carbon4 | finance

THE AGRI-FOOD INDUSTRY : SEPARATING THE WHEAT FROM THE CHAFF?

September 2024
Sector review of the
2023 CIA campaign

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Table of contents

Summary

- **The agri-food industry became highly industrialised over the last century,** with the advent of petrochemicals, nitrogen fertilisers and ultra-processed foods[1] . These various transformations have led to huge increases in yield and productivity, at the cost of a sharp rise in the sector's greenhouse gas (GHG) emissions.

- **The agri-food value chain comprises 4 major stages**: agricultural production, trading, the transformation of agricultural products into food products and their packaging, and finally the distribution of these products via the various points of sale (e.g. supermarkets).

- The agri-food industry **is responsible for around a quarter of global GHG emissions[2]** and is the biggest emitter of gases other than CO_2 such as methane (CH_4) and nitrous oxide (N_2O), gases with a much greater global warming potential than CO_2 (30 and 273 times greater respectively)[3] .

- **In this sector, deforestation is one of the main sources of CO_2 emissions.** On a global scale, the WRI (*World Research Institute*) estimates that 50% of agricultural deforestation is directly linked to three consumer products: **beef, soya and palm oil[4]** . It is regrettable that most of the companies analysed have no strategy for excluding these products and replacing them with others that have a lower impact on the climate.

- The main issue for players in the sector is the type of product. **Plant-based products generally contain less carbon** than animal-based products.

- The development of farming techniques that limit soil degradation, as well as extensive livestock farming, is a major lever for the coming decades. Transforming the agro-industry to meet the challenges of climate change requires investment in research and an upgrading of the entire sector, as well as an adaptation of the global food regime.

- In the course of this study, **152 companies in the agri-food industry were analysed using the Carbon Impact Analytics (CIA) methodology**. These companies represent **more than three-quarters of the sector's total market capitalisation**. These analyses make it possible to assess the performance of the various players in terms of transition and to evaluate the alignment of their transition strategies with different climate scenarios.

- Among these companies, **36% have a good or very good understanding of the issues involved in the climate transition (reflected by a rating of their strategy of 1 to 2), while 64% have a rating of between 3 and 5, reflecting an insufficient or even poor understanding of the issues involved in the climate crisis.** Among the latter, only 27% of companies receive a score of 4 or 5/5, corresponding to a poor or very poor understanding of the issues. This percentage of 27% is relatively low and reflects a better understanding of climate issues than in other sectors[5] .

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[1] *Formulations industrielles réalisées à partir de cinq ingrédients ou plus, incluant des substances non communément utilisées dans les préparations culinaires et des additifs dont le but est d'imiter les qualités sensorielles des aliments.* Source: Anthony Fardet, La classification NOVA : degré de transformation des aliments et santé. Summer Nutrition University, Human Nutrition Research Centre (CRNH)

[2] Poore, Joseph & Nemecek, Thomas (2018). Reducing food's environmental impacts through producers and consumers. Science (New York, N.Y.).

[3] IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

[4] E. Goldman et al, 2020, Estimating the Role of Seven Commodities in Agriculture-Linked Deforestation: Oil Palm, Soy, Cattle, Wood Fiber, Cocoa, Coffee, and Rubber.

[5] See the section on Strategy Notes.

- In our sample, only 9 companies produce plant-based alternatives to dairy products and animal proteins. These products are part of the solutions needed to bring the global diet into line with the ecological transition. The business models of these companies are very varied, ranging from meat producers to producers specialising in plant-based alternatives, via diversified food companies. In this context, alignment with the low-carbon transition can still vary greatly between these companies.

- **Too few players have already established a coherent and comprehensive climate transition strategy**, as shown by the low number of companies achieving the highest strategic score, which rewards players who think across their entire value chain, and in particular those who add value to agricultural products derived from low-carbon practices such as agroforestry and/or regenerative agriculture[6] .

[6] *Approche de l'agriculture qui utilise la conservation des sols comme point d'entrée pour régénérer et contribuer à de multiples services d'approvisionnement, de régulation et de soutien des écosystèmes, avec l'objectif que cela améliore non seulement les dimensions environnementales, mais aussi sociales et économiques de la production alimentaire durable.* Source: Giller, K. E., Hijbeek, R., Andersson, J. A., & Sumberg, J. (2021). Regenerative Agriculture: An agronomic perspective. Outlook on Agriculture, 50(1), 13-25.

Introduction

"The global food consumption alone could add nearly 1 °C to warming by 2100"[7] .
(C.C Ivanovich, T Sun, D.R Gordon, 2023)

Food is one of the major challenges of our century in a number of respects: the ability to feed a rapidly growing world population, the consequences for health (diseases encouraged by overeating or junk food in industrialised societies), and lastly for the climate and biodiversity. The way we eat depends directly on the climate, but also has a significant impact on it.

The agri-food industry is the link between the field and our plate. There are many stages in the production of foodstuffs before they reach the end consumer: growing or rearing, processing, packaging and transport. In this long and complex value chain, most greenhouse gas emissions are concentrated in the upstream phase: farming or growing. These emissions are highly dependent on the techniques used and the agricultural products concerned.

Deforestation is one of the main sources of GHG emissions in the sector, but it does not just contribute to climate change. It is also a threat to ecosystems. Biodiversity-related impacts and dependencies are not covered in this publication, but are the subject of our Biodiversity Impact Analytics powered by the Global Biodiversity Score (BIA-GBS) methodology and database.

[7] Ivanovich, C.C., Sun, T., Gordon, D.R. et al. Future warming from global food consumption. Nat. Clim. Chang. 13, 297-302 (2023).

1. Dynamics and challenges facing the sector

1. Sector dynamics and challenges

1.1 Description of the sector

The agri-food industry encompasses agriculture and agri-food. The sector's value chain can be defined as comprising 4 major stages, namely agricultural production, trading, the processing of agricultural products into foodstuffs and their packaging, and finally the distribution of these products via the various sales outlets (e.g. supermarkets).

This sector is heavily dependent on the chemical industry for its agricultural inputs, especially during the cultivation phase.

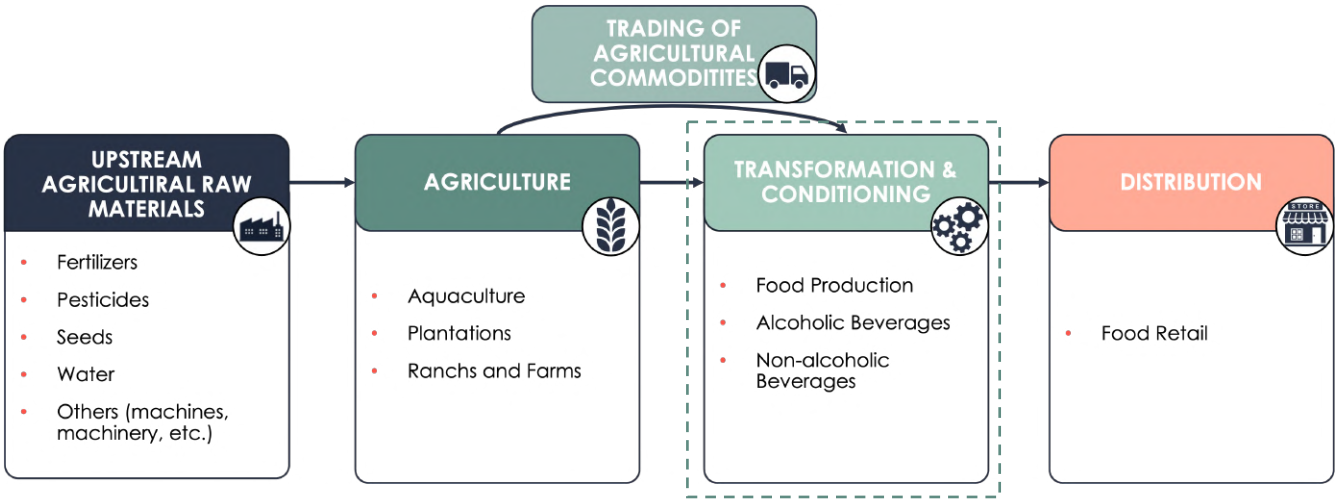


Figure 1 - Illustration of the agri-food industry value chain

The agri-food industry accounts for around a third of man-made greenhouse gas emissions. Emissions from this sector have increased worldwide by around 12% over the last 30 years.

This increase in emissions is mainly taking place in developing countries and should be seen in the context of the almost 40% increase in global food production over the same period[8] .

If agricultural production methods and the average diet do not change, research shows that the agri-food industry could be responsible for an increase in average temperature of almost 0.9°C above current levels by 2100[9] .

[8] M. Crippa et al, 2021, Food systems are responsible for a third of global anthropogenic GHG emissions
[9] Ivanovich, C.C., Sun, T., Gordon, D.R. et al. Future warming from global food consumption. Nat. Clim. Chang. 13, 297-302 (2023).

1.2 Scope of the study

This publication focuses on companies involved in the processing and preparation of food and beverage products, excluding agricultural production, commodity trading and food-retail activities. For most of these large agri-food companies, the main emissions are indirect emissions (Scope 3) located upstream of their value chain. Their main challenge is to choose their suppliers as carefully as possible, to invest in the upstream part of their value chain by carrying out projects to improve production techniques and to choose the type of foodstuff produced.

In order to provide the best possible analysis of companies according to their business model and their climate challenges, we have identified three methodological variations adapted to manufacturers of food products, non-alcoholic beverages and alcoholic beverages.

A total of 152 companies, representing the largest capitalisations in the sector in the first half of 2023, were analysed. The study sample comprises 135 companies focusing on the processing and packaging of food and beverages. The sample is made up of 85 companies producing mainly foodstuffs, 17 producing non-alcoholic beverages and 33 producing alcoholic beverages. The companies in the sample are present on 6 continents and account for 75% of the sector's market capitalisation (approximately €3,157 billion)[10] . The production volumes of these companies cover almost one billion tonnes of food and beverages.

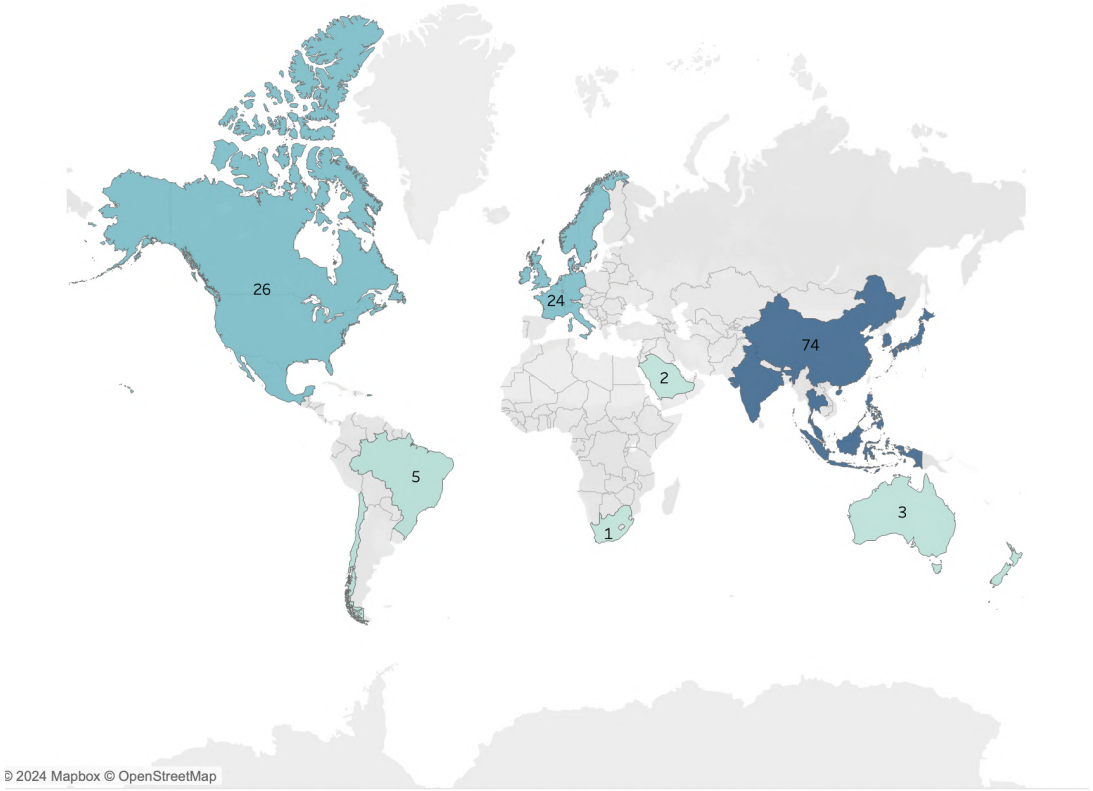


Figure 2 - Geographical distribution of campaign companies by continent

[10] Sample coverage is calculated using data from our financial data provider FactSet. To do this, we divided the sum of the market capitalisations of the companies in our sample by the sum of the market capitalisations of the companies belonging to the corresponding Factset segment.

The geographical distribution of the companies analysed in the sample is fairly representative of the overall distribution of companies in the sector.

In fact, China, India and Japan are among the 4 countries with the largest number of listed agri-food companies, which explains the very high representation of the Asian continent in our sample. We also note the variability in the type of activity of companies depending on their geography. Asian companies mainly produce foodstuffs.

In Europe, the bulk of volumes (expressed in tonnes) are linked to alcohol production, but volumes are more evenly distributed between the different categories.

In North America, the majority of volumes are non-alcoholic beverages. The following graph shows the percentage breakdown of volumes according to the geography of the company's head office.

Figure 3 - Distribution of company types by geography

1.3 The challenges of the transition for the agri-food industry

"The agricultural sector, and more generally the entire agri-food industry, is responsible for around a quarter of global greenhouse gas emissions" [11]
(J. Poore and T. Nemecek, 2018).

Given that the agri-food industry is one of the world's three biggest emitters of greenhouse gases, along with energy and transport, what are the challenges and solutions for decarbonising our food supply?

[11] Poore, Joseph & Nemecek, Thomas (2018). Reducing food's environmental impacts through producers and consumers. Science (New York, N.Y.).

