Food is Investable

Investment opportunities for venture capital, private equity, and infrastructure funds in the green transformation of food

refood

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We are a for-profit investment firm on two continents, backing growth companies that solve the most pressing food system challenges for future generations. We have invested in the green transition of the food system since 2015 and have more than two decades of experience in leading roles in the food industry. The food system equation does not add up, but it’s solvable.

- Gustaf Brandberg, Partner

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We are a private equity investment firm, specializing in the mid-market food and agriculture sector across Europe and the Middle East. With our proven track record for reaccelerating established businesses, our team offers a wealth of operational and strategic expertise to transform enterprises with values up to $250 million.

- Michael Taksyak, Partner

We would like to thank our launch partner:

<norrsken>

Executive summary

The global food system has grown tremendously over the past century through the Green Revolution, which has roughly quadrupled global food production and enabled a similar increase in population. This achievement, however, came at a steep environmental cost and created unintended adverse health related and social consequences. Estimates suggest that by 2050, food demand could rise by about 50% to 70% compared to current levels. Most of this increase will be driven by developing countries, where population growth and economic development are strongest. Increasing production further with the current model would exacerbate the system's contributions to greenhouse gas emissions, deforestation, biodiversity loss, and soil degradation and ultimately its own food production capacity.

Today, we have a unique opportunity to redesign the food system to balance productivity with sustainability. With sufficient public and private investment, the food system can meet the nutritional needs of the global population while staying within planetary boundaries. This would require optimizing rather than maximizing food production, considering both the productivity and the sustainability imperatives.

- **The Productivity Imperative:** Despite increased production, the global food system still fails to adequately nourish the growing population, often delivering the wrong types of calories to the wrong places. National food security concerns, heightened by recent conflicts, pandemics and extreme weather events, underscore the need for a more resilient food system. A calibrated food system battles undernourishment and metabolic syndrome and brings about food safety.

- **The Sustainability Imperative:** Current agricultural practices are unsustainable and threaten long-term food security. We must produce our food within the earth's ecological boundaries, including managing greenhouse gas emissions, ocean and cropland use, deforestation and biodiversity loss, natural resources, and water use.

The food system transformation presents one of the greatest investment opportunities of the 21st century. The agrifood sector, which represents 12% of the global GDP, offers numerous high-impact opportunities for driving financial returns and sustainability outcomes. There are huge values to be unlocked; for example, the annual value of food wasted or lost globally is estimated to be around $1 trillion. This includes losses at all stages, from production to consumption. This potential further increases when accounting for the potential financial and social value of carbon sequestration, biodiverse ecosystems, and improvements in public health. Despite its potential, it remains underinvested due to factors such as an unproven investment track record, the relative complexity of the industry, and regulatory challenges.

Despite these challenges, we see four shifts that make the sector increasingly attractive for investors:

1. **Growing Maturity of Disruptive Technologies:** Biological crop protection, plant-protein production, CRISPR-CAS, and other technologies have matured, reducing investment risk and increasing adoption rates.

2. **Growing Policy Support:** Policy initiatives like the EU Green Deal and similar efforts in other regions are driving the sustainability transition in the agrifood sector.

3. **More Attractive Investment Fundamentals:** Valuations in the sector have come down from their 2021 peaks, creating attractive opportunities for investors seeking realistic valuations and less competition for high-quality deals.

4. **Superior Returns Combining Financial and ESG Impact:** The agrifood sector offers strong potential for investors focused on financial returns and environmental, social, and governance (ESG) performance.

In the report Food Is Solvable, we cover the opportunity to drive sustainability through food system transformations in four themes: Healthy Soils, Sustainable Proteins and Fats, Sustainable Supply Chains, and Healthy Diets.

This report aims to inspire confidence in the sector's investability by guiding investors in different asset classes through its diverse and promising investment landscape.

The report is structured into four sections. The first two provide an overview of the current investment landscape in food and agriculture, highlighting the key challenges that have limited the sector's investment potential. The final two sections present a strong case for investing in agrifood, and introduce our Treasure Map, which outlines major investment themes in the agrifood sector and evaluates their relevance across different asset classes.

