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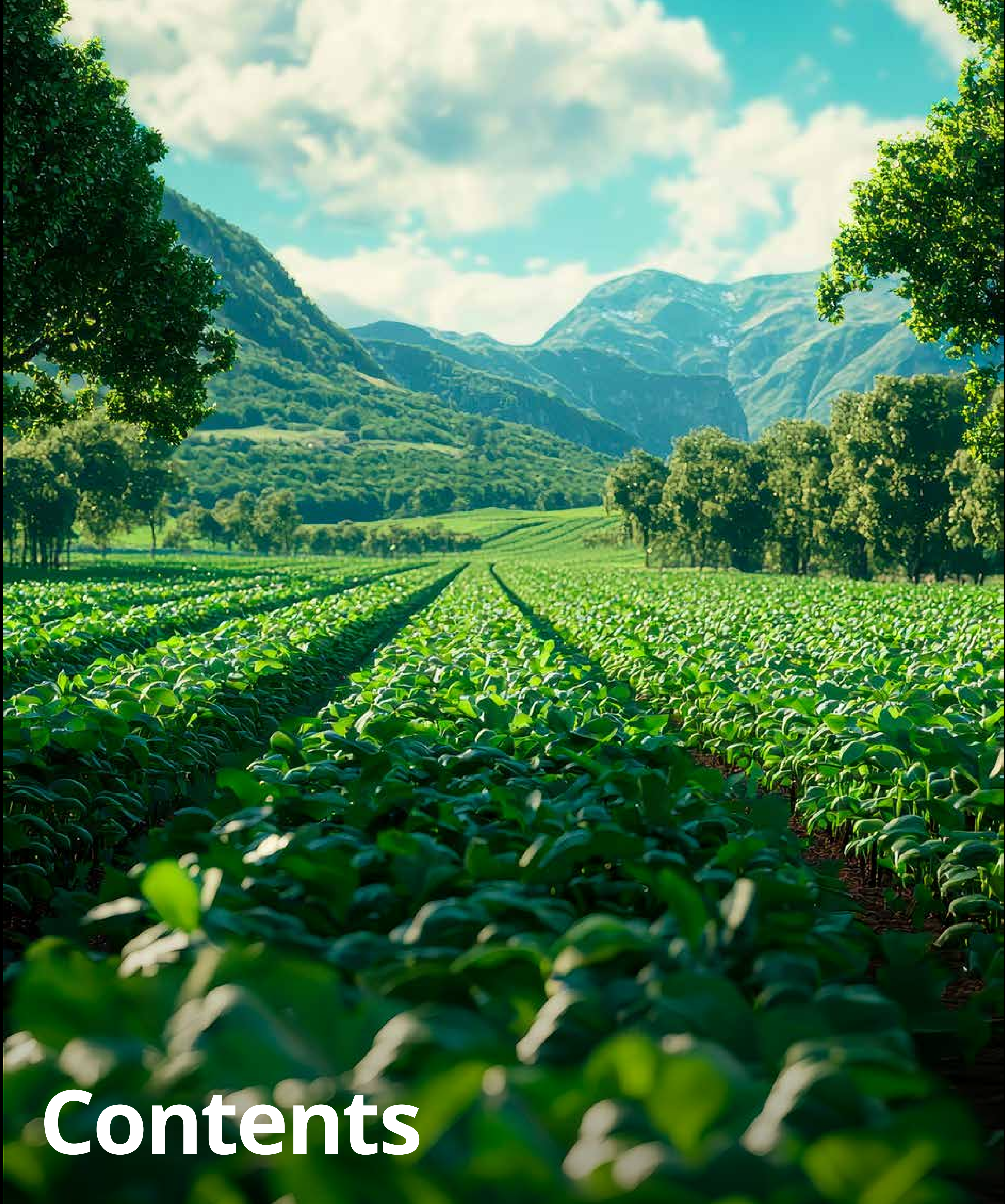
The Future of Sustainable Agriculture
Cultivating change

Report
April 2025



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Authors

Lead writers

Merlyn Gregory
Randy Jagt

Team contributors

Sadia Ahmed
Ashleigh Arton
Victoria Ponieman

Executive Summary

The global food system is at a critical turning point. While industrial agriculture has dramatically increased food production, this progress has come at a steep environmental cost. The agricultural sector is now tasked with the urgent need to decarbonise its operations to meet climate change targets while simultaneously meeting the rising global demand for food. **Failure to decarbonise the global food system and mitigate the environmental impact of agriculture will exacerbate climate change, threaten global food security, and lead to irreversible damage to vital ecosystems.**

Agriculture, encompassing a wide range of farming practices and land management techniques, accounts for around a quarter of total global greenhouse gas emissions.[1] The top four contributing factors to agriculture's greenhouse gas emissions are the following:[1] land-use change, methane emissions from livestock, the production and use of synthetic fertilisers, and energy use. These factors not only contribute to climate change but also threaten biodiversity and degrade vital ecosystems, thus jeopardising long-term food security.

According to Deloitte analysis - food security will significantly decline if we continue with business as usual with the need of feeding a growing population that will require 40% more food production in 2070.[2]

However, amidst these challenges, a confluence of factors is driving a significant transformation within the agricultural industry. Heightened ecological pressures, government policy changes, societal shifts in behaviour and technological disruptions are creating a fertile ground for change.[3]

High-impact solutions to reduce agriculture's footprint across the 4 identified areas include promoting sustainable land management and deforestation-free supply chains, reducing reliance on animal products, transitioning to precision agriculture, adopting alternatives to synthetic fertilisers, renewable energy integration and the progressive decarbonisation of farm machinery as technology continues to evolve.

