



HOW NEW TECHNOLOGIES

ARE TRANSFORMING

AGRIBUSINESS

IN LATIN AMERICA AND THE CARIBBEAN



Digital economy

Agribusiness

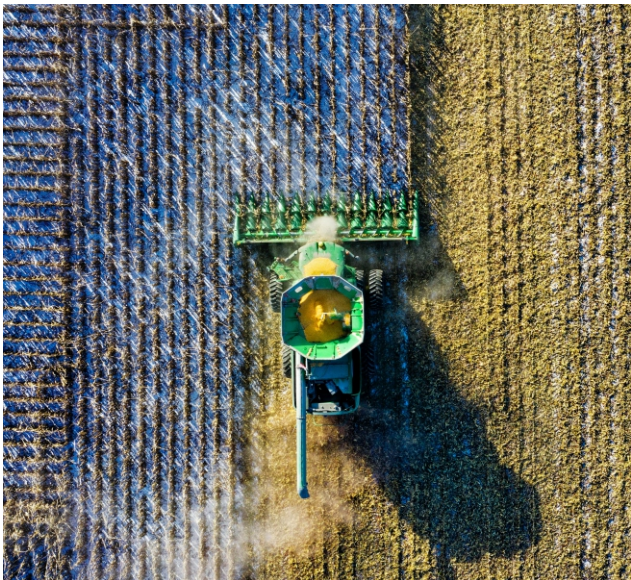


BACKGROUND

The Latin America and Caribbean (LAC) region is undergoing a digital revolution, and we are convinced that technological innovations have the potential to significantly accelerate and scale the region's development. These technologies are reshaping both traditional sectors and innovative industries. In this context, the main objective of this report is to address the disruptive technologies that are revolutionizing each of the industries in which IDB Invest operates in a structured manner. New emerging business models will be evaluated in the context of economic and social development, the foundation of the IDB Group. The selected models will prioritize inclusion, productivity, and innovation while addressing cross-cutting issues such as environmental sustainability, climate change, and gender equality.

Although new technologies have enormous potential to drive efficiency and open up new avenues of value creation, they also pose significant challenges in terms of governance, security, and equality. The rapid adoption of digital solutions has highlighted the importance of establishing a strong regulatory and investment framework that maximizes benefits while mitigating risks. As a result, the role of different economic agents and their ability to adapt and adopt these innovations becomes a critical aspect of catalyzing sustainable economic and social development.

As we examine the impact and potential of various key technologies in this report, it is important to understand that we are dealing with an interconnected ecosystem that is growing in complexity and scale. Advances in one area, such as Artificial Intelligence or Automation, are fed back and amplified in constructive collaboration with others, such as Big Data or the Internet of Things, resulting in a multiplier effect on value generation. This report aims to highlight how this technological interconnection is reshaping the economic and social context in LAC, providing an analysis that goes beyond the current situation to forecast how new technologies will continue to shape the region over the next decade.

