

Agriculture in Latin America

Recent trends in digital disruption



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The GSMA AgriTech Programme works towards equitable and sustainable food chains that empower farmers and strengthen local economies. We bring together and support the mobile industry, agricultural sector stakeholders, innovators and investors in the agritech space to launch, improve and scale impactful and commercially viable digital solutions for smallholder farmers in the developing world.

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The "Innovation in Ag Tech and Digital Agriculture for Small Farmers" project is financed by the Inter-American Development Bank, as administrator of the Multilateral Investment Fund (IDB Lab).

Disclaimer

The authors take full responsibility for the contents of this report. The opinions expressed do not necessarily reflect the views of Incofin Foundation and the Inter-American Development Bank.

Acknowledgements

Adriana Soto, Doctor Agro

Albert Scarasso, 4Told Fintech

Alvaro Camacho, Lutheran World Relief

Ana María Gallón, Blue Marble

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Abbreviations and acronyms

AI	Artificial intelligence	IICA	Inter-American Institute for Cooperation on Agriculture
AMI	Americas Market Intelligence	ILO	International Labour Organization
B2B	Business-to-business	IoT	Internet of Things
B2C	Business-to-consumer	IVR	Interactive voice response
B2B2C	Business-to-business-to-consumer	LPWA	Low-power wide-area
BCR	Banco Central de Reserva (Central Reserve Bank of El Salvador)	LWR	Lutheran World Relief
C4IR	Centre for the Fourth Industrial Revolution	MinTIC	Ministerio de Tecnologías de la Información y las Comunicaciones de Colombia (Colombia's Ministry for Information Technology and Communications)
CGIAR	Consortium of International Agricultural Research Centers	MOCCA	Maximizando Oportunidades en Café y Cacao (Maximizing Opportunities in Coffee and Cocoa – USDA initiative)
CIAT	Centro Internacional de Agricultura Tropical (International Center for Tropical Agriculture)	ND-GAIN	Notre Dame Global Adaptation Initiative
CVG	Comunidad Virtual Ganadera (Virtual Livestock Community)	NGO	Non-governmental organisation
DENDE	Fundación Desarrollo en Democracia (Development in Democracy Foundation, Paraguay)	OPSAa	Observatorio de Políticas Públicas para los Sistemas Agroalimentarios (Observatory of Public Policies for Agrifood Systems)
DFS	Digital financial services	QR	Quick response
DSIK	German Sparkassenstiftung for International Cooperation	RFID	Radio frequency identification
EU	European Union	SENA	Servicio Nacional de Aprendizaje (National Learning Service of Colombia)
EUDR	European Union Deforestation Regulation	SME	Small and medium enterprise
EWS	Early warning system	SMS	Short messaging service
FAO	Food and Agriculture Organization of the United Nations	TVWS	Television white space
FCDO	Foreign, Commonwealth & Development Office	UK PACT	United Kingdom Partnering for Accelerated Climate Transitions
FNC	Federación Nacional de Cafeteros (National Federation of Coffee Growers of Colombia)	UNDP	United Nations Development Programme
FOREST	Fostering Overseas Rule of Law and Environmentally Sound Trade	UNFCC	United Nations Framework Convention on Climate Change
FSP	Financial service provider	US	United States
GDP	Gross domestic product	USAID	United States Agency for International Development
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit	USDA	United States Department of Agriculture
ha	hectare	USSD	Unstructured supplementary service data
IDB	Inter-American Development Bank	VAS	Value-added service
IFAD	International Fund for Agricultural Development	VC	Venture capital
IFRC	International Federation of Red Cross and Red Crescent Societies	VCM	Voluntary carbon market
		WEF	World Economic Forum
		WFP	World Food Programme
		WMO	World Meteorological Organization

Executive summary



Agriculture is an important contributor to employment and the gross domestic product (GDP) of Latin American countries. This is particularly true in Central America and the Andean region where up to a third of the labour force is engaged in agricultural activities.¹

Given the structure of agricultural production in Central America and the Andes (up to 85% of farmers are smallholders), the region has productivity levels and rural poverty rates that are worse than Latin American averages. Digital agriculture solutions are ideally suited to address the challenges faced by smallholder farmers in Latin American markets. They can make smallholders more productive, give them access to much-needed financing, help them identify new buyers for their

products, increase the quality and price of the crops they sell and make them more resilient to the effects of climate change.

Over the past few years, several trends have driven the adoption of digital agriculture solutions in the region, including rising smart device ownership, accelerated digitisation during the COVID-19 pandemic and increased investor engagement in agritech, among others.



¹ World Bank Data. (2022). "Employment in agriculture".

The GSMA AgriTech team examined more than 100 digital agriculture solutions deployed in Latin America, with a focus on solutions in Bolivia, Colombia, El Salvador, Honduras, Paraguay and Peru. Through a careful review of these solutions and the players behind them, several key trends emerged including:

- 1 Sustainability is a challenge, but some agritechs have managed to scale their solutions.** A handful of solutions have 100,000 users or more – high by regional standards.
- 2 Digital advisory services are now smarter and more interactive** with the help of machine learning, artificial intelligence (AI) and the proliferation of chatbots.
- 3 WhatsApp is becoming the preferred delivery channel of digital agriculture providers** given its widescale adoption among smallholder farmers.
- 4 Agricultural parametric insurance is the fastest growing digital agriculture use case in Latin America.** Adoption is particularly high in countries like Colombia where government incentives make insurance virtually free for smallholders.
- 5 Data from digital procurement solutions is being leveraged to help smallholders participate in international carbon markets.** International carbon markets are considered an attractive mechanism for compensating smallholders who implement sustainable and regenerative farming practices.
- 6 Agri e-commerce companies are struggling to stay afloat.** A recent decision by Frubana to close their operations in Colombia and Mexico was a blow to the industry.

To capitalise on the opportunities of the digital agriculture market in Latin America, a multi-stakeholder approach that brings together government, NGOs, donors, investors, tech companies and start-ups will be critical. Based on our research, we have the following recommendations for stakeholders in the Latin American agritech ecosystem:

- 1 Look for opportunities to scale by adapting successful models from other countries.** Partnerships with investors, NGOs or organisations familiar with the target market can help minimise the risk of expanding to another country in the region.
- 2 To ensure that no one is left behind, establish clear targets for underrepresented groups** like women and Indigenous peoples. Organisations with clear targets and strategies to include marginalised populations tend to have two to three times more female users than organisations with no such targets.
- 3 Take advantage of government subsidies and other programmes that make solutions more affordable and accessible to smallholder farmers.** This strategy has supported the proliferation of parametric insurance products throughout the region.
- 4 Seek to address the multiple pain points of smallholders.** Anecdotal evidence suggests that smallholder farmers have a strong preference for using one solution to address multiple challenges rather than a variety of different services.
- 5 When deploying smart farming solutions, prioritise high-margin value chains like fresh produce, aquaculture and livestock.** Smallholder farmers working in these value chains tend to have higher disposable income and may have already invested in irrigation solutions, cold storage facilities or greenhouses that can be made more efficient with the use of smart farming solutions.

01 Introduction



Smallholder farmers in Latin America face numerous challenges, including low productivity levels and limited resilience to climate change. This is particularly true of countries in the Andean region and Central America.

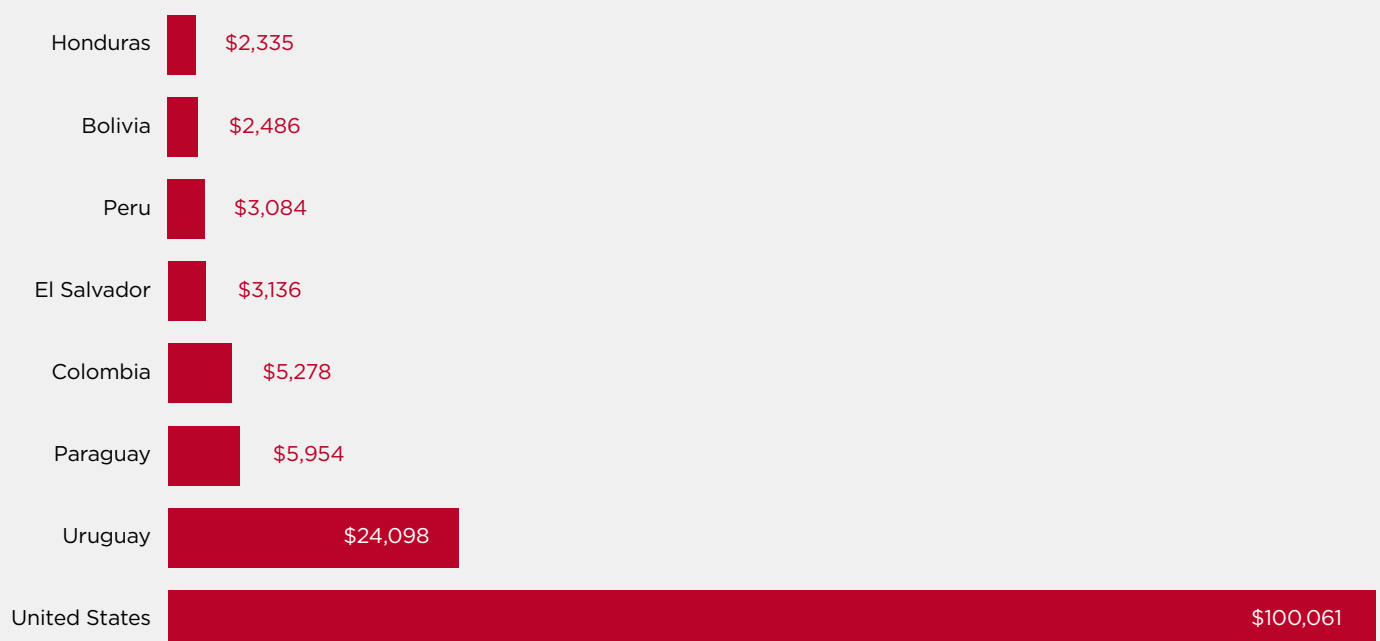
Productivity levels in Andean and Central American markets tend to be between 10% and 25% of levels observed in Uruguay, and a mere 2% to 6% of levels observed in the United States (see **Figure 1**).² These regions are also highly susceptible to extreme climate events, including prolonged El Niño and La Niña cycles and tropical storms that bring excessive rain and severe droughts.

Figure 1

Value-add per agricultural worker, selected countries in the Americas, 2019

Constant 2015 USD

Source: Inter-American Institute for Cooperation on Agriculture (IICA) Observatory of Public Policies for Agrifood Systems (OPSAa)



² IICA OPSAa. *Atlas Agroalimentario*.

Digital agriculture solutions have the potential to help smallholder farmers overcome the challenges they face by helping them become more productive, identify new markets for their products and build resilience to climate change. These solutions also benefit the environment by giving users the ability to optimise their use of natural resources, implement sustainable practices and reduce waste. Digital agriculture solutions in Latin America have failed to reach their full potential, with few solutions achieving scale beyond a few thousand users. This is due, in part, to an underdeveloped agritech ecosystem that suffers from underinvestment, limited regulatory support and few opportunities for networking and sharing of best practices.

In 2020, the GSMA conducted a market mapping and landscape analysis of the most prominent cases of digital disruption in Latin America. The results were published in a report that highlighted some of the major trends in digital agriculture in the region, identified opportunities for digital interventions and made recommendations for future engagement that could deliver long-term, sustainable economic and social benefits for smallholder farmers.³ This report provides an update of the 2020 landscape report with a focus on the agritech ecosystem in six Latin American markets: Bolivia, Colombia, El Salvador, Honduras, Paraguay and Peru. Smallholder farming is a major contributor to the agriculture sector in these countries (see **Figure 2**).

Figure 2

Snapshot of the agriculture sector in six Latin American countries

Sources: World Bank,⁴ International Labour Organization (ILO), Food and Agriculture Organization of the United Nations (FAO),⁵ government ministries⁶



El Salvador A

Agriculture as a percentage of GDP

4.7%

Agriculture as a percentage of employment

15.0%

Number of smallholder farmers

325,000
(82% of total)

Crops

Coffee, dairy, palm oil, sugar cane

Peru C

Agriculture as a percentage of GDP

7.8%

Agriculture as a percentage of employment

25.7%

Number of smallholder farmers

2 million

Crops

Avocados, cocoa, coffee, fruits, palm oil, quinoa

Paraguay E

Agriculture as a percentage of GDP

11.0%

Agriculture as a percentage of employment

17.4%

Number of smallholder farmers

240,000
(84% of total)

Crops

Livestock, maize, oil seeds, rice, soybeans, wheat

Honduras B

Agriculture as a percentage of GDP

12.6%

Agriculture as a percentage of employment

24.2%

farmers

385,000

Crops

Bananas, coffee, melons, palm oil, pineapples, sugar cane

Number of smallholder

Colombia D

Agriculture as a percentage of GDP

8.3%

Agriculture as a percentage of employment

14.6%

farmers

2.7 million

Crops

Avocados, bananas, coffee, flowers, livestock, palm oil, sugar cane

Number of smallholder

Bolivia F

Agriculture as a percentage of GDP

12.5%

Agriculture as a percentage of employment

27.0%

Number of smallholder farmers

720,000

Crops

Bananas, Brazil nuts, livestock, quinoa, soybeans, sugar cane, sunflower seeds

3 GSMA. (2020). [Landscaping the agritech ecosystem for smallholder farmers in Latin America and the Caribbean](#).

4 Agriculture as a percentage of GDP and agriculture as a percentage of employment were sourced from: World Bank Data. (2022). "Agriculture, forestry, and fishing, value added (% of GDP)".

5 Leading crops were sourced from: FAOSTAT. (2022). "Crops and livestock products, export value".

6 Smallholder farmer figures for El Salvador were sourced from: Ministerio de Agricultura y Ganadería and Ministerio de Economía. (2009). [IV Censo Agropecuario 2007-2008 Resumen de Resultados](#). For Paraguay, we include farming units of less than 20 hectares (ha) per the 2022 Agriculture Census: DENDE. (2022). [Censo Agropecuario 2022](#).

Section 2 looks at changes over the past four years that have affected the development of the digital agriculture sector in the six focus markets, both positively and negatively. Specifically, we look at the rising adoption of smartphone devices, social media and communications platforms, the impact of COVID-19 on digitisation across the economy, the introduction of new rules impacting exporters in certain value chains, the increased frequency and severity of weather events, a developing investment ecosystem for agritech and rural connectivity initiatives.

Section 3 provides an updated landscape assessment of the digital agriculture ecosystem in the six focus markets based on a careful review of available solutions. Solutions are segmented into five use cases based on the GSMA digital agriculture use case framework. For each use case, we highlight some of the leading digital agriculture solutions and outline some of the trends driving or inhibiting growth in the sector.

The report concludes with a review of opportunities and recommendations for different ecosystem players to support the growth and development of digital agriculture solutions in the six focus markets (see **Section 4**).

Methodology

The GSMA AgriTech team relied on a combination of primary and secondary research. Analysts conducted in-depth interviews with 25 industry stakeholders in all six focus countries, including agritech, fintech, agribusinesses, NGOs and financial service providers (FSPs). The interviews took place remotely between December 2023 and February 2024. Primary research was corroborated with internal and external secondary sources, both qualitative and quantitative. This included internal sources like mobile industry data from GSMA Intelligence, an extensive library of GSMA reports, toolkits, blogs and indices. External sources for this report included, among others, World Bank Data, Global Findex Data, ILOSTAT, FAOSTAT, IICA OPSAa and agriculture census reports from government ministries.

02

Key drivers of digital agriculture in Latin America



Several key pieces need to be in place for the development of a vibrant and sustainable digital agriculture ecosystem. These include, among others, mobile and internet connectivity in remote rural areas, access to affordable smartphones and Internet of Things (IoT)-powered devices, digital literacy among farmers, favourable government policy and regulation, access to farmer groups and data and support from investors and donors.

In many cases, the impetus for smallholder farmers to adopt digital agriculture solutions comes from external forces, such as the need to comply with certification and traceability requirements or the desire to work with a specific cooperative, agribusiness or exporter that requires digitisation. Increasingly, however, smallholder farmers are themselves looking for ways to become more productive, identify new buyers for their crops, access financial services more easily and build resilience to climate change. They are turning to digital agriculture services to help them.

