Future Fit Food and Agriculture:

The financial implications of mitigating agriculture and land use change emissions for businesses

March 2024

The Food and Land Use Coalition

WE MEAN BUSINESS COALITION

World Business Council for Sustainable Development

Contents

Foreword and acknowledgements

This report is the second of two in the **Future Fit Food and Agriculture** series, which aims to support food and agriculture companies to 1) understand the implications of current and emerging voluntary standards and regulation for climate and nature, and 2) comprehend the financial costs and benefits of implementing land-based GHG mitigation measures. The two reports in this series are:

1. **Future Fit Food and Agriculture: Developments in voluntary frameworks and standards and their influence on legislation for businesses**
2. **Future Fit Food and Agriculture: The financial implications of mitigating agriculture and land use change emissions for businesses (this report)**

With these reports we seek to achieve:

- A significant scale-up in the number of food and agriculture companies setting and delivering climate and nature strategies;
- Accelerated mobilization of finance across value chains to implement the land mitigation solutions needed by 2030 so that the food and agriculture sector can achieve net zero by 2050;
- Effective and responsible corporate advocacy, calling for greater public-sector regulation and action from financial institutions.

The series was produced in partnership between:

- **The Food and Land Use Coalition:** FOLU brings together a diverse network of country platforms, partner organizations and ambassadors working to advance sustainability, equity and resilience in food and land use systems. The coalition empowers farmers, policymakers, businesses, investors and civil society to unlock collective action at scale.
- **The World Business Council for Sustainable Development:** WBCSD is a global community of over 225 of the world's leading businesses driving systems transformation for a better world in which +9 billion people can live well, within planetary boundaries, by mid-century. Together, we transform the systems we work in to limit the impact of the climate crisis, restore nature and tackle inequality.
- **We Mean Business Coalition:** The coalition works with the world's most influential businesses to take action on climate change. Together, the Coalition catalyzes business and policy action to halve emissions by 2030 and accelerate an inclusive transition to a net-zero economy.

This series was made possible by the generous support of Norway's International Climate and Forest Initiative (NICFI).

NICFI
Norway's International Climate and Forest Initiative

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① Context

Today's food systems are damaging the environment. They are the largest driver of ecosystem conversion[1] and biodiversity loss,[2] and are responsible for 18–20 $GtCO_2e$ of greenhouse gas (GHG) emissions annually[3] – roughly one-third of total global anthropogenic emissions each year. Therefore, food systems are both a primary driver of the climate crisis and a critical part of the solution. At COP28, land-based mitigation strategies were recognized as critical for achieving the 1.5°C Paris target. Nearly 160 member states signed up to the COP28 UAE Declaration on Sustainable Agriculture, Resilient Food Systems and Climate Action.[4] Alongside this, the COP28 Presidency and the UNFCC Climate Champions Team developed the 'Nature Positive for Climate Action – A Call to Action', focused on protecting nature as a critical lever for keeping 1.5°C within reach.[5]

However, as things currently stand, **global food systems emissions are expected to grow to 21 $GtCO_2e$ per year by 2030.**[6] We estimate some 5 $GtCO_2e$ of these are attributable to the informal economy[7] and sit outside formalized value chains. The remaining 16 $GtCO_2e$ sit within company value chains in the formal economy (referred to as the food and agriculture sector hereafter). Over half of these emissions, we estimate 10 of the 16 $GtCO_2e$ identified above, come from agricultural production and associated land use change.

This report focuses on what it will take to mitigate these land-based emissions and associated costs and benefits for businesses. Through this work, FOLU, We Mean Business and WBCSD aim to support business leaders working in the food and agriculture sector, particularly those working in sustainability, finance, procurement, compliance and strategy teams, by:

1. **outlining how companies can tackle agriculture and land use change emissions; and**
2. **costing a range of solutions that can mitigate up to 9 $GtCO_2e$ per year by 2030.**[i]

The solutions are classified into four categories based on costs and benefits (see Section 4): i) 'no regrets solutions'; ii) 'cost of compliance'; iii) 'further costs for mitigation outcomes'; and iv) 'investment in new and growing markets'. Companies can use this analysis to develop credible, costed sustainability strategies and prioritize the most impactful mitigation solutions.

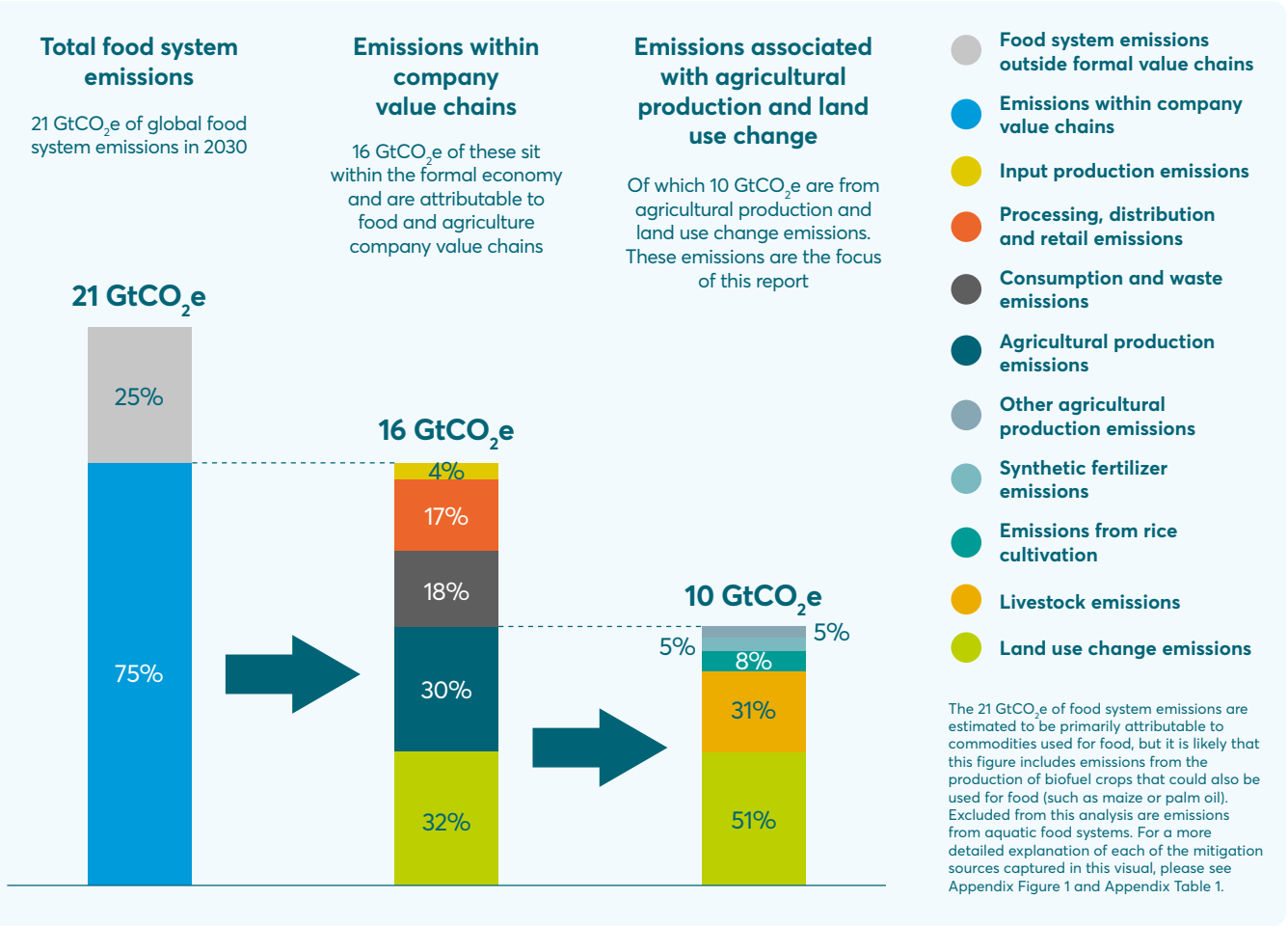
Critically, this report estimates that the food and agriculture sector will need to spend approximately US$205 billion per year (2025-2030) to achieve this 9 $GtCO_2eyr^{-1}$ of mitigation. While our analysis shows that these costs appear manageable for the food and agriculture sector as a whole, **the burden of implementing these solutions does not fall equally across value chains – nor will the benefits of implementation be shared by all.** Therefore, Sections 5 and 6 of this report outline steps that companies and policymakers can take to share the costs of mitigation more equitably across the food and agriculture sector. This report concludes by arguing that these steps will require food and agriculture companies to reassess both how they partner with other actors in the value chain and how they engage with policymakers to incentivize action. This recalibration across the food and agriculture sector is critical for achieving net zero by 2050.

