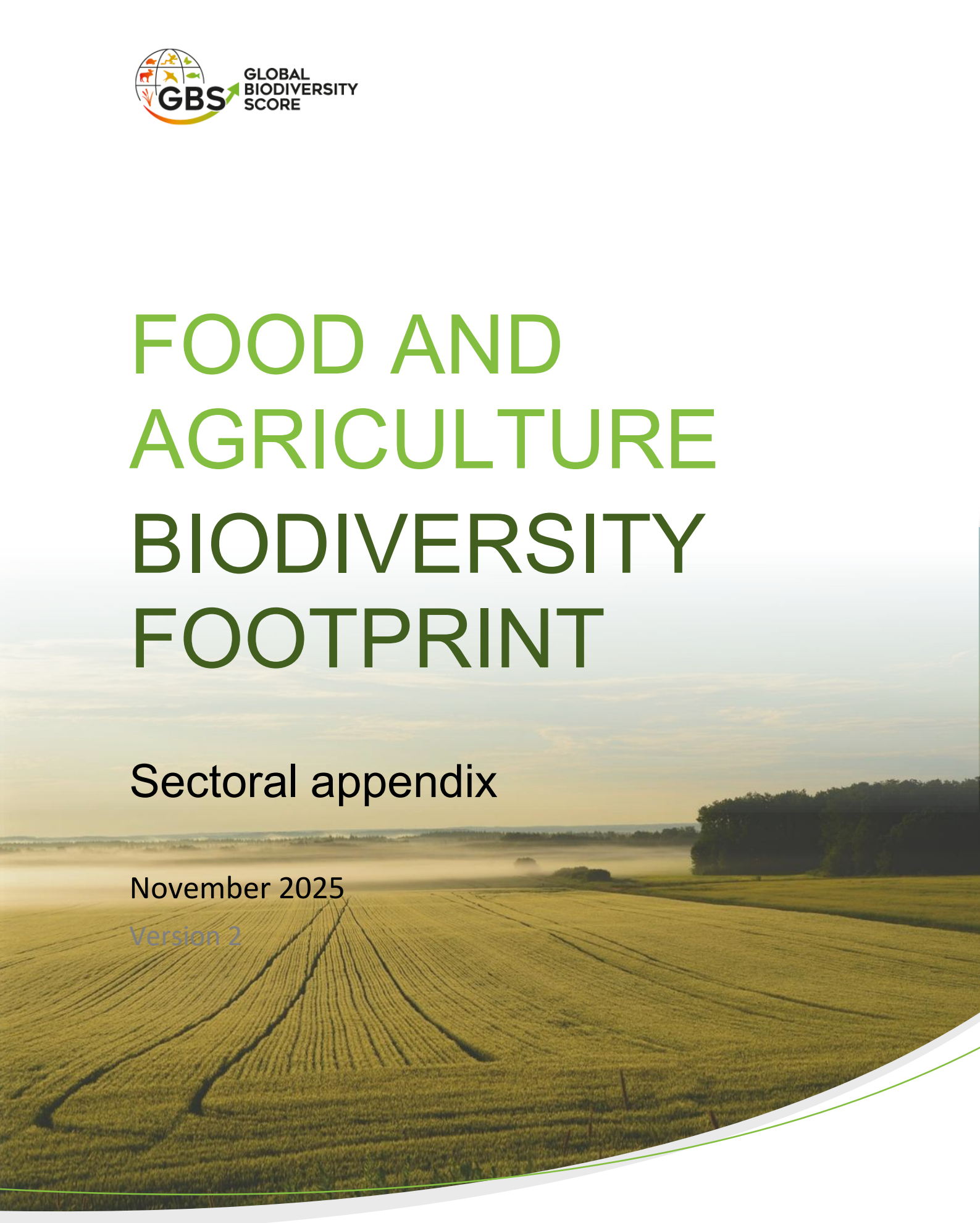
GLOBAL BIODIVERSITY SCORE

FOOD AND AGRICULTURE BIODIVERSITY FOOTPRINT

Sectoral appendix

November 2025

Version 2



CDC BIODIVERSITÉ | Caisse des Dépôts GROUPE

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A. PURPOSE OF THE DOCUMENT

The current **sectoral appendix** supports the **Food and Agriculture benchmark factsheet** and provides additional content that could not be included in the factsheet due to space constraints. Such additional content relates to the perimeter of the factsheet, more detailed results and charts and specific methodology and references.

In addition to the sectoral appendix, this factsheet is supplemented by two documents, common to all the factsheets:

- A **general appendix**, which provides methodological elements to understand how the sectoral benchmark factsheets are built and how computations and charts are obtained. It includes all the methodology and references which are common to all the factsheets, as well as guidance on how to read and use the factsheets.

- A **reading guide**, which explains the structure of the factsheets. It provides the main contents, definitions and necessary elements to know how to read the factsheets for readers with limited knowledge about the Global Biodiversity Score.

Erreur ! Source du renvoi introuvable. below encapsulates the four benchmark documents available for each s ector.

Figure 1: The four benchmark documents.

B. WHAT DOES THE SECTOR INCLUDE?

1. Perimeter of the factsheet in terms of impacts calculation

1.1. Overview of the sector

The Food and Agriculture sector encompasses crop cultivation and animal production, along with the processing of these products into beverages or food products for both human and animal consumption. This sector also involves the production of diverse intermediate products that are not intended for direct consumption as food.

The FAO defines agri-food systems as all the interconnected activities and actors involved in getting food from field to fork, from agricultural production to processing, distribution, consumption and waste management. The Food and Agriculture factsheet and this appendix cover the "agricultural production" and "processing" stages mentioned in this definition of agri-food systems. Other stages are covered by other benchmark factsheets.

1.2. EXIOBASE industries and NACE correspondence

The factsheet covers the Food and Agriculture sector which includes three EXIOBASE industry groups and 26 industries:

- **Crop and animal production, hunting and related service activities**
  i01.a. Cultivation of paddy rice
  i01.b. Cultivation of wheat
  i01.c. Cultivation of cereal grains nec
  i01.d. Cultivation of vegetables, fruit, nuts
  i01.e. Cultivation of oil seeds
  i01.f. Cultivation of sugar cane, sugar beet
  i01.g. Cultivation of plant-based fibers
  i01.h. Cultivation of crops nec
  i01.i. Cattle farming
  i01.j. Pigs farming
  i01.k. Poultry farming
  i01.l. Meat animals nec
  i01.m. Animal products nec
  i01.n. Raw milk
  i01.o. Wool, silk-worm cocoons
- **Manufacture of food products**
  i15.a. Processing of meat cattle
  i15.b. Processing of meat pigs
  i15.c. Processing of meat poultry
  i15.d. Production of meat products nec
  i15.e. Processing vegetable oils and fats
  i15.f. Processing of dairy products
  i15.g. Processed rice
  i15.h. Sugar refining
  i15.i. Processing of Food products nec
  i15.k. Manufacture of fish products
- **Manufacture of beverages**
  i15.j. Manufacture of beverages

These EXIOBASE industry groups are consistent with the divisions from the NACE rev. 2 classification : division A.01 "Crop and animal production, hunting and related service activities", division C.10 "Manufacture of food products" and division C.11 "Manufacture of beverages" (EUROSTAT 2008).

Figure 2 below shows the correspondence between the EXIOBASE industries and the NACE divisions for the Food and Agriculture factsheet.