A special feature of the sector: diversified greenhouse gas emissions

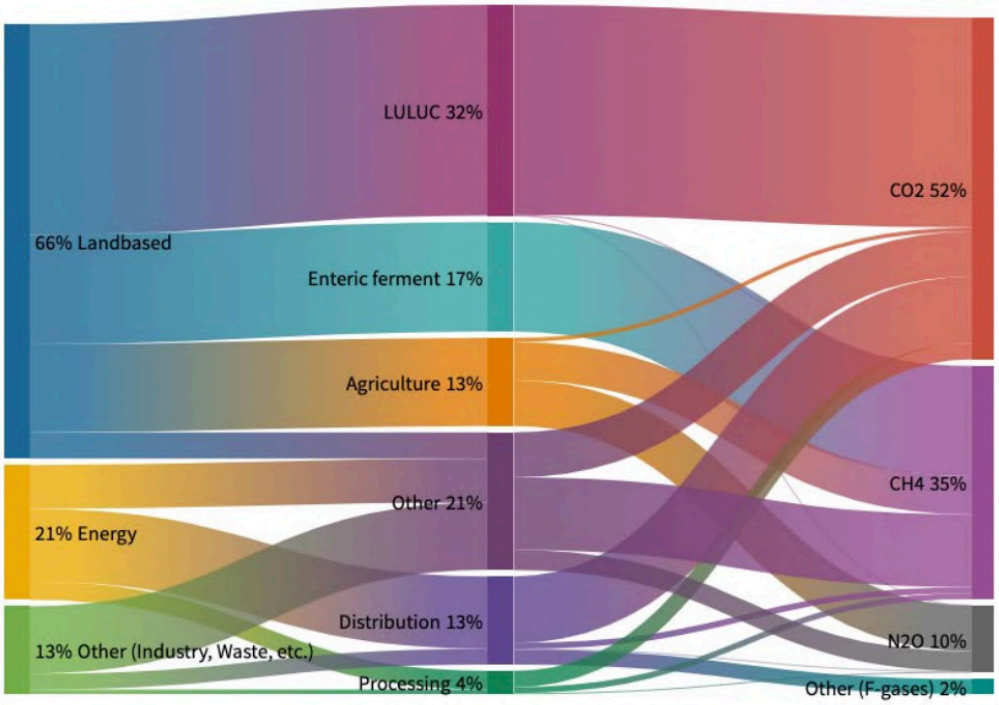


Figure 4 - Breakdown of agri-food industry emissions by category and type of gas (in tCO_2e)[12]

The agri-food industry is unique in that it produces greenhouse gases other than CO_2 , in particular methane (CH_4) and nitrous oxide (N_2O). Exceptionally, most of the industry's CO_2 emissions do not come from the consumption of fossil fuels, which account for just 21% of its emissions, but from land use and land use change (LULUC), produced by farming techniques and deforestation.

CARBON DIOXIDE AND THE CHALLENGE OF DEFORESTATION

Land-use change, particularly deforestation, is one of the main sources of CO_2 emissions in the agri-food industry. The beef and soya sectors are the main culprits behind the deforestation of the Amazon rainforest[13]. On a global scale, the World Resources Institute estimates that 50% of agricultural deforestation is directly linked to three major consumer products: beef, soya and palm oil[14] .

[12] adapted from M. Crippa et al, 2021 for 2015
[13] Nepstad DC, Stickler CM, Almeida OT. Globalization of the Amazon soy and beef industries: opportunities for conservation. Conserv Biol. 2006 Dec
[14] E. Goldman et al, 2020, Estimating the Role of Seven Commodities in Agriculture-Linked Deforestation: Oil Palm, Soy, Cattle, Wood Fiber, Cocoa, Coffee, and Rubber

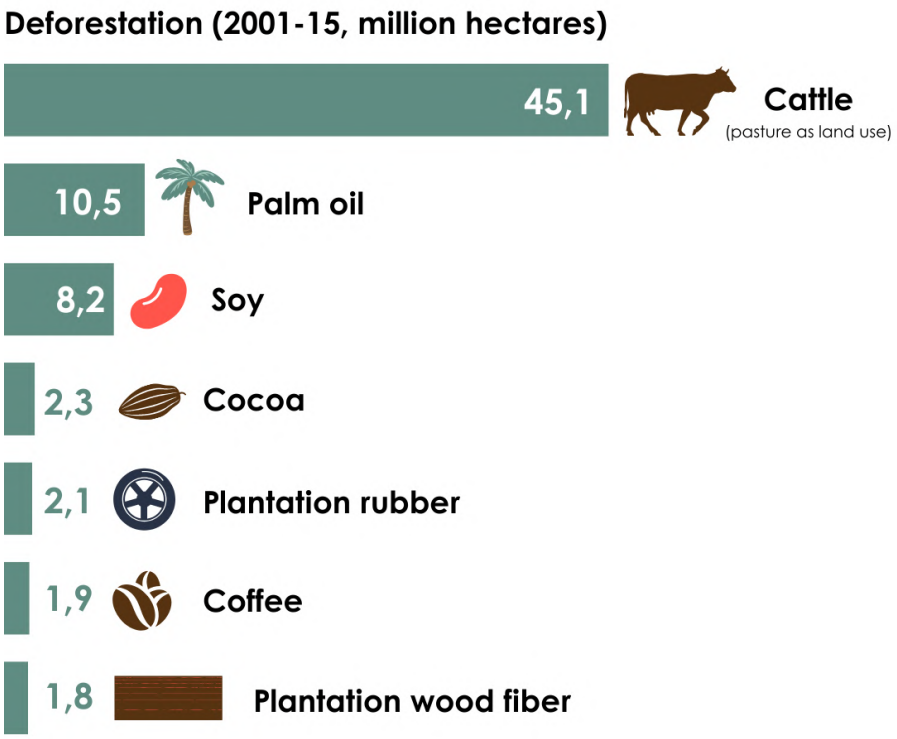


Figure 5 - Deforestation linked to the main agricultural commodities (2001-15) Source: Global Forest Review (21.02.2019) adapted to the Carbone 4 charter

For this reason, regulations are beginning to emerge, such as the European Deforestation-free Regulation, which makes it possible to combat these imported emissions. Europe is the second largest importer of products resulting from deforestation, since 16% of all deforestation worldwide can be linked to European consumption of products such as soya, palm oil and beef. This puts Europe just behind China, but ahead of the United States[15] . *"In total, between 2005 and 2017, European Union imports caused the deforestation of 3.5 million hectares, equivalent to the surface area of 5 million football pitches."*

Despite stated ambitions to halt deforestation, deforestation continues to grow[16] . At COP 26 in Glasgow, more than 100 countries, representing over 85% of the world's forests, signed an agreement to eradicate deforestation by 2030. There is still hope of achieving this objective in some countries, notably Brazil, where the government elected in 2023 is trying to slow this trend by reducing deforestation in the Amazon by more than 60% in the first half of 2023 compared with 2022. However, the overall trend is still upwards: in 2022 there were more than 4 million hectares of deforested primary forest, an increase of more than 10% compared with 2021. The following graph illustrates the loss of tropical forest cover over the last 20 years:

[15] Wedeux, Schulmeister-Oldenhove, 2021, Quand les européens consomment, les forêts se consument, WWF
[16] Alexandra Sharp, Foreign Policy, Deforestation Ramps Up Despite Global

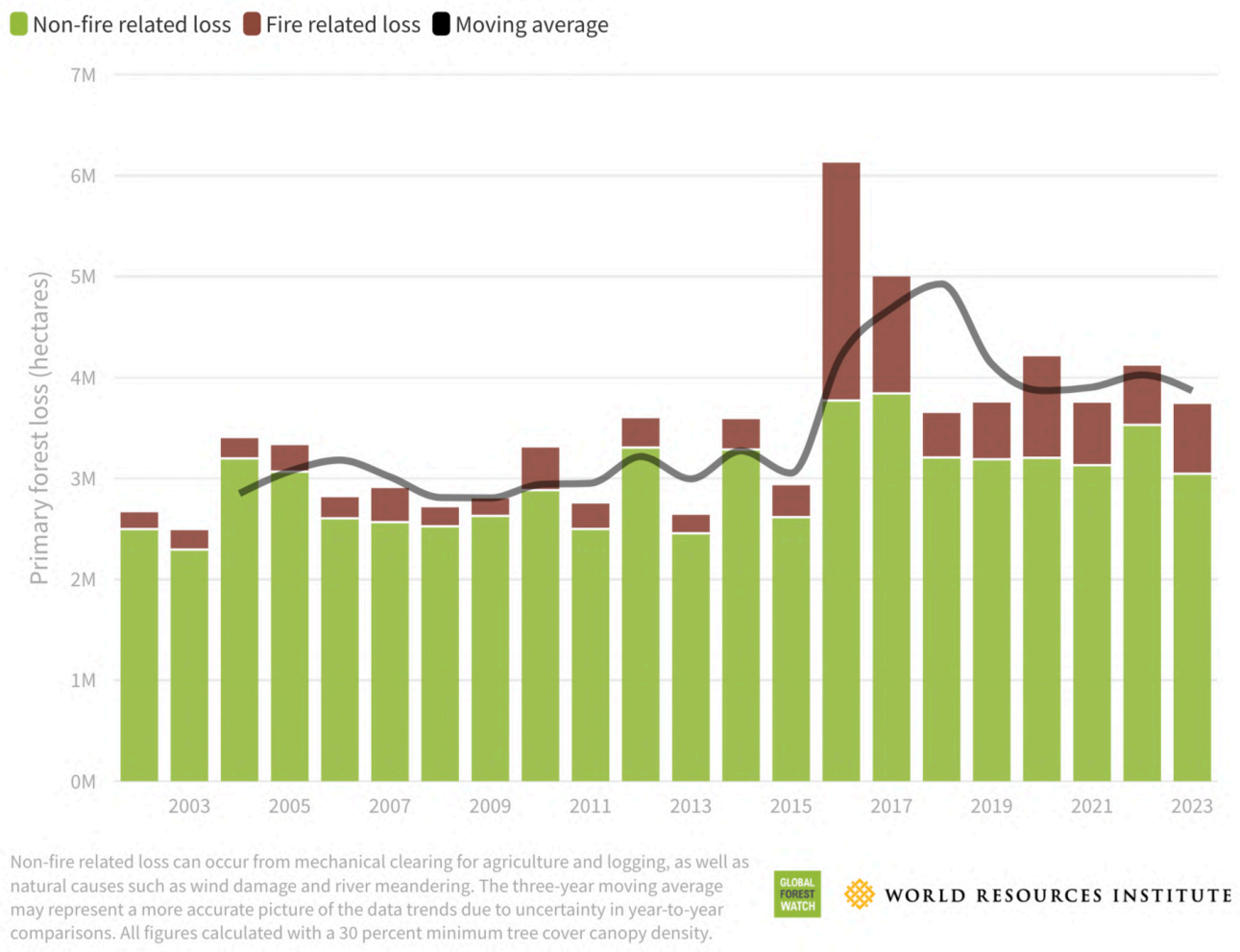


Figure 6 - Loss of primary tropical forest cover between 2002 and 2022[17]

At company level, the preferred method for ensuring that deforestation is avoided in their value chain is often certification: RSPO[18] for palm oil, RTRS[19] for soya. However, these certification mechanisms have their flaws.

In fact, there are different levels of certification: preserved identity, which represents a tiny proportion of volumes, and the three main levels: segregation, mass balance or country material balance. Of these three levels, only segregation can ensure that there is no real deforestation in the value chain and effectively combat deforestation. In the case of palm oil, considerable efforts by the industry have made it possible to improve product traceability, often right back to the pressing stage. On the other hand, it is often impossible to distinguish the plantations of origin. For example, small family plantations, with deforestation techniques and little control, account for 45% of production in Indonesia. For these reasons, the most effective way of reducing the risk of transition is to withdraw from the products that contribute most to deforestation, such as Brazilian soya and palm oil.

[17] WRI, Forest Pulse: The Latest on the World's Forests
[18] Roundtable on Sustainable Palm Oil ou “Table ronde sur l'huile de palme durable” in French
[19] Round Table on Responsable Soy ou “Table ronde sur l'huile de palme durable” in French

Understanding certification systems

There are international initiatives that seek to ensure that the main foodstuffs are not derived from deforestation or human exploitation. Among these initiatives, the **RSPO** (Roundtable on Sustainable Palm Oil) and the **RTRS** (Roundtable on Responsible Soy) are major players in the certification of deforestation-free products.
Here are the details of the different levels of certification for each of these initiatives:

RSPO

Identity preserved
Ensures the traceability of each batch of refined oil to a deforestation-free plantation.
This is the strictest certification and the one that most accurately guarantees the absence of deforestation in the final product.
Segregation
Ensures 100% RSPO-certified product content. However, the oil can come from a variety of certified plantations and palm oil mills. This is a satisfactory criterion, but it is flawed because it does not prohibit the deforestation of secondary forests, which make up the majority of forest cover in palm oil-producing regions.
Mass balance
Ensures that the quantity of RSPO-certified palm oil processed matches the quantity of certified palm oil purchased. This model cannot guarantee that certified and non-certified raw materials are always separated due to their structure or products.
Book & Claim (purchase of certificates)
Allows you to buy certificates from producers of sustainable palm oil. Products do not necessarily contain deforestation-free palm oil.

RTRS

Segregation
Ensures sourcing only from RTRS-certified producers and physical separation throughout the value chain from non-certified products.
Mass balance
Ensures that the quantity of RTRS-certified soya sold by a producer corresponds to the quantity of certified soya produced. This model cannot guarantee that certified and non-certified raw materials are always kept separate.
National mass balance
Ensures that the quantity of RTRS certified soya sold by several producers corresponds to the quantity produced by several certified soya producers. This model cannot guarantee that certified and non-certified raw materials are always kept separate.
Credits
Allows you to buy certificates from RTRS soya producers. Certified products do not necessarily contain deforestation-free soya.

METHANE, A GAS PARTLY OF AGRICULTURAL ORIGIN

Methane (CH_4) is the main gas emitted by the various fermentations that take place during livestock rearing and farming processes[20] . It accounts for more than 35% of the sector's emissions in CO_2 equivalent[21] , and is produced mainly by the rearing of ruminants, during the enteric fermentation process during their digestion. Reducing these emissions is a major challenge for the agri-food industry. Livestock reared for their milk and meat account for around 14.5% of global greenhouse gas emissions[22] .

Several technical solutions are being considered[23] , including a change in the animals' diet. This involves supplementing cattle feed with algae to reduce enteric fermentation during digestion.

However, these techniques are still experimental and their application on a global scale remains to be studied. As a result, most transition scenarios and emission reduction plans at national and global level envisage drastic reductions in the size of cattle herds, of the order of a division by two or even three[24] .

These choices are based not only on the methane issue, but also on the feed inefficiency of livestock farming. In fact, to obtain 1 kilogram of edible beef, up to 25 kg of plant dry matter feed is needed[25]. These types of farming raise questions about the use of agricultural land and have particularly high indirect emissions due to the large quantities of resources mobilised, which are also sometimes linked to deforestation, as in the case of soya cake, with soya coming from Brazil.

Beef production is the main source of methane emissions, but others are also important. The main sources of greenhouse gas emissions other than CO_2 (methane, nitrous oxide, etc.) are set out below. It should be noted that almost 35% of these emissions are not directly linked to livestock farming.