This Treasure Map provides a high-level overview of investment opportunities but it is not exhaustive and may overlook valuable opportunities in less prominent segments. As it represents a snapshot in time, the outlook is expected to evolve with ongoing technological and societal changes. Despite these limitations, the overview is a helpful starting point for investors. More detailed analyses of specific segments will be published in the future.

1 The Agrifood System Transformation Is a Major Challenge and a Major Opportunity

Over the past century, global food production has grown more than fourfold, supporting a four-and-a-half-times increase in the world's population. The Green Revolution enabled this increase through advancements in agricultural technology, improved farming practices, high-yield crop genetics, and the expansion of arable land. For example, global cereal production has risen from around 400 million tons in the early 20th century to over 2.7 billion tons.

This is a tremendous achievement, but it has come at a steep health and environmental price. Further increasing production using our current paradigm will exacerbate diet-related illnesses such as obesity and other metabolic syndromes due to the current focus on producing cheap, yet often unhealthy, food ingredients. Moreover, it will accelerate environmental deterioration driven by the sector's greenhouse gas emissions, freshwater withdrawal, deforestation, loss of species, and soil degradation.

BY THE NUMBERS

Adverse Effects of the Food System

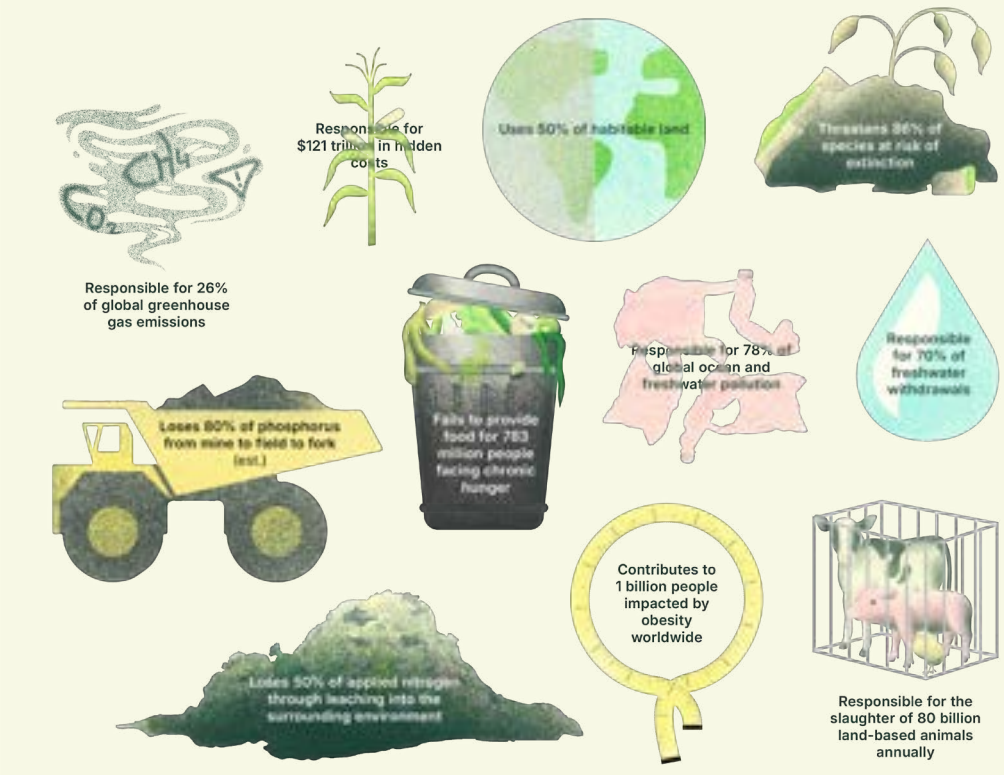

Chart 1: Overview on the adverse effects of the agrifood system

However, with growing concerns about climate, environment, and public health, we now have a window of opportunity to take the global food system to the next level by optimizing food production rather than maximizing it.

With systems-level thinking and significant public and private investments, it is possible to redesign the food system to meet all people's needs while operating within the means of our planet.

An optimized global food system solves both the productivity and the sustainability imperatives.