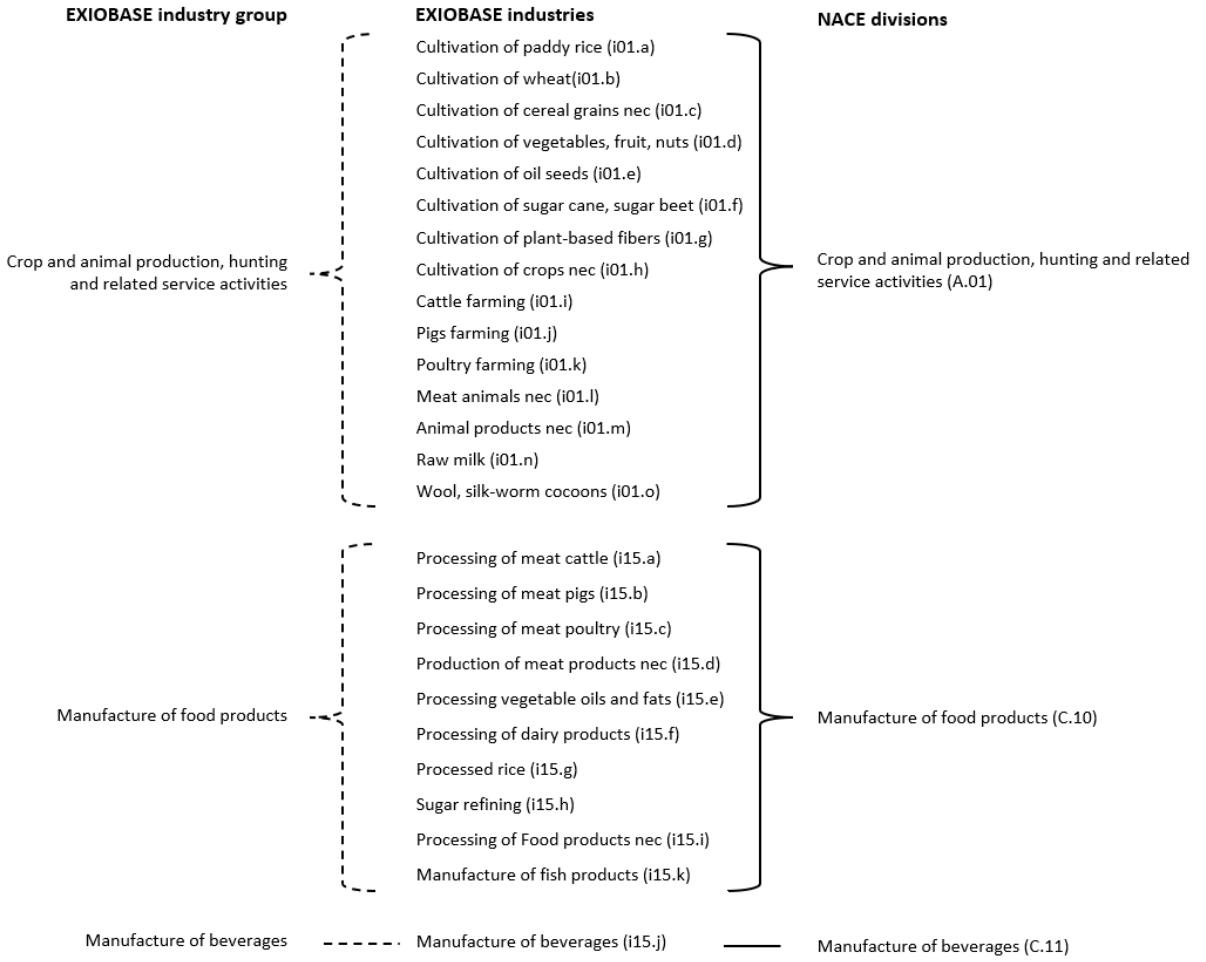


Figure 2: Correspondence between EXIOBASE and NACE rev. 2 for the Food and Agriculture benchmark factsheet.

The available NACE rev.2 classification provides a more detailed overview of the activities falling under the scope of the Food and Agriculture benchmark factsheet. For further details, please refer to the detailed NACE classification in section 3.1.F.

In the Food and Agriculture sector studied, please note that "Agriculture" encompasses the EXIOBASE industry group "Crop and animal production, hunting and related service activities." Meanwhile, "Food" refers to the EXIOBASE industry groups "Manufacture of food products" and "Manufacture of beverages."

For practical reasons, the EXIOBASE industry group “Crop and animal production, hunting and related service activities” will be abbreviated in the factsheet and the sectoral appendix as “Crop and animal production”.

The “Fishing, operating of fish hatcheries and fish farms”, “Manure treatment (biogas), storage and land application” and “Manure treatment (conventional), storage and land application” EXIOBASE industries were removed from the study. The fishing sector was excluded from the Global Biodiversity Score assessment because of the current lack of sufficient data and methods on marine biodiversity in the GBS (CDC Biodiversité 2020). As for the manure sector, it was excluded due to a lack of information for most EXIOBASE regions, rendering averaged results biased. Finally, the impact of commercial hunting is not assessed by the GBS 1.4.9.

1.1. EXIOBASE industries and GICS correspondence

To understand the dependencies of the Food and Agriculture sector, establishing a correspondence between EXIOBASE and The Global Industry Classification Standard (GICS) used by ENCORE is necessary. The dependencies to ecosystem services are expressed in scores between 0 and 1 by the GBS using ENCORE data.

Figure 3 below illustrates the correspondence between the EXIOBASE industries and the GICS subindustries for the Food and Agriculture sector. The GICS database sorts industries thanks to three levels of detail: sector, subindustry and process. To calculate the Scope 1 dependencies, the model only relies on the **process level**. Therefore, **two subindustries included in the same process will have the same Scope 1 dependencies**.

In the case of the Food and Agriculture sector, the EXIOBASE industries are divided under four GICS processes: **Large-scale irrigated arable crops**, **small scale arable crops**, **processed food and drink production** and **Alcoholic fermentation and distilling**. Thus, industries within **the Crop and Animal Production** EXIOBASE industry group will share the same Scope 1 dependencies. Similarly, industries within the Manufacture of Food Products group will have uniform Scope 1 dependencies. Since one of the GICS subindustries in the **Manufacture of Beverages** category belongs to the same GICS process category as the **Manufacture of Food Products** industries, it will share the same Scope 1 dependencies. However, it will exhibit additional specific dependencies arising from the processes associated with the two remaining GICS subindustries: **Distillers & Vintners** and **Brewers**. That said, as each GICS subindustry calls different upstream processes, **the upstream Scope 3 dependencies will differ for each EXIOBASE industry.**

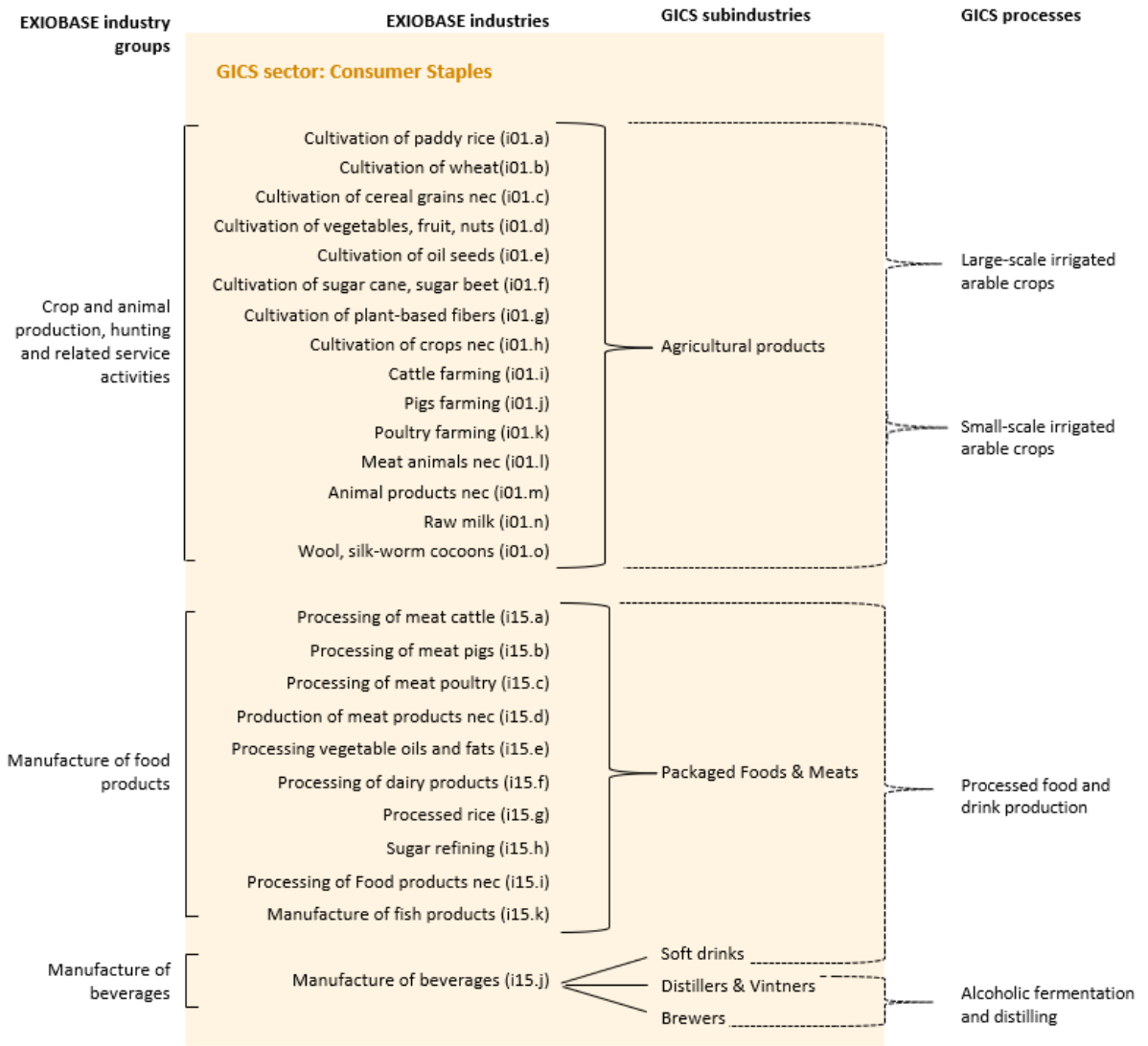


Figure 3: Correspondence between EXIOBASE and ENCORE for the Food and Agriculture benchmark factsheet.

