

AGTECH & FOODTECH

2024



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INVESTMENT OPPORTUNITY

In the dynamic landscape of agricultural and food technologies, emerging markets and developing economies present a **promising frontier for innovative investment opportunities**. AgTech and FoodTech are reshaping the way food is produced, processed and distributed in regions facing unique challenges. With increasing global demand for sustainable and efficient food systems, emerging markets offer a fertile ground for investors to contribute to transformative changes.



Agricultural development is one of the most powerful tools to end extreme poverty. Growth in the agriculture sector is two to four times more effective in raising incomes among the poorest compared to other sectors.

— World Bank, 2023

HUGE MARKET WITH STRONG IMPACT PROMISE

The agricultural sector in emerging markets is a late technology adopter, representing a great opportunity for Ag- and FoodTechs, which benefit from rising internet and mobile phone penetration (GSMA, 2024). In many emerging markets, agriculture is a core contributor to GDP and the main source of employment (FAO, 2022 a). Technology can enhance agricultural productivity and make fragmented food value chains more efficient, providing a major social impact and solving some of the world's most pressing challenges.

SYMBIOTICS' AGTECH OPPORTUNITY

As a leading emerging and frontier market debt player, Symbiotics is exploring investments in the AgTech sector. Over the past three years, several Ag- and FoodTech companies have successfully secured equity, indicating growing interest in debt funding. This trend provides an avenue for Symbiotics to expand its product offering, including investment opportunities that benefit the environment by addressing challenges related to sustainable agriculture and climate resilience.

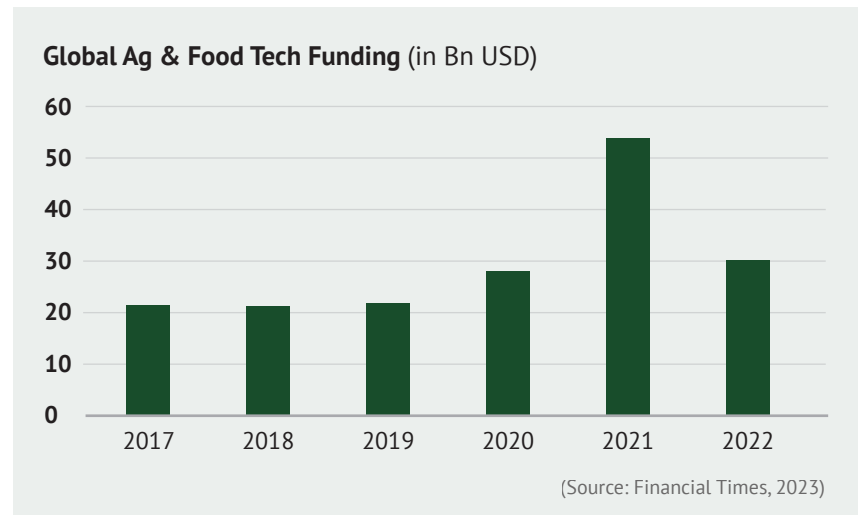
4 KEY INVESTMENT THEMES

AgTech business models can be classified based on their impact in the food value chain, resulting in four main investment themes: Pre-production, Production, Post-production and Ag-Fintech. AgTech investment prospects are vast, with opportunities being concentrated within Post-production and Ag-Fintech. Business models in these areas tend to be exposed to fewer risks than other investment themes, providing an attractive opportunity for Symbiotics Investments.

AGTECH FOODTECH GLOBAL TRENDS

Market environment

The agriculture and food sector in many developing countries exhibits common characteristics such as informality, a multitude of intermediaries and a lack of transparency. These conditions create an environment for technology to bring about transformative disruptions.



The Ag-FoodTech sector experienced a **significant funding surge**, which peaked in 2021 when investors injected a remarkable USD 51.7 billion—a substantial 85% increase from the previous year. The COVID-19 pandemic played a role in expediting the adoption of digital AgTech services, particularly in e-commerce (Agfunder, 2022). However, a subsequent dip occurred in 2022-23, coinciding with a global liquidity crunch.

The increasing penetration of mobile phones in rural areas is creating additional opportunities in agricultural technologies. This is particularly pertinent in regions dominated by smallholder farmers. For example, in Africa, smallholders account for 70% of the continent's food supply across an estimated 33 million farms. Despite their significant role, limited affordability hinders the adoption of high-end technologies, such as farm management software and sensing IoT (IFAD, 2023).