In the 2020 GSMA study, *Landscaping the agritech ecosystem for smallholder farmers in Latin America and the Caribbean*, the GSMA AgriTech team outlined several key factors driving the development of a robust digital agriculture ecosystem in the region.⁷ Most are still relevant in 2024. In this report, we look at how the events of the past four years have shaped the enabling environment and uptake of digital agriculture services in six Latin American countries.

⁷ GSMA. (2020). *Landscaping the agritech ecosystem for smallholder farmers in Latin America and the Caribbean*.

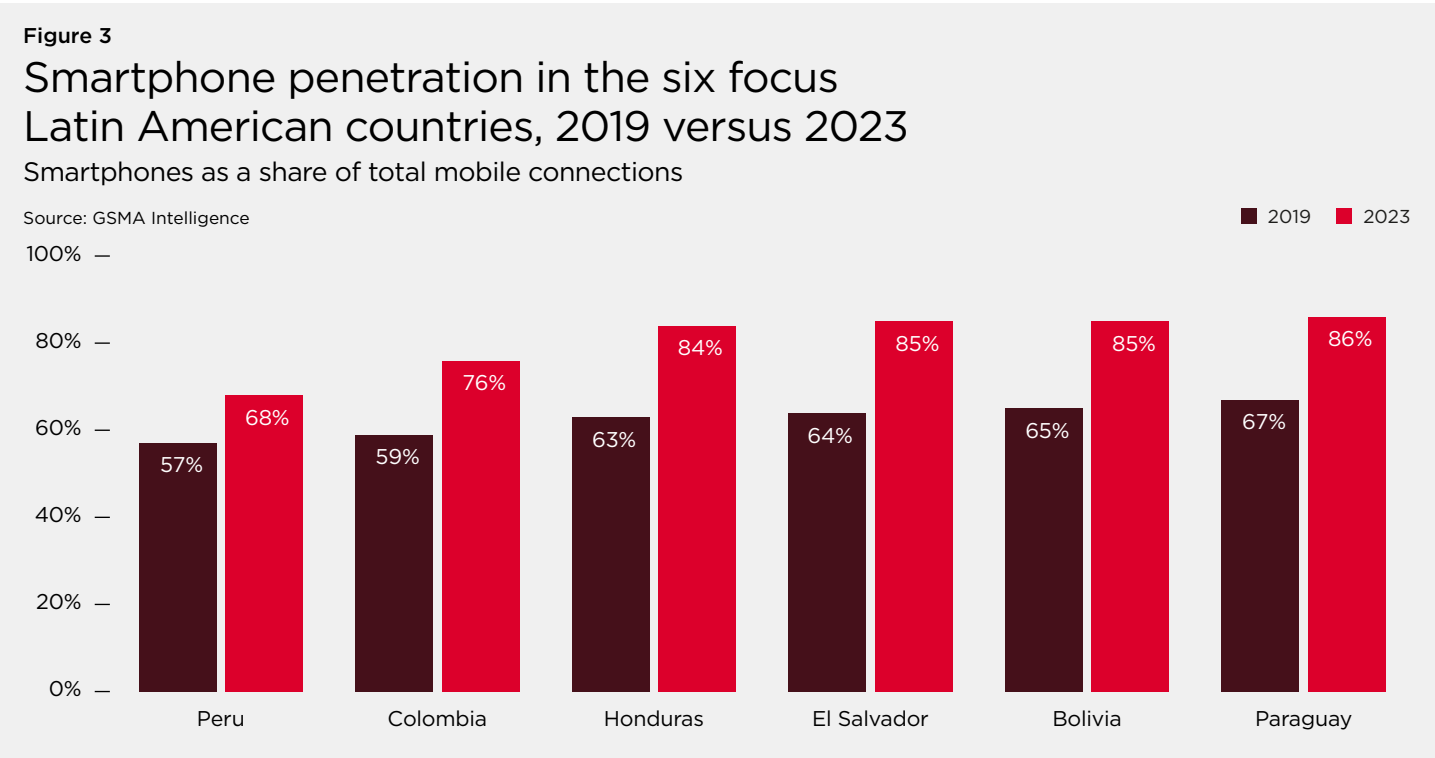
Driver 1

Rising smartphone, social media and messaging app adoption



Many digital agriculture tools available to smallholder farmers require them to have access to, and know how to use, a smartphone. In 2020, average smartphone penetration across the six focus markets was roughly 63%. That has since climbed to 81%, driven by the proliferation of low-cost devices and the appeal of social media and messaging apps, most notably WhatsApp, which is included for free in many prepaid plans (see **Figure 3**).

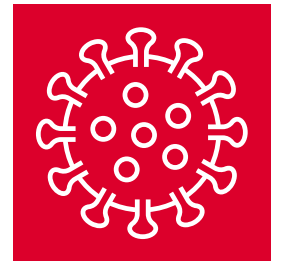
Due to the ubiquity of WhatsApp and other social media apps in Latin America, governments, agribusinesses, NGOs and agritechs are increasingly turning to these apps to provide digital agriculture solutions to smallholder farmers. Many of the organisations interviewed for this study, including Agrapp, Innovakit, Nature DAO's Farmer Coach and Producers Direct, conducted end user research with prospective users and found a strong preference for WhatsApp over other types of communication channels. As a result, these agritechs opted to shift from proprietary digital platforms to solutions built on WhatsApp, leveraging groups, chatbots and other functionalities that are familiar to smallholder farmers.⁸



⁸ Interviews with Agrapp, Innovakit, Farmer Coach (Nature DAO) and Producers Direct between December 2023 and February 2024.

Driver 2

Accelerated digitisation due to the COVID-19 pandemic



The restrictions imposed on the movement of people and goods during the COVID-19 pandemic acted as a catalyst for the digitisation of many processes. Individuals and organisations once reluctant to embrace digitisation had little choice but to adopt digital channels if they wanted to receive timely information and advisory, get paid, comply with stricter safety and certification standards and, most importantly, receive government benefits.

To distribute social benefits quickly to affected populations, governments throughout the region turned to mobile wallets, apps and other digital financial services (DFS) products. In El Salvador, for example, 22% of first-time digital wallet users interviewed by Mastercard and Americas Market Intelligence (AMI) in late 2022 and early 2023 came on board because of a government-backed social benefits programme introduced during the COVID-19 pandemic (compared to 9% region-wide).⁹ These types of efforts helped countries in Latin America close the account ownership gap with other regions. In 2017, prior to the pandemic, account ownership at a financial institution in Latin America lagged the global average by 13 percentage points. Four years later, the difference was only two percentage points.¹⁰ According to Mastercard, the share of Latin Americans who only use cash decreased from 45% pre-pandemic to 21% post-pandemic, leading to the financial inclusion of 115 million people throughout Latin America.¹¹

Increased financial inclusion and the use of DFS can be an important catalyst for the adoption of digital agriculture solutions, particularly digital procurement solutions that enable digital payments to smallholder farmers, smart farming solutions like shared tractor services that allow users to reserve and pay via digital channels and agri e-commerce solutions that allow buyers and sellers of agricultural produce to exchange funds over the platform itself, rather than in cash upon delivery.

⁹ Mastercard and Americas Market Intelligence (AMI). (2023). *Estado de la inclusión financiera después de la COVID-19 en Latinoamérica y el Caribe: nuevas oportunidades para el ecosistema de pagos.*

¹⁰ Ibid.

¹¹ Ibid.

Driver 3

New traceability and certification standards



New regulations coming into effect in some of the leading export destinations for Central American and Andean agricultural products are accelerating the roll-out of digital agriculture solutions. In June 2023, the European Parliament passed the European Union Deforestation Regulation (EUDR),¹² an initiative aimed at curbing the impacts of deforestation around the world. Those exporting commodities into European markets have 18 months (through the end of 2024) to comply with new rules that require them to demonstrate that their products did not come from land subject to deforestation after 31 December 2020 (see **Figure 4**). Small and medium enterprises (SMEs) have been granted a six-month extension, to 30 June 2025, to comply with the new rules. Agribusinesses, cooperatives and farmer groups in coffee, cocoa, palm oil, livestock and soybean value chains will be among the most affected by the new rules in the six focus markets. Colombian premium cocoa company, Luker Chocolate, is implementing new traceability systems that use georeferenced satellite polygon analysis combined with significant on-the-ground data collection to ensure compliance. The company is also working with their smallholder partners to prepare them for the transition.¹³ Colombian bean-to-chocolate premium chocolate maker, Moxe, has teamed up with Colombian forest restoration group Amazonía Emprende to ensure their smallholder partners employ regenerative practices.¹⁴

Similar legislation is being considered in the US. The FOREST Act calls for the prohibition of imports tied to illegal deforestation as well as prosecution and penalties for offenders.¹⁵ Given the importance of both US and European markets to Latin American exporters of agricultural commodities, agribusinesses and exporters will have little choice but to digitise their processes to comply with the new rules, ultimately impacting smallholder farmers as they adapt to these new processes.

GSMA AgriTech research predicts that these new regulations will lead to the proliferation of new digital agriculture solutions that leverage distributed ledger technologies (e.g., blockchain), electronic tracking mechanisms (e.g., QR codes and RFID tags) and satellite-based monitoring, as companies wishing to participate in Europe's 440 million-strong consumer market seek to comply with the new rules.¹⁶ Compliance, however, will come at a cost. Companies interviewed for this study stated that compliance will invariably require subscribing to services that provide satellite monitoring, which is beyond the reach of most small cooperatives and smallholder farmers. Ensuring that smallholders do not get left behind will require a multi-stakeholder approach involving governments, NGOs, multilateral agencies, agribusinesses and agritechs.¹⁷

12 [European Union Deforestation Regulation \(EUDR\)](#).

13 Luker Chocolate. (21 February 2024). "[Understanding the EU's New Regulation on Deforestation-Free Products](#)".

14 Roza Grisales, J.A. and Liehr, E. (12 December 2023). "[What does the new European deforestation law mean for Colombian specialty cocoa?](#)" Climate and Nature Blog. World Economic Forum.

15 United States Congress. (2023). "[S.3371 The FOREST Act of 2023](#)".

16 Chassin, L. (2024). "[Deforestation regulation: A boon for agritech innovation, but will it leave smallholders behind?](#)". GSMA Mobile for Development Blog.

17 Ibid.

Figure 4

New regulations driving the adoption of digital agriculture solutions

Sources: United States Congress, EU, World Economic Forum (WEF) and the GSMA

Regulation	Status	Jurisdiction	Affected value chains	Highlights of new regulation
European Union Deforestation Regulation (EUDR), Regulation EU 2023/1115	Came into effect on 29 June 2023	European Union (EU)	Cocoa, coffee, forestry products, livestock, palm oil, rubber, soybean	<ul style="list-style-type: none"> Commodities exported to the EU cannot have been produced on land subject to deforestation after 31 December 2020. Commodities exported to the EU must be produced according to legislation of the exporting country, particularly as it relates to employment, social and environmental issues. Exporters and traders must prove compliance through data collection, traceability, verification and ongoing monitoring. Large companies have until 31 December 2024 to comply with the new rules. SMEs have until 30 June 2025 to comply.
Fostering Overseas Rule of Law and Environmentally Sound Trade (FOREST) Act¹⁸	Legislation reintroduced in late 2023, currently under review	United States (US)	Cocoa, livestock, palm oil, rubber, soybean, wood pulp	<ul style="list-style-type: none"> Legislation would prohibit the import of products tied to illegal deforestation. Those accused of illegal deforestation would be subject to prosecution and hefty penalties. Fund would be created to support countries in developing strategies to combat deforestation and help vulnerable populations meet conditions for compliance.

¹⁸ United States Congress. (2023). "S.3371 The FOREST Act of 2023".

Driver 4

The increased frequency and severity of extreme weather events

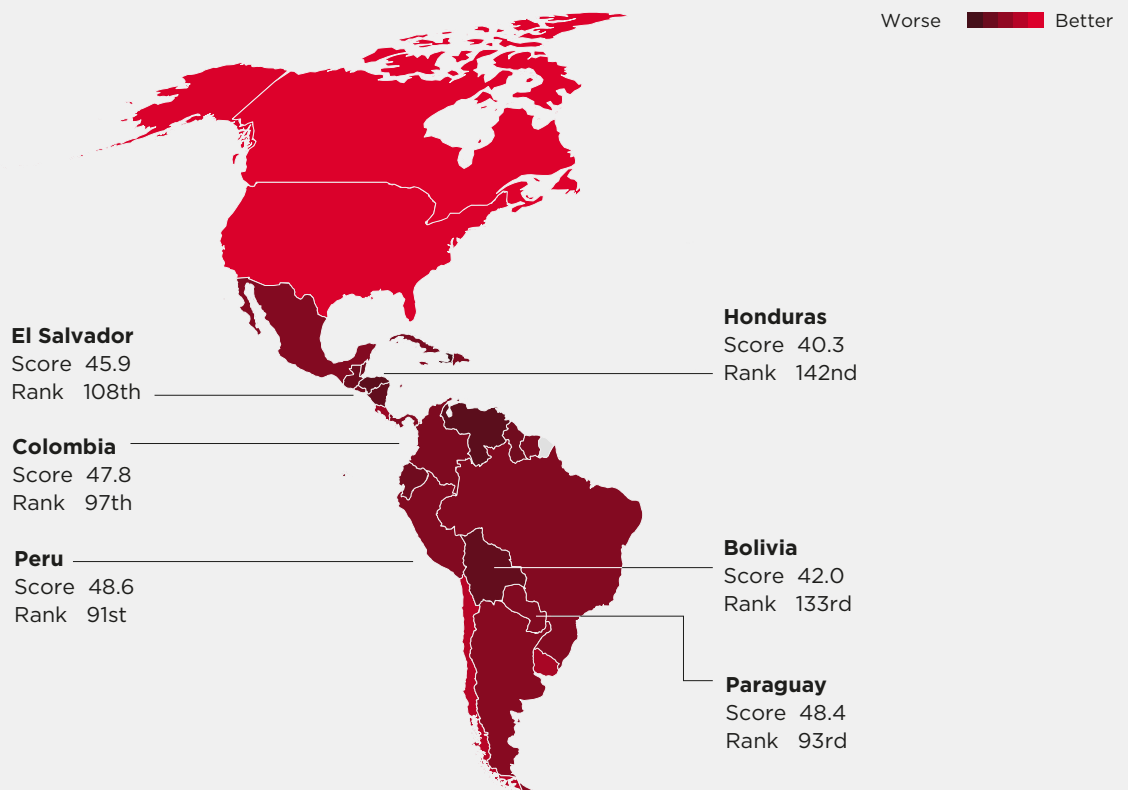


The Notre Dame Global Adaptation Initiative (ND-GAIN) Index, developed by the University of Notre Dame, seeks to measure the vulnerability of countries to climate change and their readiness to improve climate resilience.¹⁹ All the focus countries in this study have scored below 49 on the ND-GAIN

Index, and global rankings place them in the bottom half of all countries worldwide. Honduras ranks especially low given its high vulnerability to tropical storms and drought, and has one of the lowest readiness scores in the Americas (only above Haiti and Venezuela)²⁰ (see **Figure 5**).