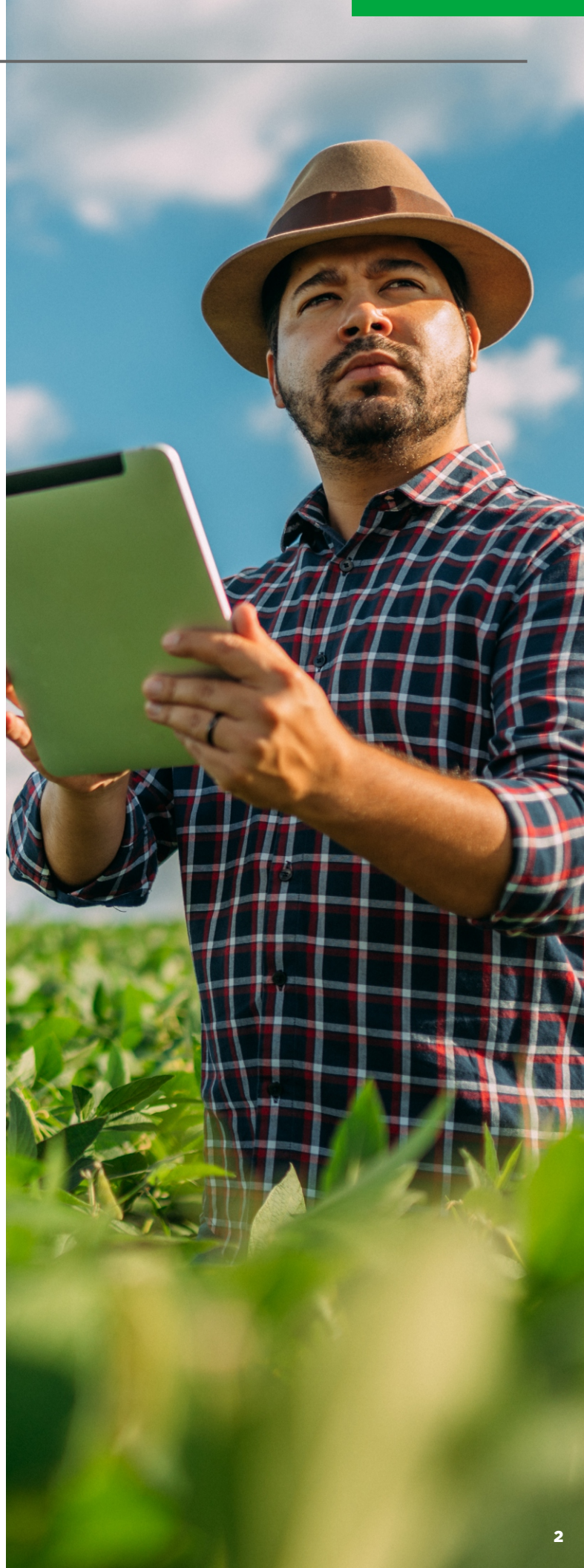


CONTEXT

Latin America and the Caribbean are world leaders in agricultural production. As one of the world's leading exporters of agricultural products, it possesses the necessary natural resources (arable land, drinking water, climate, and biodiversity) to continue evolving, thereby strengthening regional economies.

The importance of agriculture in the region's GDP has grown, reaching 6.9% in 2021 and ranking as the fifth most important sector. Bolivia, Nicaragua, and Honduras stand out for their contribution, totaling more than 10%, whereas in more advanced economies such as Mexico or Chile, this figure drops to less than 4%, a percentage the rest of the countries range between.

Latin America's agricultural and fisheries production is expected to grow by 14% over the next ten years. Crop production accounts for about 64% of this growth, about 28% from the livestock industry and the remaining 8% from fishing. This rise is largely explained by increased productivity, which the industry's digital transformation has facilitated.





To remain competitive, the sector must be prepared for the changes that we are all experiencing.

Globally, inflation has increased production inputs. Changes in consumer demand for healthier and more sustainable products, in turn, have an impact on business operations. Companies will also face increased pressure on their margins and recruiting new talent.

New technologies emerge to address the industry's challenges by accelerating productivity and improving operational efficiency through the implementation of digital solutions across the value chain. The use of sensors, drones, and other IoT devices for crop monitoring, robots to automate tasks, big data, and artificial intelligence to allow predictive analysis, and biotechnology to reduce the use of chemicals and pesticides are among the most important.



Through the granting of loans and credit facilities, the financial sector and multilateral entities play a crucial role in the digital development of the agricultural industry. Governments are expected to implement regulations that facilitate investment and foster a sustainable digital transformation, with a special focus on small and medium-sized companies in rural areas in order to achieve sustained growth.

INDUSTRY'S IMPORTANCE IN THE REGION AND IDB INVEST'S OUTLOOK

Agribusiness makes important contributions to the region by means of growth and trade, as well as employment generation, income growth, and poverty reduction, being one of the main gateways for the economic development of rural area populations. The following are the key factors:

Exports: The region is expected to further increase its trade surplus by 28% in order to account for 18% of global exports by 2031. Brazil is currently leading as the largest agricultural and food exporter (79.3 billion dollars in 2020) in the region, followed by Argentina (35 billion dollars) and Mexico (32.5 billion dollars), with corn, soy, beef, and poultry as the primary products and estimated to post the highest increase rates.



Food: According to current estimates, approximately 690 million people worldwide suffer from hunger, accounting for 8.9% of the global population. The agri-food industry is responsible for ensuring that food supply chains continue to be active and contribute to the global goal of zero hunger.

Employment: The primary sector is one of the main engines of employment within the region, with particular importance placed on rural areas, with a third of the total number of workers being represented by Guatemala, Nicaragua, and Bolivia. This percentage decreases in more economically advanced countries, such as Brazil and Chile with 9%, and Mexico with 12.5%. These figures, albeit low, still constitute the majority of the region's constructive makeup.