i 5 $GtCO_2e$ of the 9 $GtCO_2e$ mitigated comes from ending the conversion of natural habitats. Of the 5 $GtCO_2e$, 3 $GtCO_2e$ is saved by ending commodity-driven deforestation and 2 $GtCO_2e$ is saved by ending peatland degradation. While ending deforestation will be difficult to achieve solely through actions taken by businesses, companies nevertheless have a critical role to play in supporting progressive governments and preventing commodities that have been produced on recently deforested areas from entering their supply chains.

② Overview of food system emissions

Food system emissions encompass all emissions associated with the production, consumption and disposal of food. Of these emissions, we estimate 25% are found outside formalized value chains. Since they arise from the production of food for subsistence or for sale in the informal economy they never enter company value chains.[8] Of the remaining 75% – projected to be 16 $GtCO_2e$ emitted in 2030 – over half are attributable to agricultural production and land use change within the value chains of food and agriculture companies (10 of the 16 $GtCO_2e$). **These emissions, hereafter referred to as 'agricultural emissions', are the focus of this report** – see Figure 1.[ii]

Figure 1: Projected agricultural emissions in the formal food and agriculture sector account for nearly half of total global food system emissions in 2030 (10 $GtCO_2e$ of 21$GtCO_2e$).[9]



ii Off-farm emissions, accounting for less than 40% of the 16 $GtCO_2e$ outlined here, while still important, are not the focus of this report. Mitigating these emissions coming from input production, transport, processing, packaging, retail, consumption and waste, requires a different set of solutions, and is governed by different reduction targets (42% reduction by 2030 in accordance with the SBTi).

The world increasingly recognizes that food systems are both a primary driver of the climate crisis and, also, a critical part of the solution. In the last five years, this has led to an **unprecedented uptake of voluntary climate commitments from companies.** Several voluntary frameworks have emerged to support companies with developing ambitious sustainability strategies. More than 400 companies in the Agriculture, Forestry and Other Land Use (AFOLU) sector[iii] have set, or committed to set, approved emissions reduction targets with the Science Based Targets initiative (SBTi) as of November 2023.[10] Voluntary frameworks like the SBTi, among others, have played an important role in raising corporate ambition levels and more frameworks are emerging to support companies with setting and delivering science-based climate strategies.

However, the climate strategies of most food and agriculture companies, from input providers and food producers through to traders, manufacturers and retailers, are not yet comprehensive or ambitious enough.[11] **Most companies have not fully measured their Scope 3 emissions,[iv] let alone developed credible strategies to tackle them.**[v] Even for the handful that do have detailed sustainability strategies, implementation is still sorely lacking. While some outstanding technical questions regarding Scope 3 mitigation remain, many of these will soon be answered by the finalization of the GHG Protocol Land Sector and Removals Guidance, expected in 2024. In the meantime, FLAG sector companies can already make Scope 3 emissions reduction commitments using the published SBTi FLAG Sector Guidance.[vi] See the first report of this Future Fit Food and Agriculture series for more information.

Setting ambitious Scope 3 targets is critical because for many food and agriculture companies these emissions account for over 90% of total emissions. Scope 3 emissions include all indirect emissions related to upstream production and downstream use of a company's products. As an illustration, Figure 2 provides a breakdown of the Scope 1, 2 and 3 emissions of an archetypal multinational food manufacturer. Emissions include those further upstream in the value chain (e.g. from fertilizer production, farming and transport from farm to factory) as well as those downstream, (e.g. all those associated with the consumption or disposal of the product). For the archetypal company in Figure 2, 55–75% of emissions come from purchased ingredients and products – and of these Scope 3 emissions, the majority come from agriculture. This shows that even food companies not directly involved in growing, harvesting or rearing food share responsibility for reducing agricultural emissions, because these sit within their Scope 3 GHG emissions inventory. It is this subset of emissions that is the key focus of this report.