1. **The productivity imperative:** Despite a massive increase in food production, we still struggle to provide the growing global population with a nutritious diet. In simple terms, the food system fails to deliver the right amount of calories, with the proper nutritional balance, in an appealing way and to the right locations. This challenge also raises concerns for national governments about food security, as recent conflicts, pandemics, and more extreme weather events have exposed the vulnerability of relying on global food supply chains.

2. **The sustainability imperative:** Currently, we are failing to grow food within the earth's available means, threatening our long-term ability to feed the world's population. The sustainability imperative highlights the urgent need for a food system that minimizes environmental harm and helps us stay within planetary boundaries such as greenhouse gas emissions, land use, and water use.

In the report Food Is Solvable, we cover the opportunity to drive sustainability through food system transformations in four themes: Healthy Soils, Sustainable Proteins and Fats, Sustainable Supply Chains, and Healthy Diets.

Food is Solvable: Key Concepts

Re:food's guiding principle is that transformative investments in highly innovative food and agriculture companies will reduce planetary boundary pressure and create a sustainable global economy. Food Is Solvable describes the fundamental concepts of this principle, which form the core of our investment approach:

The Food System Transformation unlocks the good Anthropocene and provides some of our time's most compelling but underinvested business opportunities.

Human civilization, and therefore its food system, exists within the confines of the **planetary boundaries**—the natural systems that regulate all life on earth—and a **social foundation**. Our economy cannot function without a thriving biosphere, yet today, our economy is putting enormous pressure on our natural resources.

- The food system makes up over 12% of global GDP (per the World Economic Forum) but utilizes a disproportionately large portion of the biosphere and contributes enormously to this pressure. This is fundamentally unsustainable.

- A sustainable food system operates without adding to, and in the best case relieves pressure on, planetary boundaries while supporting a solid social foundation. A resilient food system can continue to function despite external disruptions such as droughts, pandemics, or financial crises.

We have conceptualized this definition of a sustainable, resilient, and prosperous food system in the Re:food Circle (see Chart 2).

Chart 2: Re:food Circle

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The EAT-Lancet Commission's report Food in the Anthropocene identified powerful shifts that are necessary to reverse the pressure that the food system exerts on planetary boundaries, which we have translated into four investment themes:

- Healthy Soils – shifting from a myopic focus on yield to an understanding of soil as a living ecosystem that can produce enormous environmental and nutritional benefits

- Sustainable Proteins and Fats – shifting from animal-based protein produced in factory farms to a more diverse set of protein sources, including plant-based and SynBio alternatives

- Sustainable Supply Chains – shifting from a linear, wasteful supply chain to a circular, sustainable one that replaces petroleum-based plastics, reduces greenhouse gas emissions, and rescues and redistributes food

- Healthy Diets – shifting from calorie-rich, nutrient-poor diets that drive poor health to ones that use food to protect against malnutrition and diet-related disease

Even with the definition of a sustainable food system as a North Star, the path to get there is not obvious. To demystify the transformation, we applied systems thinking tools to identify root causes of the unsustainable current food system and leverage points within the system that could shift it toward a more sustainable future state. These leverage points can be investment opportunities for Re:food and like-minded investors.

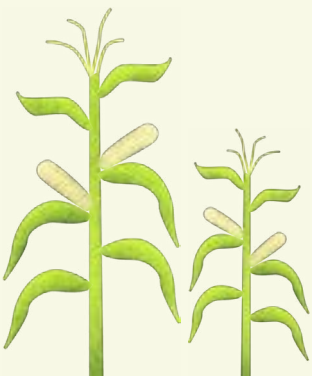
Reforming a major system will happen through waves of change, some of which will be enduring and some of which will be replaced. We use the Three Horizons **framework** to identify innovations with transformative third-horizon potential. The growth of these third-horizon innovations will naturally take time, so investing in the food system requires a degree of patience.

1.1 The Productivity Imperative

The Green Revolution led to a massive increase in food production, driven by technological advancements like improved seed varieties, synthetic fertilizers, and mechanization. These innovations resulted in significant productivity gains, allowing food production to keep pace with and surpass population growth. However, these gains are now slowing down. For example, growth rates in crop yields for staples like wheat, rice, and corn have dropped from over 3% per year in the 1960s to less than 1% in recent years. This slowdown is due to headwinds like soil depletion, increased pest resistance, and the growing impacts of climate change, including more frequent droughts and extreme weather events.