[20] FAO. 2023. Methane emissions in livestock and rice systems - Sources, quantification, mitigation and metrics. Rome.
[21] Crippa, M., Solazzo, E., Guizzardi, D. et al. Food systems are responsible for a third of global anthropogenic GHG emissions
[22] Gerber, P.J., H. Steinfeld, B. Henderson, A. Mottet, C. Opio, J. Dijkman, A. Falcucci, and G. Tempio (2013), Tackling climate change through livestock - A global assessment of emissions and mitigation opportunities, Food and Agriculture Organization of the United Nations (FAO), Rome.
[23] Abbott, D.W.; Aasen, I.M.; Beauchemin, K.A.; Grondahl, F.; Gruninger, R.; Hayes, M.; Huws, S.; Kenny, D.A.; Krizsan, S.J.; Kirwan, S.F.; et al. Seaweed and Seaweed Bioactives for Mitigation of Enteric Methane: Challenges and Opportunities. Animals 2020, 10, 2432.
[24] Christian Couturier, Madeleine Charru, Sylvain Doublet and Philippe Pointereau, Le scénario Afterres 2025 version 2016, Association Solagro
[25] Our World in Data, Feed required to produce one kilogram of meat or dairy product

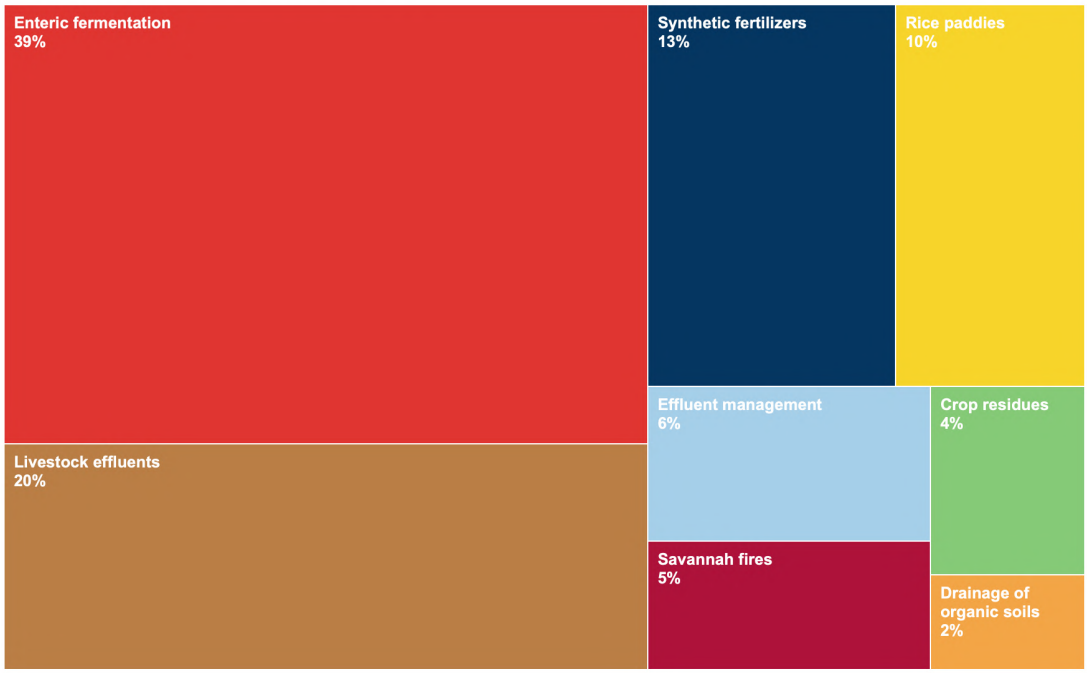


Figure 7 - Breakdown of non-CO_2 greenhouse gas emissions from the agri-food industry by source[26]

NITROUS OXIDE AND FERTILISER SPREADING

The second source of greenhouse gas emissions is the spreading of nitrogen fertilisers, which break down into nitrous oxide (N_2O). Per hectare, these emissions vary significantly depending on agricultural practices and the use of fertilisers. Apart from changes in land use, they account for almost 40% of the sector's emissions in France[27] . In developed economies, changes in land use are lower, and nitrogen fertilisers are used more frequently. Techniques for reducing these emissions need to be studied carefully, as they require changes to cultivation techniques and to the products sold.

Agriculture is responsible for the vast majority of methane and nitrous oxide emissions, accounting for almost 80% of global emissions.

[26] FAOSTAT 2020
[27] SNBC2, 2023,

1.4 Transition risks identified

A company's transition risk is the risk associated with the effects of a societal and/or economic change linked to the low-carbon transition, which may have an impact on a player's business model throughout its value chain. The figure below shows the main transition risks that the agri-food industry may face.

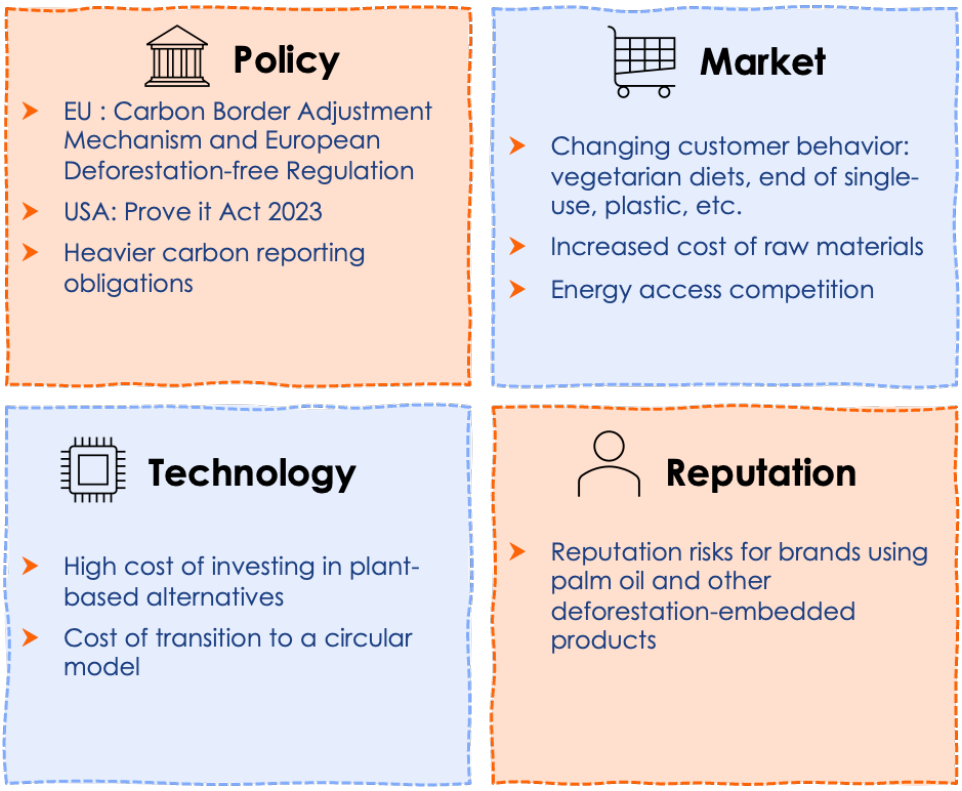


Figure 8 - Transition risks linked to the sector

Regulatory risks

Regulatory risk can be understood as the risk that a change in climate-related laws and regulations will have a significant impact on a company. In the case of the agri-food industry, Carbon Border Adjustment Mechanism (CBAM) pose the greatest risk to companies.

These mechanisms, like the one voted for by the European Union in 2021[28] , apply to fertiliser imports and are likely to increase the price of agricultural materials as a knock-on effect. From 2026, importers will have to declare the greenhouse gas emissions linked to imported products and buy CBAM certificates offsetting these emissions at the weekly average price of the EU Emissions Trading System (EU ETS)[29] .

A similar mechanism (PROVE IT Act of 2023, for *Providing Reliable, Objective, Verifiable Emissions Intensity and Transparency*) is being studied by the US Senate, supported by a bi-partisan assembly, and plans to set up a system similar to that of the European Union.

[28] European Commission, Carbon Border Adjustment Mechanism
[29] European commission, Carbon Border Adjustment Mechanism factsheet

A European regulation, which will come into force in 2023, will also increase the legal arsenal against deforestation (European Deforestation-free Regulation). Companies selling products identified as carrying a risk of deforestation (cattle, timber, cocoa, soya, palm oil, coffee, rubber and some of their derivatives) on the EU market or exporting them to Europe must now be able to prove that the products do not come from land that has recently been deforested or has contributed to forest degradation.

Market risk

Companies in the agri-food industry face a wide range of market risks. Extreme weather events are on the increase, putting raw materials at considerable risk. In 2022, several value chains were affected. The death of several thousand head of cattle in Kansas[30] due to unprecedented weather conditions led to a sharp rise in beef market prices. This meteorological phenomenon, still exceptional at the moment, is likely to become more frequent as a result of global warming: a study published in The Lancet[31] estimates the damage to the meat market at between 35 and 45 billion dollars a year by the end of the century.

All production and processing sectors are affected. In France, for example, maize prices soared in 2022 as a result of an exceptional drop in production in the country (yields down by almost 25%), caused by intense droughts[32] . These major variations affect all agricultural commodities and contribute to a high degree of variability in production costs. The following graph shows the variation in world prices for the main agricultural commodities in 2021.

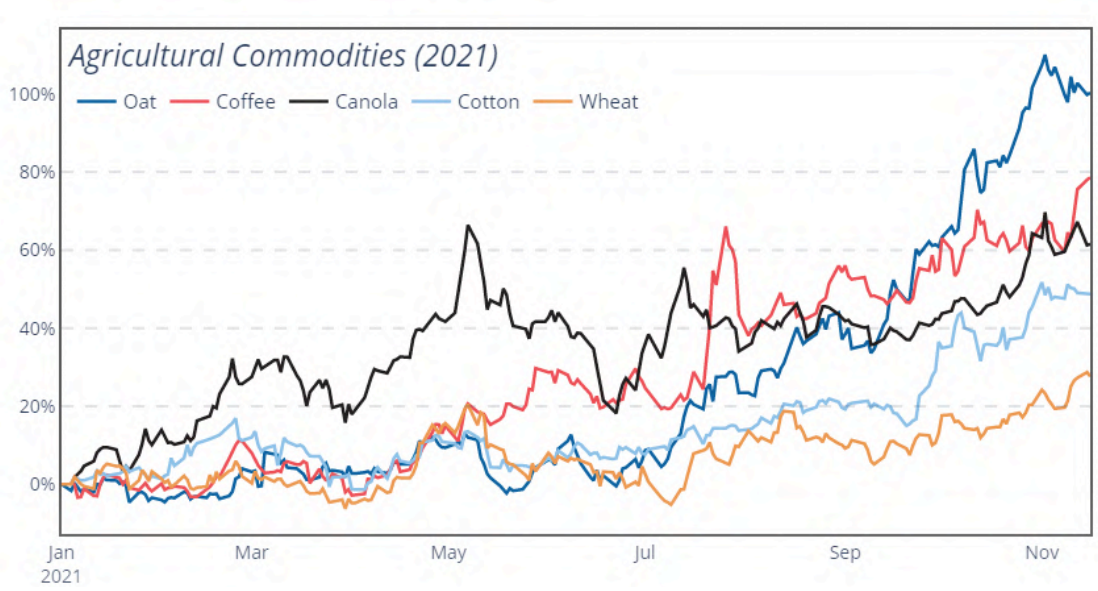


Figure 9 - Change in prices of main agricultural commodities in 2021[33]

[30] Associated Press, 16 June 2022, Heat stress blamed for thousands of cattle deaths in Kansas
[31] Philip Thornton, Gerald Nelson, Dianne Mayberry, Mario Herrero, Impacts of heat stress on global cattle production during the 21st century: a modeling study, Lancet Planet Health, 2022; 6: e192-201
[32] Agreste, Février 2023, Synthèse conjecture, Grandes cultures, 2022
[33] Geopolitical Monitor, November 16, 2021, Agricultural Commodity Prices Surge through 2021

At the same time, some consumers are changing their eating habits as they become more aware of and educated about climate issues. Meat consumption in France is changing, and climate change is one of the reasons for this. Per capita meat consumption has fallen by 5% over the last 20 years[34] and by almost 10% for red meat over the same period. This is part of an overall shift in consumer eating habits towards less processed products, which are considered healthier, with shorter distribution channels and less packaging.

Finally, tensions over supplies need to be considered: available agricultural land is limited on a global scale, and crops intended for human consumption have to compete simultaneously with fodder crops, urbanisation, the development of biofuels, materials (hemp, flax, etc.), wood and biodiversity with the imposition of fallow land. Carbon offsetting projects are also contributing to the financialisation of agricultural land, which is likely to have an impact on the cost of raw materials and food security[35] .

Technological risk

As in most sectors, the search for new, alternative and less carbon-intensive technologies can play a role in the transition of the food and drink sectors towards a greener model. To adapt to changes in consumer behaviour towards vegetarian and vegan diets, the development of plant-based meat and other alternatives offers great potential. According to a research report published in 2020[36] , the market for plant-based alternatives is expected to grow at an annual rate of 11.9% from 2020 to 2027, reaching $74.2 billion by 2027. As a result, some food companies may need to invest in new technologies capable of producing these plant-based alternatives to remain competitive in the market.

Major companies in the sector are also starting to invest: Unilever is investing $85 million from 2019 in a research centre dedicated to plant-based alternatives[37] . Unfortunately, these figures - 6% of Unilever's investments in 2019[38] - are still negligible and do not allow for a real transformation of the business model. Reducing packaging and moving towards a circular model also represents a major transformation of the current food industry model.

Reputation risk

Companies are under increasing scrutiny for their environmental performance and climate change strategy. Examples of media scandals or impacts on company revenues are multiplying. Cargill has been declared the "world's worst company"[39] , among other things for its involvement in deforestation in the soya, palm oil and cocoa value chains around the world. Similarly, JBS, the world's largest beef producer, has been boycotted by European supermarkets for its deforestation practices in Brazil[40] .

[34] Agreste, « La consommation de viande en France en 2021 », Synthèses, No. 2022 394, July 2022
[35] M. Castagné, S. Lickel, T. Ritter, G. Dufrasne, Marchés Carbone agricoles, Compensation carbone : fausse solution pour un vrai problème ?
[36] Meticulous Market Research Pvt. Ltd, Plant Based Food Market by Product Type (Dairy Alternatives, Meat Substitute, Plant-Based Eggs, Confectionery), Source (Soy Protein, Wheat Protein), and Distribution Channel (Business to Business and Business to Customers) - Global Forecast to 2027, Sep. 2020.
[37] B. Maeder, H. Walter, R. Dongoski, T. Krupke, EY-Parthenon, How alternative proteins are reshaping meat industries
[38] Unilever, 2019 FULL YEAR RESULTS
[39] Mighty Earth, Cargill et le Soja
[40] Mighty Eath, Des supermarchés européens cessent de s'approvisionner en bœuf brésilien en raison de l'implication du géant de la viande JBS dans des pratiques de déforestation

1.5 Decarbonisation levers

The agri-food industry's efforts to reduce its greenhouse gas emissions must focus on four major areas.

- Reduce production volumes: there is an imbalance in the production and consumption of certain particularly GHG-emitting products between the most developed and developing countries. In developed countries, there is an over-consumption of meat and animal products compared with public health recommendations[41] and ecological transition scenarios[42] . Reducing this overproduction would significantly reduce emissions from the agri-food industry.
- Combating waste along the value chain: almost 30% of agricultural produce is not consumed. By working on food waste, players can reduce their emissions.
- Changing product types to move towards lower-emission production.
- Changing production techniques by reducing inputs and changing land use to reduce production-related emissions.