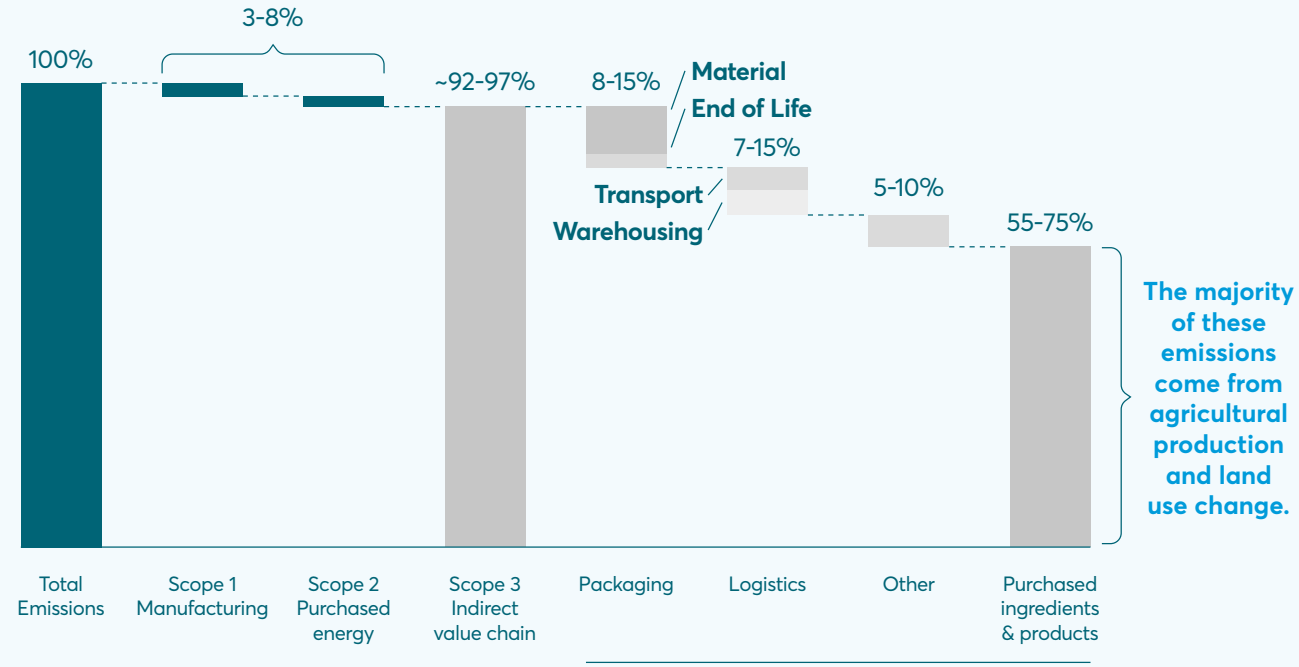
iii Out of a total of over 6,500 companies across all sectors that have set, or committed to set, approved emissions reduction targets with the SBTi. (Source: https://sciencebasedtargets.org/companies-taking-action)

iv Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions. Examples of Scope 3 emissions include the emissions of a company's suppliers or those released when their product is used. (Source: Greenhouse Gas Protocol.)

v According to the World Benchmarking Alliance, of the 350 most influential food and agriculture companies, 165 are yet to disclose any Scope 3 commitments.[12]

vi Once the new GHG Protocol Guidance is published, companies that have already set targets will have a further six months to update any of their Scope 3 SBTi commitments if needed.

Figure 2: Illustrative emissions from an archetypal food company – GHG emissions (CO_2e).



Sources: CDP, Systemiq analysis

Companies have been slow to set and implement Scope 3 emissions reduction targets because tackling these can be costly and complex.[13] This is particularly true of mitigating agricultural emissions. Implementing climate solutions frequently requires upfront investment to scale solutions and develop new markets, and can lead to increased operating expenses (OpEx). These costs are explored in more detail in Sections 4 and 5. In practice, farmers and forest communities must be relied upon to implement the majority of these solutions, and yet are also those least able to bear the cost.

Setting and implementing Scope 3 emissions reduction targets can be complex. There are still outstanding technical questions that need to be resolved to support companies to take action confidently at scale. Additionally, food production often involves long and complex value chains, making it challenging to achieve complete traceability, which is exacerbated by the lack of primary data available at farm and landscape levels.[14] Finally, agricultural emissions within a company's value chain often encompass a diversity of local conditions – spanning several jurisdictions, landscapes and agricultural practices. This makes it challenging to measure and mitigate emissions because solutions must frequently be adapted for specific local contexts. WBCSD has worked extensively with companies in the sector to identify and tackle these challenges and published their findings in their report, *Scope 3 action agenda for the agrifood sector (2023)*.[15]

Complexity and costs aside, agricultural emissions must decrease by approximately 30% by 2030 to align with the Paris Agreement.[16] Regulators are increasingly demanding that companies set, deliver and disclose against ambitious Scope 3 climate targets, inclusive of agricultural emissions. Overcoming the challenges outlined above will require deep collaboration across the full value chain to comprehensively realign incentives to end land use change and accelerate the uptake of new agricultural practices resulting in emissions reductions. The remainder of this report outlines how these challenges can be overcome.

③ Addressing complexity

Taking on agricultural emissions can seem like a daunting task. In many cases, these emissions are outside the direct control of food and agriculture companies. This can make it hard to take swift and decisive action when implementing mitigation solutions. As outlined in the first report of this Future Fit Food and Agriculture series, guidance is already available to help companies tackle this complexity. The ACT-D framework[17] is one such framework. Initially designed by Capitals Coalition, Business for Nature, WBCSD, and others, to support businesses to take action on nature, companies can use this to guide them through the development and implementation of climate and nature strategies:

Assess – Assess emissions (Scope 1, 2 and 3) and the emissions intensity[vii] of the commodities within corporate portfolios. As part of this assessment, companies need to understand what is driving the emissions of the different commodities and/or products in their portfolio, for example, deforestation, enteric fermentation, or over-application of synthetic fertilizers. Box 1 provides an overview of six production and consumption emissions hotspots, by region and commodity, to help companies focus their assessment on high-impact commodities.

Commit – Set transparent, time-bound, science-based targets that simultaneously address emissions reductions and removals alongside nature goals. The first report of this Future Fit Food and Agriculture series outlines several voluntary frameworks companies can use to set climate and nature targets.

Transform – Take action to transform how companies and their suppliers produce commodities, minimizing impact on climate and nature. There are several levers companies can use to take action. Some key examples include:

- **Eliminate the loss of nature from supply chains.** To do so, companies should identify the commodities in their portfolio that are the biggest drivers of land use change. This will involve investing in traceability solutions and working with suppliers to understand exactly where their commodities are sourced from. Companies will need to develop specific mitigation strategies for these commodities as nature protection and restoration often requires collaboration with stakeholders outside of a company's supply chain, such as local governments and communities.

- **Ensure sourcing is optimized** to the best-performing suppliers for each commodity in terms of emissions, as the emissions intensity of the same commodity can differ depending on the practices used in its production.[viii] This may involve working with specific suppliers to introduce agricultural practices that can lower the emissions intensity of their produce. There are several ways companies can incentivize suppliers to implement mitigation solutions and improve agricultural practices. These include offering bigger and/or longer contracts and shorter payment terms in return for best-in-class performance on emissions, helping to cover upfront implementation costs and/or providing direct payments to farmers implementing more sustainable practices.

vii The emissions intensity is expressed in kilograms of 'carbon dioxide equivalents' – which includes not only CO_2 but all GHGs – per kilogram of food, per gram of protein or per calorie.[18]

viii For example, cattle ranchers with low productivity who graze cattle on deforested land and fail to manage their manure will produce more emissions per kilo of beef produced than cattle farmers on productive farms who ensure deforestation-free supply chains (e.g. through their feed purchases), manage their manure through the use of anaerobic digestors and use feed additives to reduce enteric fermentation emissions.[19]

- **Tackle hard to abate emissions through product reformulation and portfolio shifts** to reduce emissions, replacing commodities with high emissions intensities for those with lower ones. As a general rule, animal products tend to have higher emissions intensities (e.g. beef = 70.6 $kgCO_2e/kg$), whereas plant-based products usually have lower emissions intensities (e.g. tofu = 3.2 $kgCO_2e/kg$).[19] For example, companies can prioritize more sustainable products in their portfolio by reallocating marketing budget and shelf space to promote them. They can also reformulate recipes to replace specific ingredients, such as replacing beef mince in ready meals with soy alternatives or updating the suggested recipes on packaging to prioritize lower emissions ingredients.[ix]

Disclose – Publicly disclose risks, impacts, dependencies and other relevant climate- and nature-related information. The first report of this Future Fit Food and Agriculture series outlines both voluntary and mandatory frameworks for climate and nature disclosures. Transparently and constructively engaging with key stakeholders across the value chain is key to unlocking transformation.[20]

While there are several factors that make it difficult for food and agriculture companies to mitigate the agricultural emissions in their supply chain, **complexity cannot be an excuse for inaction.** Whether companies adopt the steps outlined here, or choose to use another process, it is essential that they work to understand their supply chains and emissions in order to achieve targeted, effective mitigation.