As a result, continuing to push for maximum food production using this same paradigm will lead to greater greenhouse gas emissions, habitat destruction, and further depletion of essential resources like water and soil. The FAO predicts that global food demand will increase by 70% between 2000 and 2050, but the world cannot expand water, land, and soil resources fast enough to meet this demand without causing severe environmental damage and climate change. Other projections arrive at slightly different growth estimates, but they all conclude that significantly more nutrition needs to reach consumers in the upcoming decades. Adding to this, the FAO expects that over three-quarters of the world's population may be affected by droughts in 2050. Hence, a fundamental shift in agricultural practices is essential to sustain future food needs.

Moreover, the food system is struggling to provide an adequate diet for the global population. Food is misallocated and wasted. Despite producing enough food to feed the global population 1.5 times over, approximately 820 million people remain chronically undernourished, while the annual value of food wasted or lost globally is estimated to be around $1 trillion. We also face a nutritional content issue. Even in countries with plentiful access to food, the dietary miscomposition is causing unprecedented consequences to public health. Two billion people are overweight or obese, and 2 billion are micronutrient deficient. The nutritional values of some popular vegetables, from asparagus to spinach, have dropped significantly since 1950. Nutrients in garden crops are up to 38% lower than they were in the middle of the 20th century, mostly due to a change in input usage (seeds, etc.) and farming methods. On average, across the 43 vegetables analyzed in a 2004 U.S. study, calcium content had declined by 16%, iron by 15%, and phosphorus by 9%. The vitamins riboflavin and ascorbic acid had dropped significantly, alongside declines in protein levels. Similar decreases have been observed in the nutrients present in wheat. The current status quo requires rethinking how food is produced and supplied.



1.2 The Sustainability Imperative

The food sector is responsible for 26% of human-caused greenhouse gas emissions, 70% of global freshwater withdrawals, and 80% of deforestation, making it the single largest driver of terrestrial biodiversity loss. Reports from organizations like the FAO, the International Food Policy Research Institute, and the United Nations all agree that the environmental impact of the current agrifood system is unsustainable.

However, these publications also highlight the sector's potential to be part of the solution. For example, by 2050, the agrifood sector could sequester 4-6 gigatons of carbon dioxide annually through soil carbon sequestration, agroforestry, and improved land management. The FAO, International Panel on Climate Change, and World Agroforestry Centre provide further evidence of these practices' transformative potential. The agrifood system is also uniquely positioned to restore biodiversity. The sector can play a critical role in reversing ecological damage by addressing its environmental footprint and repairing deforested areas and habitats at risk of species extinction. This dual focus on reducing harm and restoring ecosystems is crucial for a sustainable future.

1.3 The Role of the Agrifood System in a Thriving Global Economy

The food system requires natural capital/ecosystem services to grow nutrient-dense food, which means that the productivity imperative and the sustainability imperative are inherently linked: Without a food system that preserves and regenerates the biosphere, we cannot produce enough food to meet the needs of the global population. At the same time, the agrifood sector exists within the context of a much bigger system: the global economy. Economic development is often portrayed as being at odds with sustainability. This view overlooks the reality that the economy is part of society, which in turn depends on a healthy biosphere. With this lens, it is clear that sustainable production and equitable distribution of nutrient-dense food are essential to both maintain the biosphere and maintain the health of society, which in turn are both essential to the health of a thriving global economy.

The transformation of the global agrifood system is not only feasible but necessary. However, it will not happen without major public and private investments in technology and infrastructure across the food chain. Today, the investment community is missing the massive opportunity to invest in the transformation of agrifood. This report aims to inspire confidence in the sector's investment potential and give an overview of investment opportunities with superior financial returns and environmental impact across different asset classes.

2 Investing in the Agrifood Sector: The Missed Opportunity

Today's investment in the food system punches significantly below the sector's weight. While the agrifood value chain represents 12% of global GDP with 6% p.a. growth expectation until 2027, as of 2023 it only represents 2% ($150 billion) of private equity's total $8.2 trillion AUM. When looking at the flow of new capital allocations, the result is only marginally better, with agrifood attracting only 5.5% of global venture capital investing in 2023.

