
From sustenance to sustainability: transforming the food system to meet global challenges

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Executive summary

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- The emergence of a new food system will be vital to achieving the United Nations' vision of a more peaceful and prosperous world.
- As a result, food is likely to represent one of the most significant long-term investment themes of the years and decades to come.
- Investments in disrupting the food system can generate solid returns over time while also addressing numerous ESG considerations.
- In tandem, they can help tackle many of the global challenges outlined in the United Nations Sustainable Development Goals.
- These include issues related to climate change, hunger, health, production, consumption, employment and economic growth.
- The necessary transformation of the food system is likely to require investment of between \$20 trillion and \$30 trillion between now and 2050.
- Spanning countries, industries and assets, opportunities can already be found both within and beyond the food and agriculture sector.

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Introduction: food as a force for good



The emergence of a new food system will be critical to realising the UN's vision of a better world.

In a previous series of papers, *Appetite for Change: Food, ESG and the Nexus of Nature*, we explored how the food system exacerbates many of the gravest threats facing the planet and its inhabitants. We discussed the notion of interconnected causality¹, the normalisation of unsustainable practices in production and consumption² and the capacity of a technology-driven Ever-Green Revolution to bring about positive change³.

Here we take a closer look at how disrupting the food and agriculture sector could help tackle the global challenges framed in the United Nations Sustainable Development Goals (UN SDGs). Building on our earlier insights, we aim to underline how investments in this space can generate solid returns while addressing an array of environmental, social and governance (ESG) concerns.

Our arguments are rooted in a conviction that food represents one of the most important investment themes of the years and decades to come. Within this overarching theme, crucially, there are several sub-themes, each of which taps into one or more of the SDGs.

The table below shows how we link four sub-themes in particular to the UN's "shared blueprint for peace and prosperity"⁴. Examining how they shape our thinking when we select investments, we consider these sub-themes in detail in the following pages.

We also present case studies of businesses that recognise the status quo as untenable. In our opinion, these companies understand that many prevailing policies and practices are dangerously short-termist and that the emergence of a truly sustainable, "smarter" food system will be critical to realising the UN's vision of a better world.

Investors have a pivotal part to play in supporting this era-defining transformation. They are in a unique and privileged position to promote approaches that provide novel solutions rather than additional problems.

As we explain, this arena already bears the hallmarks of a "genesis trend" – a phenomenon that occurs when the growth of a technology or a market becomes sufficient to trigger a substantial and lasting shift. Spanning numerous countries, industries and assets, there are likely to be many significant and financially attractive opportunities to ensure food's long-term role as a force for good.

Key food sub-themes and how they relate to the UN SDGs

Climate change and emissions intensity	Low nutritional content of food	Food waste and packaging	Labour shortage and wage inflation
SDG 13 Climate action	SDG 2 Zero hunger	SDG 12 Responsible consumption and production	SDG 8 Decent work and economic growth
SDG 6 Clean water and sanitation	SDG 3 – Good health and wellbeing		SDG 9 Industry, innovation and infrastructure

Source: Invesco; United Nations

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Key ingredients for positive change



Our belief that food is a key investment theme is reinforced by the fact that these trends are both global and entrenched.

3.1. Drivers of demand

The development of a new and genuinely sustainable food system is being driven by a number of structural trends. These are embedded in major demographic, environmental and consumer-related dynamics.

In the mid-1950s, when the original Green Revolution was in its infancy, the global population was around 2.8 billion. As the chart below highlights, it now stands at more than seven billion and is expected to top nine billion by 2050⁵.

In light of this trajectory and the enormous demands it imposes, meat production has more than trebled during the past half-century. In 2018, in a grim illustration of factory farming's rise, it reached 340 million tonnes and involved the slaughter of around 80 billion animals⁶.