IDB Invest's Outlook

IDB Invest funds sustainable, competitive, and innovative business models through investments that increase renewable energy consumption and improve water use while promoting fair workplaces that value inclusion and diversity.

Funding is provided through long-term loans and tools to optimize the agribusiness value chain in Latin America and the Caribbean. The main goals are:

- **To increase installed manufacturing capacity, productivity, and optimal use of resources, which includes renewable energies.**

- **Efforts that promote gender equality and companies committed to small producers.**

Due to the industry's importance for economies and for the most vulnerable, financing these projects is vital to ensure that companies transform digitally, increasing their productive capacity, and favoring the region's development.



INDUSTRY CHALLENGES AND OPPORTUNITIES

The evolution towards a more digitized value chain and the use of more sustainable practices pose a range of challenges and opportunities for the development of organizations. The main ones include:



Greater Operational Efficiency

Customers in this industry often base their purchasing decisions on price. Increasing pressure to maintain operating margins encourages companies to adopt digital solutions to optimize the use of their resources, such as through precision irrigation.

Increased Productivity

Decreasing arable land, talent shortages, and increased concern about water use intensify the need to be more productive. Many companies are using drones to track crops, allowing them to monitor large areas more quickly and take corrective actions as needed. The increasing automation of activities should be compensated with an upskill or reskill plan that allows workers to migrate to tasks with higher added value without losing their employability.

Talent

Many companies find it difficult to find talent with hybrid capabilities. This affects their competitiveness and brings about a risk of obsolescence as the implementation of transformation plans cannot occur due to a lack of knowledge. Particular attention should be paid to rural areas because there is a lower presence of digital skills, and the learning process is more complex.

Climate Change

There are inherent industry risks that are difficult to predict. Climate change is increasing the number of droughts and floods, consequently impacting crop production. Some companies are investing in new technologies to try to estimate, quantify, and mitigate the impact of these risks.

The industry is beginning to leverage new digital solutions (precision agriculture, the use of drones and sensors or analytical models) to respond to challenges and address its digital transformation. Although there are different levels of maturity in the adoption of these solutions depending on the company type, the most common implementation barriers are:





- **Lack of talent and digital transformation efforts underway:** The absence of talent and digital culture is one of the main obstacles to technology implementation.

Until now, very few companies have a Digital Transformation Plan with a holistic vision and a digital education process that allows workers to gain the necessary knowledge to adopt new tools and practices in order to be more productive and migrate to higher value tasks.

- **Funding:** In order to undertake digital transformation projects, organizations require capital. These investments in CAPEX typically tend to be reflected in the income statement in the medium to long term.

That is why many companies have difficulties in justifying the profitability (return on investment or ROI) of such initiatives and why the necessary budget is not allocated to address them.

At the industry level, the following should be considered:

Connectivity Infrastructure: Connectivity is the primary enabler of digitalization progress because it allows users to connect to the internet. Many of the organizations have poor coverage or quality, which is exacerbated in rural areas. Investment in network infrastructure development is required to ensure that connectivity reaches all geographical areas at an affordable cost, thereby promoting business digitalization.

Collaboration between Ecosystem Actors: In order to maximize synergies and benefits from technology adoption, all stakeholders in the agricultural ecosystem must work together. Collaboration between actors promotes the digitalization of the entire value chain and encourages transformational investments due to the achievement of economies of scale.



KEY TRENDS

The primary sector is transforming, fueled by a digital acceleration of companies seeking to remain competitive. One example is the use of IoT devices to collect data and monitor products. Another example of transformation is the use of blockchain to ensure traceability and food safety. Furthermore, robots will aid in the automation of field tasks by reducing employees' physical effort.

The following are the major technological trends:

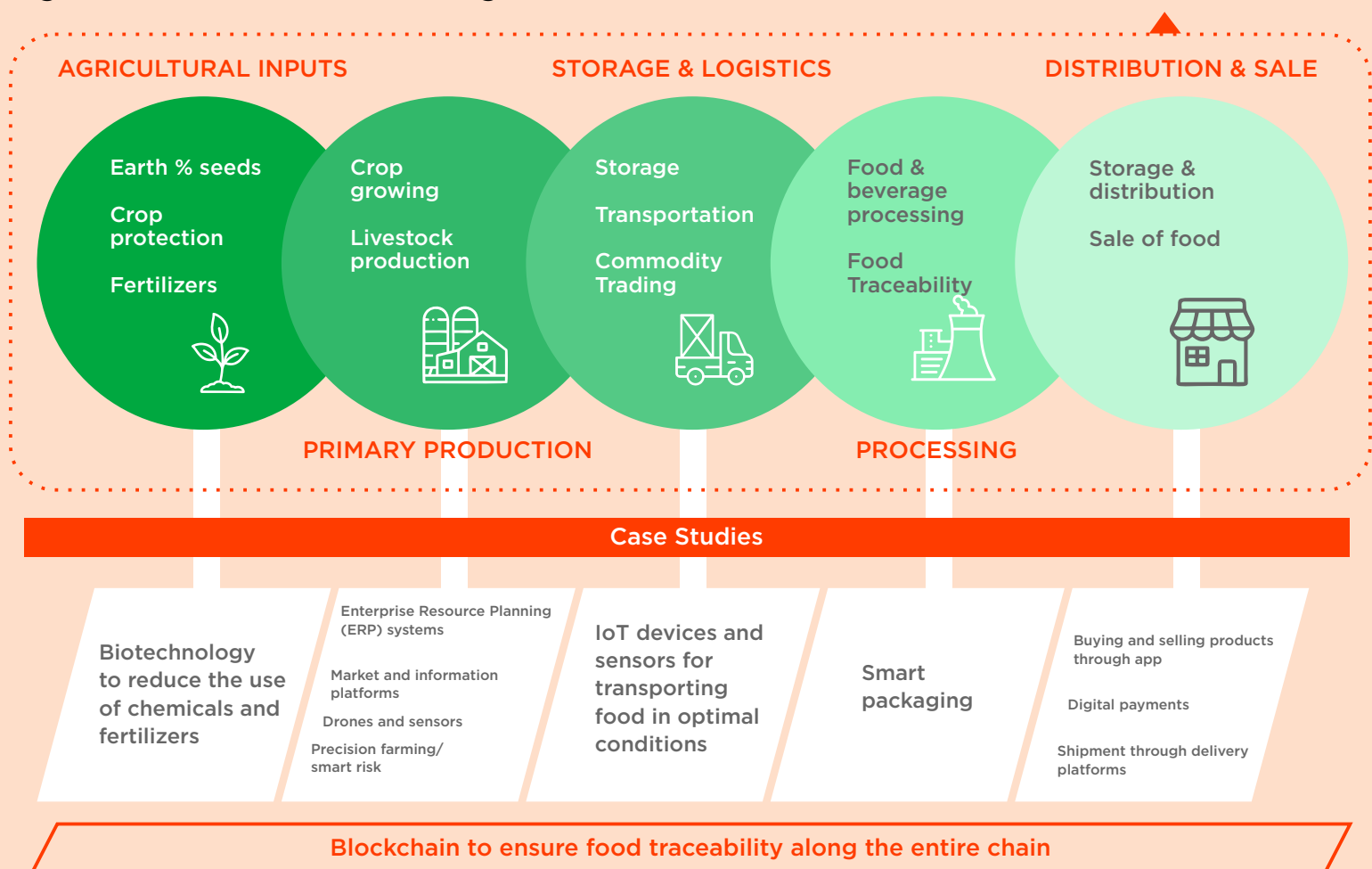
Agriculture 4.0

In recent years, the industry has sought to reinvent itself by implementing solutions that help it be more efficient, productive, and environmentally friendly. As a result, companies are leveraging technology to respond to challenges.

Agriculture 4.0, which refers to the implementation of new technologies for the digitalization of agricultural processes, allowing connectivity throughout the entire value chain and reducing information asymmetries, is the result of the industry's digital evolution.

Digitalization of Value Chain in Agribusiness

Generation of digital ecosystem



Smart farming is an example of how various digital solutions are used together to maximize productivity and reduce costs: drones are used to monitor fields, collecting data on the development of crops and their needs. Other devices, such as smart sensors, collect data about crop conditions (humidity, temperature, presence of diseases) or livestock conditions (information about an animal's health status). Furthermore, for the automation of processes, robots are used for sowing, reducing the physical effort and pressure systems that irrigate and apply fertilizers in precise quantities.

It is an opportunity for IDB Invest to drive the agricultural industry's technological revolution by supporting the digitalization of all stakeholders along the value chain and achieving two objectives: i) that companies are more productive and can reduce costs in the medium/long term, and ii) contribute to sustainable development.