Limited regulatory framework for Ag- and FoodTech companies

Governments are strongly involved in the agricultural sector, given its significance in terms of employment for many countries. However, new technologies within the Ag-FoodTech space often fall within a regulatory grey area, lacking clear frameworks, especially regarding data protection laws. To fully harness the benefits of technology, there is a need to develop clear and transparent policies governing data ownership and sharing (FAO, 2023). As governments increasingly recognize the pivotal role of technology in addressing both food security and economic development, the formulation of effective and comprehensive regulatory frameworks becomes imperative.

Booming business models

Agri-tech business models that are booming in developed economies - such as biotechnology, alternative protein, sensing & Internet of Things (IoT), and farm robotics - are still nascent in most frontier markets. However, **technology has its own role to play in these geographies**, offering solutions focusing on midstream technologies, with marketplaces, mobile technology and Ag-Fintechs offering particularly strong potential.



Ag & Food Marketplaces

Ag- and Food-Marketplaces are the dominant business models arising in emerging markets in the Food- and AgTech sector. Online platforms have the potential to revolutionize the food supply chain. By connecting farmers directly to consumers, retailers and wholesalers, they help farmers bypass traditional intermediaries, reducing post-harvest losses and ensuring fairer prices. Additionally, these platforms provide a transparent marketplace, enabling farmers to make informed decisions about where and when to buy inputs and sell their produce.



Mobile Technology in Agriculture

Mobile Technology forms the basis for the operations of many Ag- and FoodTech companies, transforming traditional farming methods. In many developing countries, where access to traditional agricultural extension services may be limited, mobile technology plays a pivotal role in providing farmers with timely and relevant information. Mobile apps, SMS services and voice-based systems offer a cost-effective way to disseminate agronomic advice, weather forecasts, market prices and other essential information.



Ag-Fintech and Digital Payments

The integration of financial technology in agriculture addresses a significant challenge faced by farmers in developing countries—limited access to formal financial services. **Ag-Fintech** solutions include digital payment systems, microfinance and crop insurance offered through mobile platforms. These can empower farmers by providing them with financial tools to manage risks, invest in their farms and improve overall financial resilience.

IMPACT CHANNELS

The global food system faces substantial challenges, with population growth resulting in escalating demand for food. Meanwhile, agricultural productivity in many emerging markets remains limited, while supply chain inefficiencies contribute to food wastage (Global Yield Gap Atlas, 2024; Totobesola et al. 2022).

In response, Ag- and FoodTech companies are employing technology to enhance crop yields, reduce waste, facilitate transparency, lower costs, bolster resilience, and reduce emissions.

FARMING INCOME



In many emerging and developing economies, around half of disposable income is spent on feeding families, underscoring the importance of food affordability (USDA, 2022 a). Technology companies in the sector boost productivity, subsequently reducing food costs and augmenting farmers' income. Fintech firms support resilience within the agricultural sector by improving access to finance and insurance.



FOOD AVAILABILITY

AgTechs can increase the productivity of farmers by enhancing crop yields and improving resource efficiency. They optimize agricultural supply chains and contribute to transparent commodity markets.



SUSTAINABLE PRODUCTION

Technology plays a key role in enhancing efficiency throughout the food supply chain. With smart logistics, data analytics and traceability mechanisms, companies can actively leverage tech to contribute to sustainable consumption and production. This helps to minimize food waste and offers opportunities to integrate sustainable reporting in the production process.

