

# A renewed focus on AgTech



BIL GROUP INVESTMENT OFFICE | JUNE 2022

***The number of people on Earth is projected to reach almost 10 billion by 2050. One of the biggest challenges we face is feeding the world's population in a sustainable way given our planet's finite resources. We believe that an AgTech boom will be key in bringing greater efficiency, security and sustainability to global food systems moving forward.***

## AGTECH AS AN INVESTMENT

While AgTech is still a relatively nascent industry, we believe that ultimately, technological disruption in the agricultural sector is both vital and inevitable. Several forces will serve as tailwinds for industry growth including:

- Changing consumer habits, especially amongst Millennials, increasing demand for the solutions that AgTech can offer such as traceability and nutritional quality
- Increasing focus on food security and localised production in response to the pandemic and the conflict in Ukraine
- Climate change and the necessity to sustainably manage our finite resources

Already, start-ups in this field - which typically had to rely on an acquisition by a larger corporation - are garnering attention in public markets, especially amongst venture capitalists.

At the same time, AgTech might be poised to receive increased public funding.

All United Nations Member States have signed up to the UN's 17 Sustainable Development Goals as part of the 2030 Agenda for Sustainable Development. Achieving the second

goal, that is, to “end hunger, achieve food security and improved nutrition and promote sustainable agriculture” will be extremely challenging if governments don't harness the power of technology.

We are also beginning to see regional initiatives. For example, the Agriculture Innovation Mission for Climate led by the US and the UAE, has kicked off an \$8 billion effort to make farming cleaner and more efficient, focusing on investments in AgTech.

At national level, the world's second-largest economy, China, has identified agricultural machinery and technology as one of 10 priority sectors in its Made in China 2025 plan.

## CONTEXT

Food security emerged as a concern amid the Covid-19 pandemic which disrupted crucial supply chains and cross-border migration, leading to a shortfall of seasonal agricultural workers in various regions. The reality of supermarket shelves bereft of certain fresh produce and kitchen basics like pasta highlighted just how fragile our current “just in time” food systems are.

Fast-forwarding to 2022, the ongoing conflict in Ukraine is reiterating the topic of food security and already, certain products like flour are subject to rations in some European supermarkets. Ukraine, often coined the “breadbasket” of



Europe, is a key producer of corn, wheat, grains, fertiliser and cooking oil. Russia, which is now subject to stringent sanctions, is also an important producer of various hard and soft commodities including potash (an essential nutrient for growing crops). With exports from these two countries highly uncertain, concerns are growing about the availability of certain produce moving forward.

Concerns about food security play out against the broader issue of climate change. Deforestation, soil erosion, droughts, and flooding are just some of the most pressing issues which threaten arable land and critical natural resources. This year, India experienced its hottest March on record, causing wheat yields to potentially slump by as much as 50% in some pockets of the country, according to Bloomberg.

The current crisis has led to high food inflation, leaving many emerging markets facing acute shortages. Even in the UK, a recent Ipsos survey found that a quarter of Britons are skipping meals due to higher costs.

Given the emergency at hand, governments have resorted to short-term, firefighting solutions. For example, the European Commission has paused farming laws, temporarily allowing

farmers to grow crops on the almost 6% of EU agricultural land that is set aside to boost biodiversity.

But such measures are a band-aid. Moving forward, we expect to see food security move up political agendas. This topic was already a key discussion point at this year's World Economic Forum in Davos

Managing our finite resources in an efficient way is increasingly crucial. We believe that an AgTech boom will be key in helping to achieve this, allowing for global food systems that are fairer, more secure and more sustainable.

## WHAT IS AGTECH?

Agriculture technology, or "AgTech", is the use of technology in agriculture, horticulture, and aquaculture with the aim of improving yield, efficiency and profitability. At the same time, given that agriculture is a significant contributor to anthropogenic global warming (largely from the emission of greenhouse gases like methane and nitrous oxide), AgTech could also be an important tool in climate change mitigation.