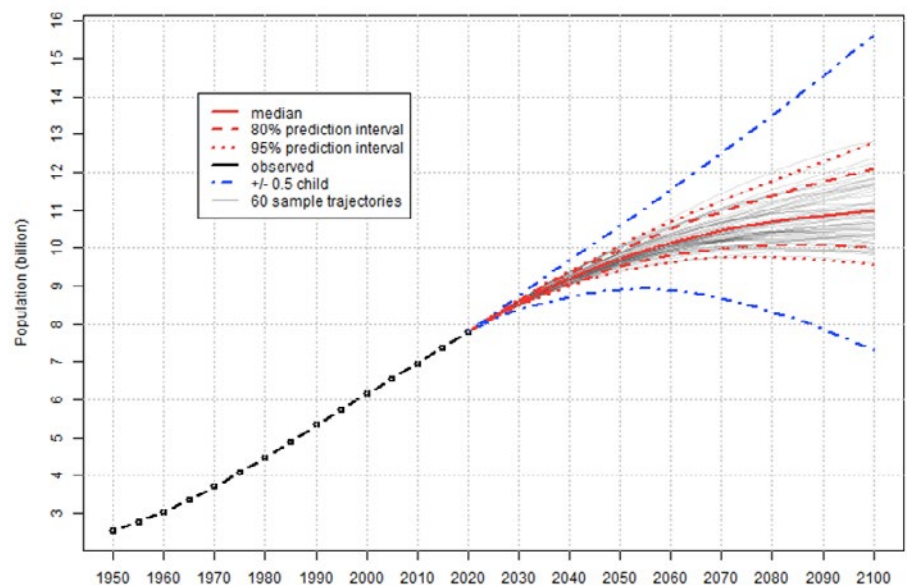
At last, ending the blight of this form of industrialisation will be fundamental to the successful disruption of the food system. According to the American Society for the Prevention of Cruelty to Animals, more than 70% of livestock is now factory-farmed; the figure in the US is thought to be in excess of 99%⁷.

In keeping with the idea of interconnected causality, the relentless adoption of industrial methods has been a leading contributor to climate change. More than 14% of all anthropogenic greenhouse gas (GHG) emissions can be attributed to livestock, with cattle accounting for the vast majority of this total⁸; livestock also occupies nearly 80% of agricultural land globally yet produces less than 20% of the world's supply of calories⁹.

Mounting opposition to these damaging realities is fuelling the spread of veganism, vegetarianism and flexitarianism. It has been estimated that the market for organic food could be worth \$150 billion by 2050¹⁰.

Our belief that food is a key investment theme – one that should stay both relevant and rewarding over the long term – is reinforced by the fact that these trends are both global and entrenched. The imperative of feeding all of humanity is still to be met; a collective desire to safeguard the future is increasingly apparent; and a popular will to disrupt the food system is clearly in the ascendant.

Population growth – past, present and likely future



Source: United Nations: World Population Prospects 2019, 2019

3.2. Investment in growth

The transformation of the food system relies on investors allocating capital to businesses that participate in the necessary shift. There are several points to observe in pursuing such an investment ethos.

The first is that the disruption needed in this sphere – as in any – will stem from innovation, much of which will emanate from newer companies. The rapid maturation of agtech – agricultural technology¹¹ – has already demonstrated this, as the chart below shows. We should therefore be prepared to identify opportunities at the small-cap end of the market spectrum.

It does not automatically follow, though, that larger businesses should be dismissed as laggards. While much of the novel thinking might come from elsewhere, it is essential that the sector's more sizeable players also embrace change.

Big-name companies feature in a number of our case studies. What unites these organisations is a willingness to refine their policies and practices over time. They appreciate what might have worked well in the past may no longer work well in the future, and they accept failure to evolve is likely to undermine both the greater good and their own long-term prospects.

Such businesses can be thought of as “transition holdings”. Their small-cap counterparts might be more cutting-edge, but these comparative giants still possess many attributes – including their existing distribution networks, their strong brand recognition and their general influence – that can underpin a wider move to enhanced sustainability.

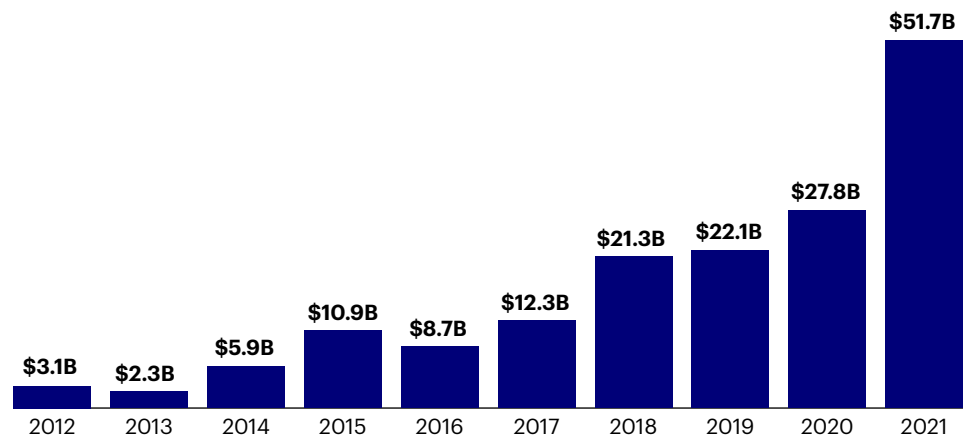
This is why constructive engagement is central to this journey as a whole. Like companies in any sector confronted by dramatic upheaval, businesses involved in every aspect of the food system must be encouraged to grasp complex issues, look ahead and adapt accordingly. The power of active ownership is among investors' most potent weapons in this respect.