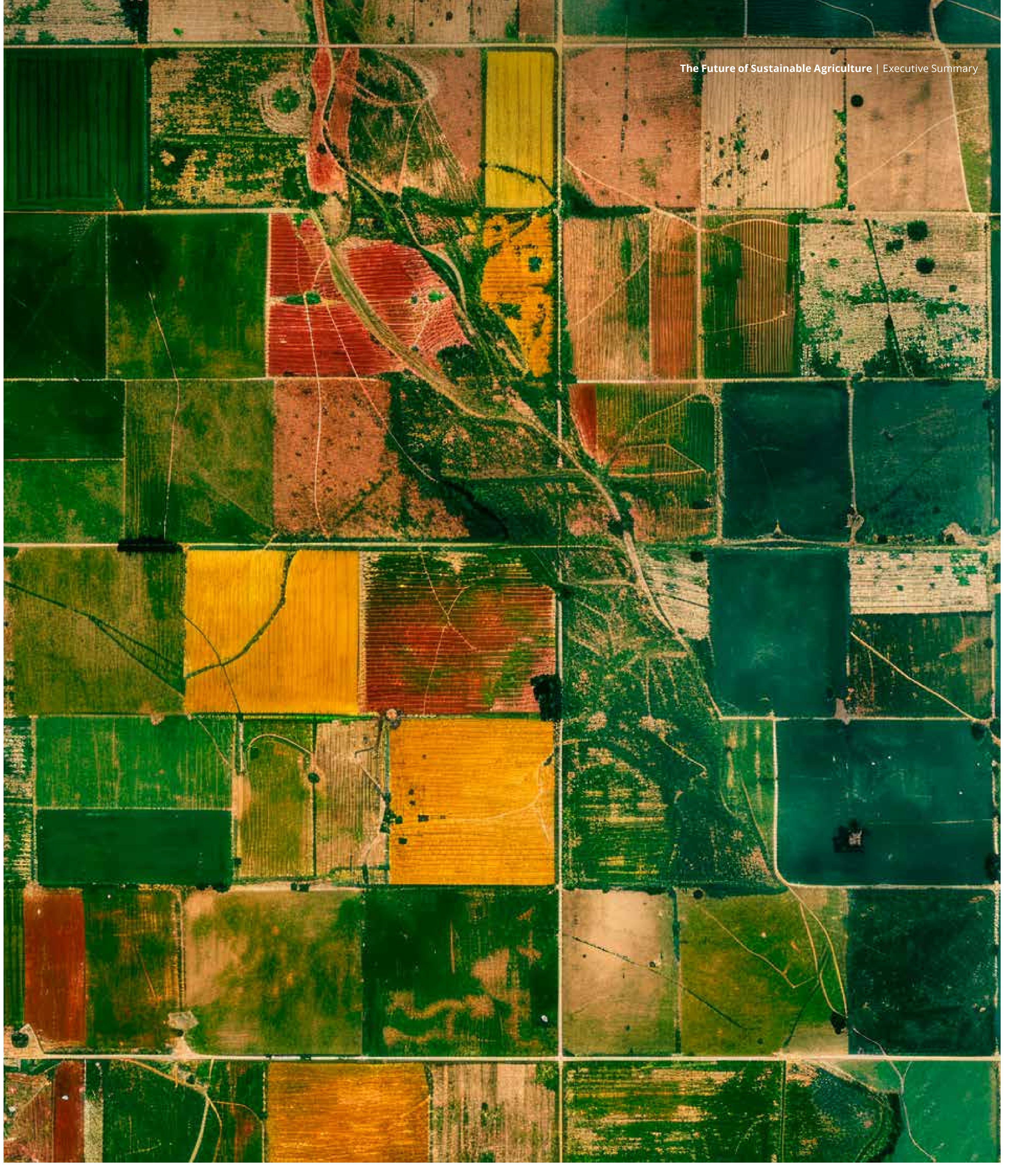
By addressing challenges holistic and shifting our perspective to view the farm as an ecosystem - focusing on decarbonisation and biodiversity regeneration to build healthy agricultural environments – we can leverage the forces shaping the industry and scale solutions to transform agriculture into a sustainable, climate-resilient sector while continuing to feed the world.

> **This report delves into the complexities of this challenge...**

This report delves into the complexities of this challenge, examining the key drivers of change, the obstacles to overcome, and the potential solutions that can pave a path toward a more sustainable and climate-resilient agricultural system.

In section 1 we explore where we are now; the challenge of decarbonising the global food system and the top contributing factors to agriculture's carbon footprint. Section 2 covers the driving forces behind the industry's ongoing transformation, including ecological pressures, policy shifts, societal demands for sustainable products and technological advancements. Section 3 outlines the promising solutions to address the top contributing factors and ends with section 4, a call to action to move towards a sustainable and resilient food system.