Box 1: Production and consumption hotspots for absolute GHG emissions

Our estimates suggest six production and consumption hotspots are responsible for over 15% of the absolute GHG emissions of the food and agriculture sector globally. Reducing the absolute emissions of these hotspots by 2030 is a priority to stay on track to meet the 1.5°C Paris target by 2050:

Production

1. Deforestation emissions from beef production in Brazil;
2. Enteric fermentation emissions from beef and dairy production in Brazil and India;
3. Methane and fertilizer use emissions from rice production in China and India;
4. Forest and peatland conversion from palm oil production in Indonesia.

Consumption

1. High beef consumption in the EU and China, sourced from Brazil;
2. High dairy consumption in the EU and US.

Please see the Future Fit Food and Agriculture: Technical Appendix for a detailed explanation of this analysis.

ix Some companies are already adapting recipes to encourage consumers to use more sustainable ingredients. For example, Unilever updated on-pack recipe suggestions in Germany to promote plant-based ingredients (e.g. lentils in their Bolognese recipe instead of beef mince).

④ Estimating the costs and benefits of mitigating agricultural emissions

We estimate that the food and agriculture sector should expect to spend, on average, an additional US$205 billion per year between 2025 and 2030 to achieve up to 9 $GtCO_2e$ of mitigation per year by 2030. The breakdown and explanation of these costs can be seen in Box 4 and Figures 3 and 4. While these costs are significant, they are manageable:

- First, they **account for less than 2% of the sector's projected US$13 trillion average annual revenues** for the same 2025–2030 period.[21]
- Second, as outlined in Table 1, **nearly one-fifth of the additional costs are actually investments** that come with substantial upsides from potential new and growing markets (see Figure 4 for more information).
- Third, **many of these solutions provide other associated co-benefits,** including increasing supply-chain resilience[x] and delivering on other sustainability commitments, such as nature targets.[xi]
- Fourth, **some on-farm solutions,** such as reducing the overapplication of synthetic fertilizers and improving the heat stress management of livestock,[24] **provide savings and/or increased yields worth up to US$30 billion per year.**
- Finally, governments are increasingly proposing new climate policies to accelerate the sector's transition to net zero. **Companies that adopt mitigation solutions early will likely face fewer disruptions and financial penalties with the introduction of new policies,** as they will have longer timeframes to adapt their procurement policies, invest in innovation, develop reporting capabilities and diversify portfolios. Companies that lag risk incurring penalties for non-compliance and costs associated with business disruption when policies come into force.

When it comes to tackling agricultural emissions, companies should first use the ACT-D steps outlined in Section 3 to identify where they can achieve maximum mitigation. They can then use the costs outlined in this section to understand the financial implications of the mitigation solutions relevant to their portfolio. Please see Appendix Table 1 for a more detailed breakdown of each individual mitigation solution included in the analysis for this section. When costing these solutions, companies can also consider where governments are offering support for such mitigation efforts (see examples in Box 2). Ultimately, each food and agriculture company will need to develop their own pragmatic decarbonization pathway. They will need to use a combination of mitigation solutions to achieve ambitious results, while managing the costs and risks associated with their specific context.

x The solutions discussed in this report have a wide range of co-benefits associated with them, including being shown to protect yields in drier and more variable climates, improve the water retention capacity of soils, and improve biodiversity. The wide range of co-benefits contribute to improved supply chain resiliency in the face of the growing disruption to weather and climate as a result of climate change.[23]

xi Ending deforestation and peatland degradation in company supply chains will help them fulfil SBTN Land's Target 1: No Conversion of Natural Ecosystems, adopting the agricultural solutions identified in this report aligns with SBTN Land's Target 3: Landscape Engagement, and managing demand through a reduction in food loss and waste and shifting to plant-based diets could help companies deliver on SBTN Land's Target 2: Land Footprint Reduction.[24]

Our analysis has focused on the costs faced by the private sector to mitigate agricultural emissions. However, it is important to note that **there will be additional costs borne by governments and other stakeholders to achieve net-zero food systems.** For example, protecting nature will require appropriate regulations and investment in monitoring and enforcement from governments. Shifting demand will require education, regulations and better access to nutritious foods. Even for on-farm solutions, there will be requirements for R&D, capacity building and technical assistance. These wider societal costs have been explored in a number of other studies, including FOLU's 2019 *Growing Better* report.[25]

Box 2: Examples of how policymakers support mitigation efforts in agriculture

EU – eco-schemes are an element of the EU's Common Agricultural Policy. They are designed to incentivize farmers to manage farm and land more sustainably and reward them for doing so, with the aim of maintaining public goods. A broad range of agricultural practices can be supported by eco-schemes, including organic farming, crop rotations, mixed cropping, cover cropping, agroforestry and improved nutrient management.[26]

India – India has introduced programmes that promote the use of controlled-release and stabilized fertilizers, such as neem-coated urea, to increase nitrogen-use efficiency and reduce fertilizer emissions.[27] On top of that, the National Mission for a Green India is a programme aiming to increase forest and non-forest tree cover by 5 million hectares, along with improving the quality of forest cover on another 5 million hectares. As part of this, joint forest committees have access to nearly US$1 billion in funding for the afforestation of degraded land.[28]

UK – the Sustainable Farming Incentive offers payments to farmers to encourage the adoption of sustainable farming practices. The Sustainable Farming Incentive aims to improve the environment and reduce carbon and other greenhouse gas emissions alongside continued food production, replacing the EU's Common Agriculture Policy.[29]

USA – the Inflation Reduction Act will provide an additional US$17 billion of funding for conservation programmes to help farmers improve soil quality, air quality, water quality and wildlife habitats.[30]

Box 3: An overview of the mitigation solutions outlined in this report

The mitigation solutions outlined in the analysis below, and detailed in Appendix Table 1, fall broadly into three categories:

1. **Solutions that protect nature,** preventing commodity-driven deforestation and peatland degradation. By preventing the destruction of nature, these solutions reduce land use change emissions.

2. **On-farm solutions** that reduce and remove emissions. Some solutions, such as improved diets for livestock or controlled-release fertilizers, reduce agricultural emissions. Other solutions, such as agroforestry, improved soil organic carbon sequestration in croplands and grasslands, and the application of biochar soil amendments, act to remove carbon dioxide from the atmosphere.