Greater sophistication in consumer demand

It is no longer enough for organizations to offer products at a low price, but going one step further: to offer quality, value, and products safe for health.

Population and urban growth combined with economic growth (per capita income) influence changes in customer's lifestyles and, as a result, in product demand. People have more knowledge about food and are more concerned about their physical well-being and environmental concerns.

Technological advancements are improving food safety as well as product quality and value. Most products are usually perishable and require process controls to be delivered on time and in good condition.

An example of how organizations implement these solutions is through smart packaging, which allows tracking and providing information on the location, temperature, and quality of products.



There are other cases that will have a significant impact, but due to their innovative nature, they are still in the early stages of implementation. One example is the use of blockchain, which allows the digital transfer of product information through the chain while ensuring the traceability of its characteristics at any stage. Biotechnology, on the other hand, is used to produce crops with specific nutritional properties, resulting in healthier products for consumers.

For IDB Invest, financing companies for the application of these technologies is increasingly important in current times, where consumers' tastes are changing at a faster rate, and companies must be able to respond quickly, promoting rapid changes in response to market needs.

Measuring environmental impact

Climate change is a problem that affects not only the region but the entire planet. Agriculture contributes to air pollution: Livestock accounts for approximately 40% of global emissions, mineral fertilizers for 16%, and biomass and crop residue combustion for approximately 18%. Fertilizers, manure, and pesticides are also major causes of water pollution (due to excess nitrogen or phosphates).

That is why, in 2015, supranational efforts such as the Paris Agreement emerged, involving several countries in establishing measures to reduce greenhouse gas emissions.



Governments are becoming more aware of how new technologies can be used to implement good practices. One of the cases is a project to promote clean and efficient energy in Mexico for agriculture and agribusiness, which allowed the demonstration of the economic feasibility of these efforts and that over 1,800 agribusinesses significantly reduced their net GHG emissions. The implementation of the Capacity Building Program for environmentally sound pesticide management in Uruguay demonstrated that it is possible to reduce herbicide use by up to 70% without reducing yield or increasing costs.

Emerging technologies have great potential in the industry to positively impact and benefit the environment. One of the various examples is through precision irrigation and how it encourages responsible water use. In turn, vertical farms contribute to more efficient land use, which decreases resource waste.



Some companies in the industry are striving to implement ESG modules integrated into their management systems in order to track and measure the impact of their activities on the environment using indicators. These investments will pay off in the medium run as regulators begin to put pressure on companies to report environmental, social, and governance factors.

IDB Invest has extensive knowledge and experience in sustainability and can advise and finance related projects that promote the use of clean energy and efficient use of resources.

New Business Models

In recent years, the agricultural industry has seen the emergence of a new wave of technological innovation known as AgTech (technology applied to the agricultural sector), which has encouraged the emergence of new business models.

In the region, it has grown from 64 digital projects in 2005 to over 450 in 2018, assuming an annualized growth rate of 16%, with the majority of initiatives concentrated in Brazil and Argentina (jointly accounting for 74%).

Three of the new business models that have emerged will be thoroughly addressed in the following section, particularly in terms of how they are enabled by new digital solutions.

NEW BUSINESS MODELS

E-commerce platforms: B2B to B2C

Food products pass through a number of players along the chain until they reach the end consumer. This meant that producers preferred to have fewer high-volume customers (processing companies or retailers) with less direct contact with the customer and less control over the product reached.

The shift from B2B (Business to Business) to B2C (Business to Consumer) models had a significant impact in the aftermath of the pandemic, when many businesses were forced to go digital in order to continue operations. Enabled by the increase in mobile penetration, the growth of the industry's e-commerce, and the arrival of digital payments, the agricultural industry's e-commerce platforms were born to sell and buy agricultural products digitally.

This entails establishing new links in the value chain, which will benefit the ecosystem. On the one hand, producers become acquainted with new technologies and digitize their business. They gain control over the product that reaches the customer, and the savings of the intermediary fees (they have a greater say in setting prices, and their bargaining power grows) can be reinvested in productive business improvements.

