

How growth capital can support the agriculture transition through new technologies



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While the "food system" as a whole is a major driver of climate change, agriculture sector face a challenge of unprecedented magnitude: to undergo a profound transformation to produce more and better with less while reducing its environmental footprint.

Within this context, Mirova's environmental impact private equity strategy focused on proven agro-technologies to lead this transition towards a more sustainable system.

AGRICULTURE AND AGRIBUSINESS FACING ONE OF THE CENTURY'S MAJOR CHALLENGES

Environmentally harmful agricultural practices

Current agriculture systems and the whole "food system" are among the main drivers of climate change, and bring with them upheaval to the environment and biodiversity, resource scarcity, deterioration of soil and pollution of aquatic and terrestrial ecosystems.

Agriculture is space-intensive. In addition to the pastures that livestock occupies, other land is dedicated to the cultivation of the foodstuffs (cereals) that they consume in large quantities: almost 40% of the planet's land is dedicated to them, with the collateral damage of increasing deforestation².

Agriculture is water-intensive. Accounting for 70% of global freshwater consumption³, agriculture is also a cause of ocean and freshwater contamination through the excessive use of inputs to increase productivity.

Agriculture contributes to climate change. A quarter of greenhouse gas emissions come from farming. These include carbon dioxide, naturally, but also methane, which is 25 times more powerful than CO₂ at equal quantities⁴.

Non-sustainable agricultural practices impact biodiversity: the overuse of water, inputs and the deforestation associated with the expansion of agricultural land directly affects soil quality and the habitat of local animal and plant species. As a result, 25% of soils are degraded to the point of needing

Summary

- ▶ **Agriculture** accounts for **40% of land occupation², 70% of fresh water consumption³ and 25% of greenhouse gas emissions⁴.**
- ▶ **Food waste** amounts to **1.3 billion tonnes per year⁵.**
- ▶ **9.7 billion human beings to be fed in 2050⁶, on a backdrop of scarcity of arable land, water stress, loss of interest in the profession and labour shortages.**
- ▶ **Agrobotics, biotechnology, predictive analytics, precision farming:** innovative solutions do exist!
- ▶ **A yearly financing requirement measured at 80 billion dollars to transform agriculture by 2050⁷.**

1. Vanessa Carvalho is employed by Mirova UK and is acting in an advisory capacity to Mirova under the terms of an "Investment advisory agreement" concluded between Mirova and Mirova UK.

2. <https://www.fao.org/sustainability/news/detail/en/c/1274219>

3. <https://www.worldbank.org/en/topic/water-in-agriculture#1>

4. <https://www.futura-sciences.com/planete/questions-reponses/rechauffement-climatique-gaz-effet-serre-co2-methane-pire-565/>

5. Worldwide food waste, UNEP

6. <https://www.futura-sciences.com/planete/actualites/population-mondiale-jusquou-va-grimper-population-mondiale-39860/>

7. <https://www.worldbank.org/en/topic/financialsector/brief/agriculture-finance>

Focus on:
*The impact of
agriculture on
the environment*



40%

of land is given over
to agriculture²



70%

of global consumption
of freshwater³



25%

of greenhouse
gas emissions⁴



25%

of farmed soil is
degraded and requires
rehabilitation⁸



80%

of mammal and bird
extinction risks are
said to be connected
with farming⁹

significant rehabilitation⁸ before they can be used for large-scale cultivation again, and it is estimated that 80% of the extinction risks facing mammals and birds today are connected with agriculture⁹.

And yet... an ever-growing need for food

In 2050, 9.7 billion human beings could populate Planet Earth - two billion more than today; a figure that could rise to 11 billion by the end of the century⁶.

Directly correlated to this **demographic growth** – combined with the relative enrichment of countries rising above the poverty line – calory demand is set to rise by 50% to 70% in the next 30 years¹⁰.

However, to produce more food, agribusiness needs more resources which are already under pressure and in limited supply: soil quality, water stress and climate change are therefore major challenges for farmers.

In addition to these challenges, there is a loss of interest in the jobs of land management, crop and livestock farming. In developed countries, the number of people working in this sector has plummeted in recent decades, leaving the industry facing a vocational crisis and labour shortages.

Finally, even though agricultural production must indeed evolve, **consumption habits** must also be reconsidered: every year, 30% of the world's food produced by humans for their own consumption, i.e., approximately 1.3 billion tonnes¹¹, is lost or goes to waste. Beyond the sheer absurdity of the situation, given that more than 800 million people suffer from malnutrition¹², this **food waste alone accounts for 20% of the consumption of fresh water, fertiliser and cultivated land.** Food which, because it is unused, unnecessarily produces greenhouse gases, contributing a little more to global warming.