In detail, since the sector's emissions stem mainly from the type of products or farming techniques used (livestock and crops), these issues can be translated as follows:

- Emissions from animal products, which are higher than in the rest of the sector, are intrinsic to the product, which implies a rationale of reducing volumes in favour of plant-based alternatives rather than improving production methods. As livestock farming accounts for 62% of emissions from the entire agri-food industry[43] , several transition scenarios predict a drop in global consumption of certain products, leading in particular to a 3:1 reduction in cattle numbers[44] . The players in the livestock value chain, and mainly ruminants, are therefore the most exposed to the risks of transition.
- For plant products, emissions come mainly from farming techniques (fertiliser spreading, intensive farming, rice paddies), which encourages a systemic rethink of production techniques (agroecology, agroforestry, organic farming). These production techniques are sometimes criticised for possible reductions in yields, but this argument does not seem appropriate in developed regions where there is overproduction and significant food waste.
- The other levers identified relate to drastically reducing food waste and encouraging the consumption of products that are minimally processed, unpackaged and in season[45] , which requires a significant transformation that is incompatible with the current state of the agri-food industry.

All of the above points suggest not only that we need to improve our production techniques, but also to think about a new global food balance, in a systemic way, which rethinks our diets for greater equity, but also to improve global public health conditions. With this in mind, the INRAE has devised a scenario for rebalancing the world's food supply by 2050[46]:

[41] INRAE, How to feed the planet in 2050?
[42] Christian Couturier, Madeleine Charru, Sylvain Doublet and Philippe Pointereau, Le scénario Afterres 2025 version 2016, Association Solagro
[43] Rogissart, Foucherot, Bellasen, 2019, Estimer les émissions de gaz à effet de serre de la consommation alimentaire : méthode et résultats, I4CE
[44] Christian Couturier, Madeleine Charru, Sylvain Doublet and Philippe Pointereau, Le scénario Afterres 2025 version 2016, Association Solagro
[45] Rogissart, Foucherot, Bellasen, 2019, Politiques alimentaires et climat : un revue de la littérature
[46] INRAE, How to feed the planet in 2050?

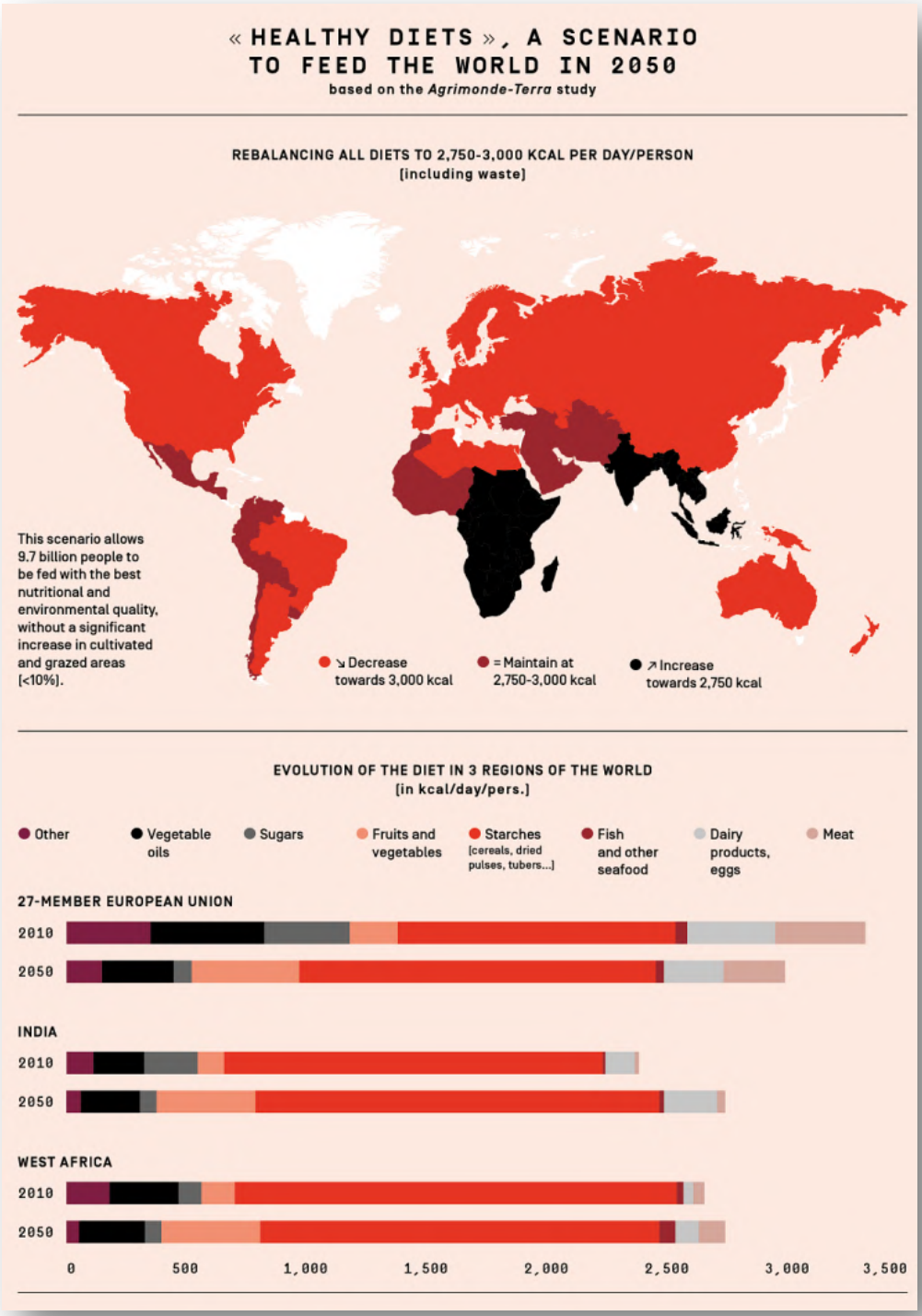
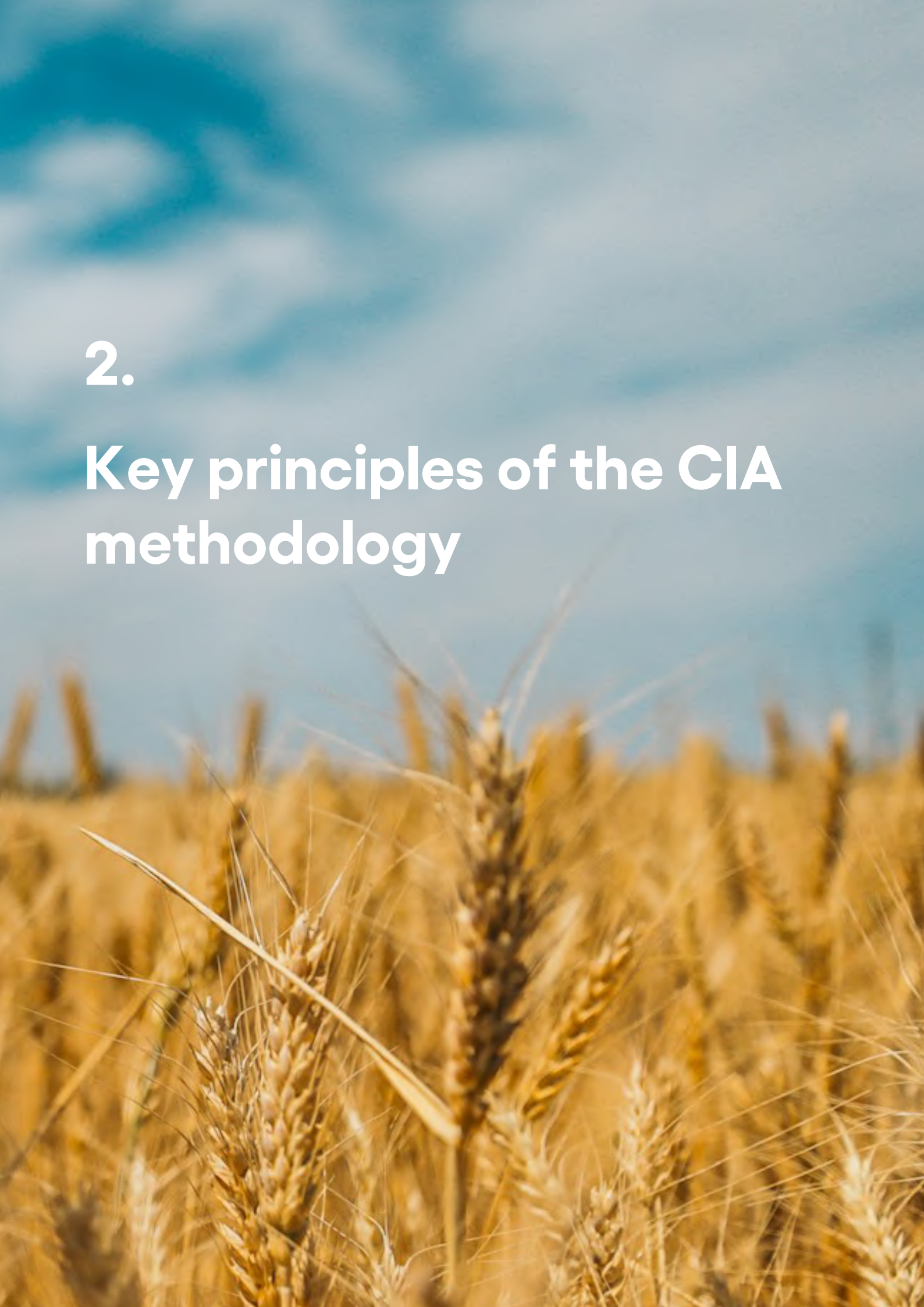


Figure 10 - The integrated, systems-based Agrimonde-Terra approach for 2050, INRAE

This approach projects a rebalancing of global food consumption, both geographically and in terms of plant production relative to animal inputs. The CIA methodology is aligned with this scenario for rating the various products required for a healthy and sufficient human diet.



2.

Key principles of the CIA methodology

2. Key principles of the CIA methodology

2.1 General principles

The Carbon Impact Analytics (CIA) methodology produces indicators for assessing the exposure of financial asset portfolios to transition risks, as well as the contribution of portfolio holdings to the transition to a low-carbon economy. These indicators are constructed using a bottom-up analysis of the financial portfolio's exposures: each exposure is analysed individually before the results are consolidated at portfolio level.

Each instrument in the portfolio is linked to an entity, and an analysis of the entity's physical (or monetary) flows is then used to calculate the GHG emissions it generates, as well as a set of indicators to construct a transition contribution score.

CIA offers methodologies specific to each type of instrument and issuer. Here, we deal only with the methodology applied to debt and equity instruments for non-financial companies, whether listed or not.

Unlike a statistical approach, the "bottom-up" approach is based on public operational data specific to each company and favours the use of physical flows (tonnes produced, etc.) over monetary flows (turnover, OPEX, etc.), thus enabling GHG emissions to be calculated as close as possible to physical reality. In addition, a company is considered as a set of activities analysed separately with a methodology adapted to each of them, enabling the most significant GHG emissions to be modelled for all the industrial processes that make up each activity - particularly Scope 3 emissions.

In addition to the emissions generated by the company's activities, CIA makes it possible to assess the company's contribution to the transition to a low-carbon economy, using various indicators. Firstly, saved emissions, which measure the emissions avoided thanks to the company's products and services, as well as the emissions reduced thanks to improvements in its carbon efficiency. The overall CIA score is based on indicators measuring the company's past, current and future performance. While past and current performance are measured by quantitative indicators, future performance is assessed by means of a qualitative analysis of the company's strategy for reducing its exposure to transition risks (including its GHG emission reduction targets, the investments earmarked for mitigation projects and the governance rules put in place to ensure that transition risks are properly taken into account).

The figure below shows the components of the overall CIA score:

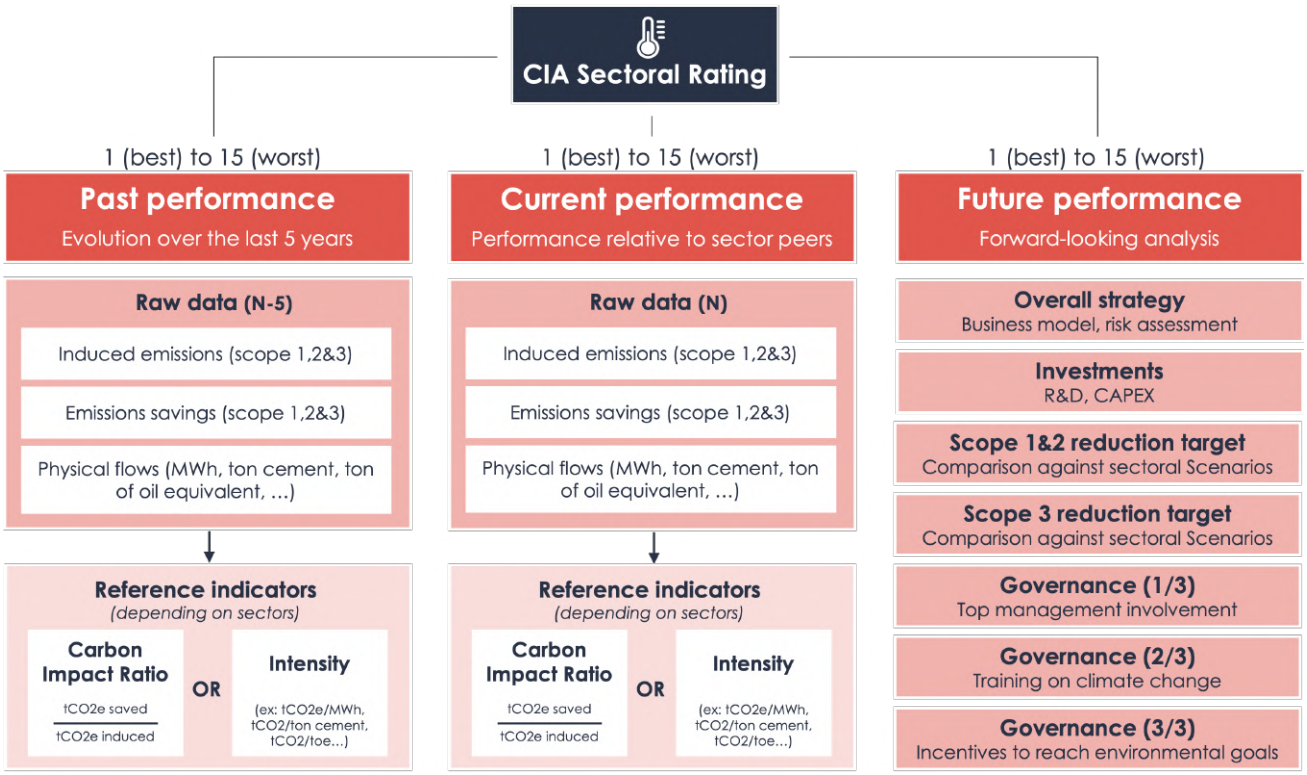


Figure 11 - Composition of the overall CIA score for companies

In addition, the CIA method produces other indicators for assessing the contribution or exposure to transition risks:

- The **Carbon Impact Ratio (CIR)** is the ratio of emissions saved (in absolute terms) to emissions induced. It is a good measure of a company's contribution to the low-carbon transition: the CIR indicates, for each tonne of CO_2e emitted by the company's activities, the capacity of its products and services to avoid GHG emissions by offering a less carbon-intensive alternative to the market.

- The **taxonomy indicators** provide information on the proportion of sales generated by green, brown, fossil or other activities, and thus provide information on the company's exposure to different types of activity.