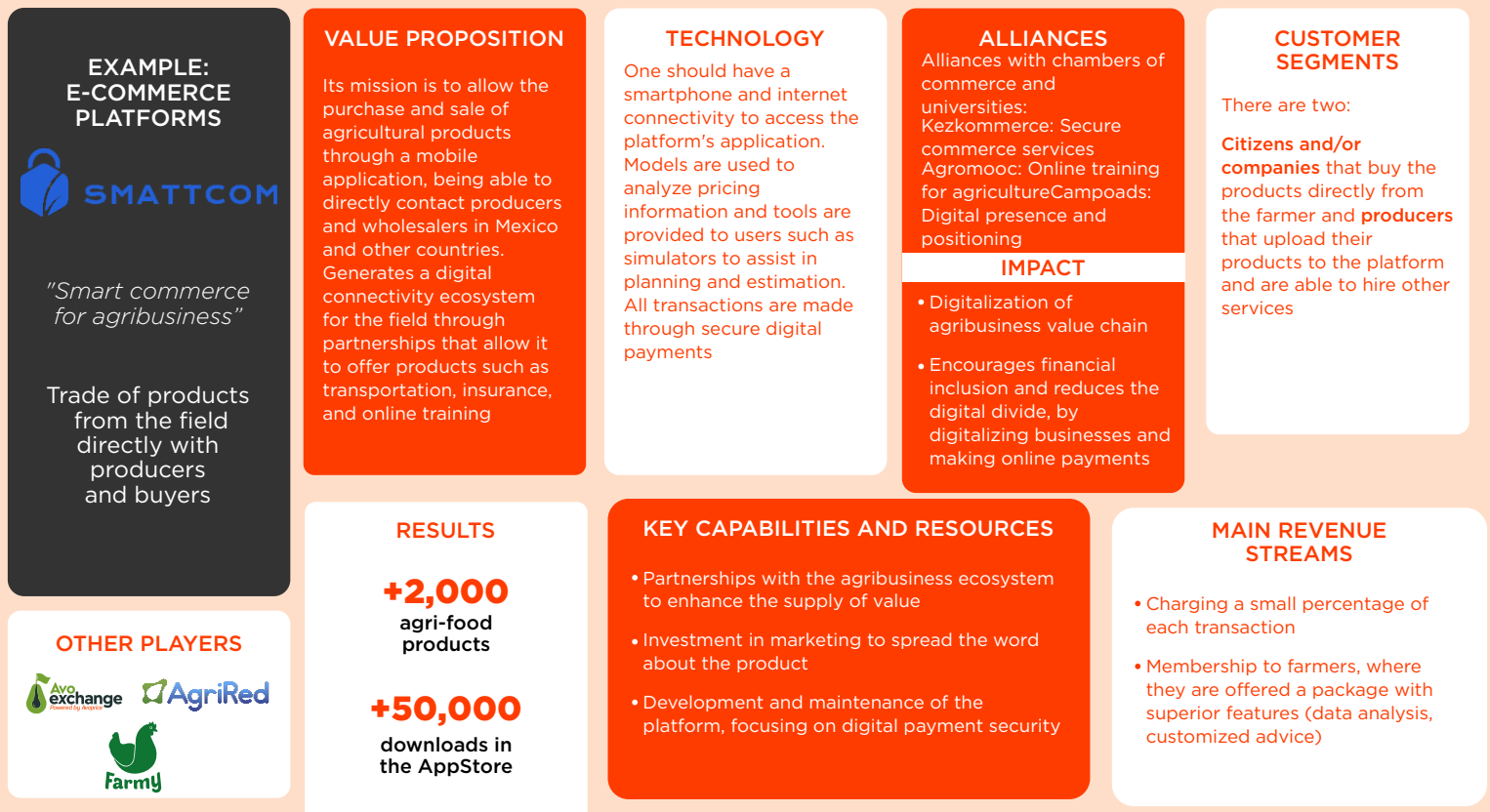


This type of digitalization has a clear impact on small and medium-sized farmers and customers. The former increase their income and, by accepting digital payments, can i) provide a direct channel of communication with the client and ii) build a digitized transactional history that facilitates access to bank loans, thereby promoting financial inclusion. Consumers benefit from fresh, healthy products that have not been manipulated along the supply chain, enhancing their overall experience.

Initial investment or the absence of digital skills can become an initial barrier for small and medium farmers. As a result, marketplaces are emerging, in which a company invests in all the necessary technological developments, and farmers increase their product offering, which is linked to demand via a platform. By digitizing the operation, data generated can be analyzed to set better prices or better understand customers.