Finally, it is vital to acknowledge this transformation extends beyond the food system. Reflecting the interplay across the SDGs, our overarching theme cannot be restricted to investments in food and agriculture alone. Technology, chemicals, healthcare, industrials and other sectors must also enter the reckoning. Global challenges demand the application of a global lens.



Businesses involved in every aspect of the food system must be encouraged to grasp complex issues, look ahead and adapt accordingly.

Investment in agtech, 2012-2021



Source: AgFunder: AgFunder AgriFoodTech Investment Report 2022, 2022

3.3. Crisis as an accelerant

The fragility of the established food system was thrown into sharp focus following Russia's invasion of Ukraine in February 2022. The Food and Agriculture Organisation of the UN was quick to warn the conflict would impact food security not just in Ukraine itself but elsewhere¹².

Russia and Ukraine were formerly responsible for around a quarter of global wheat exports, with around 40% of this output sent to the Middle East and Africa. At the time of writing, according to the UN's International Fund for Agricultural Development (IFAD), these regions are already feeling the effects of shortages brought about by the war¹³.

Russia is also the world's third-largest producer of fertiliser, whose price spiked even before President Putin approved the commencement of military action. When fertiliser becomes more expensive, as IFAD reports have also pointed out, food tends to follow suit¹⁴.

Speaking in March 2022, IFAD President Gilbert Houngbo said the situation could prove "a tragedy for the world's poorest people... who cannot absorb the price hikes of staple foods and farming inputs that will result from disruptions to global trade". He also admitted such difficulties would be hard to overcome in the short term¹⁵.

However, as recent events have demonstrated, crisis can also serve as a catalyst for progress. The COVID-19 pandemic offered compelling evidence of what can be accomplished when extraordinary circumstances shatter the conventional barriers to innovation, with breakthrough advances in numerous sectors coming thick and fast in the face of unprecedented pressures.

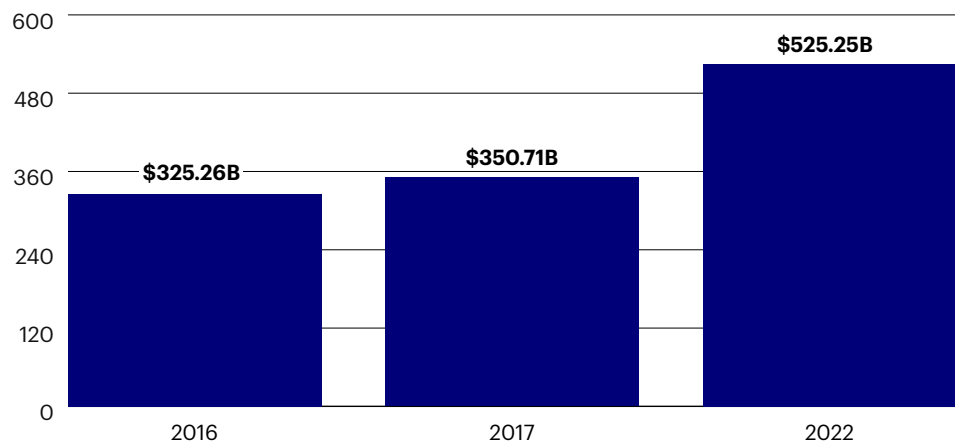
Food production and consumption must now undergo a comparably radical shake-up. As agtech pioneer Jonathan Webb has said, a new food system could bring a "third wave of sustainable infrastructure" – after renewable energy and electric vehicles – in response to the compounding inadequacy of conventional approaches¹⁶.