Digital traceability can reduce annual food losses by

30M tons

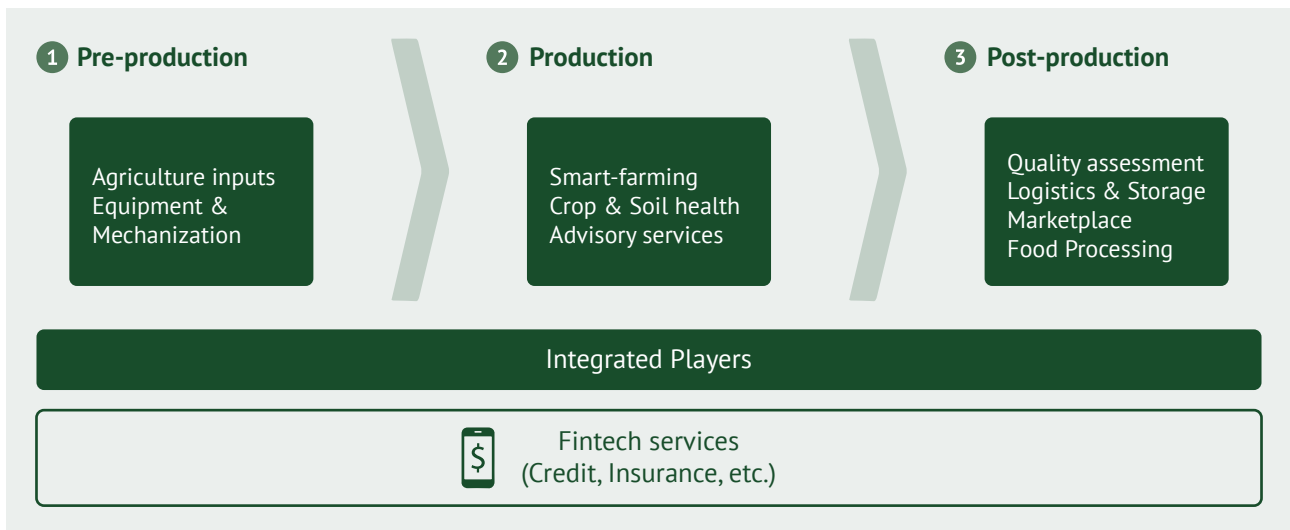
(World Bank, 2022)



Furthermore, Ag- and FoodTech companies positively impact a diverse range of other SGDs. For example, Aqua tech companies contribute to 'SDG 14 life below water' by promoting sustainable harvesting and management of fisheries. AgTechs can foster restoration of degraded soil by promoting sustainable practices, thus contributing to 'SDG 15 life on land'. Furthermore, smart farming practices (e.g., vertical farming) offer opportunities to reduce GHG emissions from agriculture and support 'SDG 13 climate action'.

INVESTMENT THEMES

Food- and AgTech companies can be classified by commodity type or their impact along the value chain, with different levels of granularity. Symbiotics Investments classifies business models based on the food value chain approach.



The **Pre-production** stage encompasses activities and technologies that occur before actual cultivation or food production. AgTechs can improve access to inputs like fertilizers, seeds and agrochemicals, as well as technical equipment, thus boosting agricultural productivity.

The **Production** stage involves core agricultural production activities, from planting and raising livestock to harvesting. Technologies and business models in this category focus on improving efficiency, yield and sustainability during the active cultivation or farming phase.

Post-Production activities occur after the primary production phase, focusing on processing, market access, distribution and marketing of agricultural products. The goal is to ensure efficient handling, preservation and delivery of food to consumers.

Various business models are dominated by **vertically integrated players**, which offer products and services at all three stages of the agrifood value chain. **Fintech services** also facilitate access to payments, credit and insurance along the food value chain.

Across the value chain, business models can also be categorized by product types. Ag- and FoodTechs focusing on staple foods, fruits & vegetables, dairy & cattle, aquaculture, poultry and fiber crops offer different solutions to players in the sector.

PRE-PRODUCTION

Examples



RATIONALE

Challenges

Businesses in the pre-production phase seek to address challenges like lack of access to necessary inputs, equipment, information and knowledge. Such issues are often caused by supply chain inefficiencies, limited access to information and unaffordable prices.

BUSINESS MODELS

Agri-Input Innovations

Most pre-production investment innovations relate to agricultural inputs such as seeds, fertilizers, feed and pesticides. AgTech companies like **AgriAku** (Indonesia), **Verqor** (Mexico) and **Agrofy** (Argentina) digitalize agro retailers and often make value chains more transparent and efficient. They take steps towards disintermediation by linking manufacturers to retailers directly. AgTechs also offer agri-input innovations based on biotechnology (e.g., breeding drought resistant crops) or specially developed organic fertilizers. For example, **Afrique Phyto Plus** (Cote d'Ivoire) promotes precision farming, including the use of drone sprayers.