Farming as a Service (FaaS)

The agricultural industry is typically associated with high initial capital investments in order to purchase land and animals, as well as inputs to begin the activity and face the productive cycles. Financing, as mentioned in the Challenges and Opportunities section, is a barrier that many small and medium farmers have to face.





New technologies have enabled technology companies to create platforms that allow for the partial consumption of resources. Farming as a Service models are a new business model that provides digital solutions or services to agricultural companies via a subscription or pay-as-you-go model. This means that the investment in technology or machinery is reduced, and it becomes an operating expense.

Farming as a Service will encourage agricultural process and product innovation, as well as the industry's technological transformation, by providing farmers with data capture tools and real-time analysis solutions. This is especially beneficial for small- and medium-sized producers because it allows them to boost the digitalization of their business by providing analysis tools and lower-cost access to machinery.

While this model is not yet well established in the region, the government of India, for example, is driving its development by providing credit to farmers, improving infrastructure, and promoting digital transactions. Some of the most important use cases and benefits for organizations are:

FaaS

Offers digital solutions or services for companies in the agricultural industry through a subscription or pay-as-you-go model

SOLUTIONS



CASE STUDIES

Proportion of technological equipment to collect information through drones and sensors

Information analysis or visualization tools (dashboards)

Education

Lease of machinery

Labor outsourcing

Providing transportation services

Connecting farmers with suppliers to purchase inputs

Connecting farmers with customers for product sales

Increases financial inclusion, thanks to the availability of digitized transactional data



Increases digital penetration, for example by allowing digital payments and collections

BENEFITS

Better trained farmers, with analytical tools, can make better decisions, increasing productivity



Promotes sustainable good practices such as improving water use and reducing carbon footprint

The development of this model requires digital connectivity and infrastructure. One of the primary benefits for farmers is that it provides digital solutions such as enterprise resource planning (ERP) and analytical capabilities, allowing them to make better decisions and increase productivity. Furthermore, the ability to lease machinery such as robots, tractors, drones, or any IoT device at a lower cost encourages them to use them, automating operations and allowing for better crop control and monitoring. Finally, having access to market platforms allows them to reach new customers and markets, increasing their revenue.



EXAMPLE: FARMING AS A SERVICE



"Farmer Business Network puts the farmer in control of the business"

Helps producers maximize their profit potential with data and technology, direct trade, a community and a sustainability platform

OTHER PLAYERS



VALUE PROPOSITION

Its mission is to boost the potential benefit of farmers through data and new technologies, offering them a wide array of solutions for their growth: purchase of inputs, financing, insurance, market strategy, and data-based analysis tools

TECHNOLOGY

It is mainly based on analytical tools, with a view to democratizing data to farmers. Has privacy and data security policies. Through the app, it provides visualization tools to support decision-making and help companies take a data-driven approach

ALLIANCES

Has a community where farmers partake, generating an ecosystem. It also invests in other agtechs

IMPACT

- Reduces costs of production
- Contributes to the digitalization of the industry

CUSTOMER SEGMENTS

Owing to the nature of their business, the main customers are farmers who want to avail of new technologies meanwhile minimize investments

RESULTS
+55,000
 farmers
4
 countries

KEY CAPABILITIES AND RESOURCES

- Customer growth and geographic expansion
- Maintenance and development of platform and app
- Capital need for direct loans and purchase of products they rent or sell

MAIN REVENUE STREAMS

Solution sales:

- **Shop:** sale of products
- **Financing and insurance:** loans, credit facilities, insurance, and advice
- **Market:** market advice, marketing, and brokerage services
- **Analysis:** tools to analyze data in a simple way along the entire production chain

The impact of climate change on crops, combined with population growth, raises the risk of having insufficient food for everyone, especially the most vulnerable. How can technological advances, in addition to increased productivity and efficiency, assist us in overcoming this challenge?

Biotechnology, which refers to any technological application that uses biological systems and living organisms or their derivatives in the creation or modification of products or processes for specific uses, is one solution. One example of its use is to produce crops that are more resistant to pests, diseases, or adverse conditions by avoiding the use of fertilizers and replacing them with microorganisms. This way, technological innovation allows for increased production and the production of healthier foods.