3. **Demand-side solutions** to reduce the quantity of agricultural production needed and shift demand away from emission-intensive commodities. Doing so reduces production emissions and relieves pressure on agricultural land.

Carbon removals, unique to on-farm solutions, are critically important as it is likely that some agricultural emissions will remain difficult to eliminate, such as emissions from enteric fermentation and manure. Finding ways to offset these will be essential if the food and agriculture sector is to reach net zero. By 2030 we estimate that over 75% of the 3.5 $GtCO_2e$ of mitigation achieved through on-farm solutions will be through removals.

Box 4: Examples of mitigation solutions across each of the four 'cost categories' in Figure 3

No-regrets solutions: reducing the over-application of synthetic fertilizers reduces costs and externalities without causing yield loss.

Cost of achieving monitored, verifiable traceability: to guarantee zero-deforestation within supply chains companies will need to invest in traceability solutions across their full supply chain. These range from investing in traceability technology and reporting capabilities, working with suppliers to gather farm- and landscape-level data and possibly offering price premiums for suppliers that offer certified deforestation-free products.

Costs for mitigation outcomes: some solutions achieve mitigation outcomes, but increase operational costs. For example, feed additives for cattle are a proven solution to reduce enteric fermentation emissions but can be an expensive addition to cattle diets.

Investments in new and growing markets: some solutions require investment today to capitalize on future market growth. For example, alternative proteins require investment in processing and production facilities to unlock a projected additional market value of US$125 billion by 2030. Other solutions include agroforestry and investing in nature-positive forest frontier businesses to produce non-timber and wild-forest products.

For a full outline of the solutions analyzed in this report, and their potential cost implications, see Appendix Table 1.

Figure 3: The food and agriculture sector should expect to spend, on average, an **additional US$205 billion per year** between 2025 and 2030 to achieve up to **9 $GtCO_2e$ of mitigation** per year by 2030.

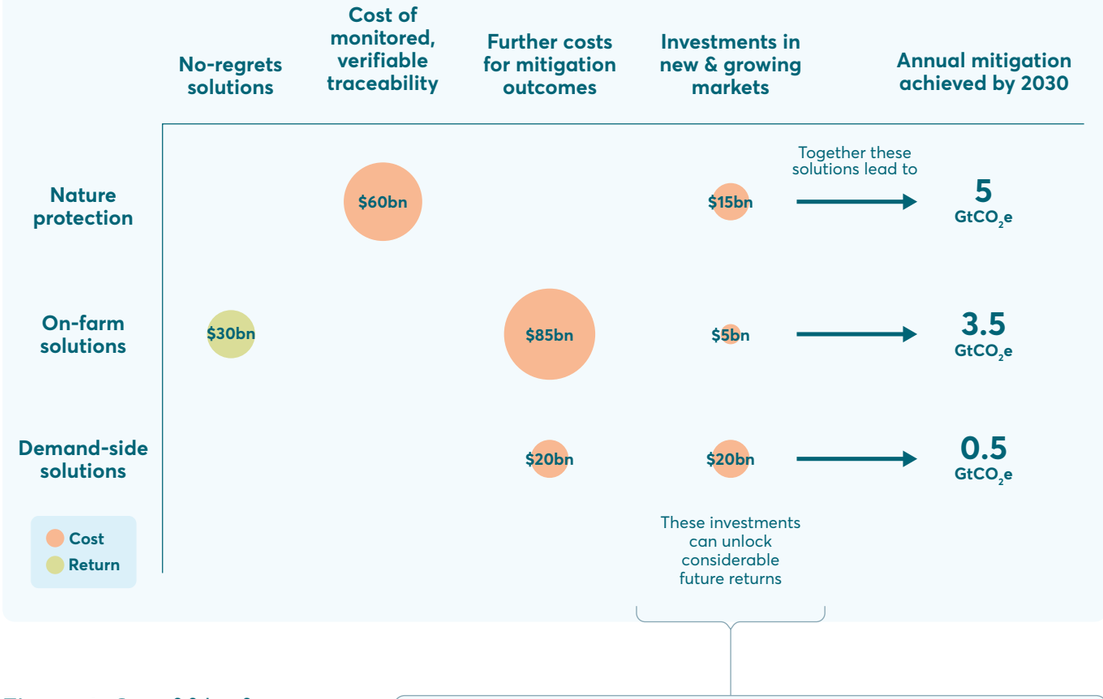
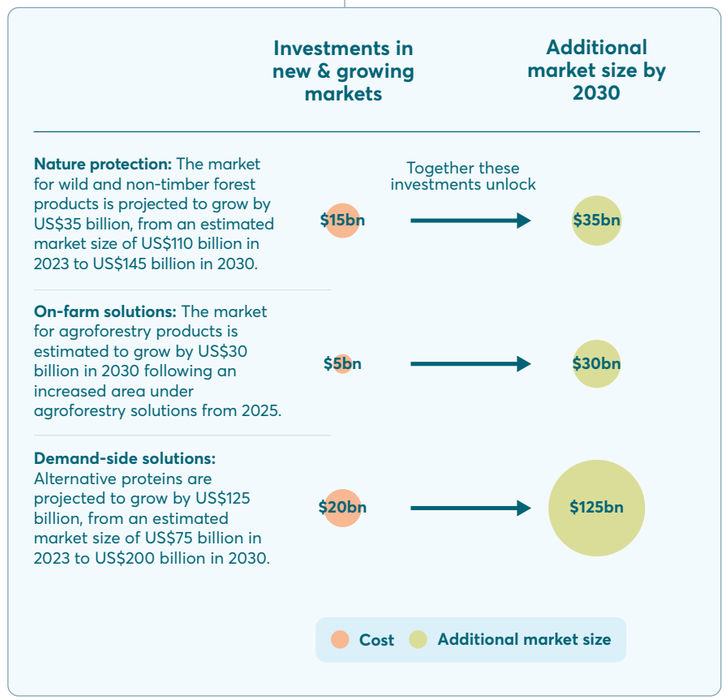


Figure 4: One-fifth of the expected additional US$205 billion per year are investments in new and growing markets. These **investments, estimated to be US$40 billion per year** (average annual from 2025-2030), could lead to potential additional returns **of US$190 billion per year** by 2030.



⑤ Inequitable division of costs is slowing sector-wide progress

While the costs of mitigating agricultural emissions appear manageable for the sector as a whole, in practice the **costs and benefits for implementing solutions fall unequally across the value chain.** Several factors drive this inequity and if unaddressed will continue to hinder the sector's transition to net zero.