Nobel laureate Milton Friedman famously wrote: "Only a crisis – actual or perceived – produces real change."¹⁷ We believe today's crises – which undoubtedly fall into the "actual" camp – will accelerate the positive transformation that is obviously needed and which, as the chart below shows, is already under way.



The COVID-19 pandemic offered compelling evidence of what can be accomplished when extraordinary circumstances shatter the conventional barriers to innovation.

Value of the global smart food market in \$US billions



Source: Emergen Research: Smart Food Market by End Products (Dairy Products, Bakery Products, Meat Products, Confectionery, Beverages, Dietary Supplements), by Food Type (Encapsulated Food, Functional Food, Genetically Modified Food) and by Region, Forecast to 2028, 2021

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How the food system can help address global challenges

4.1. Climate change and emissions intensity

Estimates of the food system's overall contribution to GHG emissions vary. For instance, a 2019 report by the Intergovernmental Panel on Climate Change put the figure at between 21% and 37%¹⁸, while research published in Nature Food in 2021 suggested 25% to 42%¹⁹.

Irrespective of the precise percentage, the message from almost every expert analysis is plain: the food system as we know it is highly detrimental to the environment. To quote the authors of the Nature Food study: "Urgent reform is needed."²⁰

The picture is complicated by the fact that more than 90% of these emissions can be classified as Scope 3²¹ – that is, they are the indirect emissions from an organisation's activities. These comprise sources a business does not own or control, which in this context could include food ingredients, packaging and other purchased inputs.

This means notable reductions in emissions intensity are likely only if there is collaboration all along the value chain. Companies must be cognisant of how each component links to others and how the food system in its entirety both influences and is influenced by other elements of the nexus of nature.

This is the sort of corporate view we look for when investing with SDG 13, "Climate action", in mind. We respect managements that regard the climate crisis as a multifaceted problem that demands multifaceted solutions.

More broadly, we try to identify businesses that are able to strengthen their resilience and adaptability to environmental challenges of every kind. These include those related to SDG 6, "Clean water and sanitation".

There are various steps companies can take to help meet this goal. They include strategies for expanding access to safe and affordable drinking water; improving water quality; addressing scarcity; augmenting harvesting, desalination, efficiency, treatment, recycling, reuse and resource management; and protecting or restoring rivers, lakes, wetlands, aquifers and other ecosystems.

On the right track: Canadian Pacific Railway

Transporting freight by rail generates far lower GHG emissions than transporting freight by road²², largely because a single train is able to carry as much weight as hundreds of trucks²³. With environmental considerations more important than ever, rail companies are increasingly playing to their strengths in this respect.

Canadian Pacific Railway is among the acknowledged leaders in developing and applying technologies that are significantly enhancing the efficiency of rail freight transportation. Its innovations include software systems that optimise fuel usage, timing and spacing across its network.

Improving the design of the company's rolling stock has helped increase the quantity of freight an average train can carry. In 2020 this was 3,817 tonnes, compared with 2,923 tonnes in 2000. A programme of retrofitting diesel-powered locomotives with hydrogen fuel cells and battery technology is also under way.

In January 2022 Canadian Pacific was included for the first time in the Corporate Knights Global 100 Index, an annual ranking of the world's most sustainable corporations. It was the top-rated freight transportation business²⁴. With road freight still dominant, companies such as this are likely to represent a long-term substitution opportunity.



We try to identify companies that are able to strengthen their resilience and adaptability to environmental challenges of every kind.

A one-step process for clean water: NX Filtration

NX Filtration is a Netherlands-based business that uses innovative technology to produce pure and affordable water. Its hollow-fibre membrane modules are used for nanofiltration, ultrafiltration and microfiltration.

The company's products enable a one-step filtration process that requires neither pre-treatment nor chemicals and which delivers a lower CO₂ footprint. The latter is especially useful for large-scale filtration, such as is practised at Veolia's Mery-sur-Oise plant in Paris; NX's technology has also been deployed in smaller facilities in countries including Sweden, Vietnam, Indonesia and the Philippines.

Founder Erik Roesink has described the business's "sweet spot" as "various kinds of high-fouling fresh water". These include surface water containing colour, micropollutants and hardness, as well as municipal effluent with contaminants such as nanoplastics, antibiotics and viruses.

Climate change is crucial to NX's thinking, since the phenomenon is likely to heighten the need for water to be reused. Roesink has spoken of "huge opportunities" in this space²⁵.