1.2. Scopes of the Food and Agriculture sector

Figure 4 below presents the value chain of the Food and Agriculture sector.

Agriculture and Food are inherently interconnected through their respective value chains. Agriculture is an upstream activity for the Food sector, as it supplies the raw materials essential for food and beverage production. Conversely, the Food sector serves as a downstream activity for agriculture, where agricultural products are further processed into manufactured products.

This sector may involve contributions from other industries not represented in the diagram. Indeed, each step can include intermediate phases such as packaging and other materials production, as well as transportation and storage. When certain stages of the value chain (production, manufacturing, sales) take place in the same location, the intermediate steps of transportation and storage may be eliminated. Conversely, if these stages occur in different locations, intermediate wholesale and retail steps may occur.

Please note that the "crop and animal production" supplies itself significantly, as crops are necessary for animal feed. Additionally, industries within the two other industry groups may also supply other industries within the same group.

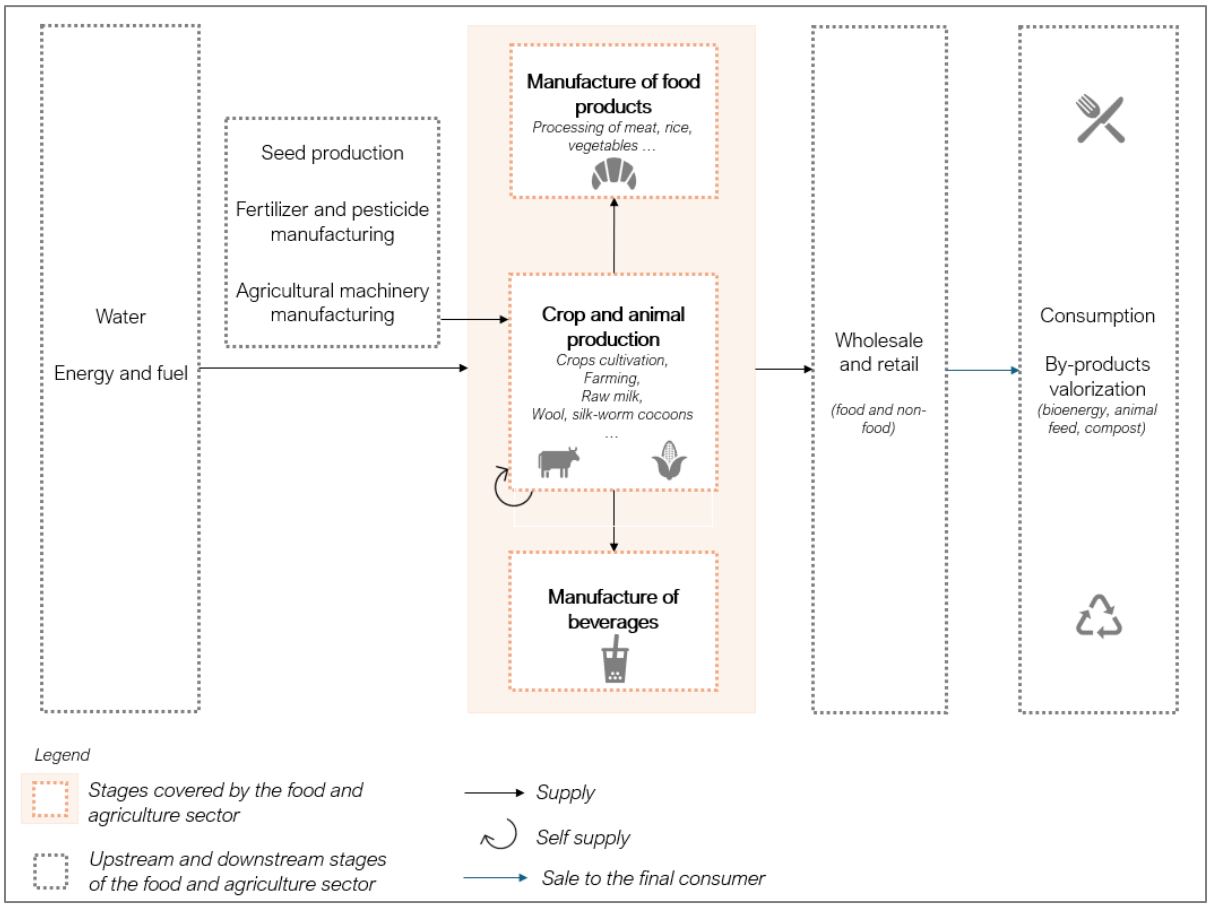


Figure 4: Value chain of the Food and Agriculture sector.

To clearly present the Scopes of this sector, the study will be divided into two parts: an analysis of the Scopes for Agriculture on one side and an analysis of the Scopes for Food on the other, for improved readability and clarity.

Figure 5 and Figure 6 below encapsulate the Scopes of the Agriculture sector and the Food sector respectively.

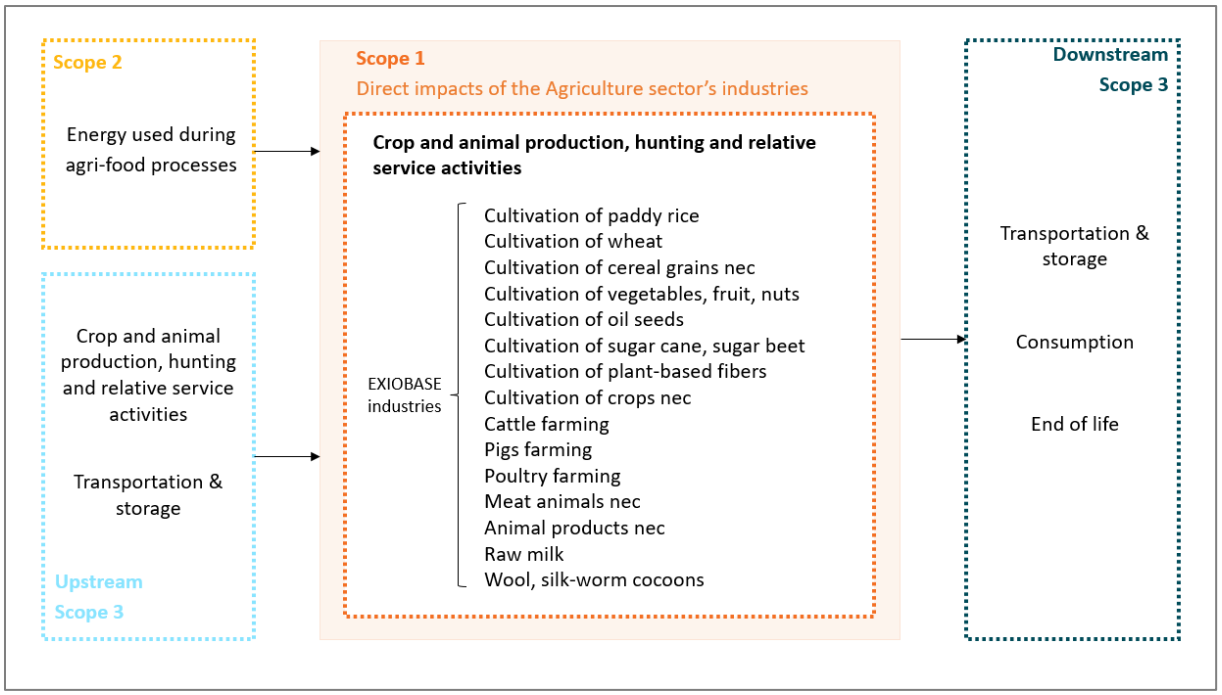


Figure 5: Scope of the Agriculture sector in the Food and Agriculture benchmark factsheet.