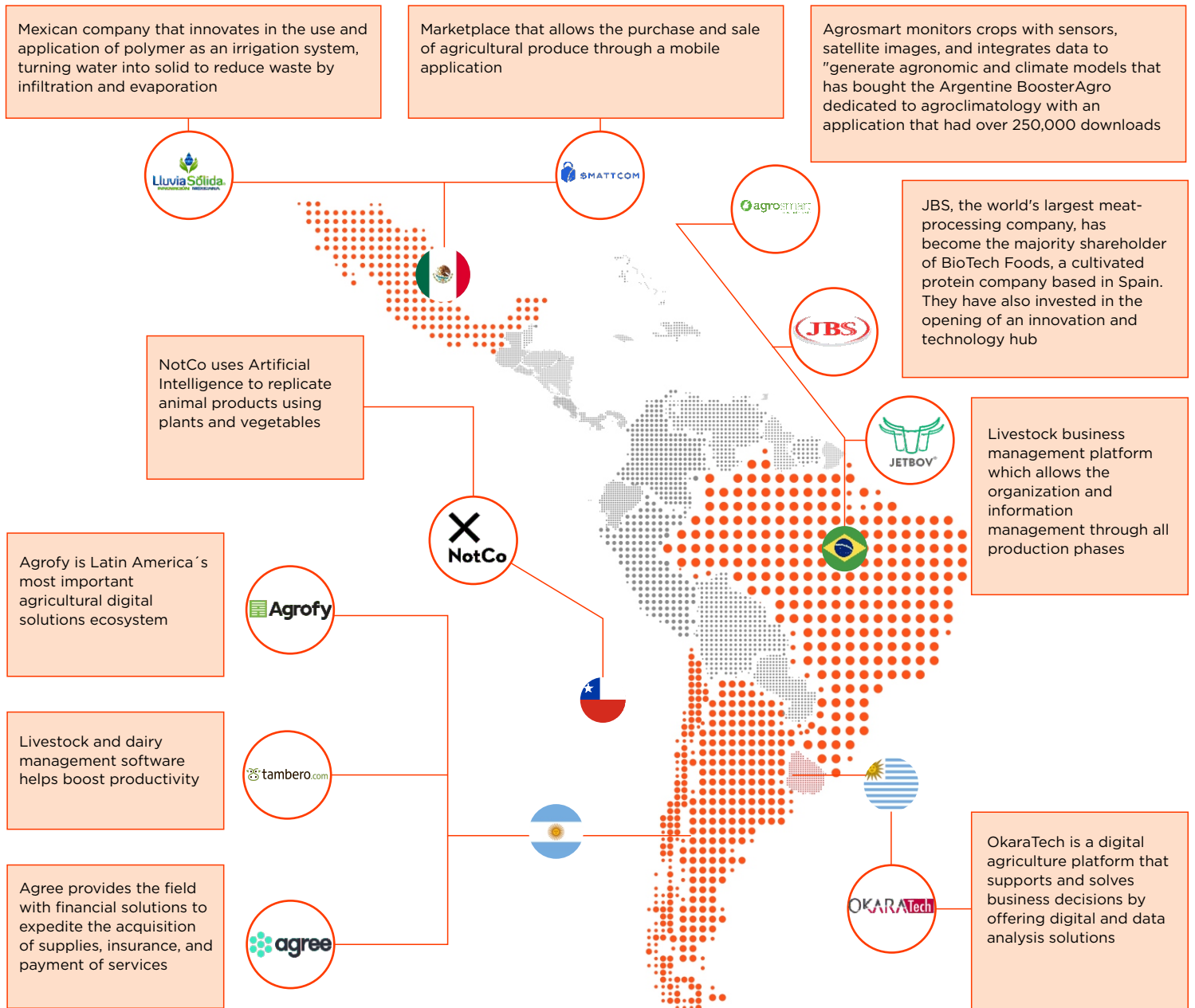


Another significant use of agricultural biotechnology is genetic manipulation, which involves the insertion, deletion, or modification of DNA sequences in order to introduce or modify a new characteristic. A possible example would be the crossing of two crops from different geographical areas, one of which is highly productive and the other highly resistant to weather conditions.

The goal of reducing hunger in developing countries through more productive crops and livestock can be achieved with the implementation of this technology. Furthermore, by reducing the need for chemicals, it will be possible to produce foods with higher nutritional value (better-fed populations) and with a lower environmental impact.



PLAYER MAP



CONTINUE THE CONVERSATION



idbinvest.org

 idbinvest.org/linkedin

 idbinvest.org/twitter

 idbinvest.org/facebook

 idbinvest.org/blog

Copyright © 2023 Inter-American Investment Corporation (IIC).