First, implementing most of these solutions will fall to farmers. They will carry most of the risks inherent in changing practices, including learning new skills and practices, and investing in and establishing new infrastructure. In many cases, financial returns to farmers will also be slow to accrue, as with several solutions – such as switching to agroforestry – it will take time before revenues compensate for upfront investments. Of all the food and agriculture sector actors, farmers are often the least able to pay for mitigation solutions. They usually operate on the smallest margins and profit the least from the global food system.[31]

Second, the costs for mitigating agricultural emissions will be very different depending on the portfolio of a farm or company. For example, the solutions required for animal products are, on average, considerably more expensive than those required for plant-based products. Therefore, companies that sell high volumes of meat and dairy products are likely to face higher costs for on-farm mitigation solutions.

Finally, new and growing markets are inaccessible to many stakeholders across the food value chain. Many either do not have the capital to invest in new markets or cannot benefit from innovation that does not provide a viable alternative source of income. For example, the growth in alternative proteins does not easily offer new revenue streams for a beef farmer or trader.

Table 1: Illustrative estimates of the cost of mitigation for archetypal businesses across the food and agriculture value chain[xii]

	Large Brazilian beef farm ~5,000 cattle	Regional meat trader	Large Multinational Food Company with multiple brands
Annual revenues	US$3 million	US$40 billion	US$50 billion
Portfolio	Beef	Beef, pork, poultry and lamb	Beef, dairy, palm oil, maize/corn, rice, soy, wheat and other minor commodities (flavours, additives etc.)
Total emissions (2020)	30 $ktCO_2e$	91,000 $ktCO_2e$	50,000 $ktCO_2e$
Agricultural (ag.) emissions'	30 $ktCO_2e$	68,000 $ktCO_2e$	30,000 $ktCO_2e$
Objective:	**30% reduction in agricultural production and associated land use change emissions in line with SBTi FLAG sector guidance**		
Relevant ag. mitigation solutions	Reducing livestock emissions; traceability; sequestration in pastureland.		All ag.-mitigation solutions
Total ag. mitigation cost (30% objective)	US$0.5 million	US$1,100 million	US$350 million
Ag. mitigation cost per tCO2e mitigated	**US$51 tCO2e-1**	**US$49 tCO2e-1**	**US$36 tCO2e-1**
Ag. mitigation cost as % of revenues[1]	**17%**	**3%**	**<1%**

1 These costs include only the cost of mitigating agricultural emissions. If the cost of mitigating other relevant Scope 3 emissions were to be included, such as the cost of mitigating emissions from transport and packaging, then the cost of mitigation will increase. In accordance with SBTi guidelines, non-FLAG emissions need to be reduced by 42% by 2030. Achieving this will increase the cost of mitigation to 4% of revenues for the trader and 1.5% for the multinational company. A US51tCO_2e^{-1}$ cost of abatement was used for these non-agricultural emissions, from FOLU analysis, informed by consultation with Systemiq.

The archetypes in Table 1 demonstrate how the financial impact of mitigating agricultural emissions is inequitably distributed across the value chain. For our archetypal beef farmer, mitigating 30% of their (Scope 1) emissions could cost as much as 17% of their revenues. **With farmers typically achieving profit margins of 10–20%,[32] this reduction in revenues could trigger insolvency.**

By contrast, if companies further down the value chain absorb the cost of mitigating agricultural emissions – which count towards their Scope 3 emissions – these costs represent a markedly smaller proportion of company revenues than they do of farm revenues. These costs range from 3% of revenues for our archetypal meat trader, to less than 1% for our archetypal multinational food company.

The prohibitively high costs of the transition for many farmers are a key factor preventing them from implementing mitigation solutions at scale. It is critical that companies find mechanisms for sharing the costs of mitigation more equitably and support farmers to manage the costs and risks of transition. Without this, companies will struggle to make substantial progress against their public commitments.

xii The archetypal companies illustrated here are fictitious companies created using publicly available industry data, from a range of sources, drawing on CDP reports and augmented information on revenues and commodity breakdowns found online. As such, while the archetypes are not reflective of any one company, they should resemble real companies and reflect the costs these companies will face.

Fortunately, there are already several steps consumer-facing companies can take to incentivize and reward ambitious action from farmers. For example:

- Companies can offer supply chain financing to give producers access to low- or no-interest working capital and/or partner with financial institutions to support products that do this.
- They can sign offtake agreements to establish and guarantee demand for sustainably produced commodities.
- They can also offer premium prices and better contract terms for these commodities.
- Finally, they can innovate current business models, for example, by locating processing facilities nearer to production hotspots, where environmentally appropriate.[xiii]

For more detail on financial mechanisms companies can adopt to support the farmer transition, see WBCSD's *Cultivating farmer prosperity: Investing in regenerative agriculture*.[33] These solutions are critical for mitigating emissions from the food system and for increasing its resilience, which in turn will ensure long-term profitability of the food system. For this reason, large downstream value chain players have a particular responsibility to act.

xiii By locating processing facilities near production hotspots, the value added through processing happens within the producing communities, potentially allowing them to negotiate better contract terms for their products, thereby generating greater revenues that can be re-invested in sustainable production. At the very least, processing near production shortens value chains and allows processors to have a better view of their supply, making monitoring and verification easier when accounting for their sourced commodities and the practices adopted in their production.

⑥ Support from policymakers

Policymakers are critical to achieving the food and agriculture sector's transition to net zero. They have multiple levers at their disposal to incentivize climate mitigation and make these costs more manageable. Companies should collaborate across the full value chain and engage with policymakers to develop a clear vision of food systems transformations and to incentivize action accordingly. **Businesses should ask policymakers to do the following to accelerate food systems change:**

- **Reform food system subsidies.** Several existing agricultural subsidies provide perverse incentives that fund practices which drive ecosystem degradation and unsustainable agricultural production. For example, fiscal subsidies linked to the production of specific commodities can lock in and/or expand their production, promote monocultures and lead to input overuse (e.g. agro-chemicals). Further, emission-intensive commodities (such as beef, dairy or rice) receive a high proportion of subsidy support despite their negative impacts on climate and nature.[34] Therefore, it is critical to repurpose the circa US$425 billion-per-year subsidy regime to incentivize sustainable practices and de-risk the transition for farmers,[35] which would potentially more than cover the estimated US$205 billion increase in costs per year.

- **Implement carbon pricing mechanisms and emissions trading schemes.** Putting a price on carbon is an effective way to incentivize new practices and catalyze investment in low-carbon solutions as carbon pricing makes previously unfelt climate costs very real to companies.[36] Broadening existing schemes to include agricultural emissions and extend coverage to new countries (or, in their absence, using border adjustment mechanisms) will level the playing field and protect against 'leakage' – when polluting actors or practices move to avoid paying these costs.[xiv]

- **Implement payments for other ecosystem services (PES) schemes.** These can help create markets for the environmental functions that healthy landscapes provide, such as biodiversity and watershed management, and potentially encompass mitigation elements. Several countries have already successfully implemented PES schemes, including Costa Rica,[38] Australia[39] and the US.[40] More recently, the UK created the Environmental Land Management Scheme, which aims to provide environmental goods and services alongside food production.[41] Repurposed agricultural subsidies could be used to fund PES schemes.