8. The State of the World's Land and Water Resources for Food and Agriculture: Managing systems at risk, Food and Agriculture Organization of the United Nations and Earthscan

9. UICN, The Lancet, 2019

10. The State of Food Security and Nutrition in the World 2021, FAO

11. Worldwide food waste, UNEP

12. <https://www.actioncontrelafaim.org/la-une/pourquoi-la-faim-dans-le-monde-existe-t-elle-toujours/>





Focus on: *Agriculture 4.0*

The future of agriculture

In 2018, the World Government Summit published “*Agriculture 4.0 - The Future Of Farming Technology*”, a report setting out the four main changes that agriculture would have to address in a near-term future: demographics, scarcity of natural resources, climate change, and food waste.

Agriculture 4.0 is one of the responses to these key challenges, and which will involve solutions such as developing precision farming combined with the use of the Internet of Things (IoT), big data and blockchain tech. The end goal: improve quality, yield and sustainability.

The only way out: a profound transformation

More than ever, the whole agri-food chain must be transformed. And this is where the equation turns out to be complex:

- ▶ Produce more (food stuffs, animal fodder, advanced alternative fibres and fuels, etc.) with fewer resources;
- ▶ Improve yields in a sustainable way while reducing the impact on the environment;
- ▶ Adapt food production to fast-changing climate conditions;
- ▶ Evolve with an increasing demand, with changing habits and higher demand for quality and sustainability.

Only a transition from the agricultural value chain to a sustainable model will allow this equation to be solved, and the substantial challenges arising therefrom to be met.

The large-scale use of new technologies thus constitutes an essential lever to help agriculture in its transformation.

WHEN NEW TECHNOLOGIES CONTRIBUTE TO LEADING THE TRANSITION OF THE AGRICULTURAL VALUE CHAIN TOWARDS A MORE SUSTAINABLE SYSTEM

The right time to change everything

Both cohesive and positive, **the current circumstances are clearly conducive to the technological and digital disruption of the agricultural value chain:**

- ▶ a **regulatory framework** and commitments from the European Union (Green Deal¹³); various support schemes, in particular in the forms of subsidies;
- ▶ **international agreements** (Paris Agreement, COP26);
- ▶ **Increased awareness** and a preparedness to pay higher prices in developed economies;
- ▶ and a **change of paradigm** aiming to focus on nutrients rather than food.

Whereas “new” technology has become pervasive in our everyday lives and many sectors, agriculture remains one of the least digitalised industries to date.

And yet, applying technology (software and equipment) **and innovation** (new methods/solutions) to the areas of agriculture and the food industry is a viable way of providing responses to problems in food production – and at nearly all the steps in the process.

The time is therefore ripe for the 4th agricultural revolution.

“

Current circumstances are clearly conducive to the technological and digital disruption of the agricultural value chain.

”

13. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_fr

Agro-technology for the benefit of high-quality, sustainable farming

New agricultural technologies can help produce more food without increasing pressure on resources. A few concrete examples:

- ▶ **Precision farming:** Draws on advanced analytics to optimise and control the management of water, nutrients or crop protection products as accurately as possible in order to reduce the use of inputs - while optimising yields.
- ▶ **Agrobotics:** Consists of deploying robotics in agricultural activities to increase efficiency and precision while reducing environmental damage (use of non-fossil fuels, reduced soil compaction, etc.).
- ▶ **Integrated pest and soil health management:** Combines analysis of long-term soil quality and short-term plant health by targeting the need for and quantity of plant protection products (targeted pest control, nitrogen fixation) and improved agricultural inputs (natural active ingredients, hardiness).
- ▶ **Biotechnologies applied to animal health and nutrition:** Combining emerging biological technologies with computational capabilities, these enable farmers to detect animal diseases at an early stage to reduce their mortality rate and

improve their feeding practices with alternative ingredients and solutions, while reducing the amount of synthetic products and the carbon footprint of animal protein production.