*AgTech has the potential to transform food systems, strengthen cooperation along the value chain, lower costs to scale, accelerate innovation, and increase sustainability.*

AgTech is still a nascent industry as farmers have been slow to adopt new technologies. There is also some ambivalence from consumers about alternative ways of producing food. However, skepticism also initially surrounded electric vehicles. As of today, thanks to technological progress, it is safe to say that the days of the internal combustion engine are now numbered.

## APPLICATIONS

AgTech has the potential to enhance the entire food chain, from source to the dinner table. It has a multitude of applications, some of which are:

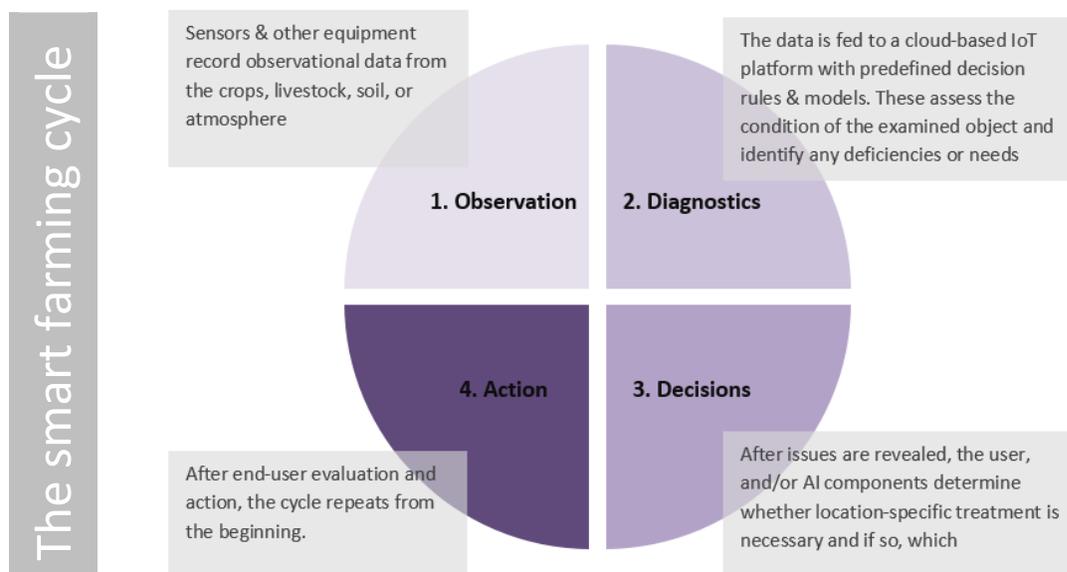
### Smart Farming

While the concept of computerisation in farming has been around for a while now, it is being supercharged by the advent of the Internet of Things (IoT). With this, a series of interconnected devices communicate with each other and gather large amounts of data which can then be interpreted using AI. As a result, the farmer is able to monitor field conditions, the wellbeing of livestock and make strategic decisions in real-time - and even from a remote location.

One particular benefit of this is **precision farming**. Precision farming makes agricultural processes data-driven and brings a whole new level of control, leaving much less to chance. Armed with so much data, farmers and their intelligent machines don't make decisions about an entire field or flock; they can make them by the square metre or by individual plant or animal.

For example, using **smart sensors** to measure variations in a field, farmers can use pesticides and fertilisers (a key source of nitrous oxide) selectively, rather than taking a broad-brushed approach. Crop infection is a persistent challenge, with every outbreak taking a toll on crop yields. While agrochemical treatments are available, applications done too frequently raise ecological, safety and cost concerns; the opposite could lead to outbreaks. With the help of sensors and a machine learning platform, data on external weather and soil characteristics reveal valuable insights into the risks of pests and fungi. Leveraging this information, farmers can apply treatments exactly when needed to ensure a healthy crop at the lowest chemical expense.

Farmers can also monitor soil quality and test its suitability to different crops. This enhances how the farming sector works, reducing errors and improving efficiency. In Indonesia, remote sensors have been used to automatically assess the growth rates of rice paddies.