- **GHG emission intensities**, calculated using different approaches, also enable a relative comparison of companies, taking into account their respective size.

The indicators obtained using the CIA method therefore enable a detailed comparison of companies within their sector, and produce an order of merit which is the subject of this publication.

2.2 Application to the agri-food industry

The general principles set out above are broken down according to each activity, in order to take better note of the main issues facing the companies concerned. The following table shows the sources of greenhouse gas emissions considered by the CIA methodology, according to the activity of the company in the agri-food industry:

	Food Production	Non-Alcoholic Beverages Production	Alcoholic Beverages Production
Scope 3 Upstream	Emissions related to **agricultural production** of upstream materials, to **deforestation**, to **packaging**, **freight** and **end-of-life** of sold products	Emissions related to **packaging**, **agricultural production** of upstream materials,, **freight** and **end-of-life** of sold products	Emissions related to **packaging**, **agricultural production** of upstream materials,, **freight** and **end-of-life** of sold products
Scope 1&2	Direct emissions from **transformation of final products**	Direct emissions from **transformation of final products**	Direct emissions from **transformation of final products**
Scope 3 Downstream	Emissions related to **end of life** of sold products	Emissions related to **end of life** of sold products	Emissions related to **end of life** of sold products
Emissions savings	• **Avoided emissions** if the company is involved in **plant-based alternatives** for meat and/or dairies • **Reduced emissions** due to the decrease in Scope 1&2 carbon intensity	**Reduced emissions** due to the decrease in Scope 1&2 carbon intensity	**Reduced emissions** due to the decrease in Scope 1&2 carbon intensity

Figure 12 - Main sources of emissions for the agri-food industry

To take account of the specific nature of each activity, we have adapted the performance indicators for each sub-sector as shown below:

Food and Beverages manufacturing activity rating			
Type Of Activity	**Past** Performance	**Current** Performance	**Forward looking** Performance
Food Production	**Evolution of the carbon intensity of Food Production** Scope 1, 2 & 3 Projection in 2030 based on evolution of the last 5 years	Scope 1, 2 & 3 **carbon intensity** *tCO2e/ton of products*	Strategy Low-carbon investments Target alignments for scope 1,2 & 3 Governance regarding climate
Beverages (alcoholics ou not)	**Evolution of the carbon intensity of Food Production** Scope 3 Packaging Projection in 2030 based on evolution of the last 5 years		
Weight	**10%**	**50%**	**40%**

Figure 13 - Breakdown of the overall CIA score for agri-food companies

The previous graph also describes the weightings according to which the various performance indicators are aggregated. For agri-food companies, the same approach has been adopted regardless of the sector of activity. As the sector has not yet fully embarked on its transition, current and future performance are given the highest weightings, as it is on these pillars that the effort must be focused. Thus, current performance is weighted at 50% because it reflects its current impact on the climate: a company involved in animal products has a greater impact on the climate than a company involved in plant-based products. Future performance is given a high weighting of 40%, as it measures the company's commitment to aligning with global emission reduction targets.

These scores are then standardised to rank the different business sectors covered by CIA according to their ability to contribute or not to the transition (which determines the maximum possible score), and to contribute or not to contribute significantly to current emissions (which determines the minimum possible score). These maximum and minimum scores are therefore based on the intensity of the activities and their possible role in decarbonising our economy. Companies in the agri-food industry will be given scores ranging from 2 to 15 (out of 15), with the variations according to their sector of activity shown below:

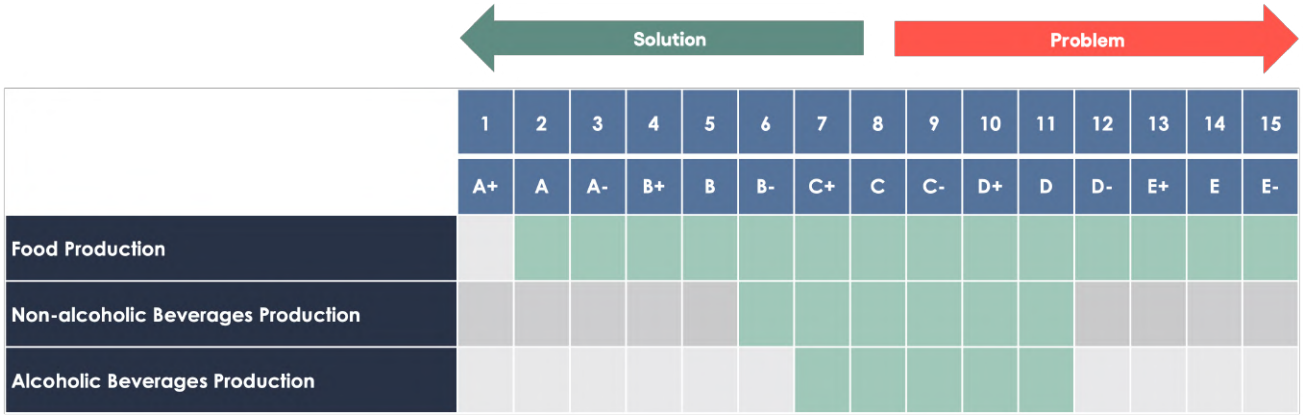


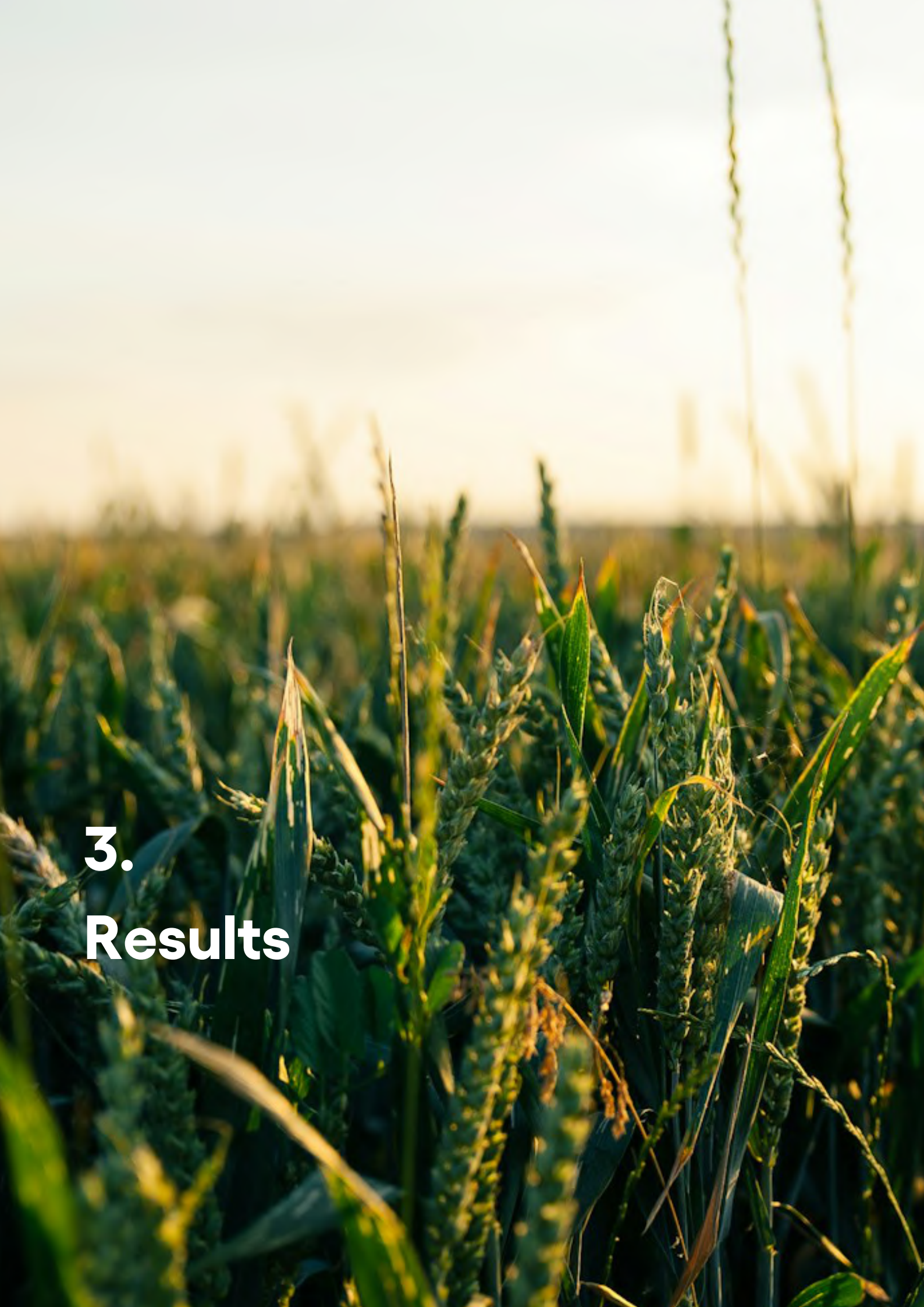
Figure 14 - Breakdown of achievable scores for agri-food companies

When a company is exposed to several activities, analysed by different CIA sector methodologies, an aggregate score is calculated. This score reflects the company's performance with regard to climate issues in each of its activities. To do this, a score is calculated for each activity, according to the principles set out above, and the scores for each sector are weighted by the importance of the activity in the company's revenues.

The following diagram shows an example of a multi-sector food company and the calculation of its overall CIA score.

Global Rating - FoodCorp		
Sectors	Food Production	Alcoholic Beverages
Revenues	80%	20%
Sectorial Rating	9.6	14
Global Rating	**10.5** *(9.6 x 80% + 14 x 20%)*	

Figure 15 - Illustration of the calculation of the overall score for a company with activities in several business sectors



3. Results

3. Results

Overall ranking

This section presents the overall ranking of CIA scores for agri-food stakeholders, by type of stakeholder:

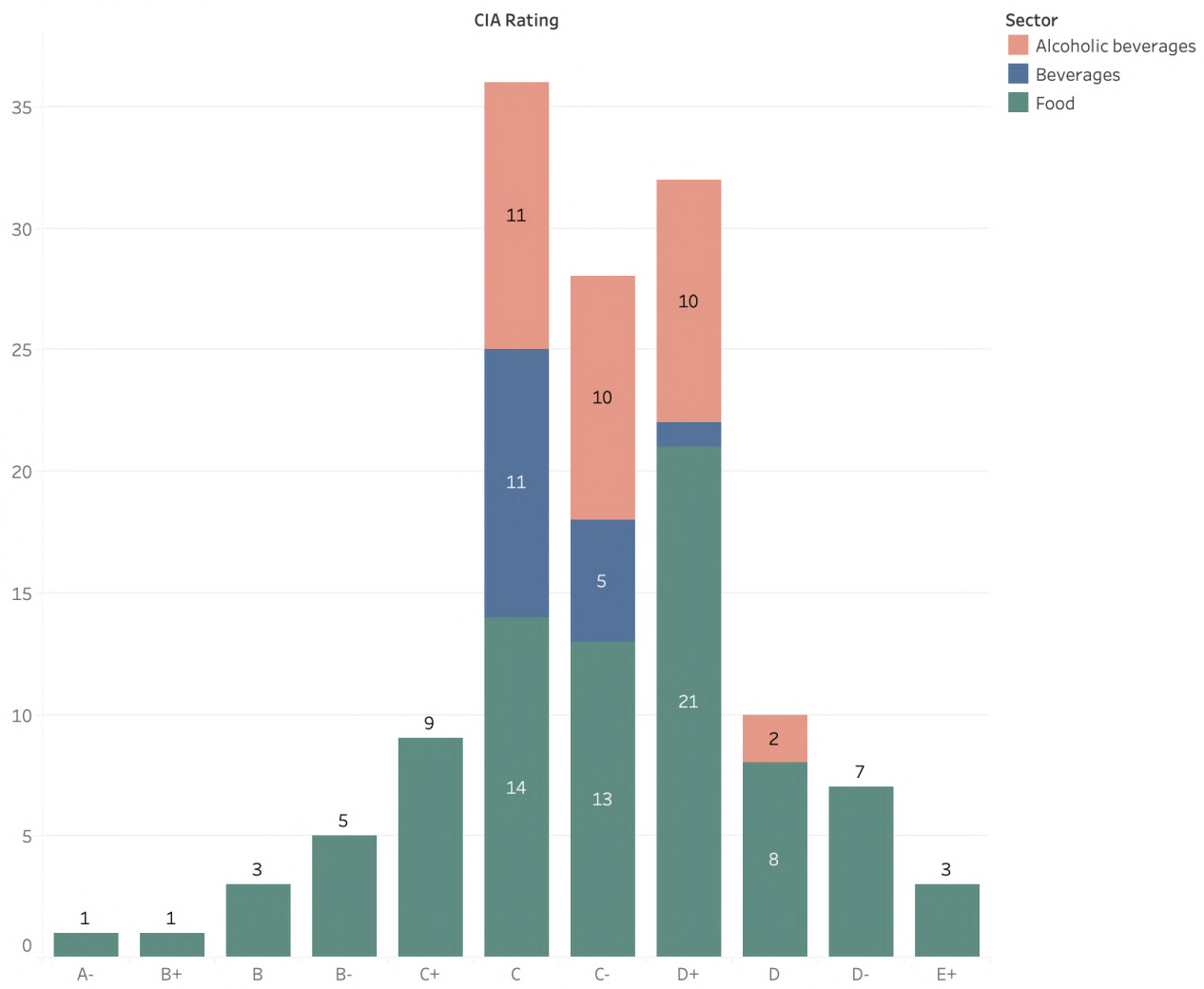


Figure 16 - Distribution of scores for companies in the campaign

The food industry falls into three main categories:

- Players producing rather low-carbon foods, up to a grade of B-, have a product portfolio mainly centred on plant production, with low carbon intensity (less than 3 tCO_2e/tonne of product, equivalent to the intensity of cereal products).
- Players between the C+ and C- grades have a highly diversified business and often produce highly processed food (ready meals, etc.).
- Players with a grade of D+ and above sell animal products (carbon intensity greater than 4.5 tCO_2/tonne produced, equivalent to dairy products).

The following figure shows the overall CIA score for a selection of players. For each company, we also visualise the segmentation of its sales by activitý as well as its market capitalisation[47] .

