per year	\$2,800	\$2,800	\$2,800	\$2,800	\$2,800	Tractor owners can earn up to \$4,200 per month. That is \$140 per day. To stay on the conservative side we calculate that the tractor is at use 20 days per month = \$2,800
Total Tractors revenue per year	\$8,400,000	\$10,080,000	\$12,096,000	\$14,515,200	\$17,418,240	Internal Calculation
Alternative Pricing	\$108,000,000	\$129,600,000	\$155,520,000	\$186,624,000	\$223,948,800	Do another calculation of average 5 ha per day; at \$40 per ha; at 9 months per year at 20 days per month
Alternative 5% Job Completion Fee	\$5,400,000	\$6,480,000	\$7,776,000	\$9,331,200	\$11,197,440	Internal Calculation
5% Job Completion Fee	\$420,000	\$504,000	\$604,800	\$725,760	\$870,912	Internal Calculation
Total Costs	\$401,250	\$481,500	\$577,800	\$693,360	\$832,032	Increased total costs by 20% YOY
R&D Costs	\$133,750	\$133,750	\$133,750	\$133,750	\$133,750	Remains constant
Total Costs	\$535,000	\$615,250	\$711,550	\$827,110	\$965,782	Internal Calculation
Annual Profit	\$485,000	\$608,750	\$757,250	\$935,450	\$1,149,290	Internal Calculation
Profit Margin	48%	50%	52%	53%	54%	Internal Calculation



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