The Future of Sustainable Agriculture | Executive Summary

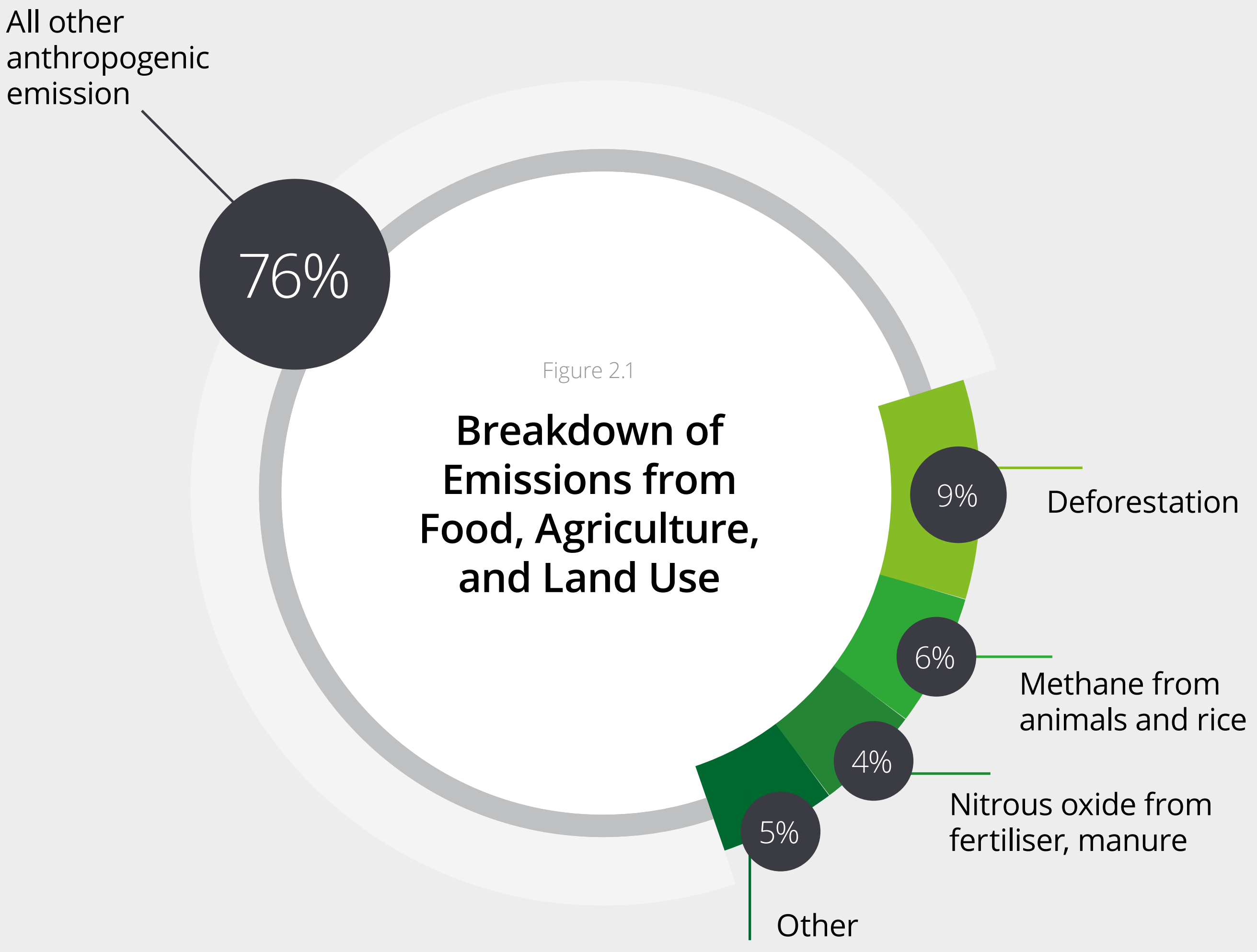


Where are we now?

Almost half of the world's habitable land is used for agriculture.[4] Agriculture is the second largest contributor to climate change after the energy sector, contributing around 24% of global emissions per year[1]. It is also the single biggest cause of environmental disruption from a soil degradation, water pollution, drought, deforestation, and biodiversity collapse perspective.[5] Conversely, environmental disruption, particularly climate change, is the biggest threat to our current agricultural system. Impacts include unpredictable weather patterns and water scarcity, which can drastically reduce crop production, threatening global food security and exacerbating malnutrition on a large scale.[6] Risks to the sector increase with every increment of global warming.

> Climate change is the biggest threat to our current agricultural system.

To address climate change whilst also mitigating these risks, we must look further at the primary sources of these emissions:[1]



Visual: Drawdown Primer, Farming our way out of the climate crisis (2020). The grey represents all other emissions (c.76%). Note: Agricultural energy not included in the above visual. See point 4 below for categorisation.

Deforestation

For the past 8 000–10 000 years, since the advent of agriculture, the practices of growing crops and raising livestock have been the leading causes of ecosystem loss and degradation.[7] Land use contributes 9% to global agricultural emissions.[1] Forests store large amounts of CO_2 both above and below ground, yet tropical deforestation and 'other land-use change' is the biggest source of greenhouse gases in the sector. Much of today's deforestation is driven by expanding agriculture (such as soybean fields for animal feed, oil palm plantations, and cattle pastures) as well as logging and mining.[1]

Methane from animals and rice

Methane emissions are the second-largest greenhouse gas source in land use and agriculture, responsible for 5.8% of global GHG emissions. Methane is a powerful greenhouse gas, trapping an estimated 28 times more heat than CO_2 over 100 years, although it doesn't stay in the atmosphere as long. The main methane sources in agriculture are from cows, sheep, and manure piles. Rice cultivation and biomass burning are another significant source of methane, responsible for 1.3% and 3.5% of global GHG emissions respectively.[8, 9]

Nitrous oxide from fertiliser, manure

The three primary macronutrients used as fertilisers in agriculture are nitrogen (N), phosphorous (P) and potassium (K). Nitrogen has by far the greatest demand of around 110 million metric tons per year, more than both P and K combined.[10] The third-largest GHG source in the agriculture sector is attributable to nitrous oxide (N_2O) emissions, contributing around 4% of global GHG emissions. Nitrous oxide is approximately 300 times more effective at trapping heat than CO_2 and remains in the atmosphere for centuries.[11] Most N_2O emissions come from inefficient fertiliser use and manure left on pastures resulting in environmental consequences beyond GHG emissions. When excess fertilisers leach into water systems, they trigger algal blooms that consume oxygen and block sunlight, creating 'dead zones'[13] where aquatic life cannot survive. These nutrient-driven transformations dramatically reduce both above and below-ground biodiversity.[14] Furthermore, the GHG emissions associated with the energy required to create and transport synthetic nitrogen fertiliser alone represents between 2.1 to 2.5% of global GHG emissions.[15]

Energy

A significant portion of agricultural emissions originates from energy use. This includes greenhouse gas emissions from the operation of agricultural machinery and vehicles, irrigation, and powering systems for climate control in storage and processing facilities. The World Resources Report estimates that emissions from on-farm energy consumption as well as from manufacturing of farm tractors, irrigation pumps, other machinery, and key inputs such as fertiliser, excluding emissions from the transport of food, accounts for just over 3% of global GHG emissions.[16]

Agriculture is intricately linked to the four most pressing risks humanity faces in the coming decade, as identified by the World Economic Forum.[17] These risks include 'extreme weather events' from climate change, 'biodiversity loss and ecosystem collapse', 'critical change to Earth Systems' and 'natural resources shortages'. As such, carbon reduction is not the only metric we should be solving for in the agricultural decarbonisation journey.

As such, it is essential to address the key drivers of agricultural emissions but also work towards a healthy environment, with intact ecosystems, functioning biodiversity, living soils, clean air and water systems. To achieve a sustainable future, we must first understand the forces shaping this vital industry. The following section will explore these forces in greater detail, examining the enabling conditions that both help and hinder the building of a more sustainable and secure food system.

Forces shaping the industry

Driven by a complex interplay of ecological, political, social, and technological forces, the agricultural industry is undergoing a profound transformation. These forces are simultaneously exerting pressure on the industry to adopt more sustainable practices while, in some cases, simultaneously creating the enabling conditions to accelerate the transition to a sustainable agricultural system. This dynamic interplay is crucial as the sector strives to address the dual challenge of feeding a growing global population and mitigating its environmental impact.