When taking a sustainability lens to agrifood, the picture is even more bleak. The food system accounts for a whopping 26% of human-caused greenhouse gas emission, and as described above, it also has deep and far-reaching adverse impacts on many other planetary boundaries (freshwater withdrawal, biodiversity, ocean use, etc.). By contrast, a recent report by the Food System Economics Commission (FSEC) placed total private capital invested in sustainable agrifood at only 1.3% of the climate capital deployed across all sectors.

No single reason can explain the current investment shortfall in sustainable agrifood. Some often-cited contributing factors include the yet-to-be-proven track record for most investors; the underperformance of some high-profile food and ag-tech companies; the slow adoption cycles of innovation by farmers and food companies; the relative complexity of the industry, given the broad scope of activities from seed to fork; the numerous stakeholders, from farmers to consumers, who need to actively contribute to drive this transition; regulatory challenges; and innate variability in outcomes.

While it's clear that agrifood is under-invested generally and within the context of sustainability specifically, it's also important to make clear the enormous size of the prize. The agrifood sector's massive scale means that food system transformation is a unique opportunity for private capital across all asset classes (venture, growth, buyout and infrastructure) to invest in technologies and businesses that will fundamentally reshape the industry and generate superior returns. FSEC's report sizes the funding required (both private and public) to enable such a transformation by 2050 at $200-$500 billion p.a., which promises to deliver economic benefits worth at least $5 trillion annually. It is clear that achieving this sustainable future will require private and public capital contributions to scale markedly from today's $43 billion. Although interest from asset allocators in sustainable agrifood is growing, as is the sustainable agrifood innovation landscape, we have yet to see a significant emergence of investment managers who systematically understand and can take advantage of this opportunity. We strongly believe that it's time for those, who are not yet looking into the sector, to reconsider the investment thesis.

Climate Mitigation Investment by Sector

Funding by type ($B 2021/22)	Agrifood (AFOLU*)	Energy	Transport	Buildings & Infra	Other**	Total
Private	8	262	210	131	2	613
Public	35	252	127	109	101	624
Total	43	514	337	240	103	1 237
Private %	19%	51%	62%	55%	2%	50%

*AFOLU stands for Agriculture, Forestry, Land Use and Fisheries.

**Other includes Water and Waste water, Industry, Adaptation and Others & Cross-sectoral

Chart 3: Climate mitigation investment by sector. Source: Climate Policy Initiative

A note on

Public Funding for Sustainable Agrifood

Public investment also has a role in the transformation as a powerful enabler, catalyst, and stabilizer. However, its role is more passive than private investment, particularly active private equity strategies, which expertly select and support the next generation of outstanding entrepreneurs. We view active investment strategies as the engine to direct and drive this sector toward an environmentally, socially, and financially sustainable future.

The public sector can be a tremendous catalyst by redirecting the $670 billion in annual subsidies for agriculture and fisheries from harmful practices toward initiatives that transform the food system. Regulators can also help, and increasingly are helping, the transition by providing access to public infrastructure, securing and enabling private funding, accelerating the timeline to register and commercialize new products, enabling industry collaboration, nudging behavior, and using the public sector's purchasing power.

3 Rethinking the Investability of the Agrifood Sector

We fully acknowledge the challenges of investing in the agrifood sector. However, we assert that the sector's attractiveness for investors is increasing, and investors should reconsider their investment thesis for this sector—an assertion that builds on four arguments.

1. Growing Maturity and Commercial Readiness of Disruptive Technologies: Many of the then-nascent technologies outlined in the 2018 report Innovation With a Purpose: The Role of Technology Innovation in Accelerating Food Systems Transformation, such as biological crop protection, extrusion for plant-protein production, vertical farming, and/or CRISPR-CAS, have now achieved meaningful commercial scale. The improved maturity and functionality of these technologies, along with growing regulatory support, reduce risks and optimize returns, leading to increased adoption.