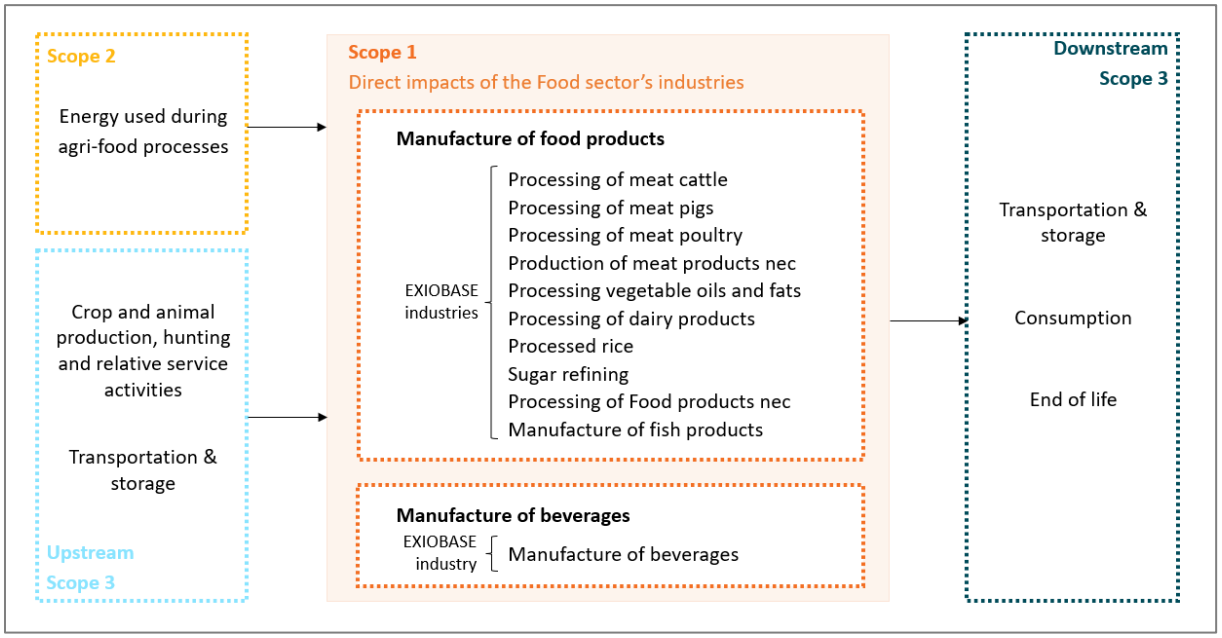


Figure 6: Scope of the Food sector in the Food and Agriculture benchmark factsheet.

Scope 2 emissions in the Food and Agriculture sector include purchased electricity, heating, and cooling used in farming and food processing for activities like irrigation, equipment operation, and refrigeration.

Most results in the factsheet are expressed in MSA.m²/kEUR of turnover. The impacts are indeed divided by the turnover of the EXIOBASE industries (the associated unit is therefore the *MSA.m²/kEUR of the EXIOBASE industry*) or by the turnover of a group of industries (expressed in *MSA.m²/kEUR*). Please note that version 1.4.9 of the GBS uses **2011 turnover data from EXIOBASE 3.8.1**. The geographical area covered by the factsheet is the **whole world**.

Table 1 below describes the share of each EXIOBASE industry group in the benchmark sector's turnover. EXIOBASE industries that represent more than 3 % of the sector's turnover are also listed under each EXIOBASE

industry group. According to EXIOBASE data, the overall turnover of the Food and Agriculture sector accounts for **7.0 % of the global turnover**, all sectors included.

In the whole factsheet and the sectoral appendix, **rounded values** are presented. Thus, **the sum of rounded values may not be equal to the rounded value of the total**.

EXIOBASE industry group	Turnover (bEUR)	Share in the benchmark sector's total turnover
Crop and animal production, hunting and related service activities	**3 200**	**43 %**
Cultivation of vegetables, fruit, nuts	800	11 %
Cultivation of crops nec	390	5.3 %
Raw milk	300	4.0 %
Cultivation of cereal grains nec	270	3.6 %
Poultry farming	240	3.3 %
Manufacture of food products	**3 700**	**50 %**
Processing of Food products nec	1 800	24 %
Manufacture of fish products	450	6.0 %
Processing of dairy products	350	4.8 %
Manufacture of beverages	**510**	**7.0 %**
TOTAL	**7 400**	**100 %**

Table 1: Turnover of the EXIOBASE industry groups included in the Food and Agriculture benchmark factsheet (data obtained from GBS 1.4.9 and therefore from EXIOBASE, 2011).

2. Perimeter of the factsheet for the dependencies analysis

C. ADDITIONAL RESULTS

1. Overall sector's impacts

1.1. Absolute impacts of the sector

The following calculations were performed using GBS 1.4.9 in October 2024. The previous factsheets are based on older versions of the GBS, which can explain some differences. Please note that the terrestrial static results include the results associated with the Climate change pressure, which is not the case for all the benchmark studies, as the static climate change pressure was added from version 1.4.2 of the GBS. Further details are available in section 2.5 of the general appendix (CDC Biodiversité 2021). The aquatic dynamic results are included in the following tables to compute aggregated scores in MSAppb*/bEUR but they are not reported in the rest of the results due to uncertainties. Please refer to the section Limits and uncertainties for further information.

Table 2 and Table 3 below present the absolute impacts in MSA.km² of the different industries within the sector, considering both their Scope 1 and vertically integrated impacts. **Crop and animal production** stands out as the **most impactful industry** across all realms and accounting categories, both within Scope 1 and throughout the entire value chain. In contrast, the beverage manufacturing industry demonstrates the lowest impact of the three industry groups across all categories. It also has the lowest turnover in the sector (see Table 1). Turnover is a critical factor in interpreting absolute impacts: two industries with the same impacts in MSA.km² will not be viewed or interpreted in the same way if their turnovers differ significantly. To enable a fair comparison proportional to industry size, impacts intensities in MSA.m²/kEUR were also calculated and presented in section "Impact intensities of the sector" below.

The difference between Scope 1 impacts and vertically integrated impacts in the crop and animal production sector is significantly smaller than that in the food products and beverages manufacturing sectors. This is because agriculture has a high direct impact on biodiversity, whereas manufacturing processes have a substantially lower direct impact. Since agriculture is a key component of the upstream value chain for food and beverage manufacturing, it leads to significantly higher vertically integrated impacts compared to Scope 1 impacts for these manufacturing sectors.

Please note that, in a vertically integrated approach, impacts can be double counted across different industry groups, meaning the sum of their impacts do not equal the overall impacts of the sector.

Realm	Accounting category	Scope 1 impacts in MSA.km²			
		Crop and animal production	Manufacture of food products	Manufacture of beverages	Total
Terrestrial	Static	28 000 000	120 000	7 900	**28 000 000**
	Dynamic	110 000	1 400	150	**110 000**
Aquatic	Static	2 000 000	4 300	15	**2 000 000**
	Dynamic	6 800	15	1.6	**6 800**

Table 2: Absolute Scope 1 biodiversity impacts of the Food and Agriculture sector. Source: GBS 1.4.9, October 2024, Blanche Houot.

Realm	Accounting category	Vertically integrated impacts in MSA.km²		
		Crop and animal production	Manufacture of food products	Manufacture of beverages
Terrestrial	Static	38 000 000	16 000 000	660 000
	Dynamic	160 000	59 000	3 200
Aquatic	Static	2 700 000	1 100 000	43 000
	Dynamic	11 000	3 600	120

Table 3: Absolute vertically integrated biodiversity impacts of the Food and Agriculture sector. Source: GBS 1.4.9, October 2024, Blanche Houot.

From a broader, more macroscopic perspective, the sector's **absolute total impacts** are substantial: Scope 1 terrestrial static impacts reach **28 000 000 MSA.km²**. This represents biodiversity loss equivalent to the destruction of a land area slightly larger than the combined land surface of the United Stated and South America, under the assumption that these regions were initially covered by intact natural ecosystems. This value focuses exclusively on the direct impacts of the sector on biodiversity, and does not encompass the sector's full biodiversity footprint, as its reliance on other industries within its value chain amplifies its overall impacts on biodiversity. Despite this limited scope, this value is exceptionally high, establishing the Food and Agriculture sector as the **most influential driver of biodiversity loss**. This is particularly striking given that the sector represents only **7 % of global turnover**, highlighting a disproportionate relationship between its economic contribution and its environmental consequences. For instance, the biodiversity impact of raw material extraction, the second most impactful sector, is approximately 4 600 000 MSA.km², about six times lower. Figure 7 below, which illustrates the share of Scope 1 terrestrial static impacts on biodiversity, highlights the predominance of Food and Agriculture in biodiversity impacts.