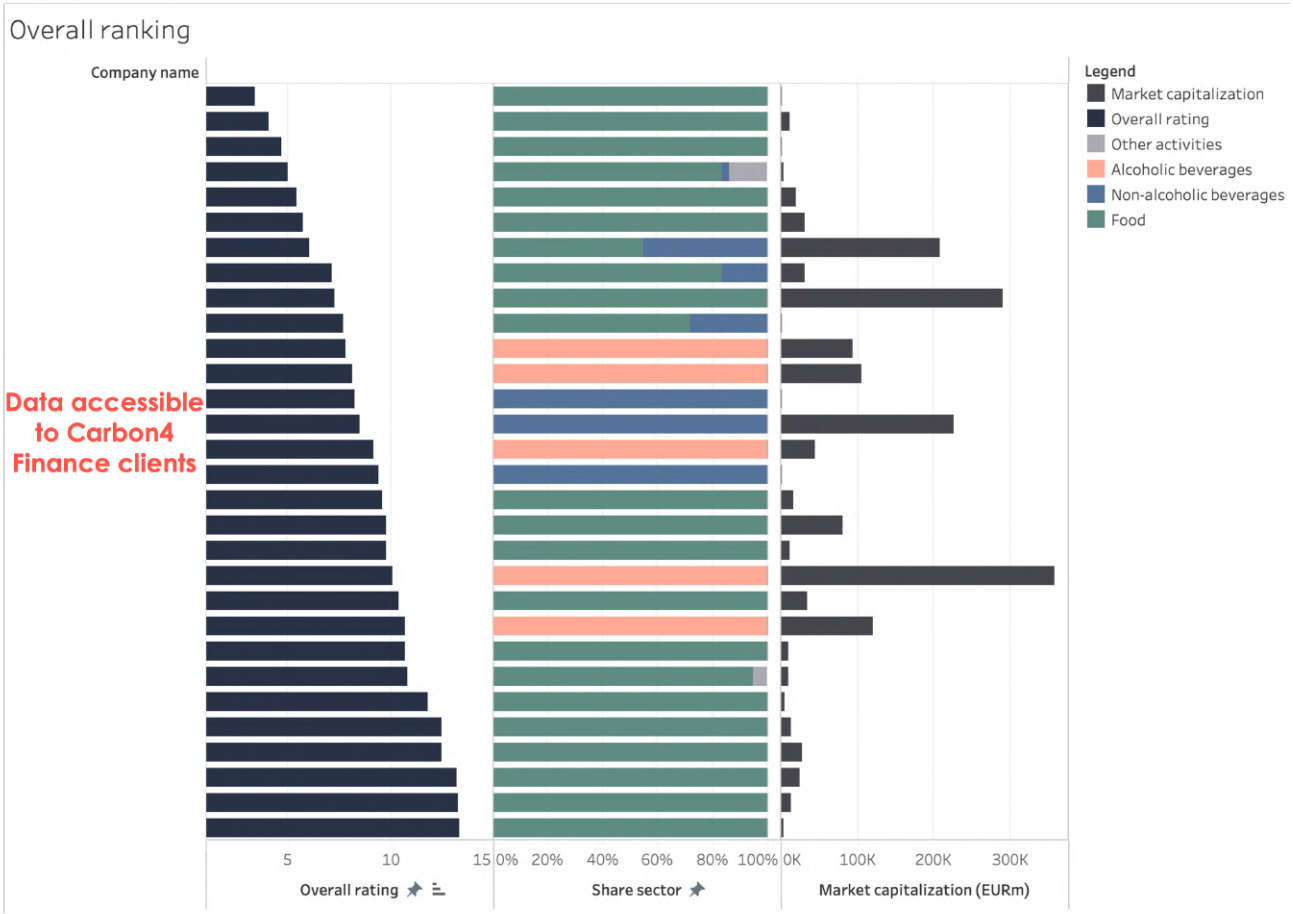


Figure 17 - Ranking of a reduced sample of companies including rating, business model and market capitalisation

The companies with the highest scores (at the top of the graph) are considered to be exposed to a lower transition risk thanks to their lower carbon intensity and their greater contribution to the ecological transition of the economy.
The companies with the worst scores (at the bottom of the graph) have both a greater negative impact on the climate and a greater exposure to transition risk (increase in the price of carbon, regulatory changes, etc.).
The carbon intensity of the company's products is one of the main determinants of the score, which explains why companies in the meat industry, or in products linked to deforestation (chocolate, coffee) make up most of the bottom of the ranking.

[47] The selection includes the ten highest-rated companies, the ten lowest-rated companies, the ten largest electricity producerś (in terms of production volume) and the ten largest market capitalisations in the sample.

The 5 companies with the highest scores are presented below in detail, including the intensity of their products and the main products manufactured.

Company Name	Business Type	Country	CIA rating	Current Score /15	Methodology	Scope 1&2 and 3 intensity (kgCO2/ton)	Portfolio's description
Oatly Group AB	Food Production	Sweden	**A-**	1	Calculated	0.7	Dairy alternative specialist, principally Oat milk
Grupo Bimbo SAB de CV	Food Production	Mexico	**B+**	1	Reported	1.3	Cereal products producer including breads, tortillas, pastries and cookies
Bonduelle SCA	Food Production	France	**B**	2	Reported	1.7	Vegetables specialist
Suedzucker AG	Food Production	Germany	**B**	2	Reported	1.8	Mainly sugar and sugary products
McCormick & Co.	Food Production	USA	**B**	4	Reported	2.6	Specialized in spices and sauces

Table 1 - Summary of the best performances in the sample

Among the top companies, Oatly Group stands out as the most virtuous, thanks to its unique model of marketing a low-carbon product that offers an alternative to dairy products (which contain more than four times as much carbon): oat milk. As a result, and thanks to a relevant strategy on the agricultural techniques used to grow its raw materials, as well as the care taken with its packaging, the company obtained the best grade of the campaign: A-.

Current performance

The current performance score represents the most important part of the CIA score for Agri-food companies (50% of the score). This performance score reflects the carbon intensity of a company's products. The least carbon-intensive products are those of plant origin, such as fruit and vegetables, sugar and cereal products. Conversely, animal products (dairy products, fish, meat) have a higher carbon intensity. It should also be noted that products with a high level of deforestation in their value chain (mainly beef, soya and palm oil, but also chocolate and coffee) are very carbon-intensive products.

The following graph shows the distribution of the companies in the sample according to their current rating and the associated carbon intensity. The size of the bubbles represents the volumes produced by the companies, while the colour represents their overall rating.

Figure 18 - Ranking of food companies according to their carbon intensity

Beverage companies, particularly non-alcoholic beverages, obtain lower current performance ratings for lower carbon intensity. The difference in the stakes of the transition between these products means that we cannot compare their participation in the transition by comparing the value of their carbon intensity. Indeed, these products are often consumed as an alternative to tap water and are comparatively several thousand times more GHG emitting.

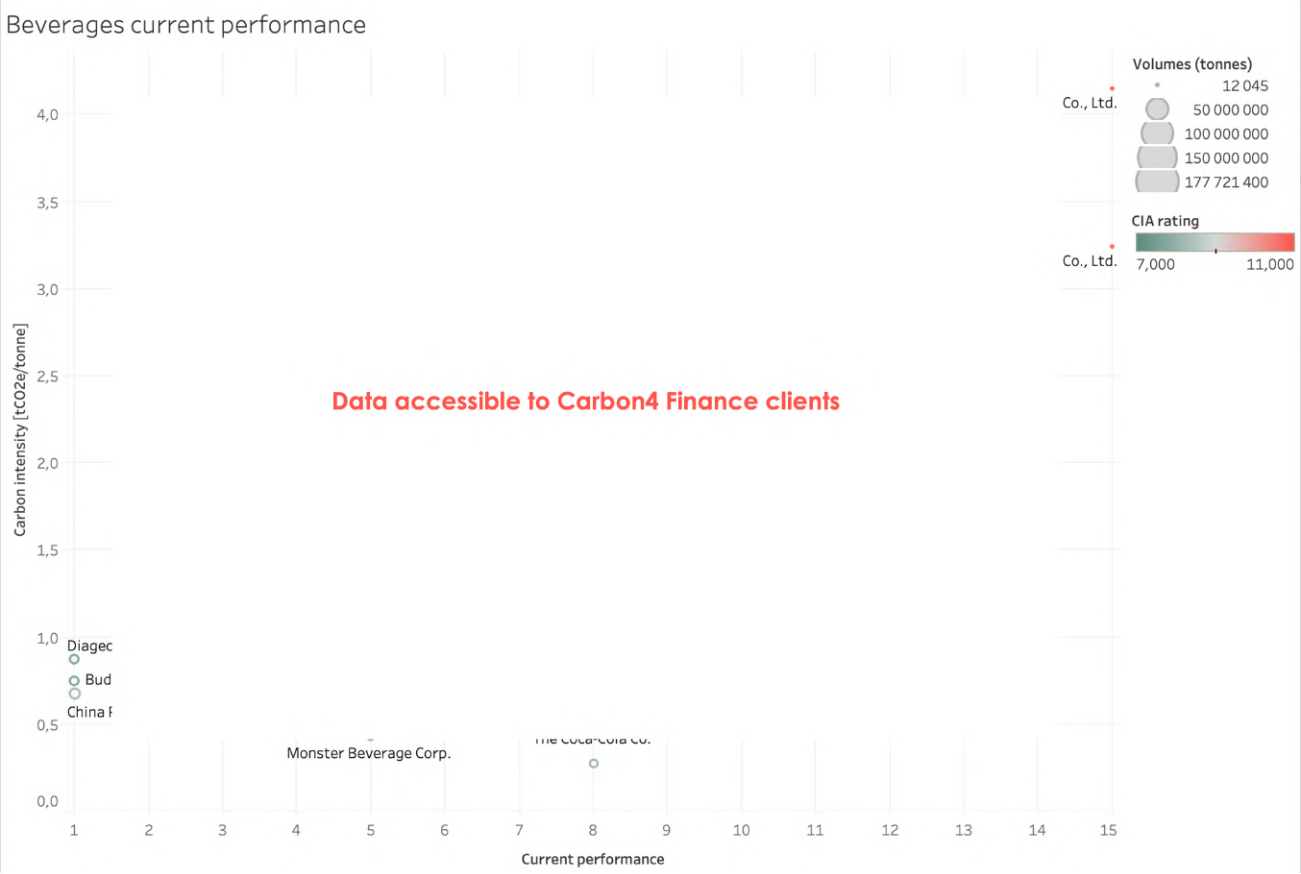


Figure 19 - Carbon intensity ranking of beverage companies on the present score

Deforestation

As deforestation is a major issue for the sector, the emissions specifically linked to it are evaluated and included in our assessment of current performance. The following graph shows that the companies in our sample are very unevenly exposed to this issue.

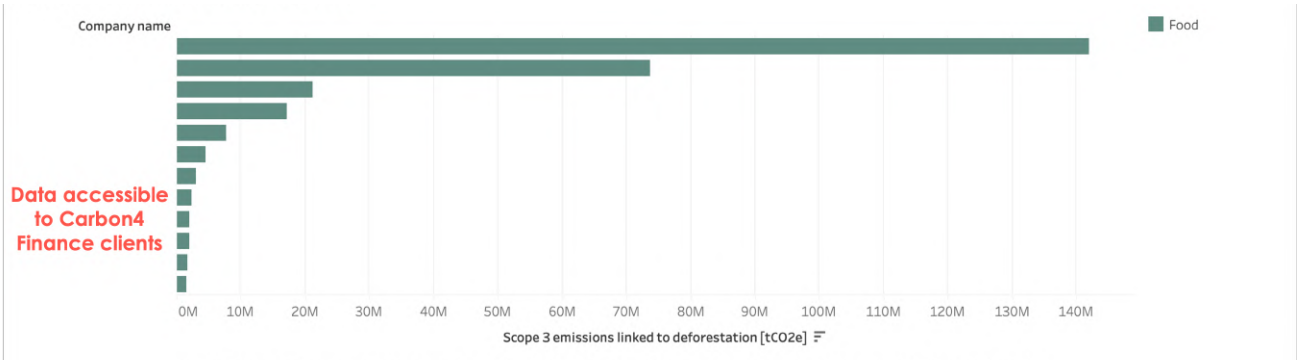


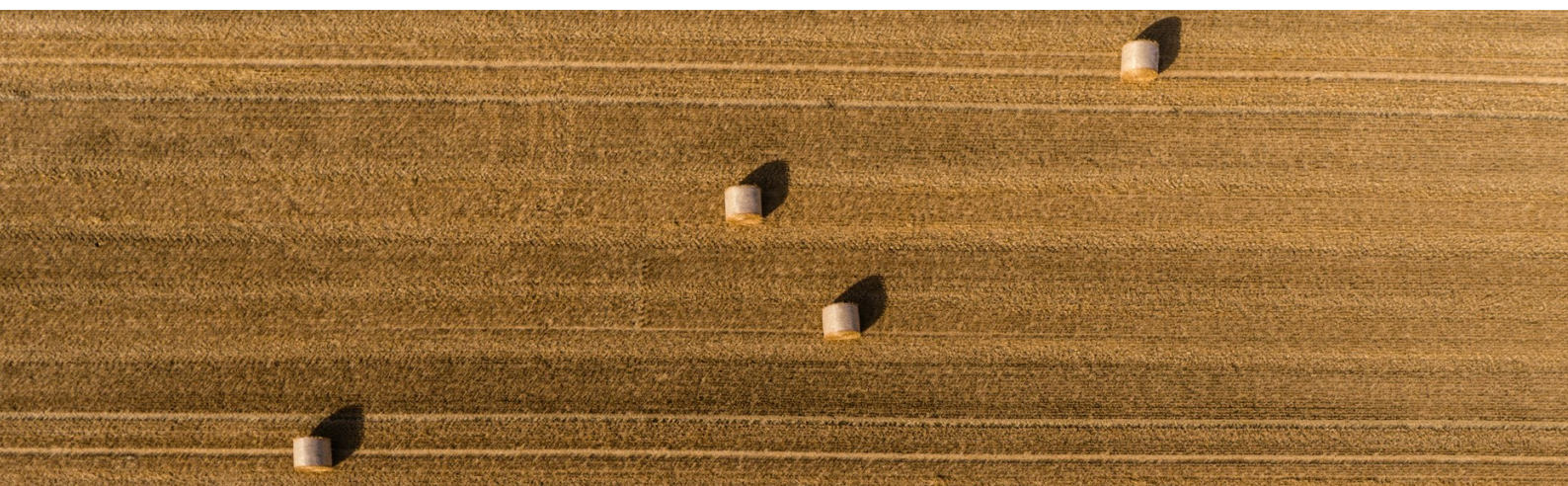
Figure 20 - Scope 3 emissions linked to deforestation

Focusing on the 3 most exposed players, here is a breakdown of their activities and in particular the strategies put in place to combat deforestation.

Company Name	Business Type	Country	CIA rating	Scope 3 deforestation (tCO_2e)	Portfolio's description	Deforestation Strategy
JBS SA	Food Production	Brazil	**E+**	141 945 278	Largest Beef meat producer	• JBS claims to have a zero-tolerance approach to illegal deforestation, excluding any farms involved in deforestation in its value chain. • Its goal is to have a supply chain that is free of illegal deforestation by 2025. • However, in 2022 illegal deforestation happened in 68 of its farm suppliers covering a cleared area of approx. 125,000 hectares, almost equivalent in size to that of London in the UK. • Furthermore legal deforestation in Brazil was until end of 2022, legal conversion in Brazil allowed for the clearance of over 88 million hectares of land – an area twice the size of Sweden.
Wilmar International Ltd	Food Production	Singapore	**D+**	73 710 974	Largest Palm Oil Producer and Trader	• Wilmar is a driving force in the transformation of the palm oil industry towards a reduction in deforestation. Commitments such as NDPE (No Deforestation, No Peat, No Exploitation) seem relevant to significantly decrease overall deforestation within the value chain. • However, deforestation in palm oil-producing countries remains one of the main sources of greenhouse gas emissions. The primary forests in these countries emit more greenhouse gases than they absorb due to deforestation. • This is mainly due to the existence of illegal deforestation in the value chain of actors like Wilmar, which is very difficult to eradicate. • The significant emissions calculated for Wilmar related to deforestation are primarily the result of the company's very large size and its exposure to palm oil, which despite its efforts, remains a high-risk commodity for deforestation.
Nestlé SA	Food Production	Switzerland	**C+**	21 118 076	Large Palm Oil Consumer	• Nestlé consumes a significant amount of palm oil in its products and does not seek to reduce this consumption (more than 450,000 tons in 2022, with no notable reduction in the last 5 years). • The company aims to ensure no deforestation in its products, but only 70% of the volumes have received RSPO certifications. The satellite-based monitoring system implemented in its value chain indicates numerous alerts of deforestation around the plantations of its suppliers (nearly 435,000 hectares potentially affected).