Figure 5
ND-GAIN Index Rankings, 2024

Source: ND-GAIN



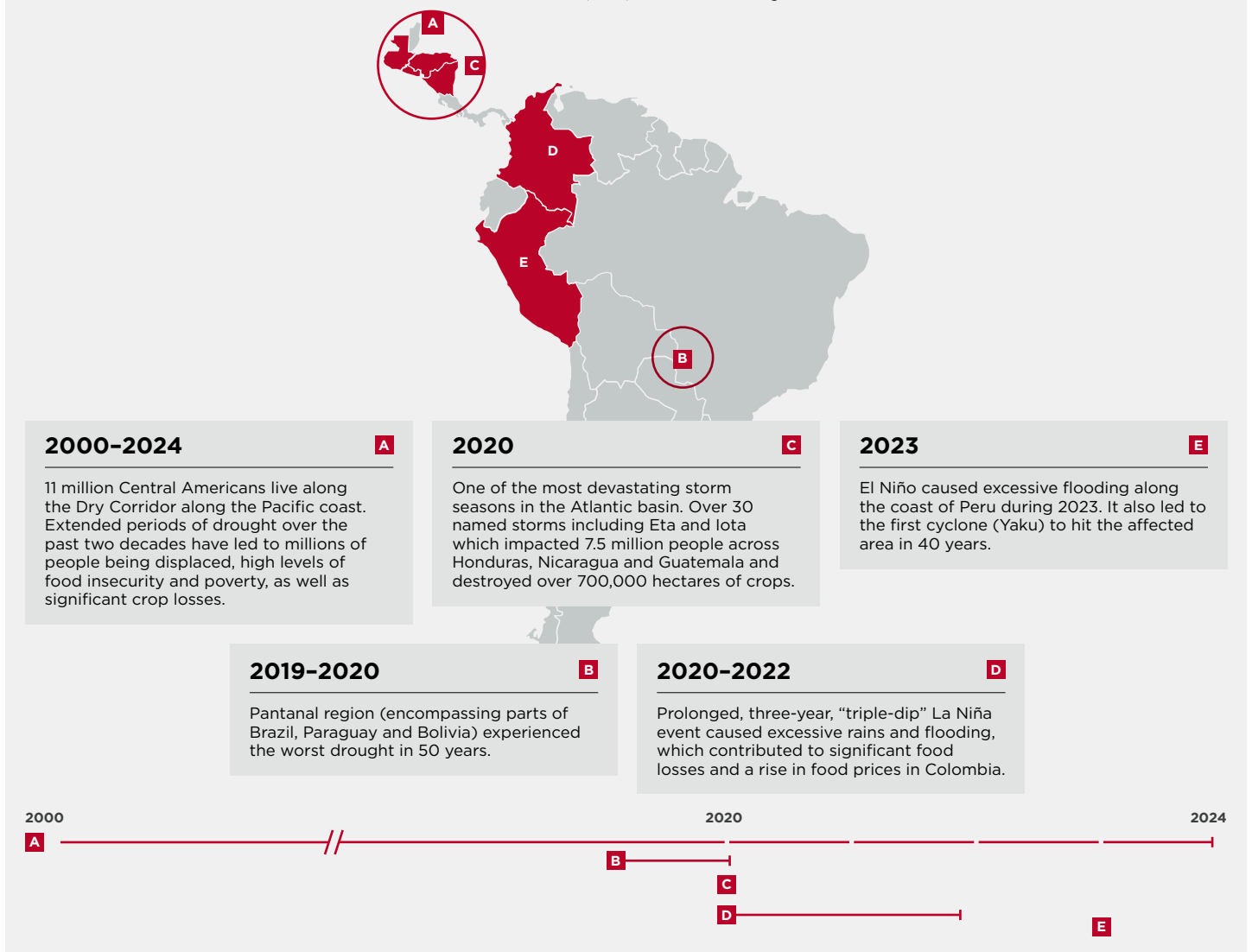
¹⁹ ND-GAIN. (2024). "Notre Dame Global Adaptation Initiative Index Rankings".

²⁰ Ibid.

Figure 6

Impacts of selected climatic events on Latin America's agriculture sector

Sources: International Federation of Red Cross and Red Crescent Societies (IFRC),²¹ Smart Water Magazine²² and United Nations²³



Rising sea levels, warming oceans, more frequent hurricanes in the Atlantic, multi-year droughts, excessive rains and melting glaciers in the Andes are all having an impact on the food security and livelihoods of smallholder farmers throughout the region (see **Figure 6**). Anecdotally, our research suggests that areas that once supported two coffee harvests per year now only support one, and some farmers have had to switch crops or even relocate in response to changing climatic conditions. Excessive rains are also leading to a higher incidence of pests and diseases.

These changing weather patterns on the most vulnerable rural communities are of growing concern to local governments and NGOs given their impacts on migration, food security, income and the global food supply. Age-old agricultural practices handed down from generation to generation are becoming

less effective at helping smallholders mitigate the impacts of climate change and severe weather events. The World Meteorological Organization (WMO) reports that Latin America has one of the highest documented needs for better early warning systems (EWS).²⁴ Farmers also need more support with strategies to combat pests and diseases and to adjust to new climate conditions (and new crop cycles).

Digital agriculture solutions are ideally suited to provide smallholder farmers with early warnings, recommendations for pest and disease management and step-by-step instruction on the adoption of sustainable agriculture practices. They can also help track the information smallholder farmers need to enter voluntary carbon markets (VCMs), an exceedingly attractive option for those looking to generate revenue from carbon sequestration and mitigation practices on their farms.

21 IFRC. (11 November 2021). “Communities affected by Hurricanes Eta and Iota are threatened by food insecurity, displacement and the climate crisis”.

22 Smart Water Magazine. (1 June 2021). “Researchers identify the causes of the extreme drought that affected the Pantanal”.

23 United Nations. (1 May 2023). “Las inundaciones causadas por el Niño costero en Perú ya han afectado a 400,000 personas”.

24 WMO and UNFCCC. (22 July 2022). “New Report Details the Climate Impact in Latin America and the Caribbean”.

Driver 5

Rising investor interest in Latin America's agritech opportunity



Historically, Latin America's agritech market has lagged other developing regions when it comes to attracting venture capital (VC) investment. Of the six focus markets analysed in this report, only two (Colombia and Peru) rank among the top 100 countries on StartupBlink's Startup Ecosystem Index, which measures a country's start-up ecosystem along several key metrics, including the number of start-ups, the quality of the start-ups and the business environment.²⁵ According to VC firm AgFunder, Latin America attracted less than 5% of all VC funding in agrifoodtech in 2022, with Brazil accounting for almost half of that investment.²⁶

Although Colombia accounted for nearly a quarter of all VC investment in agrifoodtech in 2022, most was concentrated in just two companies: e-commerce start-ups Rappi and Frubana. Still, Colombia's start-up ecosystem is showing important gains, with Bogotá and Medellín ranked among the top three "movers" among Latin American cities profiled by StartupBlink in its annual *Startup Ecosystem Report* (see **Figure 7**).²⁷ As notable as the rise of Colombian cities in the global rankings is the drop of Lima, Peru - 23 spots between 2022 and 2023. Several of the Peruvian start-ups interviewed for this study spoke of the difficulty of raising capital in recent years.

Figure 7

Leading cities in the region for start-ups, 2024

Source: StartupBlink

City	Ranking in Latin America and the Caribbean	Global ranking	Change in global ranking (2023-2024)
São Paulo, Brazil	1	23	-6
Mexico City, Mexico	2	53	-5
Bogotá, Colombia	3	63	+2
Medellin, Colombia	8	162	+6
Lima, Peru	11	191	+10
Cali, Colombia	17	281	+1
Barranquilla, Colombia	23	420	-9
Asunción, Paraguay	28	559	+168
San Salvador, El Salvador	44	705	+10
Bucaramanga, Colombia	46	738	+47
Pereira, Colombia	50	795	+12
Tegucigalpa, Honduras	57	863	*
La Paz, Bolivia	59	883	+84
Cartagena, Colombia	64	897	-26
Santa Cruz de la Sierra, Bolivia	71	954	-40
Armenia, Colombia	73	989	-77

* New to the top 1,000 cities ranking in 2023.

25 StartupBlink. (2023). "Global Startup Ecosystem Index".

26 AgFunder. (2023). Latin America AgriFoodTech Investment Report.

27 StartupBlink. (2024). "Global Startup Ecosystem Index".

For many of the agritech start-ups interviewed for this report, the availability of funding from VC investors remains a significant challenge. Most talked about bootstrapping,²⁸ seeking funding from government-backed incubators and accelerators like Apps.co, iNNpulsu and Ruta N, partnering with foreign government development agencies like the United States Agency for International Development (USAID),²⁹ Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)³⁰ and the UK PACT (Partnering for Accelerated Climate Transitions) programme³¹ or seeking the support of NGOs. Even Frubana, which managed to raise \$271 million over seven rounds of financing, ran into problems in 2023 and 2024, forcing them to shut down operations in Colombia and Mexico.³²

Improving conditions for start-ups in countries like Colombia, and the early success of start-ups like Rappi and Frubana, mean that more VCs are starting to look at investing in the region. Early investors like the Yield Lab, SP Ventures and Glocal have been joined by SoftBank, Village Capital, Rockstart and MrPink, among others, supporting agritech ventures in the region. **Figure 8** outlines some of the organisations providing financial and/or technical support to digital agriculture solution providers in the region.

Figure 8

Selected sources of funding and advisory for digital innovations aimed at smallholder farmers in the six focus markets

Sources: GSMA and the organisations listed below

<p>Research groups and academia</p> <ul style="list-style-type: none"> • CGIAR and CIAT • Universidad de los Andes • SENA 	<p>Multilateral agencies</p> <ul style="list-style-type: none"> • FAO • IFAD • UNDP • IDB • World Bank • CAF Development Bank of Latin America and the Caribbean • Fontagro • IICA • World Economic Forum • WFP • C4IR 	<p>Local government/associations</p> <ul style="list-style-type: none"> • Startup Peru • ProInnovate • Emprende UP • Ruta N • Apps.co • iNNova • Bogotá Chamber of Commerce • Cali Chamber of Commerce 	<p>International cooperation</p> <ul style="list-style-type: none"> • USDA • USAID • FCDO/UK PACT • GIZ • German Sparkassenstiftung for International Cooperation
<p>NGOs, foundations</p> <ul style="list-style-type: none"> • Mastercard Foundation • Solidaridad • Heifer International • Corus International • Grameen Foundation • Rikolto • Catholic Relief Services • CREA 	<p>Agriculture/technology</p> <ul style="list-style-type: none"> • Bayer • BASF • Microsoft • IBM • Telefónica • Nespresso • Keurig Dr Pepper • Peet's • Kellogg's 	<p>Impact investors</p> <ul style="list-style-type: none"> • Acumen • Grassroots Capital • Oikocredit • Rabobank • Root Capital 	<p>Incubators, accelerators, VCs</p> <ul style="list-style-type: none"> • The Yield Lab • SP Ventures • Village Capital • Rockstart • Glocal Managers • MrPink

28 "Bootstrapping" was mentioned by several start-up founders interviewed for this study. According to Investopedia, bootstrapping "occurs when a business owner starts a business from the ground up...[typically] with little to no assets. Founders typically rely on personal savings, sweat equity, lean operations, quick inventory turnover and a cash runway to become successful." Investopedia. (2024). "Bootstrapping Definition, Strategies and Pros/Cons".

29 See: www.usaid.gov.

30 See: www.giz.de.

31 See: www.ukpact.co.uk.

32 CB Insights. [Funding, Valuation and Revenue, Frubana](#).



We also noted a rise in acceleration and incubation programmes in the region aimed at agritech start-ups focusing on Central American and Andean markets. The World Food Programme (WFP) hosts Acelera HZero, an acceleration programme supporting start-ups that promote zero-hunger initiatives in the region.³³ In 2022, the Inter-American Institute for Cooperation on Agriculture (IICA), hosted a competition for Latin American agritech start-ups.³⁴ Also in 2022, IFAD and German Sparkassenstiftung for International Cooperation (DSIK) launched Innovatech, a programme aiming to benefit more than 9,000 smallholder farming families in six Latin American countries, including Mexico, Guatemala, El Salvador, Honduras, Colombia, Bolivia and Haiti.³⁵ Twelve start-ups received a combined \$2.2 million in grant funding to support the development of their solutions.³⁶

Most recently, Incofin Foundation, with funding from the Inter-American Development Bank (IDB) and technical support from the GSMA, launched an Innovation Call for agritech innovations targeting smallholder farmers in six markets, including El Salvador, Honduras, Colombia, Bolivia, Peru and Paraguay.³⁷ These programmes provide critical early funding to develop new technological solutions and business models suitable for the smallholder farmer target market.

33 Innovation4Nutrition. (2023). [Programa de Innovación, Acelera HZERO website](#).

34 IICA. (23 February 2022). ["IICA Launches a Competition for Startups Offering Digital Solutions for Agriculture in Latin America and the Caribbean"](#).

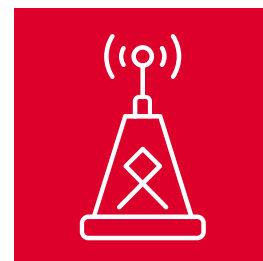
35 United Nations Mexico. (22 February 2022). ["FIDA desarrollará soluciones tecnológicas para ayudar a pequeños agricultores a superar el impacto de la COVID-19"](#).

36 [Innovatech website](#).

37 GSMA. (2024). [Advancing Digital Innovation for Smallholder Farmers in Latin America programme](#).

Driver 6

Network access and affordability



The availability of mobile networks and reliable broadband internet access in rural areas are key for the development and successful scaling of digital agriculture solutions. While progress has been made since 2020, too many areas remain outside the coverage of traditional mobile networks. This is particularly true in Central American and Andean countries where as much as 5% to 9% of the population live outside the coverage area of mobile broadband networks.³⁸ Another challenge is the high rates of poverty in rural areas, which keep smartphones and mobile data services out of reach for many smallholder farmers. A recent study on rural connectivity by Microsoft, IICA and the IDB found that lack of coverage combined with affordability concerns means that as much as 80% of the population in rural areas in the six focus countries lack access to meaningful connectivity.³⁹

Agritechs and agribusinesses have taken a proactive approach to extending broadband access into rural areas in recent years. In Colombia, for example, agribusinesses like Lavazza (through its foundation arm Fondazione Lavazza), Luker Chocolate (through its foundation arm Fundación Luker) and Grupo Nutresa, have teamed with Microsoft, USAID, local governments, NGOs and broadband providers to leverage TV White Space (TVWS) to extend broadband access to areas where their smallholder partners live and work (see **Figure 9**). A few agritechs interviewed for this study pointed to the recent arrival of Starlink in the region as a potential “game changer” given the lower price and better quality of connectivity compared to traditional satellite solutions. Smart farming provider Sioma, for example, has used Starlink in at least one implementation of its IoT solution for banana farmers.⁴⁰

38 GSMA. (2024). “Mobile Connectivity Index”.

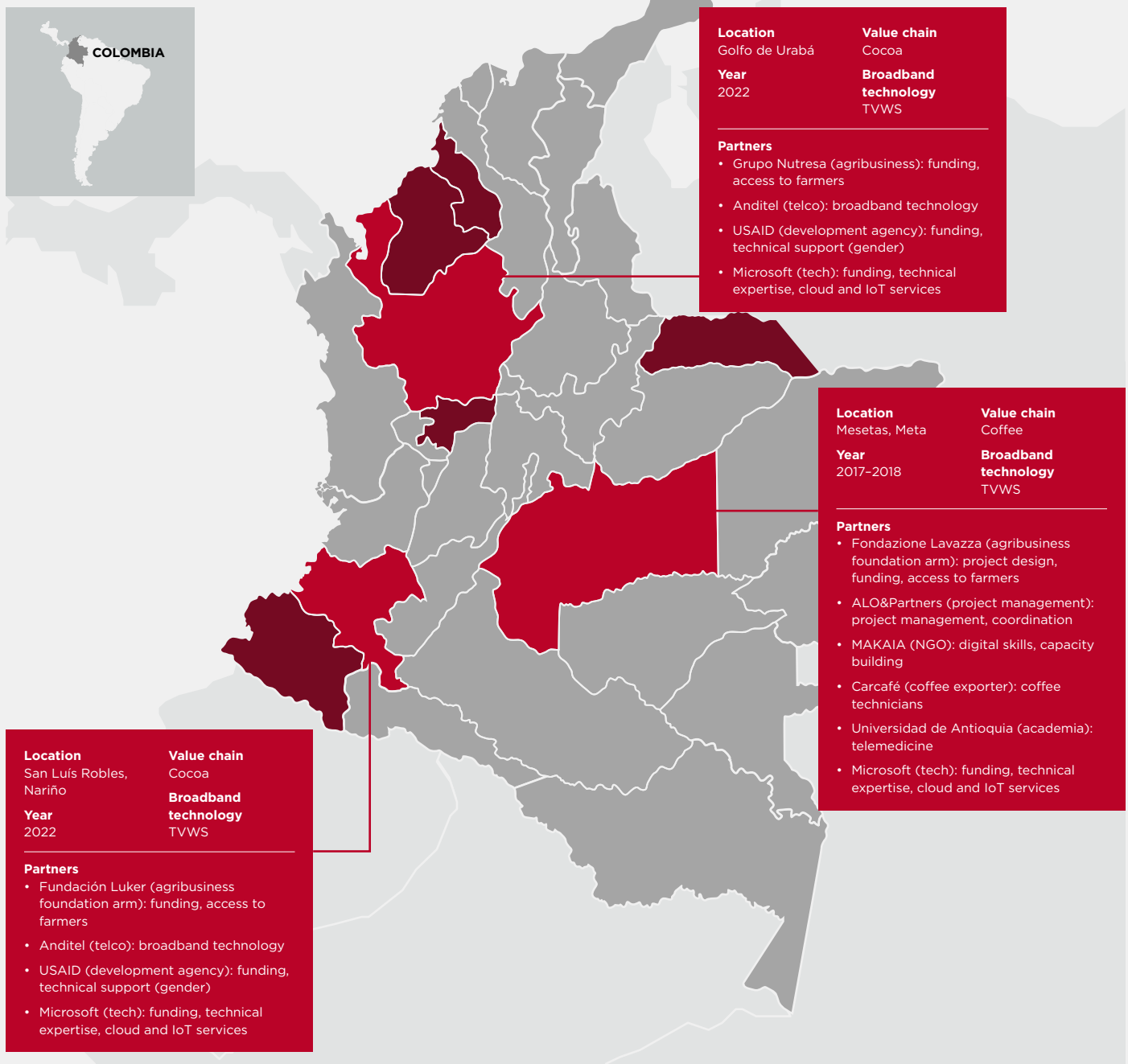
39 IICA, IDB and Microsoft. (2020). *Rural Connectivity in Latin America and the Caribbean: A Bridge for Sustainable Development in a Time of Pandemic*.