The private sector is responding to the challenge in various ways and the sustainable agriculture market size is predicted to grow at an 11% CAGR. This trend is driving grocers to build on their offerings of sustainably produced food.[18] Several major retailers are pushing for regenerative agriculture practices. One of the major retailers has committed to source meat, milk, eggs, fruit, and vegetables from UK farms using regenerative practices by 2035.[19] A multinational food corporations has committed to advance regenerative practices across 10M acres in the US by 2030[20] and another is investing CHF1.2B (~$1.3B) by 2025 in regenerative agriculture across their supply chain.[21] Private sector investment is growing, with initiatives like the Nature Markets Framework setting out to scale up private investment into nature recovery supporting regenerative agriculture.[22]

This section explores the various ways in which these forces are compelling the sector to evolve. Through illustrative examples and case studies, it demonstrates how the industry is already transforming, adapting to challenges, and capitalising on emerging opportunities. These changes are resulting in tangible sustainability outcomes across all four dimensions, showcasing the sector's proactive approach to meeting future demands.

Mounting ecological pressures

The ecological stressors on agriculture are intensifying, and sustainable practices are necessary to manage the risks and challenges the industry faces. Climate change is at the forefront of these challenges, manifesting through extreme weather events, shifting seasons, and altered growing conditions. These changes are not only affecting crop yields and food security but also threatening the livelihoods of farmers worldwide.

Biodiversity loss significantly impacts the agricultural industry. Declining pollinator populations can lead to reduced crop yields, while fewer soil organisms[23] (such as microbes and worms) cause soil degradation, further diminishing yields.[24] Although monoculture farming often produces higher yields, diversified or mixed cropping systems demonstrate greater resilience to climate change and can offer economic and environmental benefits. For example, coffee farmers in Vietnam's central highlands who integrated pepper and fruit crops into their coffee plots experienced higher profits, increased economic stability, improved nutrient cycling, and enhanced crop resilience.[25]

> **Biodiversity loss significantly impacts the agricultural industry.**

Sustainable agriculture methods, such as those used in regenerative agriculture, focus on improving soil health through practices like adding organic matter and cover cropping. By increasing biodiversity within the agricultural ecosystem, these methods enhance crop resilience to adverse weather events. A diverse range of plant and microbial species contributes to a more robust system that can better withstand challenges such as droughts or floods. Additionally, this enhanced biodiversity plays a crucial role in improving the land's ability to sequester carbon, further contributing to environmental sustainability.[26]

Navigating policy

Agricultural policies play a pivotal role in shaping farming practices and land management decisions. In recent years, shifts in agricultural policies in several regions are encouraging the adoption of more sustainable farming practices.

In the UK, the Sustainable Farming Incentive[27] offers financial support to farmers adopting practices that benefit soil health, biodiversity, and carbon reduction. This incentive-based policy approach encourages farmer participation by helping bridge the financial gap that often hinders the adoption of sustainable practices.[28] As of April 2024, there were 13,900 live SFI 2023 agreements representing over 2 million hectares of land in England, a 4x increase from the year before.[29]

On a broader scale, the European Union's Common Agricultural Policy (CAP) for 2023 set ambitious environmental targets as part of the European Green Deal. The CAP allocates significant funds towards climate and biodiversity initiatives, creating incentives for sustainable farming practices through the "eco-schemes" that fund practices such as cover cropping, precision farming and agroforestry. These policies not only provide financial support but also create a favourable environment for sustainably grown products, making sustainable agriculture more economically viable.[30]

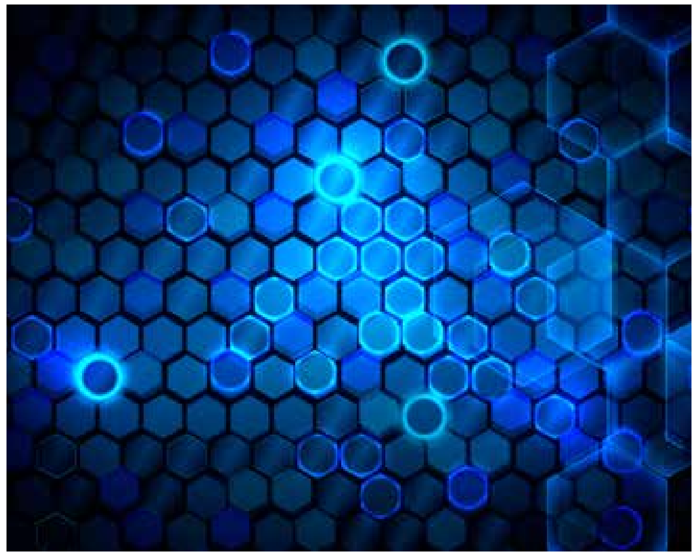
Carbon pricing mechanisms are emerging as another powerful political tool. Denmark, for instance, is introducing Europe's first carbon tax on agriculture, creating a direct financial incentive for emissions reduction.[31] Recently, the EU council gave final approval for the Carbon Removals and Carbon Farming Certification Regulation,[32] the EU's first voluntary framework for carbon removals and soil emissions reductions. Such policies are reshaping the economic landscape of farming, potentially generating new income streams through carbon credits.

Societal shifts

A growing awareness of environmental issues and consumer demand for sustainably produced food is driving a shift from both the demand and supply side as farmer attitudes towards embracing more environmentally friendly practices grow alongside changing consumer preferences.

A growing awareness of the effects of food production on climate change is influencing consumer behaviour, although many consumers still lack comprehensive knowledge about these impacts. This lack of awareness can affect their willingness to pay higher prices for sustainable products.[28] However, increasing consumer consciousness is driving demand for sustainable and ethically sourced foods, with many consumers willing to pay an average premium of 9.7% for such products.[33]

This consumer demand for sustainably produced food further encourages a shift in farmer behaviour and attitudes. While over a third of farmers are embracing more environmentally focused practices,[34] there is still resistance to change, often rooted in traditional farming methods or scepticism towards new technologies.[35] Addressing this resistance through education, knowledge sharing, financing and demonstration of innovative practices is essential for accelerating the adoption of sustainable agricultural practices.[36]



Technological disruption

Technological advancements are rapidly changing the agricultural landscape, offering innovations in precision farming, data analytics, and biotechnology. These innovations hold the potential to optimise resource use, boost yields, and minimise environmental impact.