Table 2 - Top 3 companies most exposed to deforestation

It is regrettable that the majority of companies exposed to commodities that cause deforestation, such as palm oil, soya or beef, do not have a strategy for excluding these products and replacing them with others that have a lower impact on the climate.



Future performance

The future performance score assesses the company's decarbonisation strategy:

- Ability to identify the risks and opportunities associated with climate change
- Decarbonisation strategy: ambition, quantification and planning of objectives
- Investments that will help reduce GHG emissions
- Objective to reduce the company's GHG emissions, for scopes 1 & 2 and 3
- Governance structure overseeing climate risks within the entity

The distribution of future performance by continent is as follows:

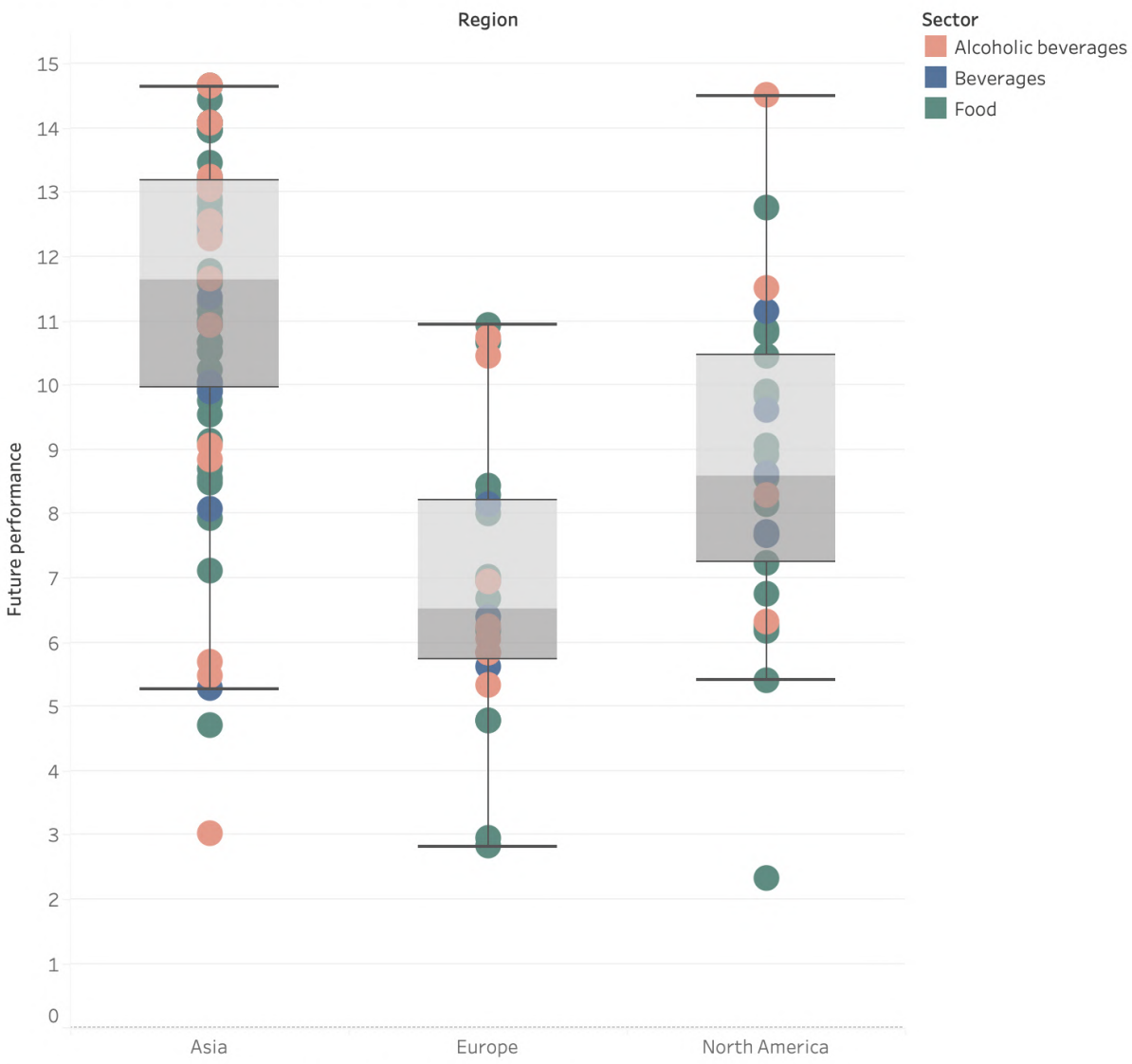


Figure 21 - Distribution of future company performance by continent

We can see that the best-rated companies are often located in Europe, unlike Asian companies, which generally receive lower future ratings. This can be explained in part by stricter European regulations on climate issues, which are encouraging players in the agri-food industry to take steps to adapt their strategy.

Below, a study of the 5 best future scores in the sample.

Company Name	Business Type	Forward Looking Score /15	Strategy Score /5	Low carbon investments are focused on:	Investment Score /5	Targets regarding the reduction of Scope 1&2 emissions	Scope 1&2 reduction target /5	Targets regarding the reduction of Scope 3	Scope 3 downstream reduction target /5
PepsiCo	Non Alcoholic Beverages	2.3	1.0	○ **Eco-conception** and packaging reduction. ○ Renewable electricity on-site production. ○ **Energy efficiency** in its production process. ○ Waste reduction.	2.2	○ **75% reduction** target on its Scope 1&2 emissions by 2030 compared to 2015. ○ Target in line with a **« Beyond 2°C scenario »** as defined by the IEA 2017 ETP and FAO's Alternative pathways to 2050	1	○ **40% reduction** target on its Scope 3 emissions by 2030 compared to 2015. ○ Target in line with a **« Beyond 2°C scenario »** as defined by the IEA 2017 ETP and FAO's Alternative pathways to 2050.	1
Danone	Dairy Products	2.8	1.8	○ **Sustainable raw materials sourcing from agroforestry.** ○ **Eco-conception** and packaging reduction. ○ Renewable electricity on-site production.	2.8	○ **47% reduction** for its Scope 1&2 emissions by 2030 compared to 2020 levels. ○ Target in line with a **« Beyond 2°C scenario »** as defined by the IEA 2017 ETP and FAO's Alternative pathways to 2050.	1	○ **42% reduction** for its Scope 3 emissions by 2030 compared to 2020 levels. ○ Target in line with a **« Beyond 2°C scenario »** as defined by the IEA 2017 ETP and FAO's Alternative pathways to 2050.	1
Nestlé	Food Production	3.0	1.8	○ Shift to **plant-based meat alternatives and regenerative agriculture.** ○ Renewable electricity on-site production. ○ **Energy efficiency** in its production process. ○ Low-carbon transportation.	1.2	○ **50% reduction** target for its Scope 1&2 emissions by 2030 compared to 2018 levels. ○ Target in line with a **« Beyond 2°C scenario »** as defined by the IEA 2017 ETP and FAO's Alternative pathways to 2050.	1	○ **50% reduction** for its Scope 3 emissions by 2030 compared to 2018 levels. ○ Target in line with a **« Beyond 2°C scenario »** as defined by the IEA 2017 ETP and FAO's Alternative pathways to 2050.	1
Kirin Holding	Alcoholic Beverages	3.0	2.6	○ Increase of the **recycled content** of its packaging. ○ **Energy efficiency** in its production process. ○ Renewable energy generation(e.g. solar farms).	1	○ **50% reduction** target for its Scope 1&2 emissions by 2030 compared to 2019 levels. ○ Target in line with a **« Beyond 2°C scenario »** as defined by the IEA 2017 ETP and FAO's Alternative pathways to 2050.	1	○ **30% reduction** target on its scopes 3 emissions by 2030 compared to 2019. ○ Target in line with **a « 2°C scenario »** as defined by the IEA 2017 ETP and FAO's Alternative pathways to 2050.	2
Ajinomoto	Food Production	4.7	2.0	○ Reduction of the impact of **raw materials.** ○ Energy efficiency in its production process. ○ Renewable energy generation. ○ Eco-conception and packaging reduction.	2.2	○ **50% reduction** target on its scopes 1 and 2 emissions by 2030 compared to 2018. ○ Target in line with a **« Beyond 2°C scenario »** as defined by the IEA 2017 ETP and FAO's Alternative pathways to 2050 .	1	○ **24% reduction** target on its scopes 3 emissions by 2030 compared to 2018. ○ Target in line with a **« 2°C scenario »** as defined by the IEA 2017 ETP and FAO's Alternative pathways to 2050.	2

Table 3 - Top 5 best-performing companies on future rating

Focus on the Strategy note

The graph below shows the breakdown of scores given by Carbon4 Finance on the Strategy criterion.

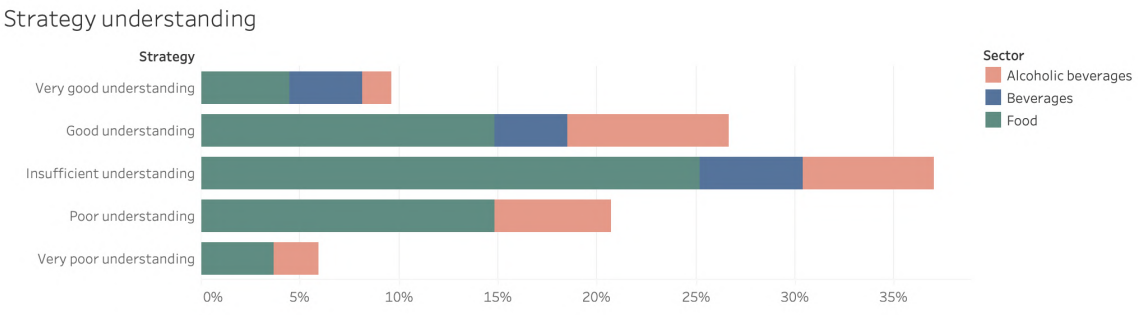


Figure 22 - Distribution of understanding of climate issues by companies in the sample

Over 60% of companies in the sector have little or no understanding of the issues surrounding the climate crisis. But it is interesting to note that companies with a good or even very good understanding represent a large proportion of our sample. Conversely, less than 30% of the companies in the sample received scores of 4 or 5/5, corresponding to poor or very poor understanding of the issues. This figure is relatively low compared with other economic sectors[48] . This is confirmed by a TCFD study which ranks the agri-food industry among the most proactive on the climate issue, using as an evaluation criterion the proportion of companies in the sector publishing key indicators on their climate strategy (resilience of the strategy, climate indicators, induced emissions and reduction targets). The graph below shows the average rate of publication of key climate change indicators for the main economic sectors.

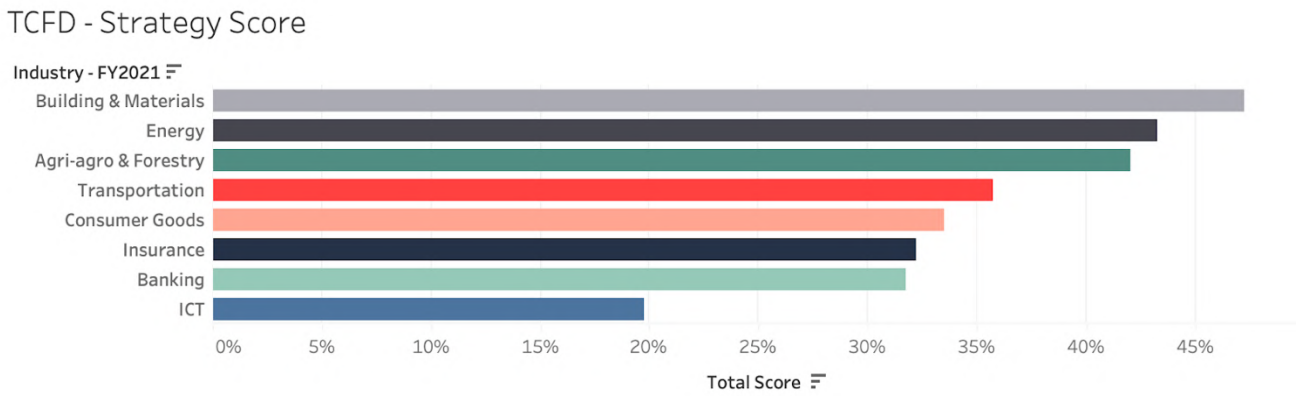


Figure 23 - Distribution of companies' understanding of climate issues[49]

[48] Welgryn L., Scache V., Carbon4 Finance, Digging beyond limits: unearthing the climate reality of Mining and Metals
[49] Task Force on Climate-related Financial Disclosures, 2022 Status Report, October 2022

Here are the top 5 companies with exemplary strategies:

Company Name	Business Type	Forward Looking Score /15	Strategy Score /5	Strategy Details
PepsiCo	Non Alcoholic Beverages	2.3	**1.0**	○ PepsiCo **is supporting sustainable and regenerative agricultural** practices. ○ PepsiCo is developing lightweight and **recycled content** of packaging. ○ The company is optimizing its logistics, working on energy efficiency. ○ PepsiCo has **identified actionable changes** and implantation to put in place and a relevant horizon timeline to reach its commitments.
Oatly Group	Plant-based dairy alternatives	4.78	**1.0**	○ Oatly's business model has been fully developed taking into consideration **climate issues** and is based on latest scientific evidence. ○ Oatly only produces and sales l**ow-carbon products.** ○ Oatly seeks to further reduce its GHG impact from **agricultural raw materials**, transport and packaging. ○ The company supports the **development of regenerative agriculture** practices for Oats.
Anheuser-Busch InBev	Alcoholic Beverages	5.34	**1.2**	○ AB InBev has sets quantified targets to shift its activities towards **decarbonized agricultural practices and products.** ○ AB InBev support in **agro-ecology** practices like soil health, minimum tillage, cover crops, etc. ○ AB InBev has a target to have a **minimum recycled content,** lightweighting packaging. ○ The company is optimizing its logistics with route optimization and **alternative fuel vehicles.**
Bonduelle	Food Production	7.02	**1.4**	○ Bonduelle is particularly involved in actions to shift toward more **sustainable agricultural practices** and aims to have **80% of its farmers engaged in regenerative agriculture**. ○ Bonduelle's core business model takes into consideration climate as the company's business is **based on plant-based products.** ○ Bonduelle is working **on energy savings**, shifting from fossil fuels to renewable energy and purchasing green electricity. ○ The company also discusses transport and packaging as a part of its climate strategy but fails to mention quantitative targets.
Primo Water	Non-alcoholic Beverages	8.63	**1.4**	○ Primo Water has set quantified targets to shift its activities towards decarbonized products, the company aims at having **50% of its single-use bottles made of recycled PET** by 2030. ○ Primo Water plans to **exit the small-format retail water** business by 2022 in its largest market. ○ The company's business model **is circular** as it generates most of its sales with large reusable containers.