40 Sioma interview, January 2024.

Figure 9

Selected Microsoft Airband deployments in Colombia

Source: Microsoft, DAI, USAID and The AgTech Network



Note: The highlighted departments are all those in which Microsoft has deployed an Airband solution. The callouts highlight the deployments most relevant to smallholder farming.

41 Microsoft. (2018). Connectivity strengthens livelihoods, preserves peace in Colombia; Microsoft. (2022). Broadband connects students, teachers, and new opportunities in rural Colombia; Microsoft. (7 October 2022). "La conectividad con propósito está transformando la zona rural de Tumaco".

42 USAID, DAI and The AgTech Network. (2023). Digital Agriculture Ecosystem Assessment: Colombia.

03

Agritech landscape and trends in digital disruption

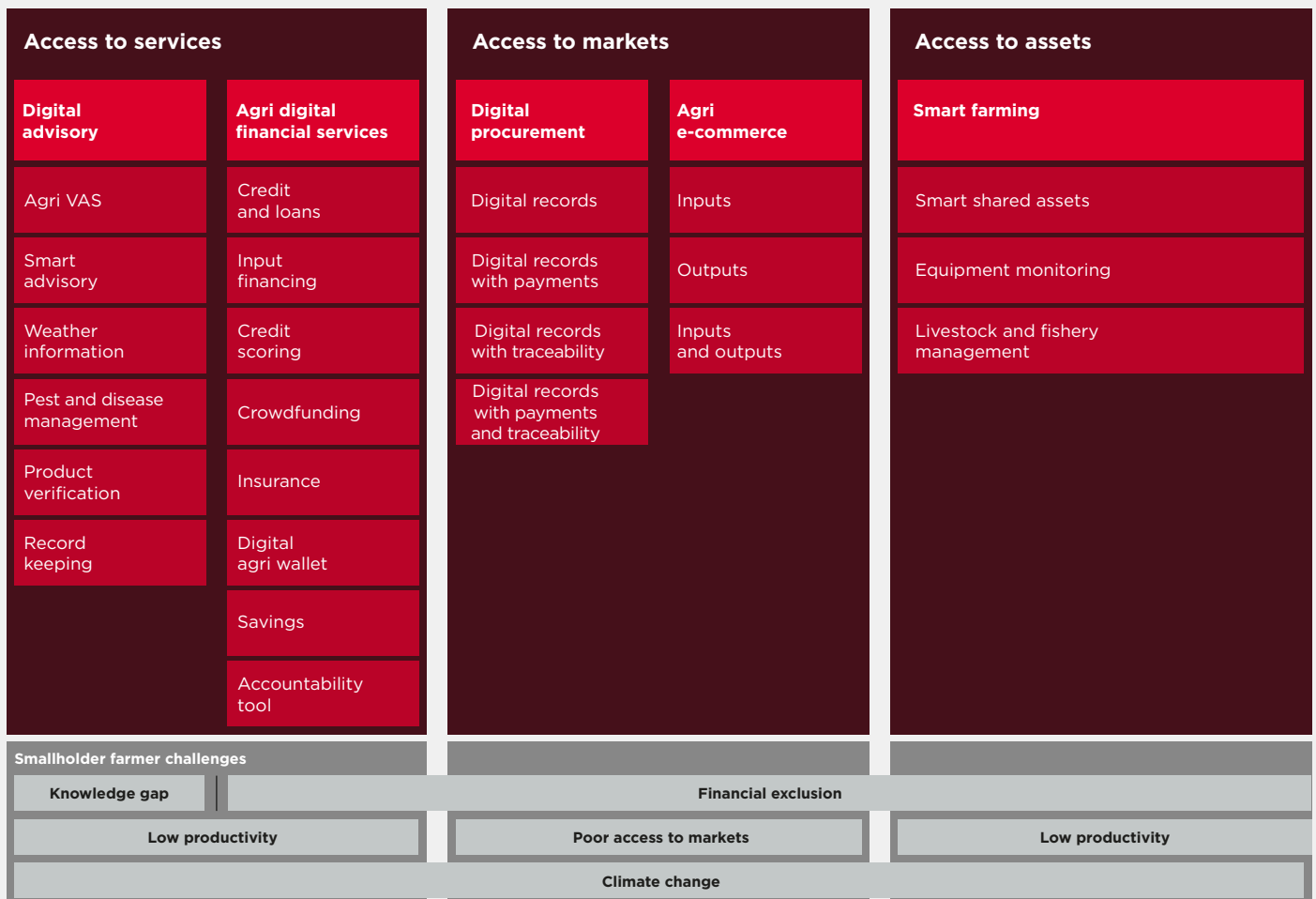


Digital interventions can have a substantial impact on the productivity and incomes of smallholder farmers by closing knowledge gaps, improving access to finance, providing access to formal markets and opening access to assets that would otherwise be out of reach. The GSMA AgriTech team has developed a framework to segment digital interventions into five main use cases and two dozen sub-use cases. (see **Figure 10**).⁴³

Figure 10

Digital agriculture use cases and sub-use cases

Source: GSMA⁴⁴



43 For a full breakdown of digital agriculture use cases and their definitions, please refer to the Appendix. For ease of comparison, the framework for digital agriculture use cases in this report is identical to the one used in the 2020 GSMA study, [Landscaping the agritech ecosystem for smallholder farmers in Latin America and the Caribbean](#).

44 GSMA. (2020). [Landscaping the agritech ecosystem for smallholder farmers in Latin America and the Caribbean](#).

Digital advisory



The GSMA defines digital advisory services as information-based services providing smallholder farmers with agronomic and livestock advice and best practices, information on market prices, weather and climate information, pest and disease management, record keeping as well as financial and digital literacy training.⁴⁵ Digital advisory services can be delivered using voice channels (IVR and helplines), messaging (USSD and SMS), social media and messaging apps (Facebook Messenger, WhatsApp, Telegram), chatbots and other mobile applications. Digital advisory services range in sophistication from the simplest services providing general information (typically related to market prices, weather or agronomic best practices) to those that use a farmer's location and data gathered from weather stations, drones, satellites and sensors to provide highly personalised early warnings, insights and recommendations. The format used for digital advisory services also varies, from simple text

or voice messages that do not require a smartphone, to always-on video and interactive chatbots that require users to have a smart device and a mobile broadband internet connection.

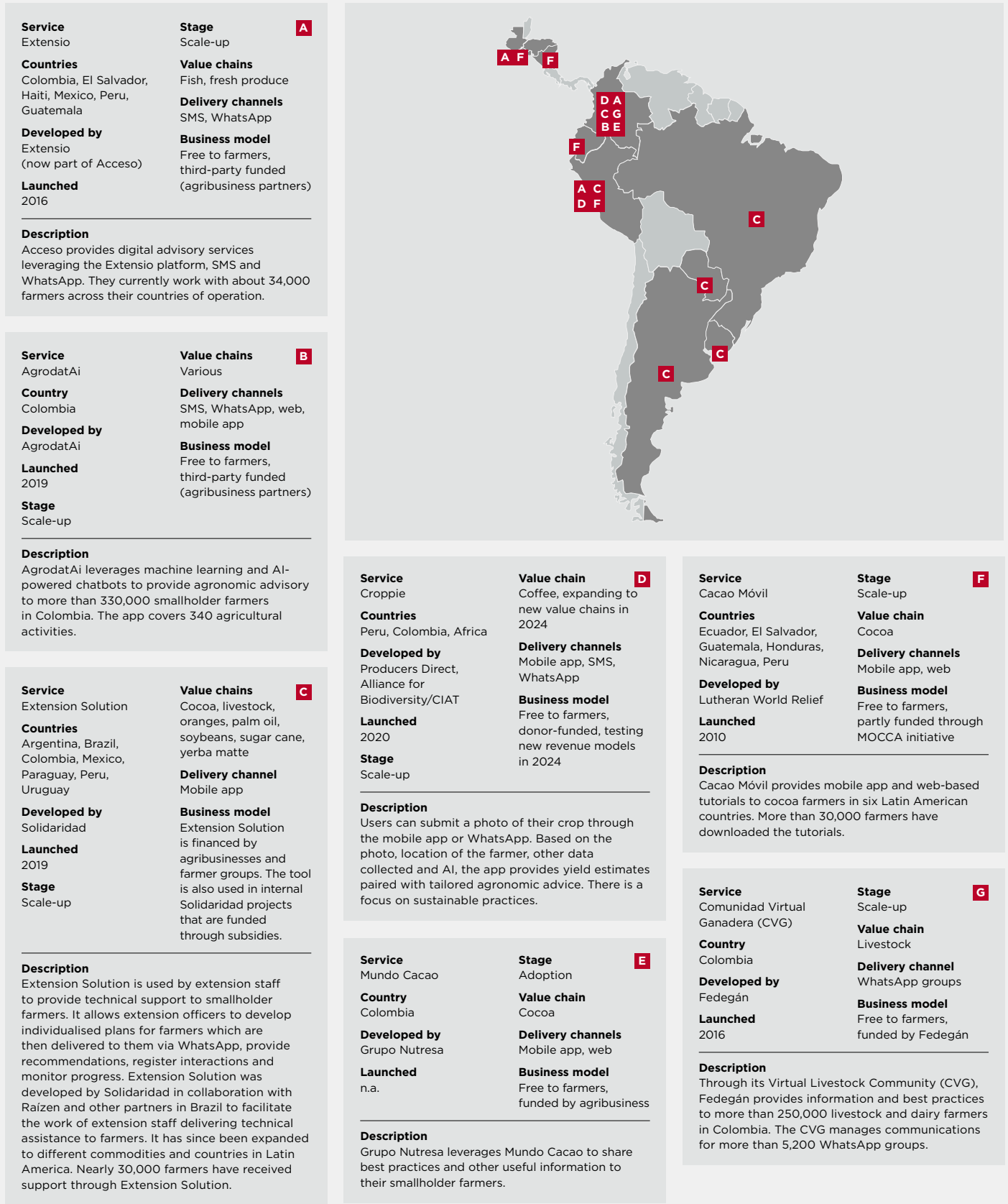
Digital advisory services have been available to smallholder farmers in Latin America for more than a decade, with many early services introduced by government ministries or research and academic institutions seeking to provide basic information on crop pricing or weather to smallholder farmers, often to comply with government mandates. Over the past five years, there has been a proliferation of new digital advisory services backed by agribusinesses, farmer groups, input suppliers and, increasingly, agritech start-ups aiming to help their smallholder farmer partners access information that will make them more productive, increase their incomes and protect them against adverse weather events and the impacts of climate change (see **Figure 11**).

⁴⁵ GSMA. (2020). *Digital Agriculture Maps*.

Figure 11

Selected digital advisory solutions in Latin America

Source: Sources: Solidaridad,⁴⁶ AgrodatAI,⁴⁷ Fedegán,⁴⁸ Corus International,⁴⁹ Grupo Nutresa, Producers Direct,⁵⁰ Alliance of Biodiversity International and CIAT.⁵¹



46 Solidaridad: [Extension Solution](#); Solidaridad interview, January 2024.

47 AgrodatAi. [LinkedIn Feed](#); USAID, DAI and The AgTech Network. (2023). [Digital Agriculture Ecosystem Assessment: Colombia](#).

48 Fedegán ["WhatsApp Ganadero" website](#).

49 Corus International and LWR interview, February 2024.

50 Producers Direct interview, January 2024.

51 Alliance Biodiversity & CIAT. (2020). ["Crocipie - the Photocropping App"](#).



Our latest research identified several trends that build on those detailed in our 2020 landscape study:

- **Digital advisory services are largely available free of charge to smallholder farmers.** Smallholder farmers in Latin America, like elsewhere, have demonstrated they are unwilling to pay for digital advisory. Most services are provided free of charge to smallholders, with governments, NGOs or other value chain actors covering the cost. Norwegian input supplier Yara, for example, has introduced three digital advisory services, including CoffeeClub, CheckIT and TankmixIT in Colombia.⁵² These services provide coffee farmers with information on coffee prices, ideal shade for coffee plants and best practices. Yara also provides recommendations for input use, which they hope will translate into increased sales of their products. Most agribusinesses, federations, cooperatives and farmer groups see the benefit of providing agronomic advisory using digital channels. Many leverage SMS, social media or WhatsApp groups. Others, like chocolate producer Nutresa or the Colombian National Federation of Coffee Farmers (FNC), have developed their own apps instead. Still others are working through third-party agritech solutions like Colombia's AgrodatAi or pan-regional Acceso's Extensio to provide advisory to their smallholder farmer partners.
- **Sustainability remains a challenge, but some agritechs have managed to scale their solutions.** Although achieving scale remains elusive for most agritechs, there have been some positive trends in the past few years. Colombian agritech AgrodatAi has seen their total number of users climb to 330,000 in less than five years. Colombian livestock federation Fedegán manages communications with over 250,000 livestock farmers through its Virtual Livestock Community. Solidaridad's Extension Solution, Acceso's Extensio and Lutheran World Relief's Cacao Móvil, all of which are available in multiple countries, have managed to reach over 20,000 users each. These figures still fall short of the millions of users several digital advisory providers are reporting in Africa and South Asia, but nevertheless show progress relative to 2020 when most tools profiled in the Landscape study had between 1,000 and 5,000 active users.
- **Digital advisory services are smarter and more interactive.** Digital advisory services are increasingly using data from weather stations, sensors and satellites to provide hyperlocal agronomic advisory and early warnings. Digital agriculture solutions are also leveraging machine learning, AI and chatbots to provide highly personalised and interactive services. Farmers are not only able to upload photos of diseased plants through an app and receive a diagnosis, treatment plan or yield estimate, they can also receive real-time answers to queries through AI-powered chatbots. Colombian agritechs AgrodatAi and SiembraCo are just two of the many agritechs that have introduced chatbots in recent years to meet growing demand for real-time, interactive agronomic advisory.