Farmers can also use such granular data to adjust the nutrition of a specific animal, thereby preventing disease and enhancing herd health. Sick animals can be quickly identified and separated from the herd to prevent the spread of disease

### Smart Greenhouses

Typically, in traditional greenhouses, environmental variables are adjusted manually or by a proportional control mechanism. This can lead to production loss, energy loss and increased labour costs.

Smart greenhouses, powered by IoT technology, intelligently monitor and control environmental parameters using a network of sensors. The data is then stored in a cloud-based platform for further processing in relation to the needs of individual crops or plants, with minimal manual intervention. The result is essentially an automatically regulated environment for crop production. This means crops have less exposure to adverse weather conditions and pests. Farmers, on the other hand, have full, real-time visibility on variables such as lighting, irrigation, humidity, temperature...

Linked to smart greenhouses is the concept of **vertical farming**. This entails growing food on several levels in a stacked fashion leading to water and land conservation and a reduction in chemicals used. Thanks to smart greenhouses, a geographically small country like the Netherlands is among the most significant agricultural exporters in the world.



Vertical farm in Bavaria

### Autonomous tractors

A driverless tractor is in essence a lot less risky than a driverless car: In a field, has no pedestrians or other vehicles to manoeuvre. Further, using GPS technology, farmers can set up **geo fences** that keep tractors on course and automatically shut them off if they go out of bounds. Autonomous tractors reduce reliance on manual labour and the machines can work 365 days per year, morning, noon or night.

### Geofencing

Geofencing has various applications. On one hand, if farmers attach GPS collars to their livestock, not only can they always know their location, they can also receive an alert if they cross a designated GPS boundary (the geo fence). On the other hand, if a field has just been sprayed with (harmful) insecticide, it's possible to create a geofence boundary around the field. If an employee crosses a boundary, a smartphone app will generate an alert warning them of the danger.

### Smart Irrigation

In the US, the Environmental Protection Agency (EPA) estimates that about 50% of water used for outdoor irrigation is wasted through evaporation, wind, or runoff due to overwatering. Smart irrigation systems are a combination of advanced sprinklers with nozzles that improve coverage and controllers that automatically adjust watering to optimal levels. **Moisture-based irrigation systems** use sensors to measure the moisture content of the soil, while **weather-based smart irrigation** involves either a mini on-site weather station or weather sensor capable of monitoring conditions such as temperature, rainfall, and solar radiation. Alternatively, this information is broadcast to the irrigation controller from a remote weather site. In a context of water shortages and droughts in some parts of the world, smart irrigation is an effective way to increase water usage efficiency in line with sustainability goals. Meanwhile, plant health is maximised with optimal soil moisture conditions.

### Agricultural Drones

Drones can have multiple uses in agriculture including crop health assessments, crop monitoring, crop spraying with precision, planting, as well as soil and field analysis.

In a nutshell, drones can help take the guesswork out of the growing process. Remote sensing technology picks up radiation on the ground, allowing it to track variables such as the physical characteristics of the terrain to the amount of

heat an area gives off. The data captured can improve efficiency, allowing better use of resources and more localised applications.

Drones also allow farmers to spray their fields with precision. Over-spraying in one place can entail extra costs and potentially decrease the quality of the yield. Too low a concentration, however, can leave crops vulnerable to weeds and pests, or malnourished, potentially decreasing the yield rate. Specific farming drones can distribute agrochemicals evenly and efficiently, potentially bringing enhanced crop quality and a higher yield rate without intense manual labour.

### Satellites

Satellite imagery can be used for plot visualisation, as well as to observe the evolution of biomass and thus provide information on crop health and growth in real time. Satellite imagery makes it possible to cover large areas with a more regular revisit rate than imagery by drone or plane.

Satellite monitoring technology could help identify areas of fertile land and the protect the most productive terrain by preventing situations such as overgrazing. This could be a powerful tool in boosting local production in places like Africa which are heavily dependent on grain imports.