However, several challenges hinder the widespread adoption and scalability of these technologies. Cost and investment requirements pose significant barriers, particularly for smallholder farmers. Concerns regarding the compatibility of new technologies with existing farming systems, technical readiness, and geographic limitations further impede access and implementation.[35]

The burgeoning influx of venture capital into the Agtech sector underscores its potential to transform agriculture and signals a positive trajectory for continued growth and innovation. Despite a brief contraction in Agtech investments in the last few years due to the challenging macroeconomic climate,[37] the industry is experiencing a resurgence in venture capital investment, with $1.6 billion invested across 159 deals in Q3 2024.[38] This marks the second consecutive quarter of investment growth, generating cautious optimism for the future of Agtech funding. The continuous development and adoption of agricultural technologies has the potential to create a compounding effect that could substantially enhance agricultural sustainability.

Taken together, changes across ecological, political, social, and technological landscapes are reshaping the agricultural landscape, creating both challenges and opportunities for a more sustainable future.

Challenges and solutions

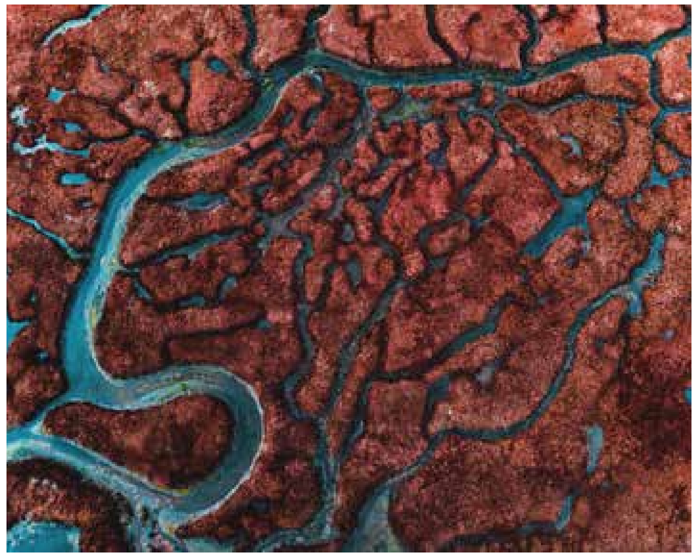
The forces above can either help or hinder the move towards decarbonisation and nature friendly farming in agriculture. They shape the landscape and influence the complexity of the challenges inherent in the top contributors to agricultural emissions: land-use change, methane emissions from livestock, fertiliser usage, and energy.

While the agricultural space is diverse with many independent farmers, it is often price constrained. Large producers, who are able to innovate, can create an environment that resembles a monopoly, limiting competition and innovation among smaller farmers.

There are certain mechanisms which will be key to unlock and drive innovation including strong governance structures, conditional financial support, and a collaborative approach across different stakeholders.[38, 39] By regulating more heavily and increasing government subsidies, we can create an environment that encourages and supports the adoption of sustainable and innovative farming practices. In this section, we will explore promising solutions to specifically address the primary sources of agricultural emissions, highlighting the importance of nature-positive approaches and the collaborative efforts needed to achieve a decarbonised agricultural sector. These solutions, when coupled with the key mechanisms outlined, will be instrumental in delivering a decarbonised agricultural industry.

Land Use Change

Land-use change, primarily driven by deforestation for agricultural expansion,[41] stands as a significant contributor to global greenhouse gas emissions. Despite multiple commitments and the pledge taken by over 100 world leaders at COP26[42] to halt and reverse deforestation by 2030, weak governance and enforcement mechanisms mean that deforestation continues, further degrading our vital carbon sinks and biodiversity hotspots. This underscores the urgent need for multifaceted solutions that address both the drivers and impacts of land-use change within the agricultural sector.



Strengthening land-use governance in producer countries is paramount. This involves robust enforcement of existing laws, halting illegal deforestation, and safeguarding the rights of indigenous and local communities (IPLC) who act as stewards of these ecosystems.[43] Indigenous lands hold 36% of all remaining intact forest landscapes globally,[44] making their protection crucial for climate and biodiversity. Research demonstrates that empowering IPLCs by securing their land and resource rights is a practical and economical approach to climate change mitigation. For example, Brazil's recognition of indigenous land rights in its 1985 constitution, encompassing over 100 million hectares, combined with protected areas, monitoring, and supply chain efforts, led to a dramatic 70% drop in Amazon deforestation from 2005 to 2013.[45] It is estimated that scaling up the legal recognition and protection of IPLC lands, from 1.5 billion hectares today to over 3 billion by 2050, could avoid nearly 2 gigatons of annual emissions by mid-century, primarily through enhanced forest stewardship.[46]

The above actions can be strengthened and further encouraged when commercial buyers demonstrate clear demand for 'deforestation free' products. Companies exposed to forest-risk commodity production can adopt and implement deforestation free supply chains. This includes establishing ambitious targets aligned with scientific guidance such as the Science Based Targets Initiative[47], transparently tracking and reporting deforestation within their supply chains, for instance through utilising the Carbon Disclosure Project's Forest guide,[48] the High Carbon Stock Approach[47]

or with the Accountability Framework initiative.[49] Companies can also ensure that all purchasing, trading, and investment decisions support 'no-deforestation' procurement goals.