Smart Farming Equipment

Many farming operations in emerging markets lack mechanization, resulting in low productivity (FAO, 2023). The introduction of advanced machinery and equipment to enhance farming operations, such as autonomous tractors and AI-powered harvesting machines, can benefit some large-scale farms in selected emerging markets. However, in the context of smallholders, AgTech companies offering more basic mechanization services have great potential to ease the lives of farmers, improve productivity and boost incomes. Companies like **Hello Tractor** (Nigeria), offering solutions to rent tech-equipment like tractors, can solve the issue of affordability for their smallholder farmers clients.

Main debt opportunities



Agri-input market place

AgTech startups in the pre-production phase frequently seek debt funding to manage inventory and address other working capital needs. The predominant investment prospects within this area are agricultural input marketplaces. These companies typically fall into the smaller scale category (Series A/B funding rounds). Despite the threat of political intervention and market price volatility with such investments, AgTechs remain interesting prospects as they can diversify their product ranges or use other mitigants to reduce such risks.

SPOTLIGHT



Tarfin Tarım AS

 Turkey

 Creation 2017

 Series B

 Quona, Collective
Spark Fund

Symbiotics Investee

PRE-PRODUCTION

Company Overview

Tarfin acts as a financing intermediary between farmers and retailers. The AgTech was established by a local entrepreneur to provide Turkish farmers access to farm inputs with competitive financing terms.

Tarfin has obtained sale licenses for seeds, feeds and fertilizers from the Ministry of Agriculture to provide farm inputs with extended payment conditions. The company's mobile app allows farmers to shop online and find the best prices, thus offering the potential to change the market.

Impact

Turkey's agricultural sector is among the top-10 in the world, with half of the land in the country being used for farming and nearly a quarter of the population being employed in the industry (ITA, 2024).

Tarfin was founded with the premise that technology and data analytics can facilitate access to agri-inputs and financing, helping farmers improve yields and reduce costs. The Ag-fintech mainly targets smallholder farmers, who remain vastly underserved by banks and represent the backbone of Turkey's agri-sector (UNDP, 2022).

Turkey's Agri sector
is among
TOP 10
worldwide

SDGs



PRODUCTION

Examples



RATIONALE

Challenges

Farmers in emerging markets often have insufficient information available (e.g., on environmental factors, soil and crop health) to make well-founded production decisions (Ordu et al. 2021; Baskaran-Makanju et al. 2021). Producers typically have access to limited technological support, negatively affecting efficiency (Goedde et al. 2020).

BUSINESS MODELS

Digital advisory services

AgTechs provide data-driven advisory services and agricultural extension services through digital platforms. For example, mobile apps and SMS services offer real-time weather updates, as well as advice on pest management and best agricultural practices. Enhanced access to information can bolster crop management, with **iCow** (Kenya) offering SMS-based advisory services to farmers to support improvements in agricultural practices.

Smart farming and precision agriculture

Smart farming operations are leveraging technology, data and analytics with the aim to optimize resource usage. IoT-based crop monitoring or early disease detection, as well as satellite imaging for precision farming, have the potential to make agricultural production more efficient. Digital farm operating systems from companies like **Solinftec** (Brazil) use sensors and AI-powered software to provide customers with real-time, in-field data on crops, equipment, weather conditions, etc.

Other AgTechs like **Victory Farms** (Kenya) are building commercial tech-enabled farms that can enhance sustainability and productivity of farming operations. Such farms leverage technology like smart, sensor-based irrigation systems to optimize water use in agriculture and vertical farms to grow crops in controlled environments.

Main debt opportunities



Software digital farming services



Tech-enabled, diversified farms

Companies offering digital farming services with a core business model based on Software as a Service “SAAS” require debt to finance working capital. These AgTechs offer solutions to tech-enabled farms addressing climate and biological risks. Smart farms need debt funding for machinery, sensors and irrigation. Given their exposure to climate, market, regulatory and biological risks, robust mitigation strategies are essential.

SPOTLIGHT



Victory Farms

📍 Kenya

📅 Creation 2015

💰 Series B

📈 Acumen, DOB
Equity, Endeavor

Symbiotics Investee

PRODUCTION

Company Overview

Victory Farms, established in 2015 and based on Lake Victoria, Kenya, is Sub-Saharan Africa’s fastest growing fish farm (DOB Equity, 2020). Operations are vertically integrated, including breeding facilities and a sales depot in Nairobi. The company has over 80 branches in East Africa and recently expanded into Rwanda.