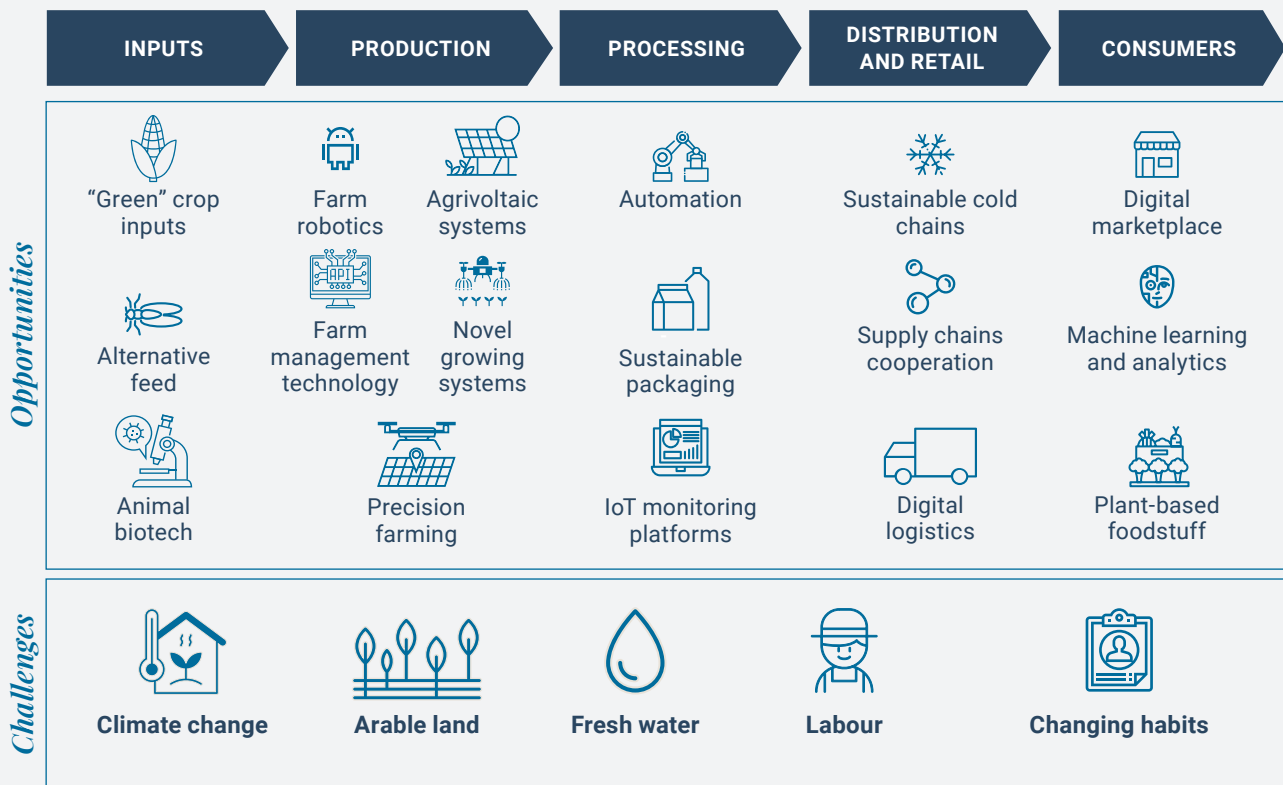
Agro-technology for resilient farming

New agricultural technologies can help adapt agricultural production to climate change:

- ▶ **Novel production systems:** Deployed in a controlled or adapted environment, these systems (agrophotovoltaics, vertical farming, aeroponics) allow farmers to reduce climate-related risks and losses where local natural resources are scarce....
- ▶ **Predictive analytics:** Use weather forecasts and data to protect crops from adverse weather conditions, optimize harvesting windows and reduce harvesting losses.
- ▶ **New sophisticated genetic selection programmes¹⁴:** Aim to develop non-GMO seeds that are better adapted to climatic disturbances (such as extreme heat, drought or frost) or micronutrients provided throughout the crop cycle or with better nutritional qualities, allowing losses to be reduced right up to the harvest and its dispatch from the farm.

14. Feeding the world sustainably, McKinsey

Focus on: *Food value chain, between challenges and opportunities*



Source: IGPI, Mirova adaptation



Agro-technology at war with food waste

New agricultural technologies can help to greatly reduce food waste. How?

- ▶ Thanks to the automation and traceability of the supply chain, businesses monitor the critical stages of the supply chain and deploy appropriate control mechanisms (temperature control, quality inspection, food safety tests, etc.)
- ▶ Or through high value-added products and nutrients generated from agricultural organic waste, such as insect-based proteins for aquaculture and animal feed.

THE SOLUTIONS EXIST. OUR ENVIRONMENTAL IMPACT PRIVATE EQUITY STRATEGY CONTRIBUTES TO THEIR LARGE-SCALE DEVELOPMENT.

A private equity strategy to boost technological innovation

Our strategy has adopted the mission of promoting and supporting the development of innovations on mature markets, by capitalising on technological centres of excellence in Europe (for 80% of invested assets, with the possibility of extending up to 20% of investments in other OECD countries).

Until recently, agro-technology financing was essentially provided by venture capital funds that focused on the seed phase and did not ensure massive dissemination of innovations in everyday agricultural practices.

Our strategy responds to this need to scale up these new and proven agricultural technologies that have a genuine need for capital to significantly support their growth with strong and measurable impact objectives.

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We invest in companies whose entrepreneurial intelligence and innovation capabilities have resulted in proven technologies to address environmental issues.