- **Aligning public procurement policies with sustainable, healthy foods.** Public institutions have significant buying power. By aligning procurement policies to prioritize the purchase of sustainable foods, public institutions can reward businesses and farmers for sustainable practices and create the demand signals needed to incentivize investment in new markets for sustainable commodities and products.[42] There are already several examples of governments doing this, such as the municipal government of Copenhagen promoting plant-based foods and the Indian government replacing rice with millet.[xv]

xiv Leakage happens when polluting actors or practices move to avoid paying these costs. Although there is limited evidence for it in this context (i.e. in reaction to climate policy), increased trade and the off-shoring of production to developing countries such as India and China has led to a decline in emissions from the EU and US while emissions in these countries have continued to increase.[38]

xv Millets are a nutritionally dense, less water- and emissions-intensive crop than rice.[44,45]

7 Summary

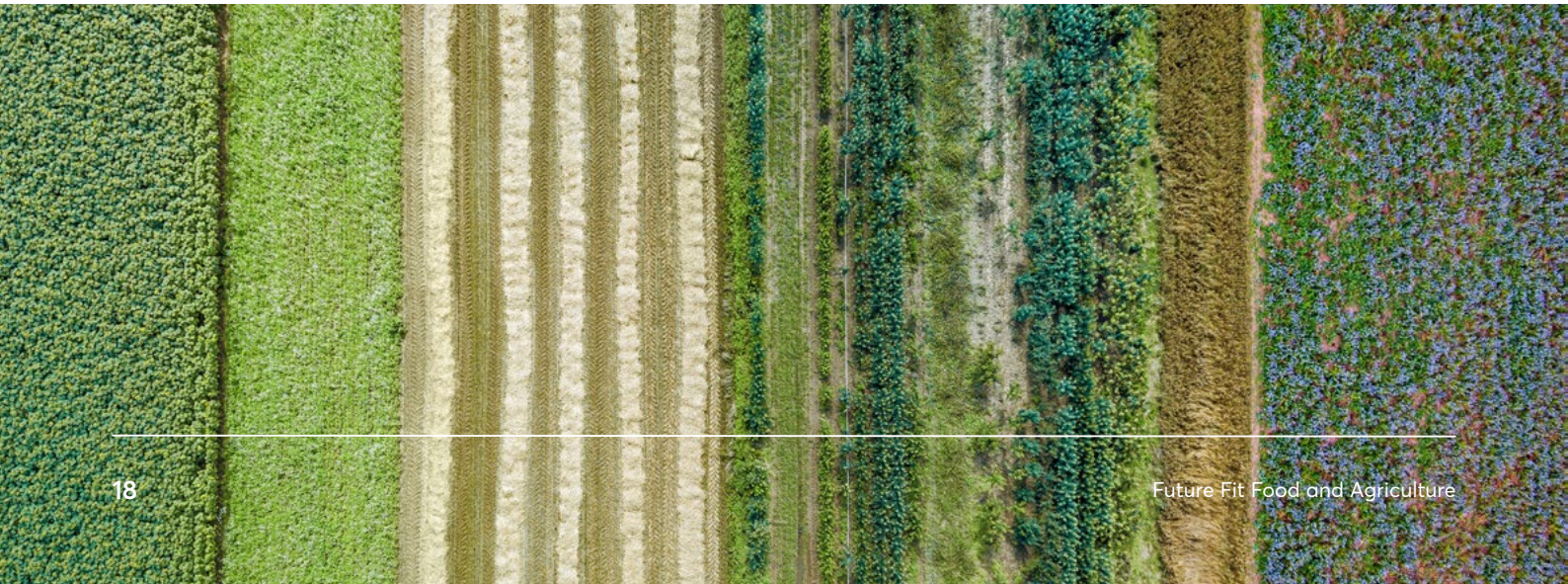
Agricultural production and associated land use change emissions in company value chains account for nearly half of total food systems emissions – an estimated 10 of a total 21 $GtCO_2e$ in 2030. Without mitigating these emissions, achieving net zero by 2050 will be impossible. Fortunately, **the combination of solutions outlined in this report can mitigate up to 9 $GtCO_2e$ per year by 2030 at a cost equal to just 2% of the sector's revenues.** Even so, agricultural value chains are complex and involve multiple stakeholders. Therefore, companies should use this report, amongst other resources, to take steps to understand their value chains, where they face critical climate and nature risks, and implement targeted, effective mitigation.

The critical challenge, however, is that these costs currently fall unequally across value chains, landing most heavily on farmers, who are the least able to pay. Overcoming this challenge will require food and agriculture companies across the sector to reassess both how they partner with other actors in the value chain and how they engage with policymakers to incentivize action. Governments are increasingly proposing new climate policies to overcome inertia in the system and accelerate sector transition to net zero. Therefore, it is in the interest of food and agriculture businesses to take action now. Doing so will secure their business interests and allow ambitious companies to take advantage of new and growing markets, as well as to deliver co-benefits beyond mitigation and ensuring sustainable livelihoods for farmers.

Areas for further study:

This analysis revealed the need for detailed value-chain roadmaps to explore the mitigation levers, financial implications and wider socio-economic implications for specific landscapes and commodity value chains.

We found that while there was a range of publicly available data at a global level, there was a lack of data at a local or commodity-specific level. For companies to fully understand the mitigation solutions relevant to their specific contexts, more data and detailed analyses of this sort will be necessary. On top of this, further analysis should consider the implications for stranded assets within food systems, the potential for foregone revenues, the costs associated with technical assistance, capacity building and R&D, and wider societal costs faced by policymakers and other food systems actors.



⑧ Appendix

Appendix Table 1: The full list of mitigation solutions assessed in this report.

Solution type	Problem	Solution	Returns to no-regrets solutions	Cost of achieving monitored, verifiable traceability	Further costs for mitigation outcomes	Invest-ments in new and growing markets	Potential additional revenues from new and growing markets by 2030	Mitigation potential by 2030
			Average annual costs or returns from 2025-2030 in US$ billion.				*US$ billion*	*$GtCO_2eyr^{-1}$*
Nature protection – Totals				**61**		**14**	**37**	**5.015**
	Nature conversion	Implement traceability solutions in the supply chain		61				5.015
		Invest in nature-positive forest frontier businesses				14	37	
On-farm – Totals			**32**		**85**	**6**	**28**	**3.663**
	Enteric fermentation	GHG-focused genetic se-lection and breeding			0			0.030
		Monitor ani-mal health and prevent illness			0			0.029
		Optimize animal feed mix			1			0.007
		Animal feed additives			15			0.160
		Process feed-grain for improved digestibility			0			0.011
		Manage heat stress	1					0.015
		Decrease forage-to-concentrate ratio	4					0.013
		Increase livestock production efficiencies	0					0.014
	Manure management	Large-scale anaerobic manure digestion			11			0.037