The company’s mission is to build commercial fish farms, providing affordable, accessible and healthy protein to millions of consumers in East Africa. Victory Farms is working towards becoming a fundamentally sustainable fish farm.

Victory Farms uses advanced aquaculture practices from around the globe to sell fresh tilapia fish in low-income Kenyan neighborhoods daily (ARAF 2021; DOB Equity 2020).

Impact

Using data, the AgTech has built efficient operations, allowing the company to lower the cost of fish, reduce food waste and implement sustainable harvesting practices (Conservation International 2024; The Farmer’s Journal, 2023).

SSA’s
Fastest growing
fish farm

SDGs



POST-PRODUCTION

Examples



RATIONALE

Challenges

Food value chains suffer from weak infrastructure and heavily fragmented supply chains. This results in a wide range of inefficiencies related to leakage, wastage, multiple intermediaries and a lack of transparency (Chauhan, 2020; Kumar, 2020).

BUSINESS MODELS

Digital advisory services

The most prevalent Food-/ AgTech business model in emerging markets is platforms that connect farmers, consumers, retailers, wholesalers and restaurants, while reducing dependence on traditional intermediaries. Marketplaces improve access for farmers, reduce post-harvest food losses and increase price transparency. Many companies are integrated, offering additional services beyond the marketplace. For example, ProducePay (Mexico) offers financial services, Farmerline (Ghana) offers advisory services and Arado (Brazil) offers prediction and inventory management tools, while vertically integrated players operate proprietary farms like Twiga (Kenya).



Smart farming and precision agriculture

Other companies seek to improve food supply chain efficiency via tech-enabled storage, warehousing, cold chain logistics, blockchain traceability, and predictive inventory management analytics. For example, Solarfreeze (Kenya) offers solar-powered fridges to reduce post-harvest losses.

Food Processing Technologies & Circular Economy

Food and agricultural processing and preservation increasingly involves technologies such as solar drying and advanced food processing machinery. Business models promote sustainability by minimizing waste and utilizing by-products. SAEL (India) uses agricultural waste to produce bioenergy, while Inseco (South Africa) converts low-value organic by-products and utilizes sustainable insect ingredients.

Main debt opportunities

-  B2B marketplace
-  Agricultural product processing

Post-production accounts for most investment opportunities (typically Series B-D), while the scalability of digital food marketplaces is attracting equity investors. B2B marketplaces mainly require debt for working capital and are exposed to less risk than companies involved in pre-production and production. Impact opportunities are also provided by food processing companies, which typically require debt for CapEx for production facilities.

SPOTLIGHT



Arya

📍 India

📅 Creation 2013

💰 Series C

🌱 Asia Impact, Ouona

POST-PRODUCTION

Company Overview

Arya helps hundreds of thousands of farmers to store and sell their produce and secure credit. The Indian AgTech supports farmers with warehousing, financing and a commerce platform for grain produce. With 11,000 warehouses, enabling the storage of commodities across 21 states, Arya links smallholder farmers with nearby storage facilities, prolonging the shelf life of produce and reducing wastage.

The company works with banks and non-banking financial institutions to help farmers secure loans, allowing them to get back to work while their produce is sold.

Impact

Post-harvest value chains in India are plagued by inadequate storage and warehousing facilities, resulting in the spoilage and wastage of agricultural produce. Professional storage by Arya helps to reduce crop wastage and thus increase overall food availability. Arya also helps farmers secure higher selling prices as they do not need to sell immediately post-harvest to increase cash flow (Omnivore, 2022).

58%

of Indian population
is dependent on **agriculture**
(Sharma 2022)

SDGs



AG-FINTECH

Examples



RATIONALE

Challenges

Smallholder farmers often struggle to access finance due to factors such as limited collateral, lack of credit history and high transaction costs for lenders. Given the small scale of their operations, traditional lending institutions are hesitant to provide loans. Unpredictable weather conditions and agricultural risks can make it difficult to mitigate risk via insurance. Additionally, smallholder farmers are often unable to demonstrate their capacity to repay loans, further hindering access to financial services (IFC 2014; Macqueen et al. 2018).