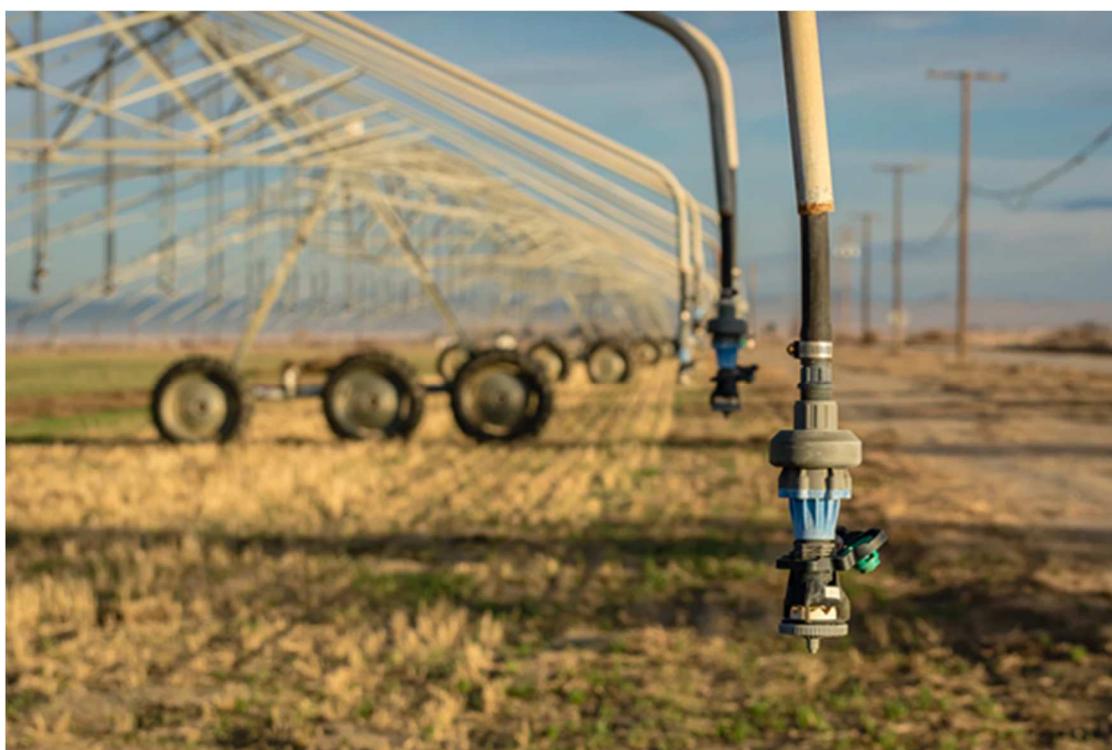
In India, satellites have also enabled agri-traders to estimate state-by-state wheat yields thirty days ahead of harvest,

giving them an advantage in terms of procurement and storage plans. Also, in India, insurance companies have started using satellite imagery to assess the extent and intensity of crop damage when resolving payment claims.

### Blockchain-based traceability

Over the past decades, the food supply chain has been well-integrated on a global scale. However, since rules and regulations are not uniform across borders, it is important to track the origin of our food. Technological tracking through the use of **sensors**, **smart labelling** and **blockchain** technology, can increase the level of control and sanitary monitoring. Sensors might even be used to ascertain whether a product is truly “bio” through soil analysis. Beyond health and safety, tracing technology can also be used to enhance transparency and better assess compliance with ethical farming rules, for example, those set out by the European Union, as it allows authorities to pinpoint the origin and the conditions of the agricultural production process.

Blockchain technology is increasingly being proposed to bring about trust and transparency to arrive at a fair and sustainable food system. In the chocolate industry, for example, the first blockchain shared-value chocolate bar went on sale in the UK. This allows customers to know exactly who grew the cocoa and ensure they were fairly paid. By



Centre-pivot irrigation system in Southern California. According to NOAA (National Oceanic and Atmospheric Administration), as of mid-July, 2021, 89% of the U.S. West was in drought and 25% was in exceptional drought conditions.

scanning a token on the packaging with a smartphone, the consumers can also help the farmer buy another cocoa tree.