4.2. Low nutritional content of food

Historically, the food and agriculture sector has coped reasonably well with both population growth and evolving consumer preferences. While it has not always produced enough, it has consistently produced more of whatever has been required or desired.

Unfortunately, quantity has not gone hand in hand with quality. Whereas production has generally risen, the nutritional value of food has fallen. What has been called "the great nutrient collapse"²⁶ is now thought to have been unfolding for around three quarters of a century.

In 2004 a landmark study found nutrient levels in most fruits and vegetables had declined since 1950²⁷. The authors concluded this deterioration could be "most easily explained by changes in cultivated varieties" – a reference to the high-yielding crops that have dominated since the Green Revolution, which was set in motion in the wake of World War II²⁸.

Other researchers have since argued carbon dioxide in the atmosphere may also be to blame, since more CO₂ means more photosynthesis – which in turn means plants are packing in more carbohydrates at the expense of nutrients such as protein, iron and zinc²⁹. In the words of plant physiologist Dr Lewis Ziska, of Columbia University: "Plants are becoming carbon-rich and nutrient-poor."³⁰

Irrespective of the precise cause, the effect is manifest. Undernourishment is on the rise, affecting around a tenth of the global population in 2020³¹. The World Health Organisation's ideal of a healthy diet³² remains out of reach for hundreds of millions of people.

Challenges such as these are encompassed in SDG 2, "Zero hunger", and SDG 3, "Good health and wellbeing". Investors can align their portfolios with these goals by gaining exposure to businesses specialising in areas such as plant-based foods, healthier products and agricultural research, development and technology.

Again, it is important to look beyond the food sector itself. For example, there are likely to be opportunities in companies that help maintain ecosystems and genetic diversity; that bolster rural infrastructure and implement resilient policies and practices; and that address not only lack of nutrition but conditions such as excess nutrition and obesity.



The World Health Organisation’s ideal of a healthy diet remains out of reach for hundreds of millions of people.

A proven commitment to positive change: DSM

DSM began its corporate life in 1902 as Dutch State Mines. It was originally established to mine coal reserves in the Netherlands province of Limburg. It closed its last mine in the early 1970s.

The company subsequently began to concentrate on “science-based solutions in health, nutrition and sustainable living”. It later entered the biotechnology market, sold its petrochemical interests and acquired several firms specialising in animal and human nutrition.

Today DSM’s Animal Nutrition and Health division serves the global feed industry. Improving the nutritional quality of meat, milk, fish and eggs is one of the six “sustainability platforms” underpinning its work. Meanwhile, the Human Nutrition and Health division focuses on early-life nutrition, dietary supplements, pharmaceuticals, medical nutrition and the food and beverage markets.

The company says its overall mission is to “turn scientific and innovation power towards tackling the greatest challenges faced by our society”, including those surrounding livestock and protein supply. It now informally refers to its name as an acronym for “Doing Something Meaningful”³³.

From refining to redefining: Tate & Lyle/KPS

Tate & Lyle was once a key player in the sugar-refining industry. Today, reflecting the trend towards a more sustainable food system, it is repositioning itself as a provider of ingredients and solutions to food and beverage companies.

This transformation reached a major milestone in April 2022, when Tate & Lyle announced it had sold a stake in a new business and its subsidiaries to private equity firm KPS Capital Partners. KPS has a reputation for improving the performance of large industrial companies.

One of the new joint venture’s targets – indicative of Tate & Lyle’s general pivot to healthier food – is to remove nine million tonnes of sugar from people’s diets by 2025³⁴. This would be achieved through low-calorie/no-calorie sweeteners and fibres, two areas in which the company feels it can be a global leader.

“The trend towards healthier food is accelerating,” Tate & Lyle CEO Nick Hampton said in announcing KPS’s involvement. “We are well positioned to meet growing consumer demand for food and drink that is lower in sugar, calories and fat and with added fibre.”³⁵

4.3. Food waste and packaging

In 2011, in an analysis commissioned by the UN, researchers from the Swedish Institute for Food and Biotechnology reported around a third of all food produced for human consumption globally was wasted. This amounted to more than a billion tonnes every year³⁶.

One of the study’s recommendations was that developing countries should cut waste by improving production and distribution. China – which describes itself as “the world’s largest developing economy” – has gone further, passing legislation that discourages food waste through measures such as banning binge-eating videos and empowering restaurants to impose extra fees on diners who over-order³⁷.