BUSINESS MODELS

Fintech in Agricultural lending

Financial technology solutions address the unique financing needs of farmers. AgTechs and Fintechs can leverage alternative data sources such as satellite imagery, weather data and farm management information to assess the creditworthiness of smallholder farmers. This can help to overcome the lack of traditional credit histories and formal documentation. AdeAgro (Brazil) has developed a credit application that uses satellite imagery and AI to estimate future and past grain production for rural properties.

Insurtech

Fintechs can collaborate with AgTechs to develop weather index-based insurance products. These products use weather data to trigger insurance payouts automatically when predefined adverse weather conditions occur, providing farmers with timely compensation for crop losses. Insurtech operator Pula (Kenya) offers crop insurance to smallholder farmers in emerging markets. Satellite technology and data analytics are used to assess and manage risks, providing affordable insurance options for farmers.

Main debt opportunities



Digital Lending

Ag-Fintechs are active across all three stages of the food and agricultural value chain. Such companies seek debt funding to facilitate loans for players along the value chain, including smallholder farmers and agricultural and food traders. Additionally, debt funding is essential for providing complementary services, such as leasing agricultural machinery or factoring post-harvest activities.

SPOTLIGHT



ProducePay

Mexico

Creation 2014

Series D

IFC, IDB, Rabo Frontier

AG-FINTECH

Company Overview

ProducePay offers financing solutions to fruit and vegetable farmers during pre-production to purchase inputs and lease land, and post-production via transaction-based funding. Besides financing, the AgTech also offers a marketplace connecting producers to international and local buyers. Growers can access real-time pricing data and market insights and use ProducePay's customs clearance and warehousing services. In turn, buyers gain access to more growers and receive fresh produce more efficiently.

Impact

The fruit and vegetables market is capital-constrained, opaque and fragmented (ProducePay, 2024). ProducePay seeks to disrupt this traditional market through its online platform, where farmers can access financing and connect with reliable counterparts while enhancing transparency and fair trade. This simplified and empowering approach is helping to eliminate economic and food waste.

Significant
Fresh produce industry to transform

SDGs



SECTORAL ASSESSMENT

30%

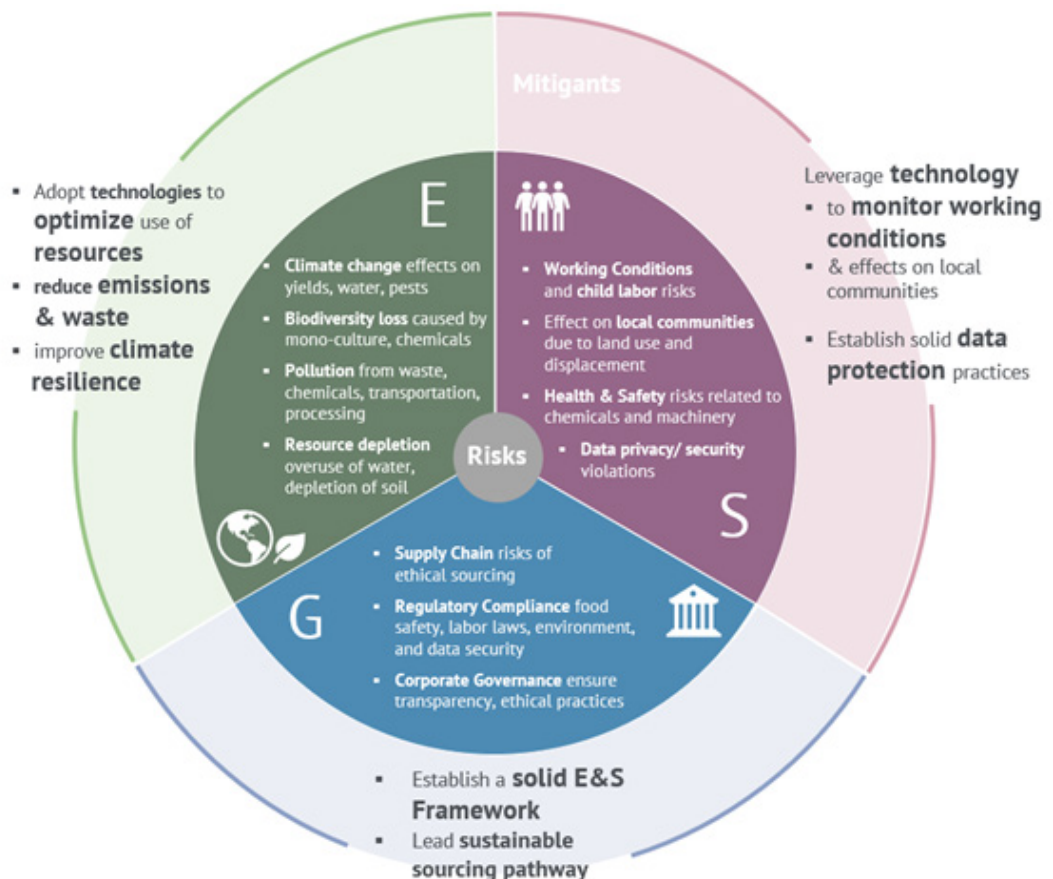
of global man-made **GHG** caused by **agriculture & food** industry