An additional benefit of such technology is that it also allows chocolate connoisseurs to know the exact origin of the beans (terroir), which hugely influences taste. Of course, this can be applied to various products such as wines, olives oils, coffee beans, and could even be used to guarantee quality labels such as “IGP” and “AOP”.

### Biotechnology

AgTech is also playing an important role in upgrading chemicals (namely fertilisers and pesticides) used in agriculture, making them more effective and less harmful to the environment and humans. The biochemical balance is important: while the use of chemicals starting in 1960 delivered quick success and large yields, negative environmental side effects were only discovered later. Scientists recently noted that chemicals found in pesticides might even be exacerbating the obesity crisis, as they create toxins called “obesogens” which can affect how the body controls weight.

Using advanced technology, biochemical companies are now prioritising the development of bio-pesticides which do not have the same negative externalities. This brings lower toxicity, better biodegradability, and less post-harvest contamination. This is a space where the potential is huge, especially given increased consumer awareness about health.

### Technology enabling Plant-Based Foods

As the world gets more prosperous, the burgeoning middle class in Emerging Market countries is consuming more protein. Since livestock and meat production is cost-intensive and produces significant greenhouse gases (carbon dioxide and methane), meat alternatives are also becoming increasingly essential if we are to meet sustainability goals. Plant-based meat is emerging as an environment-friendly substitute, requiring less energy, land and water to produce.

However, the taste, texture, and appearance of many plant-based foods needed improvement to gain greater acceptance from consumers. With the use of new technology, things are moving in the right direction.

Extrudable fat technology mimics animal fat in plant-based meats, allowing for more authentic fat textures, such as marbling. The technology allows producers to run fat through an extruder and then combine it with protein to create a



Smart labelling and blockchain technology allow greater transparency from the bean to the bar in the chocolate industry.

more refined ingredient where the fat and the protein are physically linked together. By balancing the relationship between fat and protein in a way that mimics a marbled piece of meat, such as beef, the result is better flavour release, texture, taste, and moisture retention.

## CONCLUSION

AgTech is a compelling investment theme given that it is strongly linked to the two secular themes that are shaping the future - digitalisation and sustainability. At the same time, it is associated with ensuring one of our most basic needs as human beings: food. In order to feed the Earth’s growing population, while facing the challenges posed by climate change, the agricultural sector is due a 21st century makeover.

Let’s see if a unicorn of the agricultural sector emerges to accelerate the adoption of AgTech, similar to the way in which Tesla catalysed a sea-change in the automotive industry. There isn’t such a company yet, but there are many emerging that might eventually answer this call.

## AUTHORS

**Jade Bajai** – Investment Strategy Communication Manager

**Soner Kistak** - Senior Investment Advisor

## SOURCES

[https://www.un.org/en/development/desa/population/events/pdf/other/21/21June\\_FINAL%20PRESS%20RELEASE\\_WPP17.pdf](https://www.un.org/en/development/desa/population/events/pdf/other/21/21June_FINAL%20PRESS%20RELEASE_WPP17.pdf)

[https://www.eib.org/attachments/thematic/feeding\\_future\\_generation\\_en.pdf](https://www.eib.org/attachments/thematic/feeding_future_generation_en.pdf)

<https://www.mta.org.uk/system/files/resource/downloads/Made%20in%20China%202025%20Booklet%20One.pdf>

<https://www.foley.com/en/insights/publications/2022/02/what-driving-increasing-investment-agtech-sector>

[https://ec.europa.eu/info/research-and-innovation/research-area/environment/bioeconomy/food-systems/food-2030\\_en#:~:text=Food%202030%20is%20the%20EU's,is%20fit%20for%20the%20future.](https://ec.europa.eu/info/research-and-innovation/research-area/environment/bioeconomy/food-systems/food-2030_en#:~:text=Food%202030%20is%20the%20EU's,is%20fit%20for%20the%20future.)