Table 4 - Top 5 best corporate strategies
**defined by the IAE ETP 2017 and FAO Alternative Pathways to 2050 scenarios*

Plant-based alternatives, levers for decarbonisation

One of the most valued elements in the assessment of companies' strategies in the face of climate change is the change in the type of production. The reorientation of food production towards less carbon-intensive products that serve as alternatives to animal products, such as plant-based milks and meat alternatives, is part of the overall trajectory envisaged by the transition scenarios[50].

However, only 9 companies in the sample currently produce this type of plant-based alternative. What's more, within these 9 companies there are several very different types of player, whose alignment with the low-carbon transition can vary greatly.

The following graph shows a comparison of past and present ratings for these 9 companies:

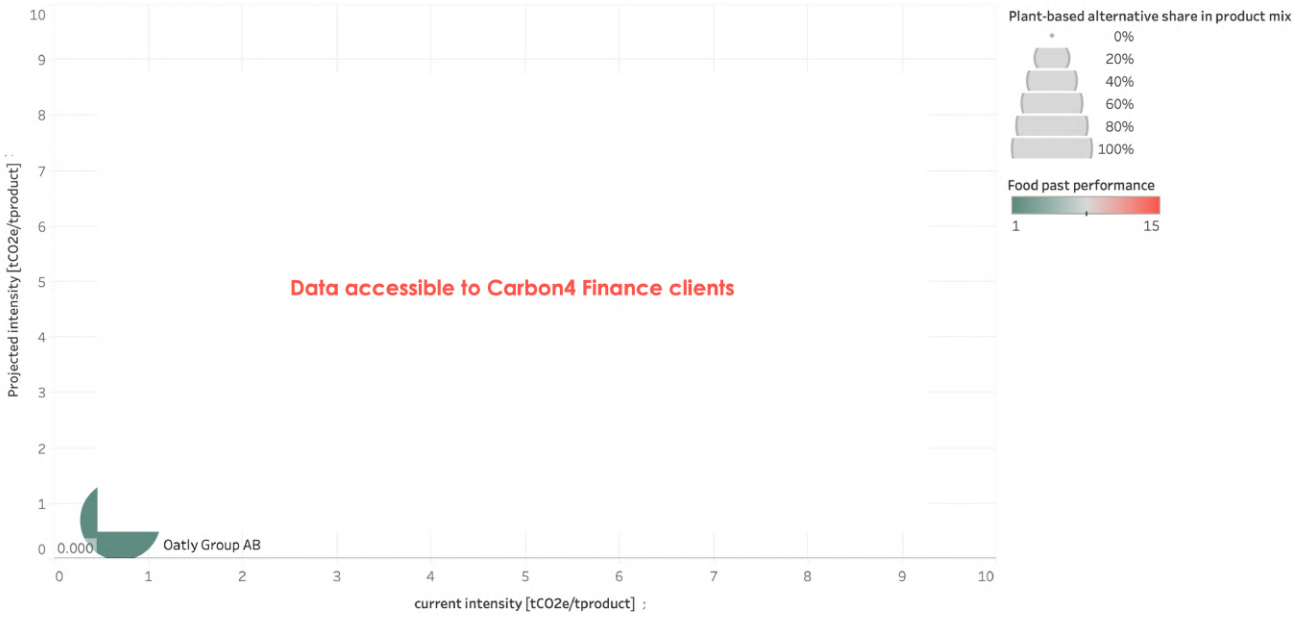


Figure 24 - Comparison of the current and projected intensity of companies producing alternative plant products

If the projected intensity is lower than the current one, this means that the company's product mix has decarbonised, and vice versa. We can see that for almost all the companies there has been no significant change in the carbon intensity of their products since they started producing plant-based alternatives. This can be explained by the fact that these plant-based alternatives account for a very small proportion of the volumes produced by the companies, less than 10% of production.

Vitasoy and Oatly are companies whose business model is centred on these products, so it is natural that they should perform better than the other companies in the sample. For these two companies, the non-variation in carbon intensity is natural because their products are already decarbonised.

So for the strategy of shifting production to plant-based alternatives to have a real impact on companies' alignment with the low-carbon transition, this shift needs to be a replacement for the

[50] Christian Couturier, Madeleine Charru, Sylvain Doublet and Philippe Pointereau, Le scénario Afterres 2025 version 2016, Association Solagro

company's carbon-based activities rather than a new product added to the company's portfolio at the margin.

Focus on large caps

Among the 3 largest companies in the sector, there are wide disparities in their understanding of climate issues.

Company name	Sector of activity	Country	CIA rating	Market capitalisation (EURm)	Strategy note	Strategy details
Kweichow Moutai Co.	Alcoholic Beverages	China	**D+**	357 932	**4.2**	- No specific strategy on climate change. - The company is reducing its agricultural emissions by having a policy of excluding the use of synthetic fertilisers and "soil-degrading" chemicals when purchasing raw materials. - Lack of strategy for the other main sources of emissions, particularly packaging and transport.
Nestlé SA	Food Production	Switzerland	**C+**	290 302	**1.8**	- A comprehensive and relevant strategy for tackling climate change. - Focuses on the main sources of emissions in its sector, in particular indirect emissions linked to its agricultural purchases. - Develop a strategy to promote agroforestry and low-carbon farming practices. - Reducing transport-related emissions by electrifying its fleet and reducing the use of virgin plastics in its packaging. - Contains quantified, time-bound reduction targets that are relevant to the company's decarbonisation.
The Coca-Cola Co.	Non Alcoholic Beverages	USA	**C**	226 102	**1.8**	- A relevant strategy, but one that could be more ambitious. - Concentrates its efforts on its most significant emissions, namely packaging. - Promotes the use of recycled PET in its bottles and has set itself major targets for recycled content. - Lacks a deposit on its packaging to improve the circularity of its products. - The rest of the strategy considers the most significant sources of emissions, i.e. upstream agriculture, focusing solely on certificate systems, refrigeration systems, without HFC-type greenhouse gases, and operations with energy savings and the purchase of renewable energy.

Table 5 - Strategy of the 3 largest market capitalisations in the sector

Kweichow Moutai Co, a Chinese company that produces liqueur, does not seem to consider climate issues in its strategy. The main source of emissions for the company comes from its packaging, but it does not seem to have any particular strategy dedicated to this. Kweichow Moutai has, however, introduced exclusions around synthetic pesticides and fertilisers that reduce its carbon footprint. What is lacking is a structured, comprehensive approach to achieving the targets set by China, which has pledged to reduce its emissions in relation to its Gross Domestic Product (GDP) by 65% compared with 2005.

Methodological limitations

As with any valuation method, the agri-food industry has its limitations:

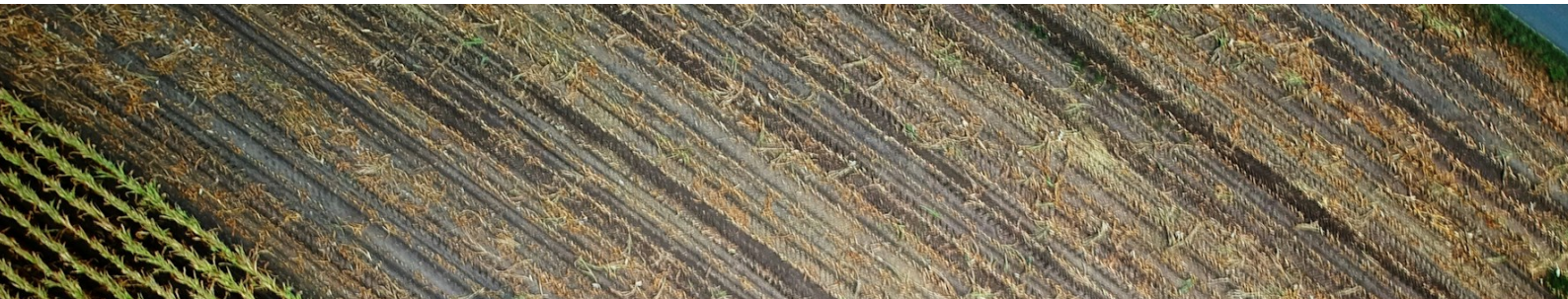
- The depth of the analysis is limited by the lack of physical production data published by companies, which does not always allow emissions or trajectories to be recalculated. This leads to approximations in the estimation of production volumes by the CIA methodology, through the use of monetary ratios which are limited in precision due to the very high variability of the products considered. It is more difficult for these ratios to reflect the diversity of the market in terms of products, geography and prices. They are therefore only used when the data published by companies is not sufficient to conduct a CIA analysis.

- The past indicator of the methodology dedicated to foodstuffs is based on the monetary ratios mentioned above. It correctly reflects variations in a company's product portfolio, but cannot capture a company's improvements in its production processes or its efforts in its value chain. These initiatives are valued in the Future score.

- The CIA analysis focuses on a sample of listed groups, the largest players in the market. However, the agri-food industry is fragmented and some of the food consumed in the world is not marketed by the groups evaluated. The analysis presented in this publication therefore does not represent the full impact of the global diet on the climate transition.

- For the drinks sector (alcoholic and non-alcoholic), the Past indicator is based on changes in emissions linked to the packaging of the various players. This source of emissions is one of the most important in the sector, but does not represent the majority of emissions (it is estimated that around 30-35% of emissions are linked to packaging for beverages). The remainder of the sector's emissions are divided between emissions linked to methods of growing raw materials, production processes and product transport. A possible development for this indicator could be to take into account changes in Scope 1, 2 & 3 emissions from players in the sector in absolute terms, subject to data availability.

- As indicated in the Present performance indicator (carbon intensity in tCO_2e/tonne), we use a mass-based approach to determine the climate performance of food products. This approach does not take into account nutritional composition. Using an approach based on calorific energy (GHG emissions per calorie) also has its limitations, with an increased preference for food products that are high in calories and not necessarily healthy. Finally, an approach based on nutritional quality would require more data on the composition of the food products sold, which is currently rarely provided by the companies analysed.



Conclusion

By analysing a sample of around 150 companies in the agri-food industry using a bottom-up approach, we were able to identify the main trends, dynamics and decarbonisation paths in the sector.

While the sector is one of the most heavily impacted by extreme weather events linked to climate change, the maturity of the players involved in tackling climate issues varies. Some players are showing exemplary understanding and have a business model aligned with a low-carbon transition. On the other hand, a number of players are maintaining very high-impact production, particularly those that produce mainly meat, and do not seem to be considering a transition to plant-based proteins.

With the exception of players such as Oatly, those who are moving towards less carbon-intensive products are still at the beginning of the transition, and the reduction in the carbon intensity of their business portfolios is still only very rarely observable.

Too few players have already established a coherent and comprehensive climate transition strategy. A small number of companies have been awarded the highest strategic score, which rewards companies that have begun to think about their entire value chain, including adding value to agricultural products derived from low-carbon practices such as agroforestry or regenerative agriculture, as well as a comprehensive strategy that includes reducing emissions from packaging, transport and manufacturing processes.

The success of the transition remains uncertain. While limiting global warming to 1.5°C remains a theoretical objective, its achievement will depend on the speed of deployment of public policies and investment in low-carbon agricultural practices.

Decarbonisation efforts must therefore be stepped up and accelerated to limit the impacts of climate change. Ambitious policies and substantial investment in low-carbon agricultural practices (agroforestry, regenerative agriculture, etc.) are critical to ensure the sustainability of this sector, which is essential to the future of humanity.

Appendices

Data accessible to Carbon4 Finance clients:

Complete classification of companies by sector of activity:

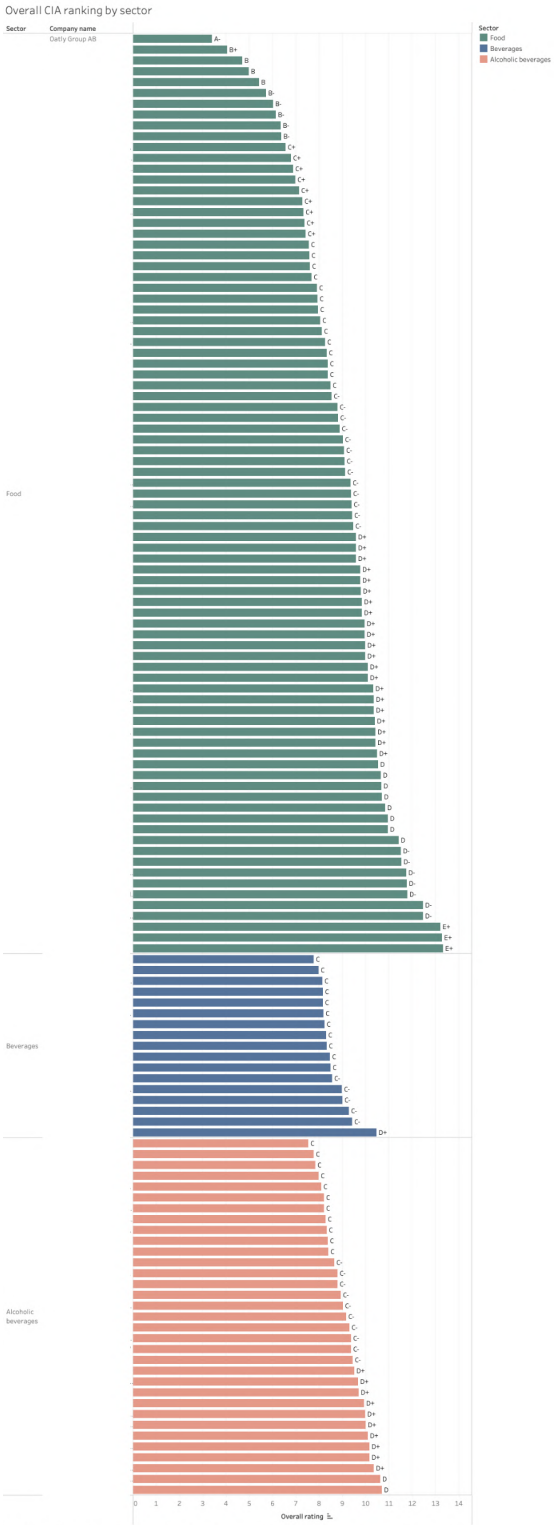


Figure 25 - Full ranking of CIA scores by sector

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Created in 2016 and based in Paris, **Carbon4 Finance** brings to the financial sector the expertise of the Carbone 4 consultancy, which since 2007 has offered carbon accounting, scenario analysis and consultancy services across all economic sectors.

Carbon4 Finance offers a comprehensive set of climate data solutions covering both physical risk (CRIS methodology: Climate Risk Impact Screening) and transition risk (CIA methodology: Carbon Impact Analytics). These proven methodologies enable financial organisations to measure the carbon footprint of their portfolio, assess alignment with a 2°C-compatible scenario and measure the level of risk arising from climate change-related events.

Carbon4 Finance applies a rigorous bottom-up approach based on research, which means that each asset is analysed individually and in a discriminating manner.

For more information, please visit www.carbon4finance.com