”

The strategy applies to and supports firms which:

- ▶ have proven that their technology works and have a clear go-to-market strategy;
- ▶ have a strong direct and indirect impact on the environment through innovations that are not easily replicable;
- ▶ provide solutions to some of the challenges faced by farmers and other actors in the food value chain;
- ▶ promote the implementation of a sustainable, productive and efficient agricultural system.

As drivers of the transition of the agricultural value chain, agro-technologies have the potential to multiply their impact and harness this transformation to other environmental levers: the circular economy, renewable energy and clean technologies.

WHEN THE SOLUTIONS ARE ALREADY OUT THERE

Focus on 2 examples of innovative investments conducted by our teams

AGRONUTRIS : *Bioconversion to feed and preserve a sustainable world*



► **Activity:** a French biotech firm, Agronutris has given itself the mission of feeding and preserving a sustainable world through bioconversion.

► **Founded:** 2011

► **Founders:** Medhi Berrada; Cédric Auriol

► **Head office:** France (Saint-Orens-de-Gameville)

To find out more about
Agronutris :
www.agronutris.com

Disruptive solution: insect-based protein solutions

Obtained through bioconversion from farm waste as its main raw material, Agronutris' alternative protein can be used for several purposes:

- **feed for aquaculture-farmed fish** (replacing fishmeal proteins);
- **feed for the petfood industry** (replacing meat or fish proteins);
- **or for direct human consumption** (even if this remains marginal to date) and for other animal protein industries in the future.

With this solution, Agronutris meets 3 challenges in 1:

- reducing the **impact of aquaculture on the oceans**;
- meeting the **protein requirements** of a growing population;
- and the recovery and recycling of farm **by-products and waste**.

“Demographic growth, climate change and new digital technologies strongly affect our world and call for a paradigm shift.” (Agronutris)

OMBREA : *Climate control and protection for crops*



► **Activity:** a French start-up working in the green transition, Ombrea offers producers solutions to deal with complex climate problems.

► **Founded:** 2016

► **Founders:** Christian Davico; Julie Davico-Pahin

► **Location:** France (Aix-en-Provence)

To find out more about
Ombrea : www.ombrea.fr

Breakthrough technology: photovoltaic shades

Installed above field crops, the Ombrea system opens and closes to create an **optimal microclimate and the right conditions for good plant development**, even in the event of extreme climate events (frost, drought, heavy rain). Fitted with a comprehensive set of about ten sensors and a **patented agro-photovoltaic device**, the system is controlled by an algorithm.

The system provides multiple benefits:

- protection against climate hazards;
- improvement of harvest quality and yield;
- controlled irrigation;
- reduction of crop protection products;
- production of renewable energy.

With this system, Ombrea meets 3 challenges in 1:

- optimising soil to **produce more with less**;
- reducing the **impact of climate change on yields** of crop production;
- applying sustainable technologies to **accelerate the low-carbon energy transition**.

“Our multi-disciplinary team, made up of computer and mechanical engineers and project managers, is committed to meeting the needs of farmers every day.” (Ombrea)



At a glance: Mirova's Environmental Impact Private Equity strategy

Our belief: Accelerating and scaling up positive impact drives strong financial performance. In other words, impact feeds performance.

A goal: accelerate the scale-up of innovative and positively impactful environmental solutions.

Significant potential: the shortfall in funding for United Nations Sustainable Development Goals is estimated at around USD 2,500 billion per year¹.

A multi-themed approach:

1. Agri-Agro technology
2. Circular economy
3. Renewable energy
4. Sustainable cities
5. Natural resources

Selective targeting:

- ▶ Companies with a **business model directly addressing at least one of the targeted SDGs²**.
- ▶ **Proven innovative solutions and technologies.**
- ▶ Companies which are implementing (or intending to implement) **rigorous ESG³ standards.**
- ▶ Companies with a **proven business model.**

- ▶ Companies that are **profitable or about to become so.**
- ▶ **"Capital Acceleration"** equity raising campaigns to supply capital to companies in growth phase.

To summarise: a strategy aimed at both instructional and private investors offering 3 key advantages:

- ▶ **a wide impact spectrum** enabling our investors to contribute to multiple Sustainable Development Goals;
- ▶ **a handpicked selection of target companies**, from a rich and varied range;
- ▶ an attractive and diversified **risk/return profile.**

To find out more: visit our dedicated page on our website and discover the presentation of our investment strategy in pictures.



1. United Nations - Sustainable Development Goals Business Forum

2. The United Nations Sustainable Development Goals (SDGs) define 17 priorities for socially equitable, environmentally safe, economically prosperous, inclusive and predictable development by 2030.

3. Environmental Social Governance

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