The effectiveness of such action is perhaps best demonstrated with palm oil. 65% of global palm oil production moves through at least one company with a no-deforestation commitment.[50] Since the implementation of such commitments, the conversion of Indonesia's forests to palm oil plantations has significantly dropped by 87% in 2023 from 2012.[51] The drivers of this change are multi-faceted, coinciding with the government's moratorium on new palm plantations in forests,[52] but still exemplifies how actions by the public and private sector can be mutually re-enforcing. It is estimated that if at least 80% of the production of major commodities linked to deforestation were covered by robust, fully implemented no-deforestation commitments, it could prevent the release of over a gigaton of emissions annually by 2030, by halting the destruction of forests for agricultural expansion.[53]

Methane emissions from Livestock

Methane emissions from livestock represents one of the most significant challenges in global agriculture.[54] This is primarily driven by the process of enteric fermentation in ruminants (cows, sheep, goats) where methane is released as a by-product of digestion. Additional sources, such as manure management and rice cultivation, contribute to methane emissions, but cattle dominate this category.[1]

Effectively addressing this challenge requires systemic solutions that begin by targeting the root causes. One impactful approach is reducing demand for animal-based products by shifting consumption patterns. Richer nations, where the overconsumption of animal products negatively impacts both human health and ecosystems, have a significant opportunity to implement beneficial dietary shifts. Reducing reliance on animal-based foods would not only reduce methane emissions but further alleviate pressure to convert land for livestock production. Simultaneously, this shift could allow poorer countries to address undernutrition by maximising existing cropland to deliver more calories per hectare directly to people.[55] Research suggests that a global shift to diets featuring more fruits, vegetables, and plant-based proteins could cut AFOLU greenhouse gas emissions by two-thirds by 2050, delivering substantial environmental and public health benefits.[56, 57]

This can be achieved through promoting plant-rich diets and fostering cultural acceptance of lower meat consumption. Public initiatives such as Meatfree Monday and Veganuary alongside campaigns such as the EAT-Lancet Planetary Health Diet[58] that highlight the environmental and health benefits of plant-based diets have proven effective in shifting consumer preferences and reducing demand for methane-intensive livestock products.

Furthermore, investments in alternative proteins - including plant-based, cultured, and microbial options - offer scalable solutions to meet growing protein demands without a reliance on traditional livestock. By 2030, alternative proteins could comprise up to 11% of global protein consumption, with significant potential to curtail methane emissions.[59]

On the supply side, feed innovation has emerged as a particularly promising avenue for reducing methane emissions from livestock, primarily by altering the fermentation process within ruminant stomachs. Feed additives, such as algae-based supplements, biochar, and synthetic compounds like 3-NOP, have shown the potential to reduce methane emissions by up to 65%. Improving feed quality and digestibility is also crucial for reducing emissions; incorporating legumes such as alfalfa into grazing systems improves protein availability for livestock and enhances overall feed efficiency, reducing reliance on grain-based feeds and their associated emissions.

Policy and market mechanisms are crucial to drive the adoption of these practices at scale. Countries have established ambitious methane reduction targets, exemplified by the Global Methane Pledge,[62] which has been signed by over 150 nations with the goal of reducing methane emissions by 30% by 2030. Financial incentives such as subsidies for methane-reducing feed additives and manure management systems can accelerate change. Companies involved in meat and dairy supply chains also play a pivotal role. By setting science-based methane reduction targets, transparently reporting progress, and collaborating with producers, they can contribute significantly to global mitigation efforts.

Fertilisers

The production of synthetic fertilisers releases substantial amounts of carbon dioxide (CO_2) due to energy-intensive manufacturing processes, while their application on fields contributes to nitrous oxide (N_2O) emissions - a potent greenhouse gas with a global warming potential 300 times greater than CO_2. Researchers at the University of Cambridge found that manure and synthetic fertilisers emit the equivalent of 2.6 gigatonnes of carbon per year – more than global aviation and shipping combined.[63] Poor fertiliser management can also lead to runoff, polluting water systems and causing ecological damage such as algal blooms.

We have three options when it comes to fertilisers: Avoid or use less fertiliser, use alternative fertiliser, or use green nitrogen based fertilisers. Each option come with their own challenges.

Precision agriculture has emerged as a key solution for using less fertiliser. This technology-driven approach, utilising tools like GPS, sensors, and data analytics, optimises fertiliser application, ensuring that nutrients are delivered precisely where and when needed. This targeted approach minimises waste, reduces costs and significantly reduces emissions. A prime example is the European Commission's Farm Sustainability Tool for Nutrients (FaST), which has helped farmers reduce N2O emissions by up to 20% through effective nutrient management. [64]

Another promising avenue for using less fertiliser or using alternative fertiliser is the adoption of regenerative farming practices, which naturally enhance soil health and nutrient retention, reducing the dependency on and need for synthetic fertilisers. Regenerative agriculture covers a host of activities such as reincorporating crop residues back into the soil, cover cropping, managed grazing, and crop rotation. Recognising the potential of regenerative agriculture, private sector investment is increasing. Notably, As part of the COP28 Action Agenda on Regenerative Landscapes, 25 food and agribusiness giants, including Danone, PepsiCo, Bunge, Nestlé and Cargill, have pledged over $4 billion to convert 160 million hectares of land to regenerative practices.[66] In 2023, Nestlé announced a $1.3bn plan to ensure that a fifth of its key ingredients are sourced through regenerative farming methods by 2025 and half by 2030.[67]

Alternatives to traditional fertilisers offer additional solutions. Enhanced rock weathering (ERW) involves spreading finely ground silicate rock material on farmland and has been shown to remove CO2 from the atmosphere while enriching the soil with essential nutrients such as potassium and calcium to act as slow-release natural fertiliser.[68] Studies have found that fields treated with ERW result in significantly higher first year crop yields, improved soil pH, higher nutrient uptake,[69] and increased earthworm abundance[70] compared to controls. Biofertilisers offer another alternative. These cost-effective inputs use living microorganisms, such as nitrogen-fixing bacteria and mycorrhizal fungi, to naturally enhance nutrient availability in the soil. Unlike chemical inputs, biofertilisers do not contribute to soil acidification or water pollution, offering a more environmentally friendly approach to agricultural intensification.[71] Finally, natural occuring fertilisers like polyhalite, are rich in potassium, magnesium, calcium, and sulphur and represent another promising alternative to synthetic fertilisers. Its slow-release properties ensure steady nutrient availability, reducing the risk of nutrient leaching into waterways. Field trials conducted in Yorkshire, UK demonstrated the efficacy of polyhalite as a fertiliser for wheat and oilseed rape, with farmers applying polyhalite observing a 5-8% increase in yields compared to those using traditional Potassium chloride fertilisers.[72]

Lastly, green nitrogen fertilser production is an option that is being explored. This includes capturing the carbon from the production process, using water electrolysis or synthesising the hydrogen required in the process from biomass.[73] Each of these are far away from price parity and scalability and also only deal with the upstream emissions, not the downstream ecological effects.