Solution type	Problem	Solution	Returns to no-regrets solutions	Cost of achieving monitored, verifiable traceability	Further costs for mitigation outcomes	Invest-ments in new and growing markets	Potential additional revenues from new and growing markets by 2030	Mitigation potential by 2030
			Average annual costs or returns from 2025-2030 in US$ billion.				*US$ billion*	*$GtCO_2eyr^{-1}$*
	Manure management	Small-scale anaerobic manure digestion			11			0.011
		Monitor animal health monitoring and prevent illness			0			0.029
		Increase livestock nutrient efficiency			0			0.022
		N-inhibitors on pasture			2			0.054
		GHG-focused genetic selection and breeding			0			0.030
		Increase livestock production efficiencies	0					0.014
	Rice cultivation	Improve fertilization practices in rice cultivation			1			0.029
		Improve rice paddy water management	3					0.045
		Expand adoption of dry direct seeding in rice cultivation	7					0.046
		Improve rice straw management	0					0.019
		Select optimal rice varieties			0			0.012
	Nutrient management	Reduce nitrogen over-application	4					0.030
		Expand adoption of controlled-release and stabilized fertilizers			1			0.022
		Apply variable rate fertilization			0			0.008
		Use specialty fertilizers			16			0.019
		Incorporate cover crops			0			0.004

Solution type	Problem	Solution	Returns to no-regrets solutions	Cost of achieving monitored, verifiable traceability	Further costs for mitigation outcomes	Invest-ments in new and growing markets	Potential additional revenues from new and growing markets by 2030	Mitigation potential by 2030
			Average annual costs or returns from 2025-2030 in US$ billion.				*US$ billion*	*$GtCO_2eyr^{-1}$*
	Nutrient management	Use of biological fertilizers	1					0.006
		Improve fertilization timing			0			0.009
	Increase sequestration	Use silvopasture				4	12	0.273
		Practise tree inter-cropping				1	1	0.096
		Practise multistrata agroforestry				1	14	0.222
		Improved soil organic carbon se-questration in croplands	8					0.559
		Soil organic carbon se-questration in grass-lands	4					0.508
		Use biochar			16			1.116
	Food loss and waste	Reduce food loss in production			4			0.084
		Reduce food waste in handling and storage			6			0.080
Demand-side – Totals					**18**	**18**	**126**	**0.521**
	Food loss and waste	Reduce food waste in process-ing and packaging			3			0.016
		Reduce food waste in distribu-tion and marketing			8			0.049
		Reduce food waste in consump-tion			7			0.144
	Diets	Switch to alternative proteins				18	126	0.566
Total			**32**	**61**	**103**	**38**	**191**	**9.200**

Note: where solutions appear twice (for example, GHG-focused genetic selection and breeding) it indicates that that solution can have an effect on more than one source of emissions (i.e. genetic selection can reduce both manure emissions and enteric fermentation emissions).

Sources for the emissions, mitigation and cost analysis. For more information please see the Technical Appendix.

The analysis draws from a number of sources, primarily:

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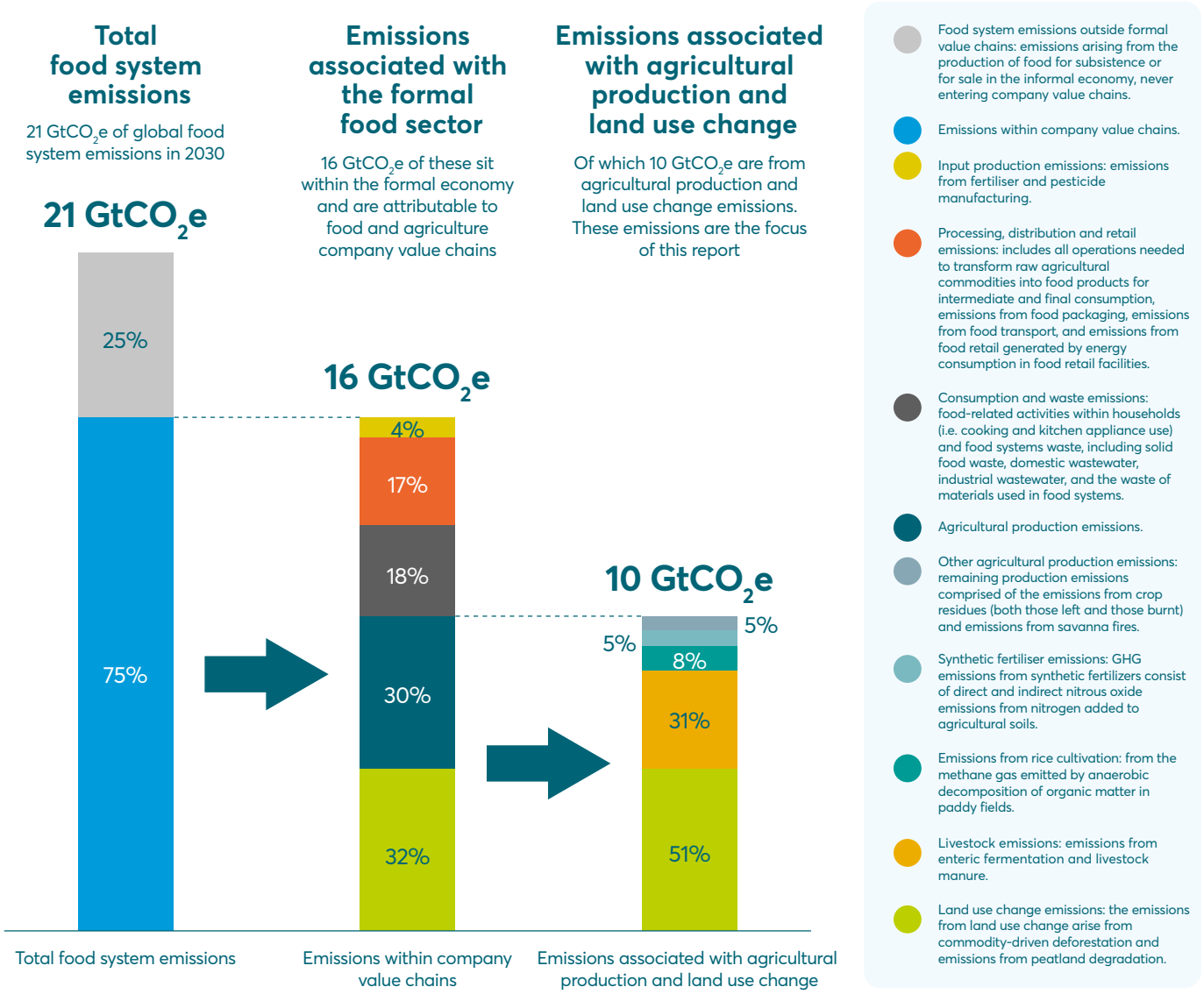
Appendix Figure 1: Projected agricultural emissions in the formal food and agriculture sector account for nearly half of total global food system emissions in 2030 (10 $GtCO_2e$ of 21 $GtCO_2e$). This is a replication of Figure 1 that includes full descriptions of emissions categories.



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Future Fit Food and Agriculture:

The financial implications of mitigating agriculture and land use change emissions for businesses

March 2024

The Food and Land Use Coalition

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