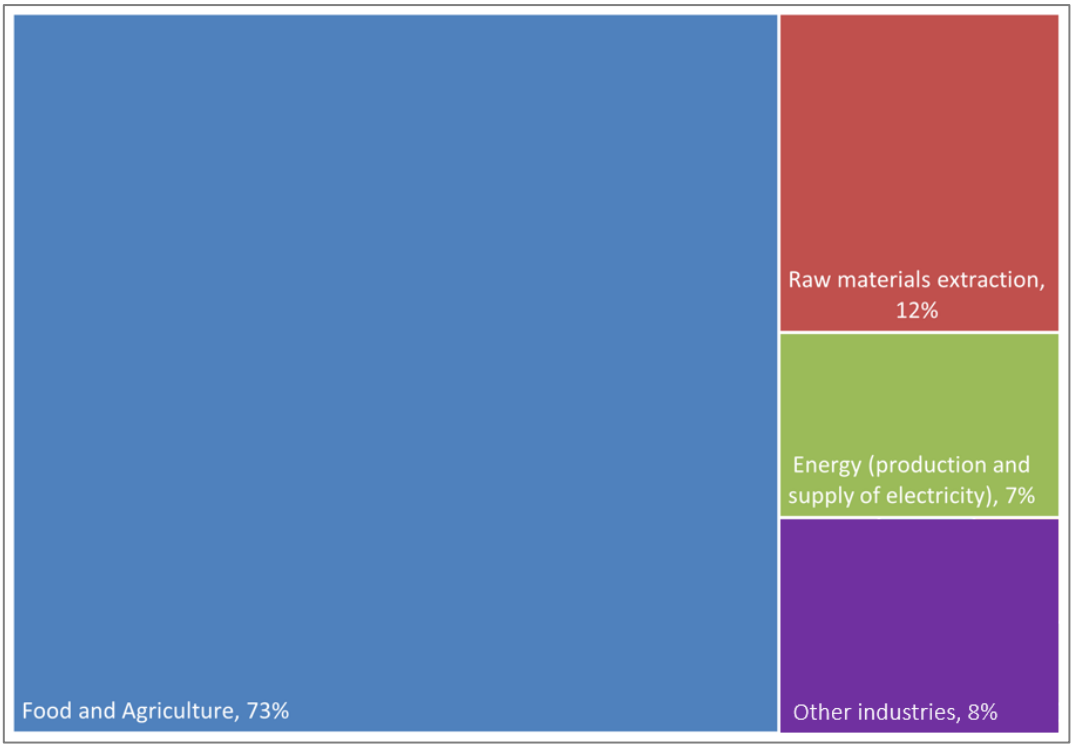


Figure 7: Sectoral distribution of Scope 1 terrestrial static impacts. Source: GBS 1.4.9, October 2024, Blanche Houot.

1.2. Impact intensities of the sector

Table 4 and Table 5 below show the impact intensities of the sector, within their Scope 1 as well as vertically integrated. The impact intensities, expressed in MSA.m²/kEUR were obtained by dividing the absolute impacts

of the sector in MSA.m² by its total turnover. This approach enables comparisons between different sectors, industries or industry groups for the same amount of turnover. The results are then converted into MSAppb per bEUR, allowing a comparison between terrestrial and aquatic impacts, and aggregated to MSAppb* per bEUR, providing a first overview of the biodiversity performance of the sector and its EXIOBASE industry groups. Further methodological details are available in section 2.2 and 2.3 of the general appendix of benchmark factsheets (CDC Biodiversité 2021).

In the same way as for the absolute impacts, the impact intensities of the Food and Agriculture sector, both in Scope 1 and vertically integrated, are significantly high compared to other sectors. For instance, the Scope 1 aggregated impact intensity for Food and Agriculture reaches **55 000 MSAppb/bEUR** for static impacts, while the Raw Material Extraction sector's intensity is 14 000 MSAppb/bEUR. Similarly, the vertically integrated static impacts for Food and Agriculture are **107 000 MSAppb/bEUR**, compared to 20 000 MSAppb/bEUR for Raw Material Extraction.

This high impact intensity of Food and Agriculture is primarily driven by the sector's high Scope 1 impacts, as detailed above in section C.1.1 for absolute impacts. As a result, this sector surpasses the corporate world average terrestrial dynamic impact intensity, with terrestrial dynamic Scope 1 impacts reaching **15 MSA.m²/kEUR**, far exceeding the corporate average of 2 MSA.m²/kEUR. Additionally, the sector breaches planetary boundary limits across all realms. Its terrestrial static Scope 1 impacts reaches **3 800 MSA.m²/kEUR**, well above the target of 320 MSA.m²/kEUR maximum to reach the world terrestrial static intensity compatible with planetary boundaries.

Realm	Accounting category	Footprint in MSA.m²/kEUR of the sector	Footprint in MSAppb/bEUR	Aggregated score in MSAppb*/bEUR
Terrestrial	Static	3 800	29 000	**1 300**
	Dynamic	15	110	
Aquatic	Static	270	27 000	
	Dynamic	0.93	90	

Table 4: Scope 1 impact intensities for the Food and Agriculture sector. Source: GBS 1.4.9, October 2024, Blanche Houot.

Realm	Accounting category	Footprint in MSA.m²/kEUR of the sector	Footprint in MSAppb/bEUR	Aggregated score in MSAppb*/bEUR
Terrestrial	Static	7 400	56 000	**2 600**
	Dynamic	30	230	
Aquatic	Static	530	51 000	
	Dynamic	1.9	190	

Table 5: Vertically integrated impact intensities for the Food and Agriculture sector. Source: GBS 1.4.9, October 2024, Blanche Houot.

Table 6 and Table 7 below present the results broken down by EXIOBASE industry groups. They are computed by weighting the impacts in MSA.m² by the turnover of each EXIOBASE industry (MSA.m²/kEUR of the EXIOBASE industries). Again, results are converted into MSAppb per bEUR and are then aggregated to MSAppb* per bEUR.

Category of industries	Realm	Accounting category	Footprint of the industry group in MSA.m²/kEUR	Footprint of the industry group in MSAppb/bEUR	Aggregated score of the industry group in MSAppb*/bEUR
Crop and animal production	Terrestrial	Static	8 700	66 000	3 000
		Dynamic	34	250	
	Aquatic	Static	630	61 000	

Category of industries	Realm	Accounting category	Footprint of the industry group in MSA.m²/kEUR	Footprint of the industry group in MSAppb/bEUR	Aggregated score of the industry group in MSAppb*/bEUR
		Dynamic	2.1	210	
Manufacture of food products	Terrestrial	Static	32	240	10
		Dynamic	0.38	2.9	
	Aquatic	Static	1.2	110	
		Dynamic	0.0041	0.40	
Manufacture of beverages	Terrestrial	Static	15	120	4.9
		Dynamic	0.29	2.2	
	Aquatic	Static	0.029	2.9	
		Dynamic	0.0030	0.29	

Table 6: Scope 1 impact intensities for the Food and Agriculture sector industry groups. Source: GBS 1.4.9, October 2024, Blanche Houot.

Category of industries	Realm	Accounting category	Footprint of the industry group in MSA.m²/kEUR	Footprint of the industry group in MSAppb/bEUR	Aggregated score of the industry group in MSAppb*/bEUR
Crop and animal production	Terrestrial	Static	12 000	89 000	4 100
		Dynamic	50	370	
	Aquatic	Static	850	82 000	
		Dynamic	3.3	320	
Manufacture of food products	Terrestrial	Static	4 400	33 000	1 500
		Dynamic	16	120	
	Aquatic	Static	310	30 000	
		Dynamic	0.99	96	
Manufacture of beverages	Terrestrial	Static	1 300	9 700	430
		Dynamic	6.2	47	
	Aquatic	Static	84	8 100	
		Dynamic	0.24	23	

Table 7: Vertically integrated impact intensities for the Food and Agriculture sector industry groups. Source: GBS 1.4.9, October 2024, Blanche Houot.

2. Breakdown by EXIOBASE industries and industry groups

In this section, the results are presented in MSA.m²/kEUR of the 2011 turnover of the EXIOBASE industry or industry group *i.e.*, for each industry the impacts in MSA.m² is divided by the turnover of the corresponding industry or industry group. This allows the different industries to position themselves within the benchmark sector. The terrestrial static results include the results associated with the Climate change pressure.

Please note that only the vertically integrated results are presented in this section.

2.1. Terrestrial static impacts

Figure 8 and Figure 9 below display the terrestrial static impact intensities of each industry group and industry of the sector respectively, broken down by Scope, Pressure and Commodity.

Figure 8**Erreur ! Source du renvoi introuvable.** illustrates that Scope 1 activities are the primary contributors to the terrestrial static impacts associated with the crop and animal production industry group. This industry group exerts significant spatial pressure due to the extensive land requirements for crop cultivation and livestock husbandry, which currently occupy almost half of the world's habitable land. Notably, 71 % of terrestrial static impacts within this industry group can be attributed to land use. Livestock production emerges as the most land-intensive activity, as the global land used for it is as large as the land area of the entire Americas. This extensive land use is driven primarily by the need for grazing land, which accounts for 80 % of this surface, alongside cropland dedicated to animal feed production (Ritchie and Roser 2019).