One example includes the adoption of novel farming technologies. About 60% of farmers in the United States and Europe are already using or planning to adopt at least one novel technology in the next two years, according to McKinsey's farmer survey in 2023. A second prominent example is the commercialization of plant-based meat alternatives. Their share among the $1.4 trillion of meat consumed globally in 2022 increased from less than 0.5% of global meat consumption in 2018 to almost 2% in 2023 with improved unit economics, better taste, and changing consumer behavior as key drivers—a notable increase, especially when accounting for the inflationary pressure on consumer spending. We expect this commercialization of mature technologies to continue. Beyond this, we see the next generation of industry-shaping technologies, such as green ammonia and precision fermentation, emerging and broader technologies, such as artificial intelligence and GLP-1 drugs, reshaping society and driving the development of even more transformative agrifood innovations.

2. Growing Policy Support: Policymakers play a key role in steering the development of the global agrifood sector through regulatory frameworks and subsidy payments. Over the last five-plus years, regulatory authorities around the globe have taken increased actions to address and steer the sustainability transition across different economic sectors and stakeholder groups, including consumers, industry players, and investors. The EU Green Deal, for example, follows the underlying ambition for Europe to become the first climate-neutral continent by 2050, meaning that it will have net-zero greenhouse gas emissions. In this context, the EU Green Deal also sets comprehensive and ambitious targets for the agrifood sector. It aims to drive the shift toward a sustainable food system while ensuring food affordability and availability by defining specific targets across different dimensions. This includes a target reduction in the use of chemical pesticides by 50% and of fertilizers by at least 20% by 2030, as well as the ambition to restore at least 20% of degraded ecosystems by 2050. Other major economies like China, Japan, and the United States have launched similar efforts or a range of individual initiatives with the aspiration to promote environmental sustainability and address climate change (although the magnitude of impact and relevant timelines differ).

3. More Attractive Investment Fundamentals: Different industry statistics and reports confirm that valuations in the agrifood sector have decreased since their peak in 2021. The 2024 AgFunder report, for example, observed "dramatically shrinking startup valuations" in the agrifood space in 2023—a trend that we also see in the private equity space. Reasons for this decline are manifold, but it overall confirms that valuations are once again more in line with companies' underlying business performance and future growth outlooks. Adding to this, the investment volume in the agrifood sector has also declined. The AgFunder team states that the sector's share of global venture capital investment decreased from 7.6% in 2021 to 5.5% in 2023, while global venture capital investment decreased by 38% overall, resulting in an overall approximately 50% decline in agrifood tech investments between 2022 and 2023. These changing investment dynamics are creating challenges for investors' existing portfolios and ability to raise new funds. However, this situation also offers attractive investment opportunities given the combination of more realistic valuations combined with less competition for good deal opportunities than in previous years.

4. Increasing importance of the sector's superior ESG impact: Investors are putting increasingly more attention on ESG performance. This is driven by a combination of factors, including changing aspirations of investors' financial sponsors, growing societal pressure, and complementary regulatory changes. Hence, the ambition to realize superior financial and ESG performance is becoming a mainstream aspect of investment strategies across different asset classes, as concluded in the latest reports by the Global Sustainable Investment Alliance and Morgan Stanley. The agrifood sector provides a superior value proposition when both considering its financial and ESG performance and comparing it across different dimensions regarding other major investment themes for ESG-oriented investors (see Chart 4).

		ENVIRONMENT			SOCIAL		
	IMPACT DIMENSIONS	GHG emissions	Water use	Biodiversity loss	No hunger	No poverty	Good health & well-being
	METRIC	Reduction in CO_2 equivalents per USD investment	Reduction in fresh water	Impact on ecosystem health (water purity, carbon sequestration, etc.)	Number of people fed	Increase in household incomes	Impact on mortality and morbidity rates
INVESTMENT THEMES BY SUSTAINBILITY INVESTORS	Agrifood	Dominant	Dominant	Dominant	Dominant	Dominant	Substantial
	Chemicals	Minimal	Substantial	Substantial	Minimal	Minimal	Minimal
	Construction (green buildings, sustainable materials)	Substantial	Substantial	Substantial	Minimal	Substantial	Substantial
	Transportation (EV)	Substantial	Minimal	Dominant	Substantial	Dominant	Substantial
	Renewable energy (hydrogen, solar, wind)	Dominant	Minimal	Substantial	Minimal	Substantial	Substantial

Chart 4: Indicative assessment of the ESG performance in the agrifood sector vs. other major investment themes for ESG-oriented investors. Source: Re:food and ADAM Partners

When taken together, these four arguments support the attractiveness of the agrifood sector transformation for both generalist and specialist private capital investors. We recognize that while the size and complexity of the agrifood sector offer great opportunities for investors, they can also pose challenges, especially for those new to this space, making it less approachable compared to other popular investment sectors. Therefore, we have created a Treasure Map of sustainable agrifood investment opportunities that can help private capital allocators navigate this complex landscape.