The Future of Sustainable Agriculture | Challenges and solutions

Energy

Agriculture is heavily dependent on fossil fuels. On farms, energy use is split between powering machinery for activities like tilling, harvesting, and irrigation, and powering systems for climate control in storage and processing facilities. Traditional fossil fuels often power machinery like tractors and combine harvesters. Simultaneously, electricity, often generated using fossil fuels, is essential for running irrigation pumps, climate control systems for storing perishable goods, and processing equipment. Transitioning farms to a cleaner energy system is another vital means to decarbonise the sector.

Transitioning farm machinery away from fossil fuels presents a significant decarbonisation challenge for the agricultural sector. Electrifying farm machinery and vehicles is a potential long-term solution but comes with a host of challenges. Machines like combine harvesters operate for long hours under heavy loads and meeting this demand with batteries has proven a challenge. As batteries become more efficient and reduce in size and weight, this barrier may well be overcome. However, in the interim, alternative fuels such as hydrogen or biofuels can be explored. Companies like Fendt are pioneering hydrogen fuel cell technology for heavy-duty agricultural equipment.[74]

On-farm energy consumption can be transformed by integrating renewable energy sources. Solar panels and wind turbines can power various farming operations, from irrigation systems to grain dryers, and greenhouses. Not only reducing reliance on fossil fuels but providing farmers with increased energy security and reducing electricity costs. The Clean Energy Finance Corporation in Australia[75] exemplifies this shift by supporting farms in adopting these technologies. Similarly, Kenya's Solar Freeze initiative,[76] providing off-grid solar-powered cold storage, demonstrates a practical solution for smallholder farmers, particularly in areas with limited grid access. The initiative has the added benefit of reducing food waste (another contributor to agricultural emissions) and hence farmers' incomes.

Through a combination of policy incentives, technological innovation, and industry collaboration, the agricultural sector can transition to cleaner energy systems, reducing its carbon footprint while maintaining productivity.

A perspective shift: the farm as an ecosystem.

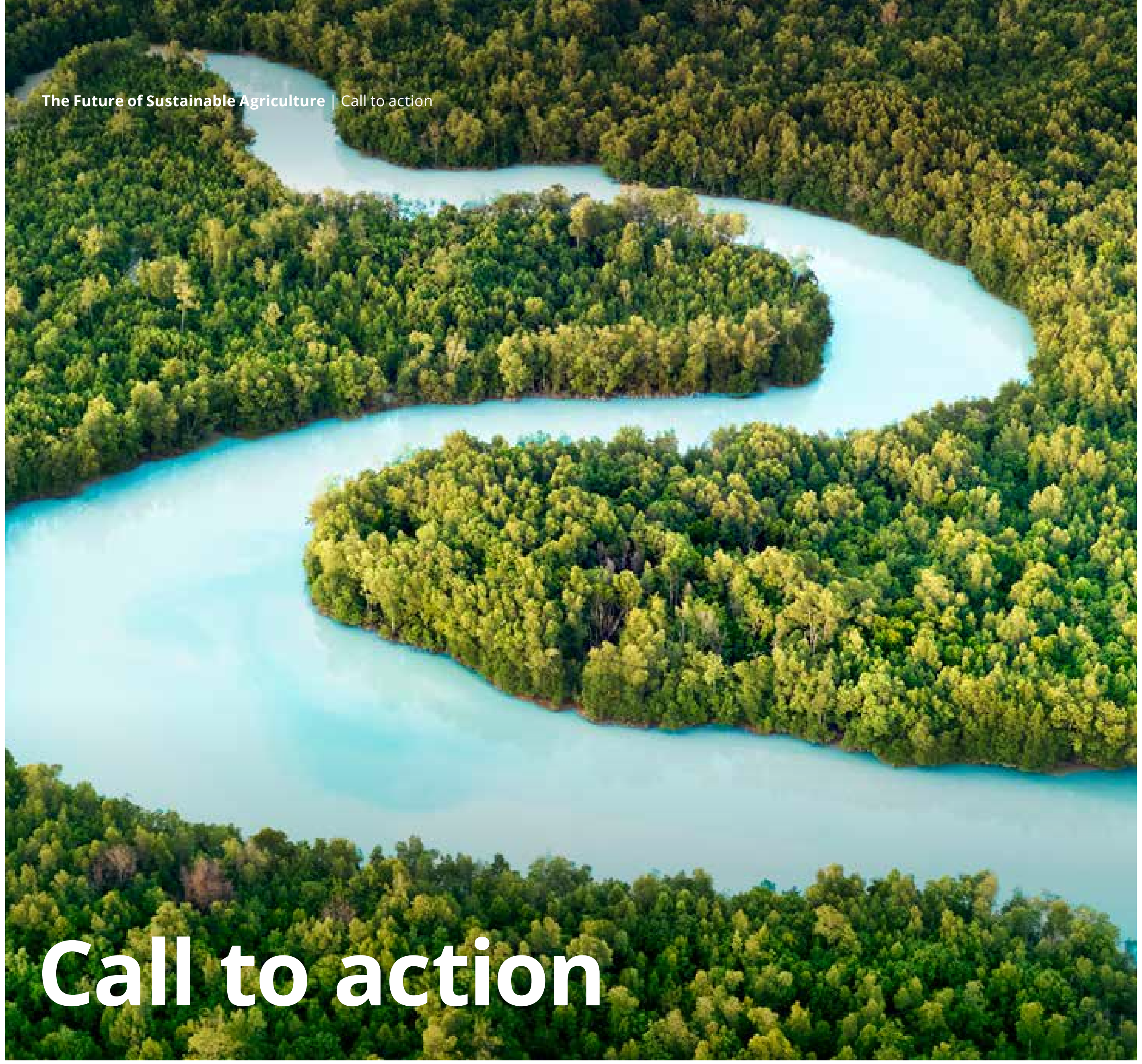
Overarching these four main contributors to agricultural emissions is a central challenge and opportunity: shifting our perspective to view agriculture and the farm as an ecosystem.

The natural world is the foundation on which the global economy is built[77] and we must not only see the farm as a natural system rather than an industrial machine, but we must also focus on more than just climate change to ensure these foundations are solid.[78] If we look after the natural world, then we create a greater chance of ensure the ecosystem services we rely on like the provision of clean water, pollination, alive, nutrient-rich soils, are functioning in our favour.