The terrestrial static impacts of manufacturing industries are almost entirely linked to their upstream Scope 3 activities. This pattern aligns with the structure of the Food and Agriculture value chain, where beverage and food manufacturing industries heavily depend on agricultural raw materials. As a result, the upstream Scope 3 impacts of the manufacturing industries closely mirror the Scope 1 impacts of the "Crop and animal production" industry group. Within the vertically integrated approach used to present the results, land use logically emerges as the primary driver of terrestrial static impacts in manufacturing industries. This factor accounts for approximately two-thirds of their terrestrial static impacts, underscoring the deep interdependencies inherent to the supply chain.

Please note that, as this GBS assessment relies exclusively on financial data, it does not capture the spatial impacts of Food and Agriculture infrastructures (see Limits and uncertainties). Consequently, the observed spatial pressures are allocated to agricultural activities and upstream production, leading to an underestimation of the Scope 1 impacts, particularly those of Food industries.

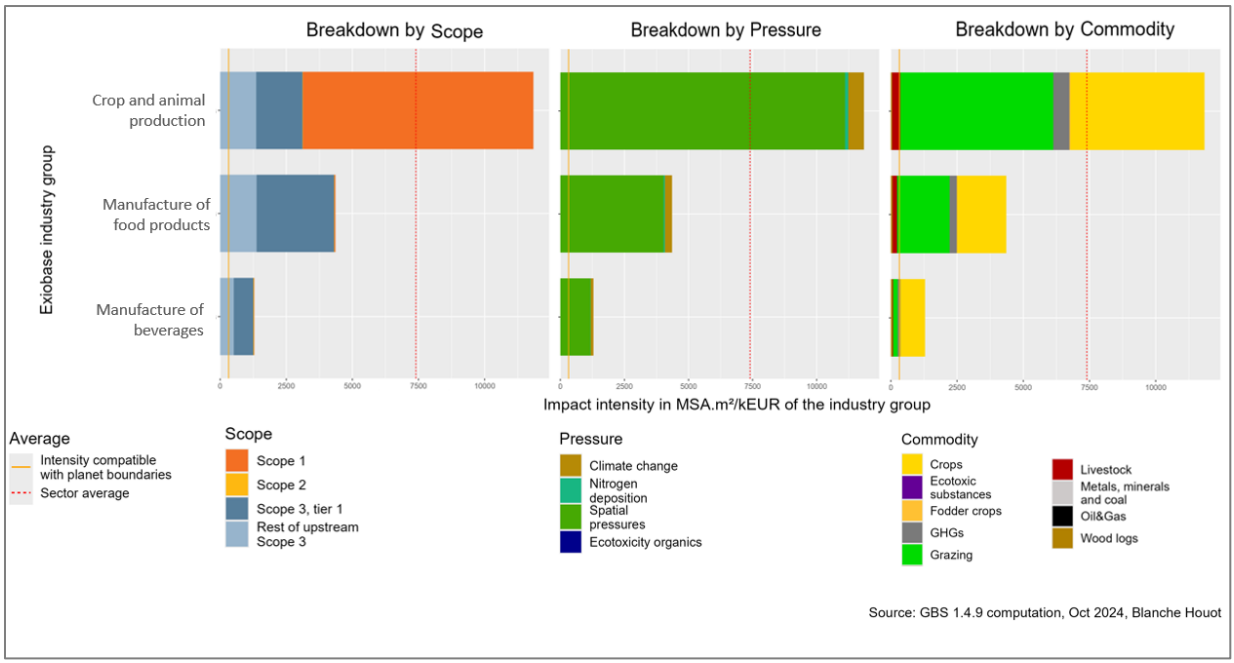


Figure 8: Terrestrial static impact intensities of the Food and Agriculture sector, breakdown by EXIOBASE industry group, vertically integrated. The sector average is weighted by each industry group's turnover.

However, Figure 9 reveals significant disparity and heterogeneity across industry groups. A particularly high impact intensity is observed for activities related to cattle: cattle farming and meat processing. Indeed, beef cattle uses about three-fifths of the global agricultural land, causing global warming through its consequent methane emissions participating to climate change, and its effects on deforestation, both directly through pasture and indirectly through its use of feed and forage (Boucher et al. 2012). Indeed, clearing land for cattle pasture is now estimated to be the number one driver of deforestation worldwide, as cattle pasture accounts for 36 % of all tree cover loss associated with agriculture between 2001 and 2015, for a total of 111 million acres of land deforested (Global Forest Review 2024).

Across all three industry groups, spatial pressures are followed by the impacts of climate change, driven by greenhouse gas (GHG) emissions throughout the value chain. Industries associated with animal production are particularly significant contributors to GHG emissions, primarily through methane emissions linked to enteric fermentation, and by feed production, animal waste and land use change, leading to CO2 emissions. Notably, per unit of protein consumed, ruminants generate more than 20 times more GHG emissions than pulses (Ranganathan et al. 2016).

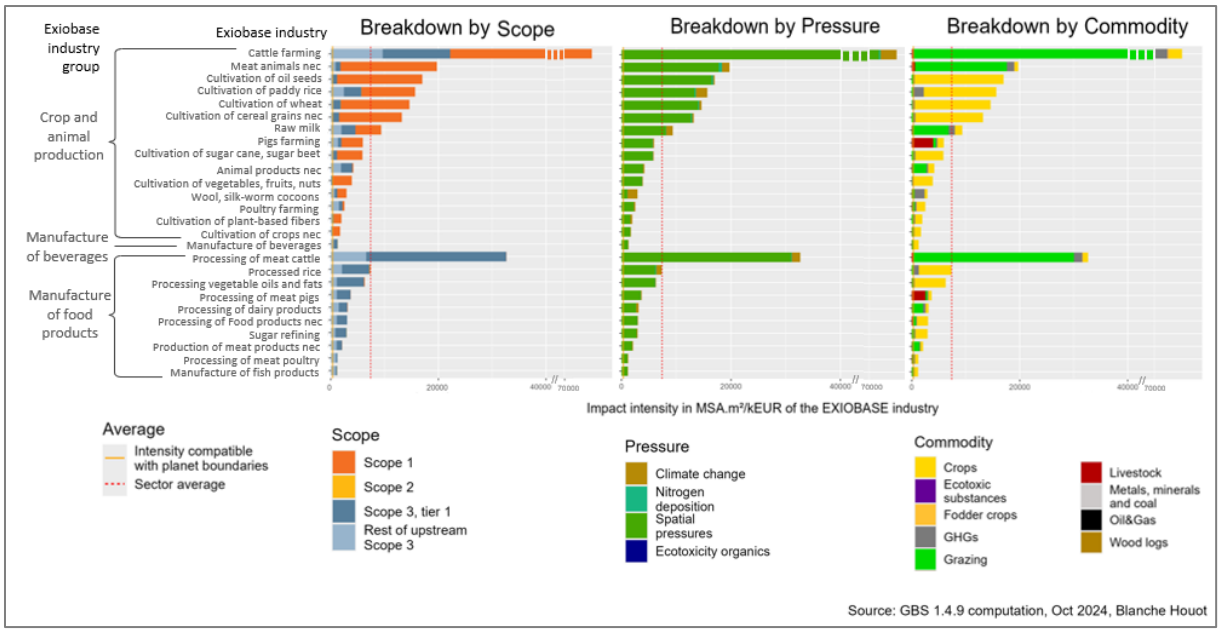


Figure 9: Terrestrial static impact intensities of the Food and Agriculture sector, breakdown by EXIOBASE industry, vertically integrated. The sector average is weighted by each industry's turnover.

2.2. Terrestrial dynamic impacts

Figure 10 and Figure 11 below display the terrestrial dynamic impact intensities of each industry group and industry of the sector respectively, broken down by Scope, pressure and commodity.

Figure 10 reveals that, as for terrestrial static impacts, spatial pressures are the dominant drivers of terrestrial dynamic impacts across the industry groups, due to grazing and crops, followed by climate change. However, terrestrial dynamic impacts are less influenced by spatial pressures compared to static impacts, as encroachment and fragmentation have a smaller, if not negligible, impact. Conversely, climate change exerts a more significant pressure on dynamic impacts due to the greenhouse gas (GHG) emissions associated with the three industry groups. In 2020, global emissions from agrifood systems were mainly driven by CO2 emissions from deforestation and CH4 emissions from enteric fermentation in ruminant livestock, together accounting for nearly 40 % of these emissions. Crop and animal production activities contributed to nearly half of the emissions, followed by pre-production and then post-production processes, including manufacturing industries, as well as land-use change (FAO 2022).

Figure 11 highlights cattle farming as the largest contributor to GHG emissions within the sector. Indeed, cattle production is responsible for about two-thirds of livestock supply chain's global anthropogenic GHG emissions, largely due to methane emissions resulting from rumen fermentation (FAO 2017).