4 Navigating the Investment Landscape in the Agrifood Sector

The agrifood sector stands out as one of the most diverse sectors in terms of investment opportunities. This is not only due to the broad range of activities it covers along the value chain but also due to differences between geographies' natural and societal contexts. It is also important to note that the investment horizon in the agrifood sector is longer than in other sectors, given the dependency on mostly seasonal businesses and annual growing cycles. Hence, the investment timing dimensions in the agrifood sector are different from those in other sectors like chemicals, construction, or renewable energy—a reality that needs to be reflected in an investor's investment approach.

Chart 5 offers an introductory overview of the agrifood investment landscape, organized into four investment themes, their underlying categories and segments, and their relevance to three major asset classes: venture capital and growth (VC), private equity (PE), and infrastructure-related investments. A segment's relevance for a specific asset class reflects the likelihood that investors will be able to identify a critical mass of attractive investment opportunities. This relevance assessment is based on a combination of criteria, including:

- Number of available investment targets in the space
- Historic track record of assets and investors focused on the space
- Current and future maturity of the underlying technology
- Market size and growth outlook (expected evolution of demand, indication of supportive trends, regulatory landscape, etc.)
- Economic viability (unit economics, capital needs, etc.) for scaling scenarios
- Magnitude of the potential positive impact

This overview is not exhaustive and operates at a high level, which means it may overlook potentially excellent investments in segments that appear less relevant from a broad perspective. Additionally, it does not reflect potential synergies and the additional impact from investing in multiple segments simultaneously. Lastly, it provides a snapshot of current conditions, but given the rapid technological and societal developments, we expect this outlook to evolve. Nonetheless, this overview offers initial guidance for exploring investment opportunities in the agrifood sector. In future reports, we will also publish more detailed deep dives on selected segments.

More relevant | Less relevant | Not relevant as of today

THEMES	CATEGORIES	SEGMENTS	Investment attractiveness by asset class as of H2 2024: VENTURE CAPITAL	PRIVATE EQUITY	INFRA-STRUCTURE
	Market-based Incentives	Ecosystem services such as carbon and water credits	■		■
		Agrifinance (agri-fintech, insurance, etc., for climate-smart agriculture)	■		
	Sustainable Agriculture Inputs	Crop biologicals (bio crop protection and biostimulants)	■	■	
		Resilient seed genetics (disease resistance, nitrogen efficiency, drought resistance)	■	■	
		Specialty crop nutrition (water solubles, controlled/slow release, micronutrients, etc.)	■	■	
		Sustainably produced NPKs (organic, recycled, green ammonia)	■		■
	Precision Agriculture Tools	Farm robotics & automation	■	■	
		Mechanized irrigation	■	■	■
		Precision agriculture ("see and spray," "variable rate," "soil testing")	■	■	
	Supply Chain Resilience	High- and mid-tech greenhouses	■	■	■
		Vertical farming	■		■
	Sustainable Packaging	Compostable alternatives (bioplastics, organic packaging, etc.)	■	■	■
		Circular packaging solutions	■		
		Recycling infrastructure	■	■	■
	Food Waste Mitigation	Food preservation equipment and infrastructure	■	■	■
		Food waste recovery and redistribution (e.g., odd-shaped)	■	■	
		Supply chain management software	■	■	
		Upcycling food waste	■	■	
	Sustainable Protein Production Technologies	Animal cell cultivation	■		
		Fermentation-based protein (precision, biomass, gas-based, etc.)	■	■	
		Plant-based (peas, chickpeas, mushrooms, aquatic plants, etc.)	■	■	■
		Sustainable aquaculture	■	■	■
	Food Science	Better-for-you indulgence (sugar reduction/replacement, free-from, healthy snacking)	■		
		Functional foods and nutraceuticals	■	■	
		Functional ingredients	■	■	
	Nutrition 2.0	Food safety and traceability	■	■	
		Personalized nutrition	■		

Theme: The highest-order division of food system companies. Each theme is broad, caputiring a necessary shift from an unsustainable status quo to a more sustainable future. The four themes are fixed and unchanging.