(FAO, 2022 b)

ESG Assessment

Environmental, Social and Governance “ESG” performance is increasingly important for food and agriculture companies. Environmental and Social risks are a major concern within the food and agriculture industry, which accounts for around one third of human-caused greenhouse gas emissions. Furthermore, an overapplication of chemicals and monocultures can cause biodiversity loss, while agricultural production often involves harsh working conditions and sometimes child labor (FAO, 2021).

However, AgTech companies can **leverage technologies** with the potential **to mitigate various risks**, offering solutions to transition to more environmentally and socially sustainable agriculture.



Ag- and FoodTechs can offer **solutions**

For example, digital food marketplaces like Sabi (Nigeria) use traceability systems to monitor that their products on offer are produced sustainably. Data-driven precision agriculture technologies are used by companies like Fasal (India) to help reduce water usage, application of pesticides and the carbon footprint of agricultural production.

However, a thorough E&S assessment of any Ag-/ FoodTech investment is necessary to avoid social or environmental harm.

INVESTMENT RISK

The wide range of risks arising within the four main investment themes can broadly be classified based on the following metrics, developed by Symbiotics Investments:

Investment Themes			
Risk categories	Pre-Production 🏠	Production 🏭	Post-Production 🏡
	High	High	Low
	High	High	Low
	Medium	High	Low
	Low	High	Low
	Medium	High	Low
	Medium	Medium	Medium
	Medium	Low	High
	Low	Medium	High

Pre-production AgTechs face risks related to political interventions (e.g., subsidized fertilizers lead to price dumping) and market sensitivity (e.g., inputs experience high price volatility).

In the **Production** phase, AgTech companies encounter the highest risk exposure. In addition to price volatility and regulatory risks, they are also exposed to climate-related risks, biological risks (e.g., pests and diseases) and resource-related risks (e.g. water scarcity).

Post-production entities, particularly those operating digital marketplaces, face supply-chain and infrastructure risks. They also bear more responsibilities and risks related to ensuring food safety and quality.

However, Ag- and FoodTechs often use technology to reduce risk exposure. For instance, IoT-based monitoring not only detects diseases but also facilitates **predictive analytics**, enabling proactive measures to be taken. Controlled environment agriculture and advancements in precision farming help to improve **resource efficiency**, while **digital traceability** can be used as a warning system to prevent supply chain disruptions. In addition to technology, Ag- and FoodTech companies also use product **diversification** and **vertical integration** to reduce operational risks.