Today, however, it is overdevelopment that is seen as more culpable. In 2021 the World Wide Fund for Nature (WWF) published *Driven to Waste*, which revealed that well over a billion tonnes more food than previously estimated is now wasted each year, that approximately 40% of all food goes uneaten and that more industrialisation is likely to lead to more waste³⁸.

Unveiling the findings, Pete Pearson, the WWF’s Global Food Loss and Waste Initiative Lead, said: “This is not just an issue for developing regions. More food is lost on farms per capita in very advanced supply chains, like the US and Europe. The problem is likely bigger than we had thought.”³⁹



Well over a billion tonnes more food than previously estimated is now wasted each year... and more industrialisation is likely to lead to more waste.

How food is packaged has a substantive bearing on waste. As the UN has remarked, the “huge environmental burden” of food waste can be better alleviated through adequate packaging than through no packaging at all⁴⁰; yet plastic is still the material of choice, even though it can take centuries to degrade, and the packaging industry is the largest consumer of synthetic plastics derived from fossil fuels⁴¹.

All these concerns are covered by SDG 12, “Responsible consumption and production”. With this objective in mind, we look for businesses that strive for sustainable management and efficient use of resources during every phase of a product’s life cycle.

Such efforts might include strengthening scientific and technological capacity and integrating sustainability information into corporate reporting. The latter is especially desirable among multinational companies.

A holistic approach to innovation: Smurfit Kappa

The Smurfit Kappa Group is a leading specialist in paper-based packaging. It runs a network of paper, recycling and forestry operations in more than 30 countries, including more than 20 in Europe. Its plants source most of their raw materials from the company’s own paper mills.

Smurfit works closely with customers to develop solutions that add value to its own supply chains and those of its clients. It aims to deliver efficiencies in storage, transport and display, as well as optimising recovery and recycling.

A range of sustainability data underpins these efforts. Smurfit uses monitoring, scorecards, its Smart Services function and its InnoTools suite – including eSmart, SupplySmart and Pack Expert – to track novel ideas from development to implementation.

The company’s Better Planet Packaging initiative was set up to “make a positive impact on supply chains around the globe and on millions of consumers”. It seeks to encourage circularity and reduce carbon footprints, environmental footprints, and packaging traces⁴².

Crisis as an engine of positive change: Graphic Packaging Holding Company

The Graphic Packaging Holding Company is a leading provider of sustainable, paper-based packaging solutions. Headquartered in the US, it operates globally and supplies a wide variety of food and beverage businesses.

Its sustainability goals for 2025 include generating 100% of sales from products that are recyclable. By 2020, according to its 2020 ESG Report, the company had reached 98%.

Another objective is to support the American Forest and Paper Association’s initiative to achieve an industry-wide 70% recovery rate for paper and paperboard in the US by 2025. The rate in 2020 was 65.7%.

In 2021, reflecting on the COVID-19 pandemic’s role as a catalyst for innovation, CEO Michael Doss wrote: “I consider 2020 in many respects an inflection point on ESG-related matters. [We have] the resolve and commitment to continue advancing our ESG programme and deliver inspired packaging making a world of difference.”⁴³

4.4. Decent work and economic growth

Agriculture is the world’s biggest employer. In 2019, according to the UN, it was home to 884 million workers – more than a quarter of the global workforce – despite 169 million Chinese and 25 million Indians exiting the sector during the preceding two decades⁴⁴.

The relevance of SDG 8, “Decent work and economic growth”, and SDG 9, “Industry, innovation and infrastructure”, becomes apparent when we consider the majority of agricultural jobs are in rural economies. As a result, they tend to be both precarious and poorly paid.



The majority of agricultural jobs are in rural economies. As a result, they tend to be both precarious and poorly paid.”

It has been estimated that 65% of low-income working adults attempt to make a living through agriculture⁴⁵. The sector employs around 225 million people in Africa – roughly half the continent’s workers – and a total of around 400 million in China and India⁴⁶.

Particularly in regions such as these, most of the world’s 570 million farms are smaller than two hectares⁴⁷. Often family-run, many such small holdings are in desperate need of positive change if they are to have any realistic hope of prospering.

This situation can be found in close proximity to, and even within, developed economies. Interviewed in one of our earlier papers, Jonathan Webb cited “labour concerns” in Mexico as a powerful motivation behind his decision to establish US agtech pioneer AppHarvest.