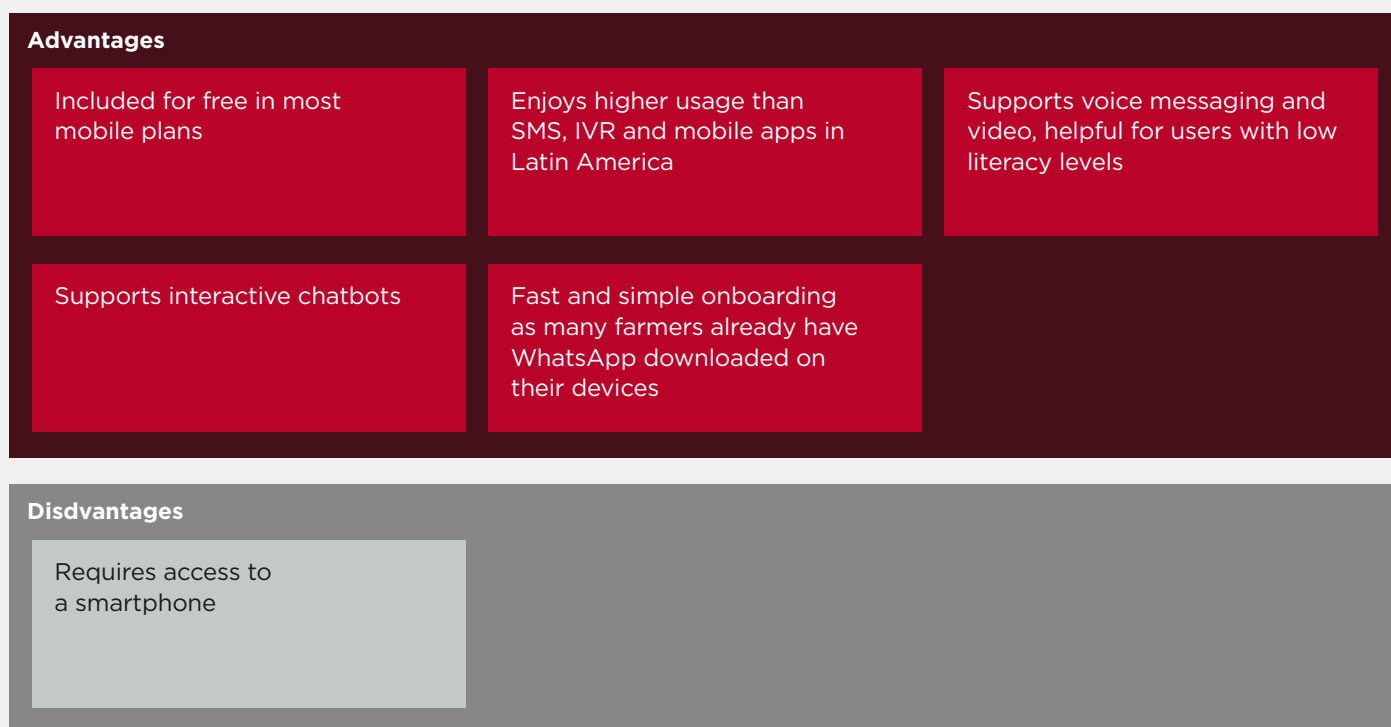
52 Yara Colombia; CoffeeClub; CheckIT; TankmixIT.

- **Digital advisory is becoming more embedded in other digital agriculture tools.** Two main factors are driving this trend. The first is demand-driven as farmers are reluctant to download multiple apps and access various services to manage their on-farm activities. The second is supply-driven and responds to the need of other service providers (e-commerce, agri digital financial services, digital procurement) to ensure that smallholder farmers improve productivity and quality to increase yields or repay a loan. Agri e-commerce provider SiembraCo, for example, launched SiembrAI in Colombia in late 2023 to enable their smallholder farmer partners to ask for agronomic support through an AI-powered chatbot.⁵³ Peru's Agrobanco links their clients to AgroChatea, a service offered by Peru's Ministry of Agriculture that enables farmers to access pricing for different crops.⁵⁴
- **WhatsApp is becoming the leading delivery channel for digital advisory solutions.** Agritechs interviewed for this study overwhelmingly relied on WhatsApp to provide digital advisory to smallholder farmers, with interviewees citing several key advantages (see **Figure 12**). Given the ubiquity of WhatsApp, several agritechs have either switched to WhatsApp or added it to their multi-channel strategy. One such organisation is RARE, which originally relied on SMS for its One Message for the Field (Un Mensaje por el Campo) digital advisory service launched in collaboration with PxD and the Nature Conservancy in Colombia.⁵⁵ It has since introduced WhatsApp after receiving feedback from smallholder farmers that this was their communication medium of choice.⁵⁶ Other agritechs leverage WhatsApp to encourage users to take action. For example, Solidaridad sends messages via WhatsApp encouraging farmers to download their Extension Solution, Farm Diary and other mobile apps.⁵⁷

Figure 12

Factors driving the use of WhatsApp for digital advisory services

Source: GSMA



⁵³ SiembraCo interview, February 2024.

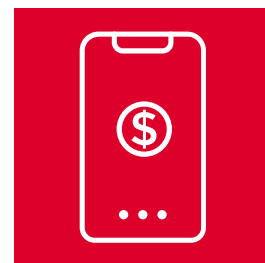
⁵⁴ Ministerio de Agricultura Peru: [AgroChatea](#).

⁵⁵ PxD. (2021). "Adopting New Technology, Mindsets, and Practices to Transform Colombia's Agricultural Sector".

⁵⁶ USAID, DAI and The AgTech Network. (2023). [Digital Agriculture Ecosystem Assessment: Colombia](#).

⁵⁷ Solidaridad interview, January 2024.

Agri digital financial services (DFS)



Agri digital financial services, or agri DFS, are digitally enabled financial services for smallholders that facilitate their inclusion in the formal financial economy and allow investment in farming activities. Agri DFS also include solutions that enable FSPs to lower both the cost and risk of lending to smallholder farmers. Agri DFS include digital credit and loan products, credit scoring, crowdfunding, input financing, savings, insurance, digital agri wallets and accountability tools.⁵⁸ For agri DFS providers, digitisation can take place at various stages of the loan application, disbursement and collection process. The collection of farmer data can move from pen and paper at the bank branch to a tablet or smart device on the farm. Algorithms, machine learning and AI can support the credit-scoring process. Disbursements and collections can be made digitally using mobile wallets. Alerts and notices can be delivered using SMS, WhatsApp messages or alerts on other mobile apps. For farmers, digitisation can mean applying for a loan online through a website, WhatsApp form or mobile app rather than travelling to a bank branch. It can also mean making repayments on their loan directly from their mobile phone.

Agri DFS have many benefits for FSPs, smallholder farmers and others in the agritech ecosystem. Digitising and automating the credit application and scoring process with AI can save a financial institution time and money while also reducing the risk of issuing loans to smallholder farmers. 4Told Fintech, which operates in several Latin American countries including Peru and Colombia, estimates that the financial institutions that adopt their credit platform could increase the productivity of loan officers by 35% to 65% as they move from pen, paper and spreadsheets to a fully digital system.⁵⁹ Agri DFS can also increase access to financial services by allowing users to apply online rather than making a lengthy and expensive trip to the bank. Colombian crowdfunding platform, Agrapp, for example, allows farmers to apply for a loan using a simple questionnaire powered by WhatsApp.⁶⁰

As in 2020, the largest category of agri DFS solutions available in Latin America are those related to credit and loans, including credit scoring and crowdfunding. **Figures 13** and **14** outline some of the leading digital credit and loan solutions identified in the six focus markets.

⁵⁸ GSMA. (2020). [Digital Agriculture Maps](#).

⁵⁹ 4Told Fintech interview, January 2024.

⁶⁰ Agrapp interview, January 2024.

Figure 13

Selected loan and credit-scoring solutions in Latin America

Sources: Financiera MiCrédito,⁶¹ Finagro,⁶² Desjardins,⁶³ 4Told Fintech⁶⁴ and IncluirTec⁶⁵



Solution DECISIÓN	Stage Re-organisation	A
Country Colombia	Value chains Various	
Developed by Finagro, Desjardins (DID), FADQDI	Business model Donor-financed. Finagro seeking sustainable model for scaling.	
Launched 2018		

Description
DECISIÓN is a credit tool that helps financial institutions determine the ability of a smallholder farmer to pay back a loan. Data collected via a tablet or smartphone on the farm is combined with data on crops, geography, etc. and run through an algorithm developed by Desjardins.

Solution Financiera MiCrédito	Stage Scale-up	B
Country Honduras	Value chains Various	
Developed by Financiera MiCrédito	Business model B2B and B2C, loan products for individual farmers and associations	
Launched n.a.		

Description
Financiera MiCrédito acquired Finca Honduras in 2023. Agents use mobile devices (smartphones or tablets) in the field to help process new credit applications for smallholder farmers.

Solution 4Told Fintech	Value chains Various	C
Country Colombia, Peru	Business model B2B, 4Told Fintech charges financial institutions for the digitisation of the credit process, an initial set-up fee and then a monthly subscription	
Developed by 4Told Fintech		
Launched 2019		
Stage Scale-up		

Description
4Told Fintech digitises the credit application process and automates it using AI. They allow a financial institution to collect the required information from an applicant via a smartphone, tablet or PC and then provides a response within seconds of submitting an application.

Solution IncluirTec	Stage Scale-up	D
Country Colombia, Mexico	Value chains Various	
Developed by IncluirTec	Business model B2B, service provided to financial institutions and microlenders	
Launched 2016		

Description
IncluirTec developed a tool that helps financial institutions and microlenders assess the ability of a smallholder farmer to pay back a loan. The tool relies on data collected on the farm as well as crop-specific data.

61 [Financiera MiCrédito Honduras website](#); Financiera MiCrédito. (3 April 2024). "MiCrédito inicia operaciones en Honduras".

62 [Fondo para el Financiamiento del Sector Agropecuario \(Finagro\) website](#).

63 Desjardins. (20 May 2020). "Mission accomplished for PASAC!"

64 [4Told Fintech website](#); 4Told Fintech interview, January 2024.

65 [IncluirTec website](#).

Figure 14

Selected crowdsourcing solutions in Latin America

Sources: Agrapp,⁶⁶ Agrone⁶⁷ and Sosty⁶⁸



<p>Solution Sosty</p> <p>Country Colombia</p> <p>Developed by Sosty</p> <p>Launched 2020</p> <hr/> <p>Description Sosty is a crowdfunding platform that links Colombian livestock farmers implementing regenerative agricultural practices with investors committed to sustainable farming. It also gives livestock farmers access to international carbon markets for an additional income stream.</p>	<p>Stage A Scale-up</p> <p>Value chain Livestock</p> <p>Business model Share of transaction value</p> <hr/> <p>Description Agrone links individual investors with smallholder farmers looking for credit to grow their business. Projects are segmented into low-medium risk, medium risk and high risk, with payback periods averaging around 30 months.</p>	<p>Solution Establecimiento, Cosecha Más</p> <p>Country Colombia</p> <p>Developed by Agrapp</p> <p>Launched 2019</p> <p>Stage Scale-up</p> <hr/> <p>Description Agrapp allows farmers to apply for credit using a simple WhatsApp form. Once approved, an on-site visit takes place to confirm farm/farmer information. The farmer's project is then uploaded onto the Agrapp crowdsourcing platform. At present, demand for loans far outstrips the supply of investors as Agrapp processes more than 2,000 loan requests per month.</p>
		<p>Value chains C Avocado, exotic fruits, cocoa, coffee</p> <p>Business model Share of transaction value, commission on other transactions (input sales, sale of exotic fruit to exporters, etc.)</p>

66 Agrapp interview, January 2024.

67 Agrone website.

68 Portafolio. (25 May 2022). "Así funciona Sosty, la plataforma que permite invertir en ganado".

Since 2020, the agri DFS market in Latin America has changed significantly in line with the financial services sector in the region (see **Section 2**). A rapid rise in financial inclusion and digital transactions since the COVID-19 pandemic has transformed the landscape for agri DFS, leading to several new trends:

- **Agricultural insurance is the fastest growing agri DFS use case in Latin America.** Research for the GSMA landscape study in 2020 uncovered only a handful of digital insurance products aimed at smallholder farmers in Latin America. This stood in stark contrast to other regions like Africa and Asia, where insurance was one of the largest agri DFS categories. Since 2020, however, dozens of digital insurance products aimed at smallholders have been introduced, particularly in Colombia where the government offers subsidies of up to 95% on insurance premiums (and agribusinesses or groups like Fairtrade International often cover the balance). These have been launched as stand-alone products or in combination with loans to de-risk the loan portfolio.

This growth has been due not only to government programmes, but also to a growing number of smallholder farmers with financial services accounts. Working with smallholders that have a mobile money account facilitates insurance payouts. Blue Marble, MiCRO, MAPFRE, Seguros Bolívar, SFA Sebar, Interactuar and Davivienda, among others, have introduced digitally enabled parametric insurance products that protect smallholders against excess rainfall, drought and earthquakes (see **Figure 15**). Payouts provided by Blue Marble and other insurance companies following a particularly damaging La Niña period in Colombia have only increased demand among smallholder farmers and prompted many insurance providers to launch new products.
- **Governments, NGOs, FSPs and agribusinesses are leveraging agri DFS to promote sustainable practices and support underrepresented groups.** In the 2020 landscape study, we noted that several financial institutions were beginning to offer preferential terms to smallholder farmers employing sustainable or “green” practices. According to El Salvador’s central bank, Banco Central de Reserva (BCR), 59% of financial institutions in the country offer green credit products.⁶⁹ As interest in voluntary carbon markets (VCMs) grow, there are more efforts to link financial services products to participation in these markets. Colombia’s Sosty is a crowdsourcing platform that links individual investors to livestock farmers implementing sustainable farming practices. It has also teamed with Carbono Local+ to help smallholder farmers access new income streams from the implementation of sustainable farming practices.⁷⁰
- **AI, machine learning and datasets from satellites, sensors, weather stations and drones increasingly underpin agri DFS.** Most agri DFS rely on large datasets. Credit-scoring solutions developed by Colombia’s Finagro and IncluirTec, for example, rely on significant crop-level data to understand the agricultural cycles, cost structures and revenue potential of smallholder loan applicants. Parametric insurance solutions increasingly rely on hyperlocal weather and climate data obtained through weather stations, satellites and sensors to determine whether certain weather events trigger payouts to farmers. Crowdsourcing app Agrapp is looking at employing satellites to replace on-site agent visits after a farmer has been approved for a loan, which they estimate would reduce origination costs by up to 85%.⁷¹

69 El Mundo. (13 November 2023). “El 59% de los bancos salvadoreños ofrece líneas de crédito verdes”.

70 See: Carbono Local+.

71 Agrapp interview, January 2024.

Figure 15

Selected parametric insurance products in Latin America

Sources: MiCRO,⁷² Blue Marble,⁷³ Suyana,⁷⁴ AgrodAtAi, Aseguradora Tajy,⁷⁵ Proagro Seguros⁷⁶ and SFA Cebarr⁷⁷



<p>Product Seguro Agrícola</p> <p>Country Paraguay</p> <p>Developed by Aseguradora Tajy</p> <p>Launched 2018</p> <hr/> <p>Description Parametric insurance covering drought.</p>	<p>Products Café Seguro, Buen Clima</p> <p>Countries Colombia, Guatemala, Honduras</p> <p>Developed by Blue Marble</p> <p>Launched 2018, 2021</p> <p>Stage Scale-up</p> <hr/> <p>Description Blue Marble offers parametric insurance to smallholder farmers that protects them against drought and excess rain. As of early 2024, Blue Marble served more than 28,000 smallholder farmers through their various products.</p>	<p>Product Seguro Paramétrico</p> <p>Countries Mexico, Colombia, Peru, Guatemala, Honduras, Nicaragua</p> <p>Developed by Proagro Seguros</p> <hr/> <p>Description Proagro Seguros is a Mexico-based insurance company that covers drought, excess rain, hurricanes and biomass loss for livestock through their parametric insurance. Leverages satellite technology from NASA to monitor insured farmers' plots.</p>
<p>Product Suyana</p> <p>Country Bolivia, Peru</p> <p>Developed by Suyana</p> <p>Launched 2024</p> <p>Stage Pre-launch</p> <p>Value chains Export crops, fish</p> <hr/> <p>Description Parametric insurance leveraging data sets from various sources including satellite, IoT sensors, global weather models and AI. In Bolivia, protects farmers from flooding and drought. In Peru, protects smallholder fishermen from lost income due to port closures.</p>	<p>Product AgroProTech</p> <p>Country Colombia</p> <p>Developed by SFA Cebarr</p> <p>Launched 2023</p> <p>Stage Adoption</p> <hr/> <p>Description Parametric insurance covering excess rain and drought. Insurance accompanied by adverse climate warnings and agronomic advisory supported by AgrodAtAi's existing AI-based platform.</p>	<p>Products Mi Siembra Segura, Inversión Protegida, Campo Seguro, Produce Seguro</p> <p>Countries Colombia, El Salvador, Guatemala</p> <p>Developed by MiCRO</p> <p>Launched 2017-2023</p> <p>Stage Scale-up</p> <hr/> <p>Description MiCRO has introduced parametric insurance products in three Latin American countries offering smallholder farmers protection against drought, excess rain and earthquakes.</p>

72 MiCRO. (2 December 2021). "Mi Siembra Segura: Parametric insurance to protect vulnerable rural communities in Colombia, with UNDP"; MiCRO. (9 October 2019). "Seguro innovador basado en índices, lanzado en Colombia para proteger a las familias vulnerables y de bajos ingresos contra las pérdidas financieras graves"; MiCRO. (27 June 2018). "MiCRO further expands microinsurance market in Central America".