Category: Each theme is further divided into innovation categories. The unifying factor of a category is that all the innovations address a similar barrier preventing the shift from occurring. We rarely add new innovation categories to the framework.

Segment: The specific innovations that make up a category are called segments. Companies within a segmnet have a similar product, technology, or business model. New segments emerge often.

Chart 5: Indicative assessment of the ESG performance in the agrifood sector vs. other major investment themes for ESG-oriented investors. Source: Re:food and ADAM Partners

5 Conclusion

All stakeholder groups are waking up to the reality that the technologies and innovations of the Third ("Green") Agricultural Revolution have created a status quo in agrifood that is unsustainable in every sense: environmental, social, and financial. Because of this, it is now time for a Fourth Agricultural Revolution—one that is truly green and one that must take place to sustain our society and economy. This Fourth Revolution will combine a deeper understanding of the value of ecosystem services with innovations like artificial intelligence and synthetic biology to evolve the agrifood system toward a paradigm that depends less on fossil-fuel-based chemistry, labor-intensive processes, and wastefulness and more on biology, automation, and circularity.

Like the Third Agricultural Revolution, this next transformation will catalyze the development of novel technologies and create massive economic, social, and environmental value for participants. To date, private capital has been slow to recognize this opportunity, as indicated by the limited investment flows into the sector. Yet now is the time for all investors to turn their attention toward the agrifood sector to simultaneously accelerate and benefit from this shift by investing in these transformative technologies.

Appendix

1. Acknowledgments

We would like to extend our appreciation to the following people who generously shared their expertise with us when writing this report:

Stockholm Resilience Centre
- Beatrice Crona, Professor in Sustainability Science
- Line Gordon, Professor in Sustainability Science

Axfoundation
- Madeleine Mörner, Program Director Food of the Future

McKinsey & Company
- Karl Nilsson
- Tom Brennan

Fjärde AP-fonden (AP4)
- Jenny Askfelt Ruud

Smit Management Consultancy
- Jeroen Smit

Solvable Summit 2024 participants

Abel Rossignol	Thia Ventures
Adam Anders	Anterra Capital
Anna Adlarson	Kinnevik AB
Anna Ottosson	Mudcake
Axel Boethius	KF Stockholm
Björn Heinz	Yara Growth Ventures
Bodil Sidén	Kost Capital
Carl Folke	Stockholm Resilience Centre
Christoph Jenny	Planted
Daniel Nyander	Gullspång Re:food
Erik Brandberg	Gullspång Invest
Fanny Näslund	PolarVentures
Felix Leonhardt	Oyster Bay
François Poulain	Planted
Gustaf Brandberg	Gullspång Invest
Jörgen Bergqvist	Ocean Collective
Lars Dithmer	Alfa Laval
Lauri Reuter	Nordic FoodTech VC
Lena Horvath McAtee	Gullspång Re:food
Magnus Brandberg	Gullspång Invest

Malin Carlström	Climentum Capital
Marika King	PINC
Matilda Ho	Bits x Bites
Nathalie Öhlander	Gullspång Re:food
Peter Aschmoneit	Planted
Peter Odemark	Gullspång Re:food
Philip Nobel	Stardust Foods
Snir Aharon	Mediterranean Food Lab
Sofia Lindelöw	Norrsken Foundation
Willem Huidekoper	IMAS Foundation
Yair Yosefi	Mediterranean Food Lab

Gullspång Invest and the Re:food team
- Gustaf Brandberg
- Peter Odemark
- Lena Horvath McAtee
- Edward Arthy

ADAM Partners team
- Michael Takysak
- Roy Meltzer
- Alexander Bülow
- Dan Ziv

In addition, this report wouldn't exist without our ability to seek inspiration and build upon the extensive research, knowledge, and insights compiled by leading experts, organizations, and their respective work listed below.

2. References

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