The results are presented within a vertically integrated approach, but when assessing the direct impacts (*i.e.*, Scope 1 impacts) of the manufacturing industry groups, climate change stands out as the most significant pressure on biodiversity, driven by substantial GHG emissions. Indeed, climate change accounts for 92% of terrestrial dynamic Scope 1 impacts in the food manufacturing industry group and an even higher 98% in the beverage manufacturing industry group. The main sources of these emissions are the consumption of fossil fuels in vehicles and machinery on-site, and fugitive emissions from refrigeration, which is essential in food cold chains. Large-scale cooling systems, if not maintained, can release powerful greenhouse gases (Persefoni 2024).

The wool and silk cocoon industries have significant GHG emissions. Animal fibers generally demand higher resource inputs compared to plant-based fibers, leading to greater emissions per unit mass. For silk, environmental impacts arise mainly from cultivating mulberry leaves (the primary food for silkworms) and cocoon production. Furthermore, a substantial amount of co-products remains unutilized. A case study in India

found that over half of the dry weight of the output consists of pupae (developing insects inside cocoons) and sericin (a silk protein), with no evidence of their utilization in Southern India (F. Astudillo et al. 2015). Wool, derived mainly from sheep but also from goats, camels, alpacas, and llamas, also generates substantial emissions during farming, primarily from enteric methane. Indeed, 4.5-6.5% of the energy can be lost as methane when sheep digest pasture. Additional emissions occur during wool processing and garment manufacturing due to energy consumption (The Woolmark Company 2019).

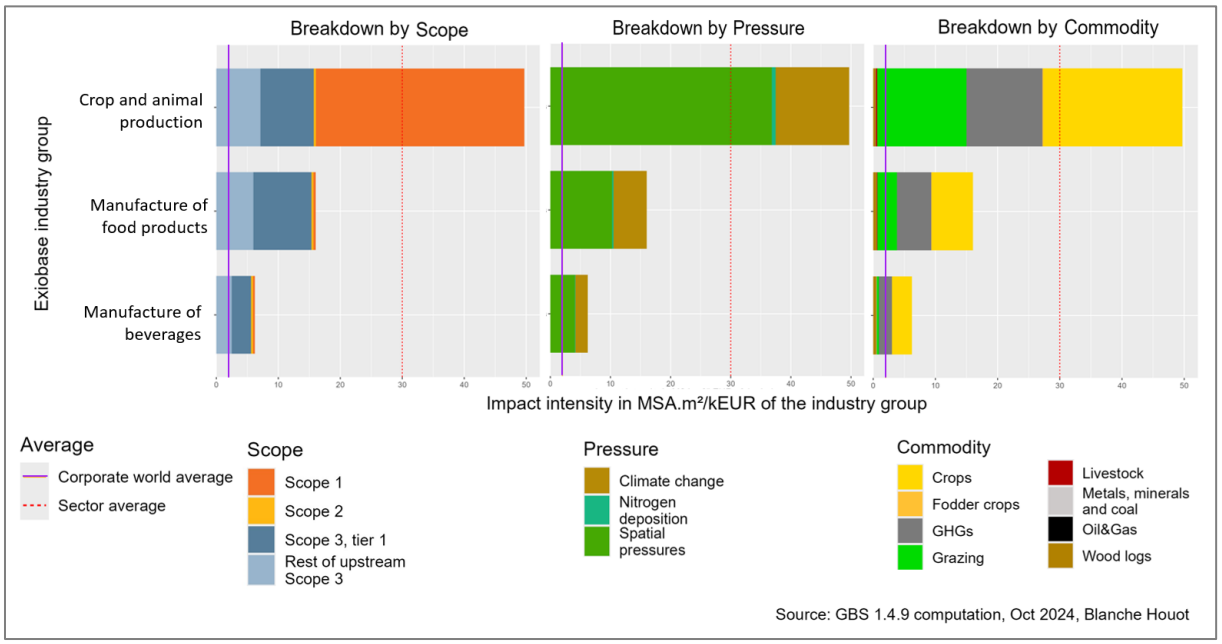


Figure 10: Terrestrial dynamic impact intensities of the Food and Agriculture sector, breakdown by EXIOBASE industry group, vertically integrated. The sector average is weighted by each industry group's turnover.

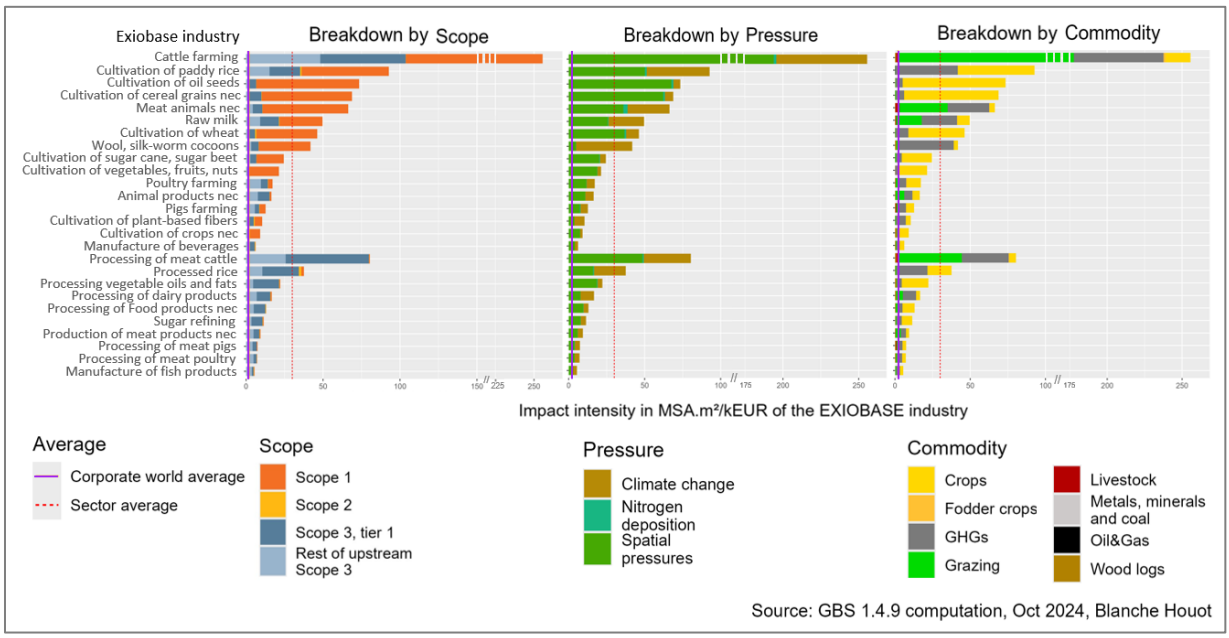


Figure 11: Terrestrial dynamic impact intensities of the Food and Agriculture sector, breakdown by EXIOBASE industry, vertically integrated. The sector average is weighted by each industry's turnover.

2.3. Aquatic static impacts

Figure 12 and Figure 13 below display the aquatic static impact intensities of each industry group and industry of the sector respectively, broken down by Scope, Pressure and Commodity.

The distribution of static aquatic and terrestrial impacts are nearly identical, the distribution of impacts is thus broadly consistent across all realms and accounting categories, for the three industry groups.

Figure 12 reveals that agricultural-related practices exert significant pressures on aquatic ecosystems, particularly wetlands. These practices are estimated to negatively impact more than 50 % of Wetlands of International Importance, recognized for their contribution to the conservation of global biodiversity (The Secretariat of the Convention on Wetlands 2021). In this context, the static impacts of the Food and Agriculture sector on aquatic ecosystems are predominantly linked to **land use in wetland catchment areas**. This pressure is particularly pronounced within the "Crop and animal production" industry group as it arises from the agricultural practices of grazing and crop cultivation. Agricultural activities in these regions often lead to water diversion for irrigation, significantly affecting the quality and flow of water entering wetland ecosystems. Additionally, agricultural runoff from farming practices can carry pollutants that negatively impacts wetlands, thereby diminishing their ability to provide certain ecosystem services (FAO 2008). These effects can indirectly affect agriculture both inland and downstream of wetlands, by altering the quality or availability of water resources.

Another significant pressure on aquatic ecosystems, particularly wetlands, arises from **wetland conversion**. As this analysis focuses exclusively on static impacts, it assesses the consequences of historical wetland conversion while excluding the impacts of current agricultural practices on aquatic ecosystems. This pressure is accompanied by a global shift toward intensive mono-agriculture, which is leading to a vast transformation of wetlands into agricultural land. This conversion involves drainage, livestock grazing, fertilizer and pesticide application, water management interventions and vegetation clearance, with more freshwater being abstracted for irrigation, and a growing propensity for agricultural pollution (FAO 2008). These practices result in the degradation and loss of aquatic ecosystems.