73 Blue Micro interview, January 2024; Blue Marble. (2018). "Supporting Nespresso build climate adaptation for their end suppliers"; Blue Marble and LinkedIn. (2023). "Our new product "Buen Clima" has launched in Colombia!"

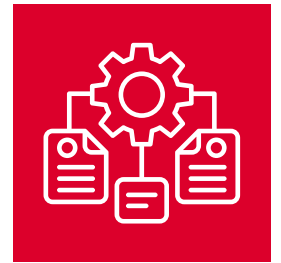
74 Suyana interview, February 2024.

75 Aseguradora Tajy. [Seguro Agrícola website](#).

76 Proagro Seguros [website](#).

77 SFA Cebarr. [AgroProTech website](#).

Digital procurement



Digital procurement solutions are digital solutions in the last mile that enable a range of digital systems and processes to transition from paper to digital. These solutions help agribusinesses increase the transparency of their transactions with smallholders and improve efficiency and operational profitability. At the same time, farmers benefit from more transparent transactions, improved market access and establishing a digital footprint, which can be used to access financial services.⁷⁸

Although digital procurement solutions benefit from the availability of mobile connectivity and internet access, many have offline capabilities that enable them to be used when not within range of a mobile network. Digital procurement solutions usually require the use of a smart device (either a tablet or smartphone) that can be used either by a smallholder farmer or by the extension officer collecting farmer data. Other enablers of digital

procurement solutions include the prevalence of export crops such as coffee, cocoa, palm oil and livestock, the presence of large agribusinesses or exporters in the country, new and stricter certification and traceability requirements in markets such as the US and Europe and the trend among agribusinesses worldwide to adopt sustainability or net-zero carbon commitments.

Most agribusinesses interviewed for this study have implemented a digital procurement solution. Some, like Olam and ECOM, have developed proprietary solutions that work across their global footprint, with some modifications to adapt to the local context. Others, like Colombian juice company Postobón, work with third-party platforms to digitise farmer records. **Figure 16** outlines a few of the digital procurement solutions identified in the six focus markets.

78 GSMA. (2020). *Digital Agriculture Maps*.

Figure 16

Selected digital procurement solutions in Latin America

Sources: Agros,⁷⁹ ECOM,⁸⁰ Control Ganadero,⁸¹ Luker Chocolate and The AgTech Network⁸²



Service Farm Management	Stage Adoption	A
Country Colombia	Value chain Cocoa	
Developed by Luker Chocolate	Delivery channels Mobile app	
Launched 2020	Business model Luker Chocolate developed the tool for internal use	

Description
The tool is used by Luker Chocolate's extension officers to collect data from farmers. It was part of the Cacao Effect initiative.

Services SMS Integrity, MOVE	Stage Scale-up	B
Countries Colombia, El Salvador, Peru	Value chains Cocoa, coffee, cotton	
Developed by ECOM	Delivery channels Mobile app	
Launched n.a.	Business model ECOM developed the tool for internal use.	

Description
ECOM replaced the SMS Integrity tool with MOVE, a tool specific to the Colombian market. The tool allows ECOM extension officers to collect data from farmers, monitor projects, support certification and run surveys.

Service IDENTI	Value chains Avocado, cocoa, coffee	C
Country Peru	Delivery channels IVR, WhatsApp, desktop app	
Developed by Agros	Business model B2C, clients mostly input suppliers and financial institutions.	
Launched 2019	Stage Scale-up	

Description
Leveraging blockchain, Agros developed a digital ID for smallholder farmers that enables them to access inputs, financing, advisory, among other services.

Service Control Ganadero	Value chains Livestock	D
Countries Colombia, Peru, Bolivia, Ecuador, others	Delivery channels Mobile app	
Developed by Apptank	Business model B2C, B2B. The app is free to those with fewer than 20 animals. Those with more than 20 animals pay an annual fee.	
Launched 2012	Stage Scale-up	

Description
Control Ganadero allows livestock farmers to keep digital records of their animals.

— **Blockchain is underpinning many digital procurement solutions.** Blockchain's distributed ledger technology is ideally suited to support the increasingly stringent traceability and certification requirements of North America and Europe, two of the biggest destinations for Latin American export crops. For this reason, an increasing number of digital procurement solutions are relying on blockchain to give all stakeholders in the value chain access to the information they need. This includes smallholder farmers, crop buyers, exporters and even consumers in destination countries. Agros, a Peruvian agritech that developed a digital identification card for smallholder farmers, relies on a blockchain platform managed by IDB Lab (LACChain).⁸³

— **Data from digital procurement solutions is increasingly being leveraged to help smallholder farmers participate in international carbon markets.** Over the past one to two years, interest among organisations to participate in international carbon markets has risen exponentially. For many, participation in carbon markets is seen as a relatively easy way to generate additional income from data that is already being captured for other purposes. It is also a way to encourage smallholder farmers to comply with what may seem expensive and onerous requirements to retain or plant new shade trees. Many other agritechs active in digital procurement that were interviewed for this study (as well as DFS and digital advisory providers) hoped to leverage the data collected to help smallholder farmers enter the international carbon market.⁸⁴

79 Agros interview, January 2024.

80 ECOM interview, February 2024.

81 Control Ganadero 4.0 pro website.

82 USAID, DAI and The AgTech Network. (2023). Digital Agriculture Ecosystem Assessment: Colombia.

83 IDB Lab. (2023). Tech Report: Blockchain; LACChain website.

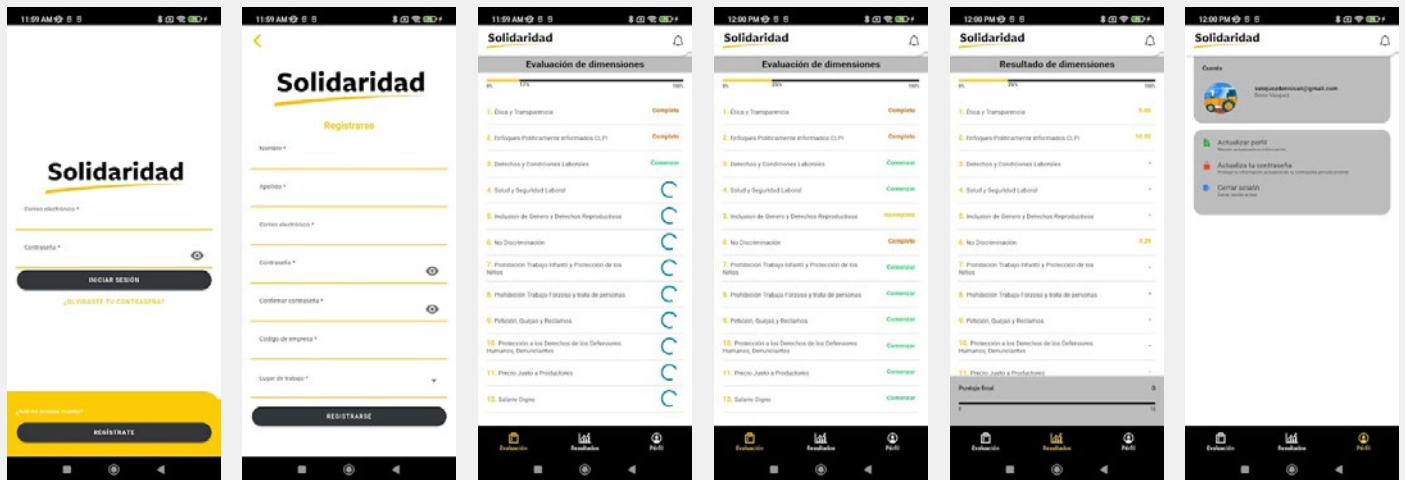
84 Solidaridad. (15 September 2023). "Carbon credits and carbon markets: Unlocking benefits for smallholder farmers".

— **New tools are seeking to capture labour data to help agribusinesses improve their labour practices and ensure compliance with local and international labour laws.** Consumers in North American and European markets are increasingly concerned about the labour practices sometimes employed in emerging economies. Consumers want to ensure that the food they consume is not being produced through the exploitation of minors and that farmers receive a decent wage for their labour. To demonstrate compliance, agribusinesses are increasingly looking at digital tools to assess their labour practices and improve

reporting of the age of the farmer, hours worked, wages paid, and other data points. Solidaridad recently introduced Trabajo Decente (Decent Work), a tool that enables agribusinesses to run a self-diagnostic of their practices related to indicators of decent work and generate an improvement plan (see **Figure 17**).⁸⁵ Lutheran World Relief (LWR) introduced the mobile app Evaluación y Seguimiento APP de Género under the Cacao Móvil umbrella, which seeks to help agribusinesses run a self-diagnostic on gender issues in the workplace.⁸⁶

Figure 17
Screenshots of the Trabajo Decente mobile app

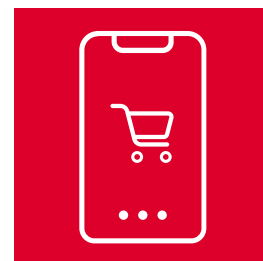
Source: Solidaridad



85 Solidaridad and Google Play. [Trabajo decente app](#).

86 Lutheran World Relief (LWR). [Caja de Herramientas de Género website](#).

Agri e-commerce



Agri e-commerce refers to digital platforms that enable the buying and selling of agricultural produce and inputs online. Although most agri e-commerce businesses sell domestically to urban consumers, agri e-commerce also enables smallholders to reach international buyers.⁸⁷

Agri e-commerce platforms provide numerous benefits to smallholder farmers. By buying directly from smallholders and eliminating intermediaries, agri e-commerce platforms can have more influence on the quality and types of products that farmers grow. For their part, smallholder farmers can secure a higher price for their goods than from selling to intermediaries, often negotiating long-term contracts at a fixed price that provide longer term security. Agri e-commerce companies often provide financing and technical, logistics and marketing support, helping smallholder farmers increase their productivity and income.

A robust agri e-commerce market depends on several key factors, including internet connectivity and access to smartphones or computing devices, reliable logistics, a strong digital payments ecosystem, rising urbanisation and a growing middle class. Restrictions on the movement of people and goods during the COVID-19 pandemic and concerns over food safety accelerated the growth of e-commerce in Latin America, which once lagged behind other regions given issues with consumer trust and the lack of a digital payments ecosystem. Since the beginning of the pandemic, dozens of e-commerce start-ups have emerged in the six focus markets, capitalising on the growing opportunity around delivery of fresh produce and other agricultural products to businesses and consumers, as well as the delivery of inputs, machinery and services to smallholder farmers. Agri e-commerce start-ups have been encouraged by the early success of e-commerce companies like Colombia's unicorn Rappi.

Most of the agri e-commerce companies that have emerged in the past five years are agritech start-ups, although some, like Colombia's Acércate, are the digital arms of traditional brick-and-mortar retail chains. We noted the presence of a few government initiatives, like PRODUCE's Productor Digital in Peru⁸⁸ and Colombia's El Campo a Un Clic,⁸⁹ which aim to link smallholder farmers to crop buyers to improve the farmers' livelihoods (See **Figure 18**).

87 GSMA. (2020). *Digital Agriculture Maps*.

88 Ministerio de Producción. (1 February 2023). "PRODUCE presenta "Productor Digital", primera plataforma estatal de compra directa a productores agrícolas".

89 Ministerio de Agricultura de Colombia. *Campo a un Clic*.

Figure 18

Selected agri e-commerce platforms in Latin America

Sources: Ministerio de Producción (PRODUCE),⁹⁰ Acércate,⁹¹ Producers Direct,⁹² SiembraCo,⁹³ Croper.com⁹⁴ and SEV Mercado Ganadero⁹⁵



Platform Productor Digital	Launched 2023	A
Country Peru	Stage Adoption	
Developed by Ministerio de la Producción, MIDAGRI, FAO, ALTERNATIVA	Value chains Various	
	Business model Government-funded	
Description Government-backed platform aiming to link 2 million smallholder farmers in Peru to companies looking for crops, fish, livestock and other food products.		

Platform SiembraCo	Stage Scale-up	C
Countries Colombia, Guatemala	Value chain Fresh produce	
Developed by SiembraCo	Business model B2B, mark-up	
Launched 2021		
Description SiembraCo is an e-commerce platform that engages with smallholder farmers much earlier in the agricultural cycle. Once farmers are identified and vetted, SiembraCo provides inputs and advisory throughout the agricultural cycle, thereby ensuring the produce provided is of high quality and that the farmer employs sustainable practices. As of early 2024, SiembraCo worked with 2,600 farmers.		

Platform FarmDirect	Value chain Non-cash crops	E
Country Peru	Business model Currently offered to buyers and sellers for free. Assessing introduction of a mark-up to make the site sustainable.	
Developed by Producers Direct		
Launched 2020		
Stage Scale-up		
Description Producers Direct established FarmDirect to help smallholder farmers increase their incomes by selling their non-cash crops to local buyers in their own communities (small shops, ice cream parlours, individual buyers, etc.).		

Platform Acércate	Stage Scale-up	B
Country Colombia	Value chain Fresh produce	
Developed by Megatiendas	Business model B2B, mark-up	
Launched 2018		
Description Originally founded to improve the quality of the produce sold at parent company Megatiendas' supermarkets. By working directly with smallholder farmers, Acércate could eliminate intermediaries and get access to better quality produce at a lower price. Smallholder farmers upload the crop available for sale onto the Acércate app and Acércate aggregates demand, coordinates pick-up and delivers to their supermarkets. Acércate also delivers to third-parties like fast-food chains (e.g. Burger King), restaurants and small corner markets.		

Platform Croper.com	Stage Scale-up	D
Country Colombia	Value chains Inputs, financial services	
Developed by Croper.com	Business model B2C, mark-up, advertising	
Launched n.a.		
Description Croper.com was born as a marketplace for inputs and machinery for smallholder farmers in Colombia. More recently, Croper.com has teamed with fintechs like Tú Primero to offer credit and insurance products on their marketplace.		

Platform SEV Mercado Ganadero	Stage Scale-up	F
Country Colombia, Ecuador	Value chain Livestock	
Developed by SEV Mercado Ganadero	Business model B2C, advertising	
Launched n.a.		
Description SEV Mercado Ganadero is a marketplace linking buyers and sellers of livestock. Users can place an advertisement on the site using a desktop or mobile app for free with information about the livestock being sold. The site also sells inputs for livestock, including seed and medicine. The app has 18,000 registered users.		

90 Ministerio de Producción. (1 February 2023). "PRODUCE presenta "Productor Digital", primera plataforma estatal de compra directa a productores agrícolas".
 91 Acércate interview, January 2024.
 92 Producers Direct interview, January 2024; WFP. (2022). [Farm Direct website](#).
 93 SiembraCo interview, February 2024.
 94 [Croper.com website](#).
 95 Basto Escobar, L.M. (18 April 2022). "SEV, una plataforma que conecta compradores y vendedores de ganado en Colombia". Agronegocios.

Our latest research uncovered the following trends in the agri e-commerce market in the six focus countries.