LEADING EMERGING COUNTRIES IN AG- AND FOODTECH INNOVATION

ASIA

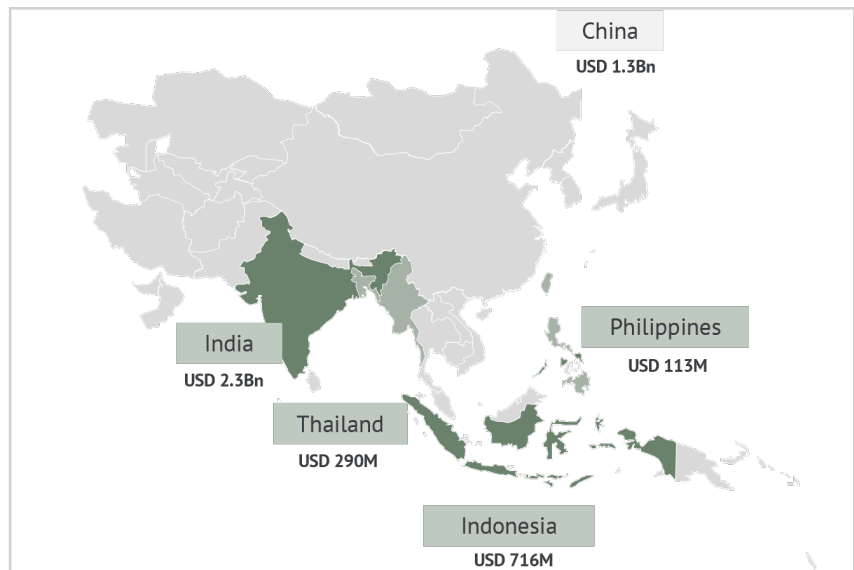
USD 4.9Bn

Ag-/ FoodTech

funding raised in 2022

(AgFunder, 2023 b)

Key players



Asia is the is leading in the emerging markets Ag-/ FoodTech sector, raising significantly more funding than LATAM, SSA and MENA. There is a steady increase of debt and early-stage deals, with popular investment opportunities including Marketplaces (e.g., DeHaat, Jai Kisan, AgriAku) and Biotech (e.g., Absolute).

LATAM

USD 2.4Bn

Ag-/ FoodTech

funding raised in 2022

(ForwardFooding, 2023)

Key players



LATAM has a very heterogenous Ag- and FoodTech landscape. For example, Brazil is the fourth largest producer and second biggest exporter of food in the world, while production in other countries is dominated by smallholder farmers. Marketplace and Food delivery (e.g., iFood, Jüsto, Trela, ProducePay), Ag-Fintechs (e.g., Agrolend, Traive, A de Agro) and Conservation (e.g., Re.green) are the dominant business models in the region.

SSA & MENA

USD 1.3Bn

Ag-/ FoodTech

funding raised in 2022

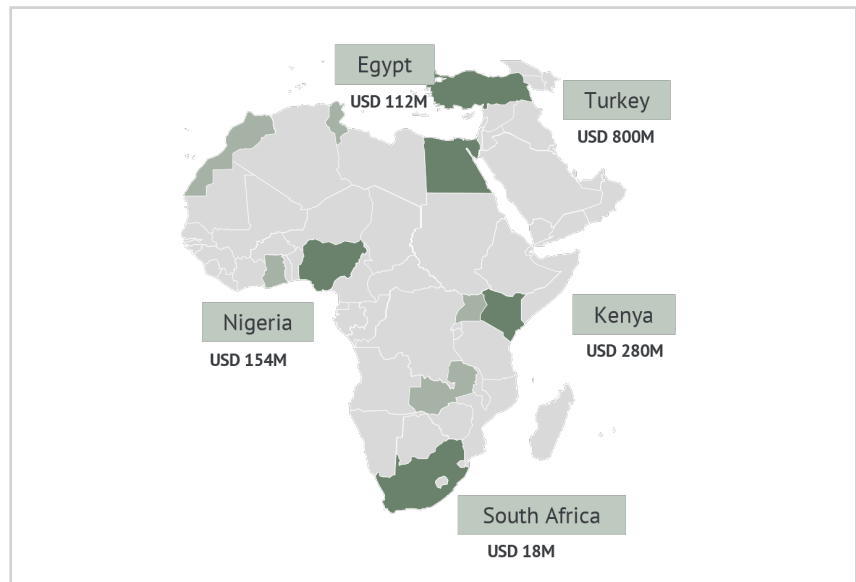
(AgFunder, 2023a)

Key players

Sabi

WASOKO

ThriveAgric



The Ag- and Food sector employs around 70% of the African population and offers significant potential for efficiency gains. Food and agriculture marketplaces (e.g., Wasoko, MaxAB, Sabi etc.) are clearly the leading business models in MENA & SSA, followed by tech-enabled Agribusiness (e.g., Apollo Agriculture, ThriveAgric) (AgFunder, 2023a).

Despite attracting the least funding in the AgTech sector, the region offers vast growth potential. While agriculture accounts for a quarter of Africa's GDP, it receives only 5% of Global AgTech funding, with an estimated annual financing gap of USD 80 billion (AgFunder News, 2023).

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