Condemning the status quo, Webb said: “We’re feeding our country through the work of people who aren’t making a living wage. [There’s] deception, withholding of wages, debt bondage and other abusive working and living conditions – and I worry that this is just the tip of the iceberg.”⁴⁸

Long-term solutions are likely to lie in higher levels of economic productivity and more reliable infrastructure. Diversification, technology, development-oriented policies and greater access to financial services will all be key. Industrialisation has to be central to the transformation, but this, too, must be innately sustainable.

Charting food’s global journey: Antares Vision

Antares Vision is a tech company that specialises in inspection, track-and-trace and smart data management systems. These are areas vital to the far-reaching disruption of the food system, given the need – as framed in SDG 9 – to improve industry, innovation and infrastructure throughout supply and value chains.

Antares focuses on monitoring every stage of food’s journey, essentially equipping each product with a “digital passport”. The company says how an item of food progresses through various phases – for example, harvest, production, export and retail – tells “a very important story”.

Crucially, it is a story consumers increasingly want to hear. Antares reports that 80% of buyers now check the origins of their food and that 96% want a “controlled food supply chain”.

Based in Italy, Antares operates worldwide in a number of sectors. These include pharmaceuticals, medical devices and cosmetics. By enhancing quality, safety, trust, transparency and production efficiency throughout a product’s lifespan, its work in the food sector is helping transform the system from the ground up – figuratively and literally⁴⁹.

Cultivating a sustainable future: John Deere

John Deere is one of the biggest names in agriculture. The business was founded in 1837 and has remained at the forefront of its sector for almost two centuries by consistently focusing on innovation.

Its approach to the burgeoning agtech arena offers no exception in this regard. Writing in the company’s 2020 Sustainability Report, Chairman and CEO John May declared: “We’re directing the power of our enterprise to deliver intelligent, connected machines and applications that will revolutionise our customers’ businesses, unlocking economic value across the full life cycle of our products in ways that are sustainable for all.”

John Deere has identified electrification, automation and autonomy as three core technologies that will shape agriculture’s future. Its work in these areas includes zero-emissions tractors, crop-spraying drones and systems that can automatically distinguish between cultivated plants and weeds.

The company says agtech allows farmers to “monitor their operations, make tactical decisions and devise strategic plans for the following season”. More than 20 new products were rolled out in 2020 alone⁵⁰.

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Q&A: genesis trends and growth opportunities

Erik Esselink is a Fund Manager for Invesco's European Equities and Global Core Equity teams. With more than 25 years' experience, he currently specialises in the research and management of strategies for small-cap equities.

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Dr Henning Stein is Invesco's Global Head of Thought Leadership and Market Strategy. He has more than 20 years' experience in the sphere of responsible investing and continues to advise on developing novel ESG solutions.

Here Erik, James and Henning explain why the transformation of the food system represents both a key investment theme and a compelling genesis trend. They also consider the scale of the positive disruption such a transition could entail – and the magnitude of the investment opportunities it is likely to bring.

You say the development of a new food system is quickly emerging as a significant investment theme. Could you begin by briefly explaining the idea of thematic investing as a whole?

EE: Thematic investing is an approach that's increasingly influencing the thinking of many long-term investors. It focuses on the discernible trends that are reshaping our lives, which means it requires us to think about major structural shifts and their impacts.

In other words, it's not about where the market might be in the next quarter or the quarter after that. It's about where the market is likely to be five, 10, 20 or maybe even 50 years from now.

We have to ask ourselves which companies, sectors or industries might have vanished, and which might have taken their place. We also have to try to understand which of today's innovations are likely to become central to our everyday lives over time.

Since we know the system as it stands today is fundamentally unsustainable, food clearly fits this bill. This is a transformation that should bring positive, lasting change on a global scale in the years and decades ahead.

[Why is it important to take a broad view of a theme like this?](#)

JM: The previous major disruption of the food system happened more than three quarters of a century ago. That was the Green Revolution, which introduced a raft of policies and practices that, in many cases, have endured to this day.

It's evident that the Green Revolution has now run its course. Most cultivatable land is used for crops to feed livestock or for processed food. Factory farming is pretty much ubiquitous. There's a dangerous overreliance on fertilisers and irrigation. And we still haven't eradicated the scourge of hunger.

These are all problems that can be addressed, but we shouldn't pretend they can be solved overnight. What's needed now is a new revolution – and that's going to take time, collaboration and continued innovation.