- **Agri e-commerce solutions tend to be among the most complex digital agriculture solutions on the market.** Most agri e-commerce platforms in Latin America do much more than link buyers and sellers of products. Agri e-commerce companies may also have one or more of the following functions: customer acquisition, training and technical support, financing, transportation, warehousing, quality control, packaging and online payments. Acércate, for example, teamed with Banco Agrario to use the data from their contracts with smallholder farmers to extend credit to those farmers to purchase machinery and improve productivity.⁹⁶ SiembraCo provides zero-interest financing to their smallholder farmer partners in Colombia and Guatemala,⁹⁷ and recently introduced a chatbot to provide agronomic advisory to farmers to increase the quality and quantity of produce. Many also provide logistics, from farm pick-up to transportation, warehousing and delivery. Acércate, for example, sends trucks to pick up produce from their smallholder farmer partners. To offset the cost, they have teamed up with input supplier Monómeros to transport inputs to the rural areas where they have scheduled pick-ups.⁹⁸
- **Due to the complexity of the model, many agri e-commerce platforms do not survive more than a few years.** The COVID-19 pandemic saw dozens of start-ups enter the agri e-commerce space, hoping to capitalise on the opportunity to provide high-quality fresh food to customers at their doorstep. Agri e-commerce companies emerged to cover almost every conceivable niche. Some linked smallholder farmers to small mom-and-pop shops while others focussed on kosher foods (Koshcampo⁹⁹) or restaurants (Frubana,¹⁰⁰ Plaz/JOKR¹⁰¹). For all but a handful of these companies, expanding beyond one or two metro areas has proven difficult. Colombia e-commerce start-up TuPlaza,¹⁰² for example, quickly scaled to four metro areas after receiving some early funding from Rappi. Later, they had to scale back to two cities given the complexities associated with working in four. Considered among the more successful agri e-commerce start-ups in the region given their ability to raise capital, Frubana announced in February 2024 that they would close their Colombian and Mexican operations to focus all their energy on Brazil. Frubana cited high interest rates and an inability to raise capital as the main reasons for the closure.¹⁰³

96 Acércate interview, January 2024.

97 SiembraCo interview, February 2024.

98 Acércate interview, January 2024.

99 [Koshcampo website](#).

100 [Frubana website](#).

101 Caparros, J. (4 May 2022). "Jokr compra Plaz, plataforma colombiana de frutas y verduras". Forbes Colombia.

102 [TuPlaza website](#).

103 Caparros, J. (16 February 2024). "Frubana se enfocará en Brasil: suspenderá sus operaciones en Colombia y México". Forbes Colombia.

Smart farming



Smart farming refers to the use of sensors, drones, satellites and other farm assets to generate and transmit data about a specific crop, animal, asset or practice to support agricultural activities. Smart farming solutions rely on connectivity between IoT-enabled devices to optimise production processes and growth conditions while minimising costs and scarce resources.¹⁰⁴ The three main categories of smart farming are equipment monitoring, often involving the use of sensors to remotely manage irrigation systems, cold storage facilities or other farm assets; livestock and aquaculture management, which typically involve the use of sensors to monitor livestock, beehives or aquaculture ponds; and smart shared assets like tractors or other farm equipment using the shared economy model.¹⁰⁵

Smart farming solutions have the potential to dramatically increase productivity and reduce costs, which would in turn have a positive impact on income and livelihoods. Solutions that rely on IoT-based sensors, drones, satellite imagery and smart assets have been used in large-scale industrial farming for years given the productivity benefits of remote monitoring and automation.

Factors driving the adoption of smart farming solutions by smallholder farmers include the availability of low-power wide-area (LPWA) networks in rural areas, since powering hundreds of sensors using traditional mobile networks can drive the cost of a smart farming solution beyond the reach of most smallholders. Other important drivers include favourable regulation on the use of satellites, drones and sensors; government subsidies for irrigation, cold storage or greenhouse systems for smallholder farmers; low taxation on the import of equipment and parts needed to implement smart farming solutions; local manufacturing and/or assembly

capabilities; and the availability of local talent in rural areas that can implement, operate and repair smart farming hardware and software solutions.

As in 2020, most smart farming solutions identified through our research in the context of smallholder farming use cases have failed to move beyond the pilot stage despite demonstrating significant benefits in terms of productivity improvements and cost efficiencies.¹⁰⁶ The Ministry of Telecommunications in Colombia (MinTIC) in conjunction with the Center for the Fourth Industrial Revolution (C4IR) conducted the Agro 4.0 smart farming pilot in 2021. The Agro 4.0 initiative consisted of 10 pilots with 100 farmers across eight departments in Colombia working in coffee, cocoa and avocado.¹⁰⁷ Despite the important productivity gains observed during the pilots, MinTIC and C4IR concluded that most smart farming solutions were still too expensive for small and medium-sized farming operations in the country to implement, and that the cost for individual farmers needed to come down before these solutions could be scaled.¹⁰⁸

Despite the cost challenges of smart farming solutions in the smallholder farmer context, the GSMA Agritech team identified a few more smart farming solutions being implemented in the focus countries in this most recent assessment than it did in 2020. While many of these support large-scale agribusinesses and exporters (e.g., Colombia's Farmapp, Peru's SpaceAg and Colombia's Sioma), a few focus specifically on addressing the pain points of smallholder farmers (see **Figure 19**). Ubees, for example, is working with coffee and avocado farmers in Colombia to install smart beehives that improve the yield and quality of the farmer's core crop. The honey from the hives also provide a new revenue source and can increase smallholder farmer incomes by as much as 30%.¹⁰⁹

104 GSMA. (2020). *Digital Agriculture Maps*.

105 Ibid.

106 GSMA. (2020). *Landscaping the agritech ecosystem for smallholder farmers in Latin America and the Caribbean*; GSMA. (2022). *Assessment of smart farming solutions for smallholders in low and middle-income countries*.

107 C4IR. (2022). *Resultados del Proyecto 2021: Agro 4.0*.

108 Ibid.

109 Ubees. (2024). "Our Impact by Crop".

Figure 19

Selected smart farming solutions in Latin America

Sources: InspiraFarms,¹¹⁰ AgroMEL,¹¹¹ Ubees,¹¹² Nespresso,¹¹³ Hola Tractor¹¹⁴ and Visualiti¹¹⁵



Service
AgroMEL

Country
Colombia

Developed by
GIS Data Center

Launched
2013

Stage A
Scale-up

Value chains
Various

Business model
B2B, B2C

Description
Data collected from satellites and sensors is used to deliver recommendations on irrigation, fertilisation and pesticide use. Provides monitoring and fertilisation using drones and, most recently, introduced remote monitoring and automation for greenhouses.

Service
Agtech monitoring solution for crops

Countries
Colombia, Honduras, Nicaragua

Developed by
Visualiti

Launched
2016

Stage D
Scale-up

Value chains
Tropical crops (avocado, lime, grapes)

Business model
B2C, B2B targeting small and medium-sized farmers. Works directly with farmers or through associations.

Description
IoT sensors placed in the ground provide information on temperature, soil moisture, pH levels, etc. Data collected generates recommendations on irrigation and fertilisation.

Service
Bees for Coffee

Country
Colombia

Developed by
Ubees

Launched
2020

Stage B
Adoption

Value chains
Avocados, coffee, honey

Business model
B2B, Ubees works with local agribusinesses and exporters including Nespresso in Colombia.

Description
Sensors are placed on beehives installed on smallholder farmers' plots. The sensors measure weather, hive health and activity, exposure to pesticides among the bees and pollination efficiency. The presence of bees helps improve coffee yields (15% - 50%) while giving farmers a new source of income through the sale of honey.

Service
Hola Tractor

Country
Bolivia

Developed by
Hola Tractor

Launched
2020

Stage
Scale-up

Value chains C
Various

Business model
B2C, work through agents that aggregate demand in certain regions so that assets (e.g. tractors) can be deployed to specific areas.

Description
Hola Tractor leverages the shared economy model to give smallholder farmers access to mechanisation assets that enable them to improve productivity. An app links those looking for a tractor with tractor owners and operators.

Service
InspiraFarms cold storage and packhouses

Countries
Colombia, Guatemala, Mexico

Developed by
InspiraFarms

Launched
2019 (Colombia)

Stage
Scale-up

Value chains E
Fresh produce, flowers, other

Business model
B2C, B2B. InspiraFarms sells directly to farmers, to agribusinesses working with cooperatives (e.g. BASF) or NGOs/development agencies supporting smallholder farmers.

Description
Through the use of IoT-connected cold storage units and pack-houses, smallholder farmers can extend the life of their produce. Data collected through the sensors can also be leveraged for certification/traceability.

110 Rodriguez, P. (24 April 2019). "Inspira Farms arrives in South America: a 60m2 on-farm packhouse with cold storage is benefitting 390 small farmers in Colombia". Inspira Farms; Inspira Farms. (2017). "Small scale farmers are realizing big opportunities with a little help and technology".

111 AgroMEL website.

112 Ubees. (2024). "Our Impact by Crop".

113 Nespresso. (2023). "The Beans and the Bees".

114 Hola Tractor interview, December 2023.

115 Visualiti interview, December 2023.

Our latest research uncovered several key trends related to the smart farming opportunity in Latin America:

- **The initial opportunity for smart farming solutions lies primarily with high-margin, capital-intensive crops.** Although some of the smart farming pilots have been conducted in the coffee (MinTIC's Agro 4.0 and Telefónica's Smart Agro 4.0), cocoa (MinTIC's Agro 4.0) and rice (e-kakashi¹¹⁶) value chains, most commercial smart farming implementations are focussed on other export crops like flowers, bananas, avocados, limes and grapes. These are crops for which smallholder farmers are more likely to have invested in irrigation systems, greenhouses, cold storage facilities and packhouses, and more likely to take the incremental step of installing sensors to make these assets more efficient. The higher margin associated with these crops gives smallholder farmers more room to invest in smart farming solutions, particularly those that take more than one agricultural cycle to produce a return.
- **Gaining the trust of smallholder farmers remains a significant challenge for smart farming providers.** Although their trust in digital solutions and payments has increased over the past few years, smallholder farmers remain reluctant to use fully automated and remote solutions. Colombia's AgroMEL, for instance, had trouble convincing customers that their IoT, drone and satellite solutions could reliably capture data to generate effective irrigation and fertilisation plans. The company had to acquire a soil analysis lab to give farmers peace of mind that the readings could be used for decision-making on the farm.¹¹⁷
- **Shared asset models and aquaculture management solutions common in Asia and Africa have yet to make much headway in Latin America.** In Asia and Africa, shared asset providers like Hello Tractor, Vaya Tractor and Trotro Tractor have managed to sign on tens of thousands of users and generate significant attention. The only such company identified in the six focus markets for this study is Bolivia's Hola Tractor, a new agritech that uses a mobile app and tracking devices to link small and medium-sized farmers to tractor owners and operators. Similarly, Asian aquaculture agritechs like eFishery and JALA have managed to translate high user numbers and a subscription revenue model into millions of dollars in financing.¹¹⁸ Despite the importance of aquaculture to countries like El Salvador, we have not yet observed the implementation of these types of solutions in the six focus markets.

116 e-kakashi and CIAT. (14 March 2018). "Smart and Sustainable Agriculture with IoT".

117 USAID, DAI and The AgTech Network. (2023). *Digital Agriculture Ecosystem Assessment: Colombia*.

118 Mosqueda, M.W. Jr. (28 November 2023). "Indonesian aquatech startup JALA Tech raises about \$13.1m in funding", *DealStreetAsia*, Nikkei Asia; Shu, C. (7 July 2023). "Indonesian aquaculture startup eFishery nets \$200M at unicorn valuation". *TechCrunch*.

Gender trends in digital agriculture

Although women play an important role in the agriculture sectors of the six focus countries, they are still underrepresented when it comes to the adoption of digital agriculture solutions, particularly when providers fail to develop specific gender policies. For these providers, the share of female users tends to be between 10% and 15%. This is despite anecdotal evidence that suggests that women farmers have lower default rates for financial services products and tend to do a better job at adapting agronomic advice received from experts and disseminating that information among their peers.¹¹⁹ Digital agriculture providers that deliberately work with female smallholder farmers, either because they believe in gender equity or are mandated to do so by their donor, tend to have higher adoption rates among women, averaging 30% to 35% among those interviewed (see **Figure 20**). Producers Direct developed an agritech platform called FarmDirect that originally was designed to serve women exclusively. Producers Direct

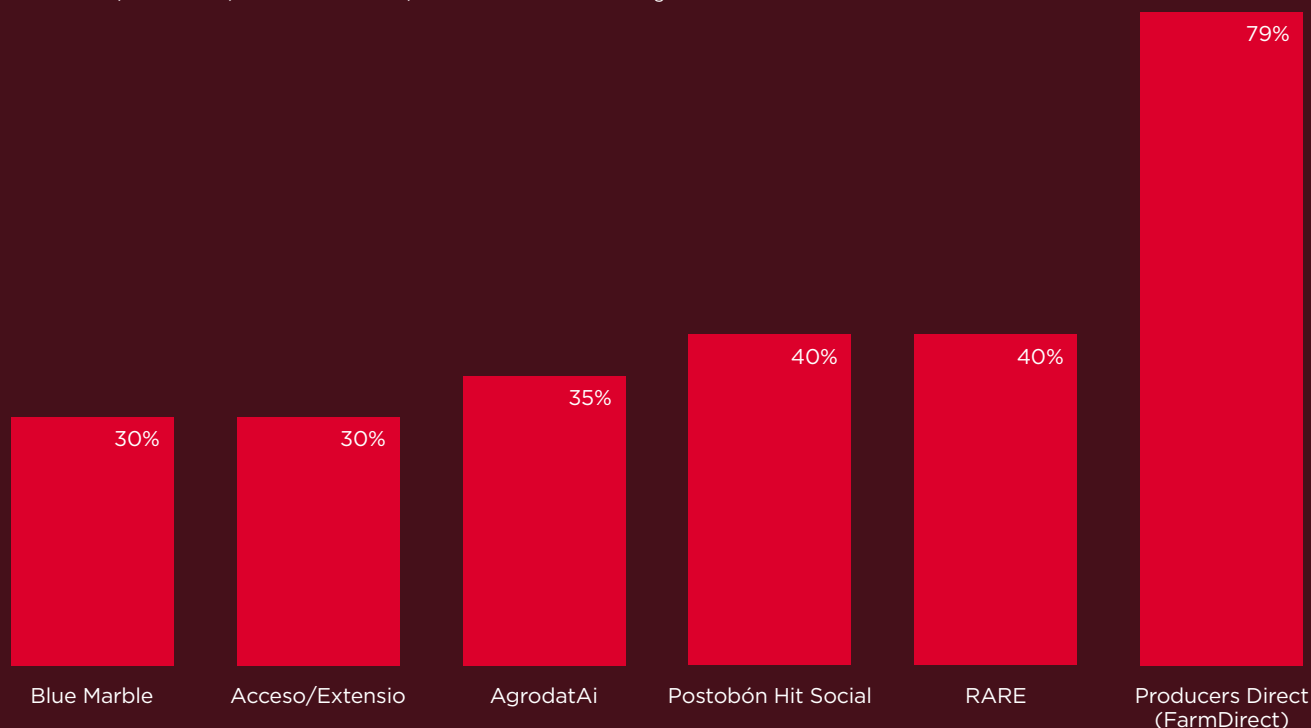
identified women as those in the household most likely to be responsible for crop diversification and food security crops. Although FarmDirect later expanded to include men, Producers Direct still reports that 79% of their user base are women. It is hoping to reach 10,000 female farmers by the end of 2024.¹²⁰

We also identified efforts to reach other underrepresented groups, particularly Indigenous peoples or those of African origin. Peruvian agritech Agros, for example, provides services in the local Quechua language.¹²¹ Acceso, which offers services in Spanish, English and French, recently introduced Nahuatl, an Indigenous language of Mexico.¹²² Acceso relies on ChatGPT to field inquiries on their digital advisory platform. While ChatGPT appears to understand questions posed in Nahuatl, Acceso finds that it sometimes uses non-existent, Nahuatl-sounding words to respond. As a stop-gap measure, Acceso is currently providing responses in Spanish until the quality of Nahuatl responses on ChatGPT improves.¹²³

Figure 20

Share of women users by selected agritech (early 2024)

Sources: Acceso, Blue Marble, Postobón Hit Social, Producers Direct and The AgTech Network¹²⁴



Note: The percentages in this chart are reported by the agritechs themselves. The GSMA has not independently verified these figures.