Farming with nature also brings opportunities such as government incentives, markets willing to pay a premium, and the additional revenue streams from biodiversity and carbon markets. [79, 80, 81]

> **Through a combination of policy incentives, technological innovation, and industry collaboration, the agricultural sector can transition to cleaner energy systems, reducing its carbon footprint while maintaining productivity.**

The Future of Sustainable Agriculture | Challenges and solutions



Call to action

The agricultural sector stands at a pivotal moment, facing both an urgent necessity and an opportunity to transform into a sustainable and resilient system. The sector can mitigate its environmental impact and secure food systems for future generations, but to do so it must address the key challenges of land use change, livestock emissions, fertiliser overuse, and fossil fuel-based energy dependency.

The Future of Sustainable Agriculture | Call to action

Three key strategies will be instrumental in achieving this future:

1. Embracing the synergy between sustainability and productivity.

By prioritising soil health, biodiversity, and natural resource management, we can enhance long-term productivity and resilience within the agricultural sector and wider ecosystem. This shift, as exemplified by the benefits of diversified cropping systems over repeat monoculture farming, could result in both environmental and economic gains.

2. Unlocking the potential of technology.

The recent investments in Agtech over the past 5 years signals a positive trend in technological advancements across precision farming, data analytics, and biotechnology. By proactively addressing barriers to wider adoption, such as cost, technical accessibility, and integration with existing systems, we can further accelerate the agricultural sector’s journey towards a more productive, technological, and sustainable future.

3. Prioritising collaboration for systemic change

Transforming the agricultural sector will require continued collaboration between farmers, policymakers, businesses, and consumers. Initiatives like the EU Common Agricultural Policy and the Sustainable Farming Incentive in the UK exemplify how shared responsibility, knowledge sharing, and coordinated action can drive meaningful and lasting change.

Together, we can redefine agriculture. By working together to enable change we can ensure food security, protect biodiversity, and mitigate climate impacts for generations to come, creating an agricultural sector that thrives within the limits of our natural world.

Deloitte Future of Food

At Deloitte, we believe the future of food should be sustainable, regenerative and resilient. Achieving this requires leaders across industries to show courage and collaboration.

Through our global Future of Food platform and together with clients and alliances, Deloitte is helping to transform the food ecosystem. We are committed to bringing our advisory, technology and influence to meeting the challenges of addressing climate change and biodiversity loss while improving food security for a growing population. Globally, we have made substantial investments in the capability of our people and the development of technology solutions to improve climate smart practices across the food ecosystem.

For more information on Deloitte Future of Food, please visit the website.

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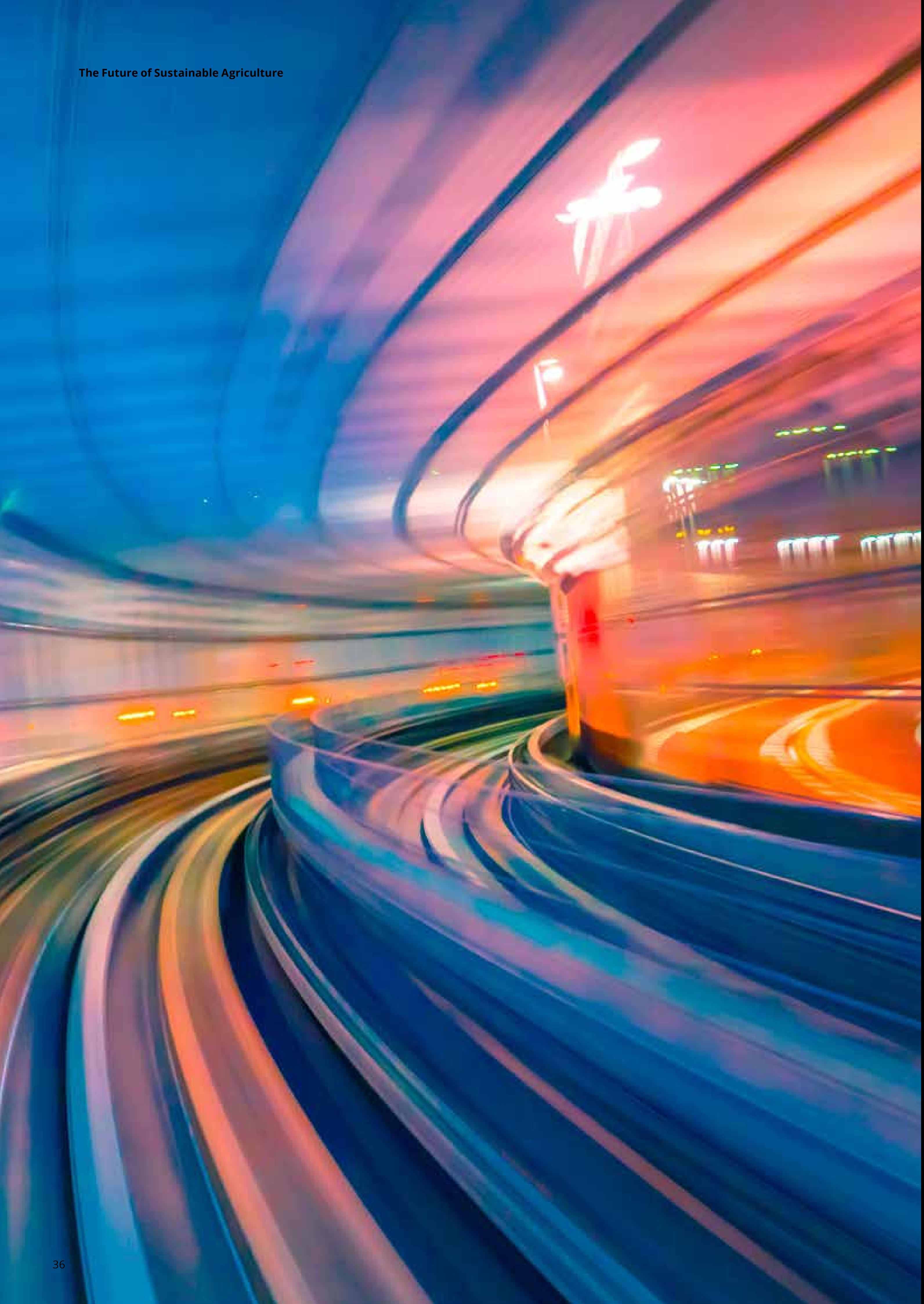

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