So, this is a transition that's far too substantial to be viewed purely through the prism of food and agriculture. Many individuals, organisations, industries and sectors are going to contribute, and this should translate into a wide range of growth opportunities.

[Why do you describe what's happening as a genesis trend?](#)

HS: We use this term when we believe the growth of a particular technology or market reaches a tipping point that signals a substantial, lasting shift. It can also be referred to as a "big bang" trend.

The recent growth of sectors such as agtech suggests we're already witnessing this phenomenon within the food theme. So do numerous forecasts – for example, Emergen's calculation that the smart food market could be worth more than \$940 billion by 2028 and is likely to deliver double-digit CAGR before then⁵¹.

Another important hallmark of a genesis trend is that it has many architects and enablers. This echoes James's observation about how wide-ranging this transformation is likely to be, and it's a vital point for investors.

An earlier genesis trend – the smartphone – illustrates this. We all know the iPhone has been a huge factor in Apple's long-term success, but what's less appreciated is that other businesses involved in the rise of the smartphone have enjoyed even more spectacular growth.

Take Innox Corp, which makes semiconductors, or Sanan Optoelectronics, which makes LEDs. Both have generated investment returns of around 20,000% since the iPhone's launch, and they've done so not by designing and marketing smartphones but by making the components that allow smartphones to function.

So, a crucial lesson for investors in genesis trends is to look beyond the headlines and the big names, because it's the lesser-known players that might enjoy the greatest long-term growth of all. That's why we're trying to identify opportunities across the market-cap spectrum in this space.



The fact that investments in this space can be aligned with the UN SDGs underlines the significance and size of this transition.

6

Conclusion: an appetite for disruption



All these aspects of the unfolding transformation should be of interest to investors who have a long-term outlook, an ESG-aware focus and an appetite for positive disruption.

Looking ahead, how big do you think this trend could become in investment terms?

EE: We believe between \$20 trillion and \$30 trillion needs to be invested between now and 2050 to develop more sustainable systems around the production and use of food. We include the goal of clean water and sanitation in that figure.

It's hard to think of many investment trends that could be bigger. Maybe the only obvious comparison is investment in climate action, which has been estimated at up to \$275 trillion by 2050⁵².

JM: The fact that investments in this space can be aligned with the UN SDGs underlines the significance and size of this transition. We're talking about a truly global undertaking with the most far-reaching implications.

The bottom line is that investing in the status quo is likely to add to some of the greatest challenges facing the planet. By contrast, investing in a new food system is likely to address those same challenges.

HS: It's basically a choice between being part of the solution and being part of the problem. We can either prop up a failed system or help create a new one that will benefit billions of lives globally.

The ultimate aim is nothing less than positive disruption on a worldwide scale. That's why this is an investment theme that's likely to rank among the biggest growth opportunities in human history.

The food system has reached an inflection point. Ideas that were once innovative and seemingly capable of meeting unmet needs have become unfit for purpose. Entrenched approaches to production and consumption are no longer part of the solution: they are part of the problem.

It is now obvious the way ahead lies in novel policies and practices that are respectful of nature rather than to its detriment. The status quo must cede to something that is both more sympathetic and, above all, more sustainable.

As we have seen, this revolution is already under way. Bearing many of the characteristics of a genesis trend, it is likely to take years – if not decades – to realise in full, requiring trillions of dollars in financial backing.

The transition will be multifaceted, spanning numerous sectors and embracing a wide variety of architects and enablers. It will benefit from the forward thinking of start-ups and corporate titans alike – not to mention entities at all points between the two on the market-cap spectrum – and it is likely to generate consistently attractive returns over time.

It will also once again make food a force for good. This is an especially relevant corollary today, when the issue of food security is perhaps more pressing than it has been for at least three quarters of a century.

More broadly, a new food system will help address a number of global challenges – as enshrined in the UN SDGs – and so improve lives around the world. Ultimately, it could play a major role in halting the steady destruction of the planet and saving humanity from itself.

We believe all these aspects of the unfolding transformation should be of interest to investors who have a long-term outlook, an ESG-aware focus and an appetite for positive disruption. This is why we regard food as one of the most significant investment themes of both the present day and, crucially, what we hope will be a brighter future.

7

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Investment risks

The value of investments and any income will fluctuate (this may partly be the result of exchange rate fluctuations) and investors may not get back the full amount invested.

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