119 Agritech interviews, December 2023-February 2024.

120 Producers Direct interview, January 2024.

121 Agros interview, January 2024.

122 Acceso interview, January 2024.

123 Ibid.

124 USAID, DAI and The AgTech Network. (2023). *Digital Agriculture Ecosystem Assessment: Colombia*.

04 Recommendations and future outlook



Since the publication of the 2020 landscape study, the agritech ecosystem in the six focus Latin American countries has changed significantly. The expansion of mobile networks, the increased availability and affordability of smartphone devices, the proliferation of social media and communications apps and the wider adoption of mobile money services, have all made smallholder farmers more receptive to digitisation.

A careful review of digital agriculture solutions implemented to date shows that digitisation is helping smallholder farmers become more productive, gain access to markets and financial services and build resilience to the impacts of climate change. In response to these trends, dozens of new agritechs have launched digital agriculture solutions over the past few years with the support of an expanding ecosystem of investors, accelerators, tech companies, incubators and donors. Despite the gains observed, there is much more work to be done, particularly in El Salvador, Honduras, Bolivia, Paraguay and Peru, where the agritech ecosystem is significantly less developed than in Colombia. Capitalising on the opportunities in Latin America's agritech ecosystem will require the participation of the various stakeholders active in Latin America's agritech ecosystem. Below, we provide recommendations for each of these stakeholders, from agritechs themselves to donors and NGOs, investors and government.

Donors and NGOs

- **Support digital and financial literacy programmes in rural areas.** Many of the digital agriculture organisations interviewed for this study spend significant time and resources training smallholder farmers on digital and financial literacy – resources that could be better spent on farmer acquisition and product development. Postobón, for example, found that many of the smallholder farmers it worked with lacked the digital and financial skills they needed to benefit from their digital agriculture solutions. To address this problem, the company teamed with WOM Colombia to provide digital training to 300 smallholder farmers.¹²⁵ Donors and NGOs can play a key role in providing the digital and financial literacy training that can underpin not only the use of digital agriculture solutions, but also other tools related to financial inclusion, education, social benefits and health care, among others.
- **Promote the creation of national or regional databanks.** A frequent challenge cited by digital agriculture service providers is accessing the underlying data they need to develop their solutions. This can include farmer and crop data to inform credit-scoring algorithms, pest and disease photos to build digital advisory solutions, weather data and satellite polygons. There may be a role for donors and NGOs to help develop national or regional databases of information that can be accessed by multiple organisations to speed the time to market for new digital innovations. This should be done in accordance with local governance regulations and in coordination with government officials.

¹²⁵ Postobón. (25 May 2023). "Nos unimos a WOM para impulsar la alfabetización digital en el país".

- **Maintain targets for underrepresented groups, especially women and Indigenous peoples.** Most of the digital agriculture organisations interviewed for this study did not have specific strategies to target underrepresented groups like women farmers, Indigenous peoples or ethnic minorities. Organisations that have been most successful in bringing on female farmers were mandated to do so by a donor. Producers Direct, an NGO with a strong gender focus, initially targeted only women for their digital agriculture solution.¹²⁶ This is why, even though it has expanded to include men, 80% of their users are still women. Where these mandates are not in place, the share of women users often falls below 10%. It is critical that NGOs and donors continue to hold their agritech partners accountable for including marginalised populations.

Agritechs and digital agriculture innovators

- **Take advantage of subsidies where available.** Digital agriculture service providers can take advantage of existing government programmes that seek to help smallholder farmers gain access to financial services or assets. Colombia's government, for example, offers subsidies of up to 95% on insurance premiums, which explains why the number of insurance solutions in that country have expanded substantially in recent years in comparison to countries where subsidies are not available. Governments also offer subsidies for the acquisition of irrigation systems, greenhouses and tractors, making smart farming solutions that leverage these solutions more affordable to smallholder farmers.
- **Seek to address multiple smallholder farmer challenges.** Smallholder farmers do not want to access multiple mobile apps and tools to access different services. Digital agriculture providers that address multiple pain points will have an advantage over niche solutions. They can try to do this themselves or in partnership with another provider. Agri e-commerce provider SiembraCo, for example, provides farmers with financing support as well as agronomic advisory. Through holistic support, SiembraCo hopes to generate loyalty among their smallholder farmer partners and ensure a reliable supply of sustainably grown, high-quality produce for their platform. Digital advisory provider AgrodatAi leverages their database of more than 300,000 smallholder farmers in Colombia to offer insurance and access to carbon markets with the support of partners.

- **To promote adoption among women, include content specific to the needs and interests of female farmers.** This can include both agronomic content as well as content related to the household, family, entrepreneurship and money management, among others. Agritech Acceso, for example, sends gender-specific messaging at least once a week to keep female farmers in Colombia, El Salvador and Haiti engaged.¹²⁷ Innovators should also **draw on the expertise of organisations that work with women in rural communities.** Groups like Colombia's Fundación delamujer can be especially helpful to new start-ups.¹²⁸

Investors

- **Look for opportunities to scale an existing solution beyond its current market.** The GSMA AgriTech team identified few solutions that operate across countries. Most are focussed on a single country or specific national region and value chain. As some solutions begin to scale, there is an opportunity to help them expand into new markets. Solidaridad, for example, originally developed a wide portfolio of tools based on the needs of partners in individual countries. It has recently decided to consolidate their efforts around a smaller number of tools that it can then implement in different markets to help scale each solution.¹²⁹ Hola Tractor is looking to take their agricultural asset-sharing model beyond Bolivia into other countries with low mechanisation rates like Ecuador, Peru and Colombia.¹³⁰ Investors can play a role in helping digital innovations cross borders, not only by supporting financing but also with local market know-how and technical support.

Governments

- **Ensure that regulatory barriers remain low.** The organisations interviewed for this study often pointed to regulatory barriers standing in the way of growth. Barriers mentioned include regulations on digital transactions and payments, regulation on the operation of drones and challenges importing machinery and parts, among others. Governments should do what they can to ensure barriers to innovation remain low. They should also ensure there is a level playing field between new entrants and established players. A few of the fintechs interviewed expressed concerns that government benefits designed for smallholder farmers could often only be accessed through traditional financial institutions. Fintechs were often excluded from these initiatives. Colombia is one country that has taken steps in recent years to lower regulatory barriers, which has resulted in a rapid rise in the number of start-ups.

¹²⁶ Producers Direct interview, January 2024.

¹²⁷ Acceso interview, January 2024.

¹²⁸ [Fundación delamujer website](#).

¹²⁹ Solidaridad interview, January 2024.

¹³⁰ Hola Tractor interview, December 2023.

- **Consider introducing government-backed incubator and accelerator programmes to support early-stage innovations.** Government agencies at the local and national level in Colombia and Peru have established incubators and accelerators that promote digital innovation through financial and technical support. Many of the digital agriculture innovations interviewed for this study received early funding or technical support from groups like iNNpulsa, Apps.Co, Startup Peru, ProInnovate and Ruta N, among others. The governments of Bolivia, El Salvador and Honduras could help to drive local innovation by replicating this model. This, in turn, can attract donor and investor support.
- **Provide clarity on carbon markets for stakeholders in the agritech ecosystem.** As is often the case with new technologies and business models, regulation has not kept pace with the rapidly evolving market for carbon credits. Some analysts have dubbed the international carbon market the “Wild West”, as the same carbon capture is sold across multiple markets and Indigenous communities point to a violation of their heritage and customs as a result of various carbon credit projects.¹³¹ To get ahead of the curve and attract investment, some governments like Paraguay’s are enacting new rules to create a framework for participation in the carbon market.¹³² Other governments, like in Honduras, have issued moratoriums to help prevent bad actors from exploiting vulnerable communities. Given the far-reaching interests of ecosystem players in the international carbon market opportunity, governments would be well served by establishing clear rules, preferably ones that comply with international norms.

¹³¹ Monsalve S., M.M. (29 November 2023). “How to regulate the ‘Wild West’ of carbon markets in Latin America”. El País.

¹³² Nielsen, C. (17 October 2023). “Paraguay approves new carbon credits law in bid to conserve and manage resources sustainably”. Quadriz.

Future outlook

One of the main objectives of this report is to provide an update of the digital agriculture ecosystem in the Latin American countries of Bolivia, Colombia, El Salvador, Honduras, Paraguay and Peru. Much has happened since 2020, including a global pandemic, a war in Ukraine that fuelled an increase in production costs and new regulation around deforestation in Europe and the United States that affects farmers growing key export crops to these regions. There have also been important gains in connectivity, financial inclusion, digitisation, device ownership and affordability, all prerequisites for the development of a robust digital agriculture ecosystem.

Despite some of the gains observed in the past few years, Latin America's agritech sector remains underdeveloped, particularly compared with those in Sub-Saharan Africa and Southeast Asia. Most digital agriculture providers have yet to achieve scale, with many start-ups failing after just a few years. For Latin America's agritech sector to reach its full potential, the coordination and commitment of various ecosystem players will be needed, including regulators, NGOs, academia, agribusinesses, tech companies and investors. Projects like "Advancing Digital Innovation for Smallholder Farmers in Latin America", a joint project of the GSMA, Incofin Foundation and IDB Lab,¹³³ are a critical first step in the development of Latin America's agritech sector. With the support of Incofin Foundation and the GSMA, IDB Lab is funding an Innovation Call that will select up to 14 digital agriculture innovators operating in the six focus markets identified in this study.¹³⁴ The call aims to enhance the productivity of smallholder farmers, build their resilience to climate change and promote gender inclusivity, all foundational elements of a mature digital agriculture ecosystem.

¹³³ GSMA. (2024). *Advancing Digital Innovation for Smallholder Farmers in Latin America programme*.

¹³⁴ Ibid.

Appendix: Use cases and sub-use cases in digital agriculture



Sub-category	Characteristics
1 DIGITAL ADVISORY	Information-based services providing smallholder farmers with agronomic and livestock advice and best practices, information on market prices, weather and climate information as well as financial and digital literacy training.
1 Agricultural value-added services (Agri VAS)	One-to-many advisories covering agricultural and livestock information, weather and climate information and information on market prices. Agri VAS are delivered via voice channels (IVR, helplines), text channels (SMS and USSD) and via apps.
2 Smart advisory	Data-driven advisory based on tailored, farm-level agro-climatic and crop-specific information to support decision making, maximise productivity and reduce costs. Technologies such as sensors, satellites and drones, as well as big data analytics and AI, underpin many of these services.
3 Weather information	Specialist services that provide regional and localised weather forecasts. This sub-category may include weather-adaptive and climate-smart advice.
4 Pest and disease management	Digital tools that help farmers diagnose plant disease and develop strategies to treat diseased plants as well as mitigate future outbreaks. Most of the services are accessible via mobile applications and require a farmer to upload a picture of the infected plant for diagnosis. Some services are also accessible via USSD. Also includes national and regional-level pest and disease early warning systems.
5 Product verification	Digital tools designed to enable farmers to validate the authenticity of agriculture inputs such as seeds, fertilisers, agro chemicals and other agro inputs and prevent the proliferation of counterfeit products. Most services require farmers to send a scratch-off code from the product to a specified number via SMS.
6 Record keeping	Digital tools that enable farmers to keep detailed records of livestock, including health and feeding data, to help mitigate diseases and avoid missed conceptions. Record keeping tools are also used to keep details of input use, procurement, cost and revenue and sales records.
02 AGRI DIGITAL FINANCIAL SERVICES	Digitally-enabled financial services for smallholders to facilitate their inclusion in the formal financial economy and allow investment in farming activities. These services are customised to meet farmers' needs and tailored to suit their cropping cycles. This category also includes financial products that enable financial service providers to lower the risk of lending to smallholders.
7 Credit and loans	Lending products that target smallholders and address specific agricultural needs. Most of these products enable the provision of short-term financing for agricultural inputs.
8 Credit scoring	Digital solutions that assess the creditworthiness of smallholder farmers using aggregated data from multiple sources, including bio data, procurement records and mobile money transactions. These tools enable financial service providers to serve smallholder farmers and lower their risks.
9 Crowdfunding	Online platforms that enable investment in smallholders by sourcing funds from individuals (investors or sponsors). Most platforms also allow investors to "follow" the farmers they have invested in by providing updates via text, pictures and videos from their dashboard through a website or an app.

10 Input financing	Digital tools that enable financing for the purchase of inputs like seeds, fertiliser, pesticides/herbicides from various sources, including governments, through subsidies.
11 Savings	Targeted digital savings products for farmers designed to match their spending and savings habits, enabling them to put money aside for agricultural activities.
12 Digital agri wallets	Digital wallets enable farmers to transact with various actors within the agriculture ecosystem, for instance, making and receiving payments, including electronic vouchers with which to redeem agricultural inputs. Digital wallets also allow farmers to save money and develop a transactional history, which can be used alongside other types of data to access additional financial services.
13 Insurance	Digitally-enabled agricultural insurance services that help smallholder farmers mitigate the risks associated with external shocks, such as weather events and pest and disease outbreaks. Agricultural insurance includes weather index, area yield index, multi-peril, livestock and livestock index insurance products.
14 Accountability tool	Digital tools designed to help farmers view farming as a business by allowing them to track farming expenses and revenues and prove their creditworthiness.

**03
DIGITAL
PROCUREMENT**

Digital solutions in the agricultural last mile that enable a range of digital systems and processes to transition from paper to digital. These solutions help agribusinesses increase transparency in their transactions with smallholders and improve efficiency and operational profitability. At the same time, farmers benefit from more transparent transactions, improved market access and from establishing a digital footprint, which can be used to access financial services.

15 Digital records	Digital solutions that replace paper-based systems and digitise transactions between farmers and agribusinesses.
16 Digital records with payments	Digital solutions that replace paper-based systems, digitise transactions between farmers and agribusinesses and enable the integration of digital payments for the procurement of crops.
17 Digital records with traceability	Digital solutions that replace paper-based systems, digitise transactions between farmers and agribusinesses and support the traceability of produce from "farm to fork".
18 Digital records with payments and traceability	Digital solutions that replace paper-based systems, digitise transactions between farmers and agribusinesses, enable the integration of digital payments for the procurement of crops and support the traceability of produce from "farm to fork".

**04
AGRI
E-COMMERCE**

Digital platforms that enable the buying and selling of agricultural produce and inputs online. Although most agri e-commerce businesses sell domestically to urban consumers, agri e-commerce also enables farmers to reach international buyers.

19 Inputs	Agri input platforms enable the sale of inputs, such as seeds, fertilisers, pesticides/herbicides, from input suppliers to farmers. Such platforms may also enable groups of farmers to aggregate demand and place bulk orders.
20 Outputs	Platforms that enable farmers to sell to consumers (B2C model) and to enterprise customers (B2B model), such as companies in the catering industry (e.g. hotels, restaurants) and market retailers, or a hybrid of the two.
21 Inputs and outputs	Platforms that enable the sale of agricultural inputs to farmers from input suppliers, as well as the sale of agricultural produce from farmers to consumers and businesses.

5
SMART FARMING

Smart farming refers to the use of sensors, drones, satellites and other farm assets to generate and transmit data about a specific crop, animal or practice to support agricultural activities. Smart farming solutions rely on connectivity between IoT-enabled devices to optimise production processes and growth conditions while minimising costs and saving resources.

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- 22 Equipment monitoring** The smart monitoring of equipment, such as irrigation systems that enable farmers to remotely control, track and look after their equipment and farming operations, leading to a reduction in water consumption and waste.
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- 23 Livestock and aquaculture management** Digital tools that allow farmers to monitor herds remotely to determine their exact location at any time and track the health and habits of livestock, including when they are in oestrus or about to calve. Similarly, aquaculture management systems enable farmers to monitor feeding patterns of fish and other aquaculture, detect diseases in advance, control water quality and, in some cases, automate feeding completely.
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- 24 Smart shared assets** Digital tools that enable the sharing economy for assets, such as tractors, drones and other mechanised farming equipment. They provide smallholder farmers an opportunity to mechanise processes, such as crop spraying, crop monitoring and land preparation.
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