<https://reuters.com/world/uk/one-four-britons-skip-meals-due-inflation-survey-shows-2022-05-17/>

<https://news.sky.com/story/world-economic-forum-davos-distracted-by-war-in-europe-and-growing-global-division-12621843>

<https://www.forbes.com/sites/oliverwilliams1/2022/02/24/agritech-gets-8-billion-boost-as-us-agriculture-secretary-vilsack-addresses-dubai-climate-summit/?sh=759f9db44b57>

<https://enterprise-insights.dji.com/blog/drones-in-agriculture#:~:text=Agriculture%20drones%20can%20be%20used,quality%2C%20and%20increased%20yield%20rate.>

<https://www.epa.gov/watersense/when-its-hot>

<https://www.theother.bar/>

<https://www.theguardian.com/environment/2022/may/19/environmental-toxins-are-worsening-obesity-pandemic-say-scientists>

All images courtesy of Unsplash

## Disclaimer

All financial data and/or economic information released by this Publication (the “Publication”); (the “Data” or the “Financial data and/or economic information”), are provided for information purposes only, without warranty of any kind, including without limitation the warranties of merchantability, fitness for a particular purpose or warranties and non-infringement of any patent, intellectual property or proprietary rights of any party, and are not intended for trading purposes. Banque Internationale à Luxembourg SA (the “Bank”) does not guarantee expressly or impliedly, the sequence, accuracy, adequacy, legality, completeness, reliability, usefulness or timelessness of any Data. All Financial data and/or economic information provided may be delayed or may contain errors or be incomplete. This disclaimer applies to both isolated and aggregate uses of the Data. All Data is provided on an “as is” basis. None of the Financial data and/or economic information contained on this Publication constitutes a solicitation, offer, opinion, or recommendation, a guarantee of results, nor a solicitation by the Bank of an offer to buy or sell any security, products and services mentioned into it or to make investments. Moreover, none of the Financial data and/or economic information contained on this Publication provides legal, tax accounting, financial or investment advice or services regarding the profitability or suitability of any security or investment. This Publication has not been prepared with the aim to take an investor’s particular investment objectives, financial position or needs into account. It is up to the investor himself to consider whether the Data contained herein this Publication is appropriate to his needs, financial position and objectives or to seek professional independent advice before making an investment decision based upon the Data. No investment decision whatsoever may result from solely reading this document. In order to read and understand the Financial data and/or economic information included in this document, you will need to have knowledge and experience of financial markets. If this is not the case, please contact your relationship manager. This Publication is prepared by the Bank and is based on data available to the public and upon information from sources believed to be reliable and accurate, taken from stock exchanges and third parties. The Bank, including its parent,- subsidiary or affiliate entities, agents, directors, officers, employees, representatives or suppliers, shall not, directly or indirectly, be liable, in any way, for any: inaccuracies or errors in or omissions from the Financial data and/or economic information, including but not limited to financial data regardless of the cause of such or for any investment decision made, action taken, or action not taken of whatever nature in reliance upon any Data provided herein, nor for any loss or damage, direct or indirect, special or consequential, arising from any use of this Publication or of its content. This Publication is only valid at the moment of its editing, unless otherwise specified. All Financial data and/or economic information contained herein can also quickly become out-of-date. All Data is subject to change without notice and may not be incorporated in any new version of this Publication. The Bank has no obligation to update this Publication upon the availability of new data, the occurrence of new events and/or other evolutions. Before making an investment decision, the investor must read carefully the terms and conditions of the documentation relating to the specific products or services. Past performance is no guarantee of future performance. Products or services described in this Publication may not be available in all countries and may be subject to restrictions in some persons or in some countries. No part of this Publication may be reproduced, distributed, modified, linked to or used for any public or commercial purpose without the prior written consent of the Bank. In any case, all Financial data and/or economic information provided on this Publication are not intended for use by, or distribution to, any person or entity in any jurisdiction or country where such use or distribution would be contrary to law and/or regulation. If you have obtained this Publication from a source other than the Bank website, be aware that electronic documentation can be altered subsequent to original distribution.