The extent of these impacts, whether from land use in wetland catchments or wetland conversion, correlates directly with the **intensity of agricultural practices** employed.

Hydrological disturbance due to direct water use is the next most significant pressure on aquatic biodiversity, due to the intrinsic need for water in the agricultural sector. This makes agriculture responsible for almost 70% of the global water withdrawal (Ingrao et al. 2023).

The Hydrological disturbance due to climate change pressure is not accounted in the aquatic static results. This may underestimate the aquatic static impacts given the part of Climate change in the terrestrial static pressures.

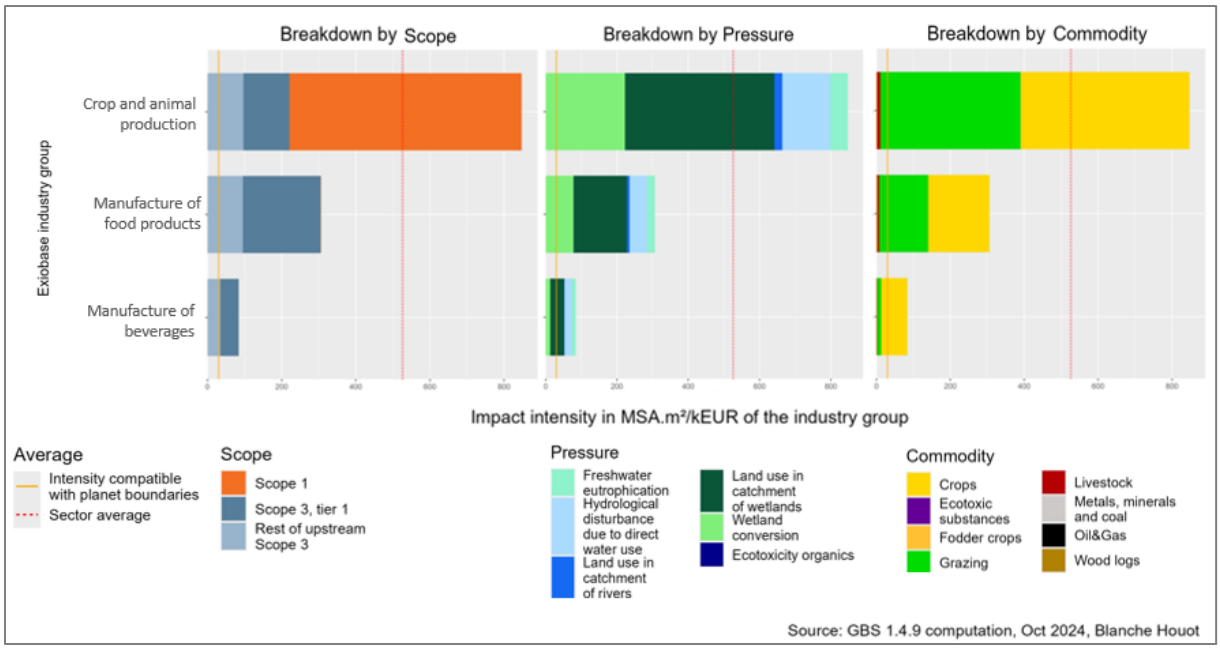


Figure 12: Aquatic static impact intensities of the Food and Agriculture sector, breakdown by EXIOBASE industry group, vertically integrated. The sector average is weighted by each industry group's turnover.

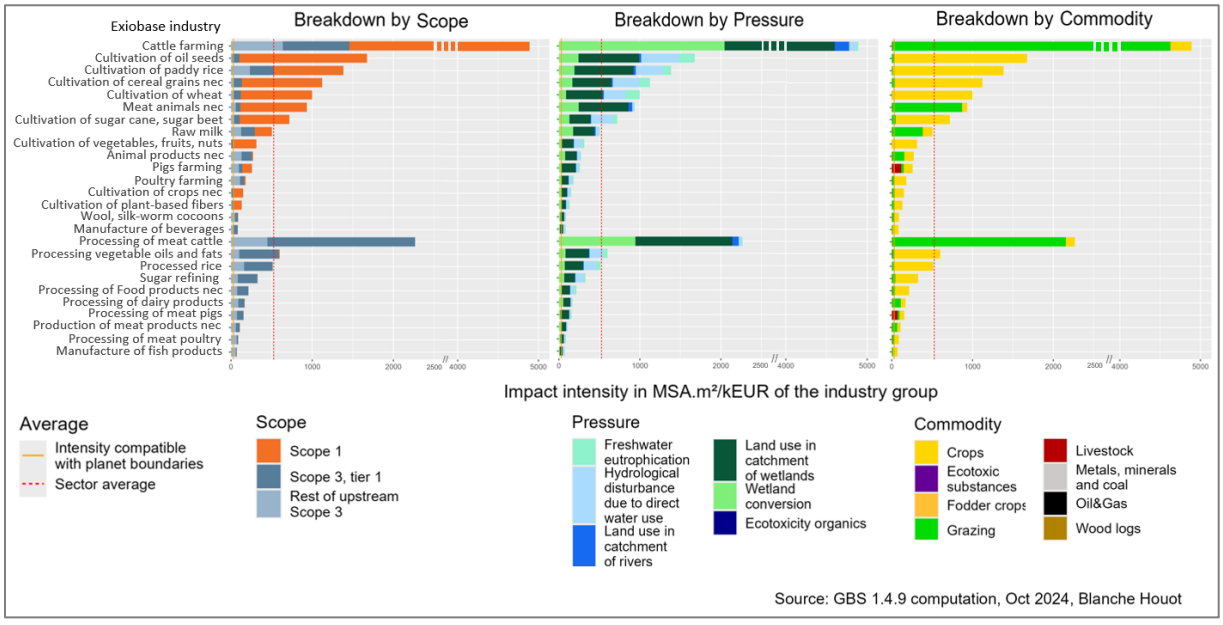


Figure 13: Aquatic static impact intensities of the Food and Agriculture sector, breakdown by EXIOBASE industry, vertically integrated. The sector average is weighted by each industry's turnover.

3. Limits and uncertainties

The Crops, livestock husbandry and grass CommoTools encounter several limitations due to underlying data used, uncertainties and the methodology and assumptions made. To consult them, please refer to the Crop and Livestock husbandry and Grass CommoTools GBS reviews.

When calculated with financial data, the GBS results do not provide impacts due to spatial pressures of industrial buildings, offices, parking lots, etc., because land occupation data is not available. Thus, Scope 1 impacts due to spatial pressures are underestimated, mainly within the Food and Beverage manufacturing industry groups. This limit can be overcome by adding la d use data to the GBS input information.

GBS calculations do not cover the downstream impacts of the sector, due to a lack of available data and method to track the use and end-of-life of traded goods. However, it is important to remember that those steps can also have a significant impact on biodiversity. Additionally, the Ecotoxicity pressure due to metallic substances is excluded because of high uncertainties because of intrinsic difficulties in modelling. These difficulties also affect the Ecotoxicity pressure due to organic substances but to a lesser extent. Therefore, this pressure is included in the results but can still cause uncertainties. So does the static Climate change pressure. The aquatic pressure Hydrological disturbances due to climate change is not accounted in the aquatic static impacts because of methodological limitations but may be significant as suggested by the importance of terrestrial static impacts due to the Climate change pressure.

Finally, the aquatic dynamic results also have a high uncertainty and are therefore only presented in the Overall sector's impacts section for the computation of aggregated scores in MSAppb*/bEUR.

In addition to the limitations of the GBS, there are significant impacts and pressures not covered by the GBS that should still be considered when defining action plans for industries in the sector. These include avoiding the establishment of activities on or near areas of high environmental value or developing a specific management plan for such sites, ensuring that farmers refrain from harmful practices such as deforestation in line with the EU Deforestation Regulation (see section D.5), implementing measures to detect and eliminate the spread of invasive species, and conducting systematic reviews to identify priority ecosystem services, among other measures.

Furthermore, while biodiversity consists of three components—ecosystem diversity, species diversity, and genetic diversity—the GBS focuses solely on ecosystem diversity, leaving the other two components unaddressed. For a full list of environmental safeguards to implement, refer to the GBS review report on "Quality Assurance" (CDC Biodiversité 2020; International Finance Corporation 2012).

4. Sector's dependencies

In this part are presented additional results on the sector's dependencies, including a breakdown by EXIOBASE industries. A methodological explanation is available in section 2.4 of the general appendix (CDC Biodiversité 2021).

Table 8 and Table 9 below display the average total dependency scores for each EXIOBASE industry group and individual EXIOBASE industry within the Food and Agriculture sector, broken down by Scope. The results highlight that Scope 1 activities of industries related to crop cultivation exhibit a high dependency on ecosystem services, while those associated with animal production demonstrate a moderate dependency. In contrast, the direct activities of industries involved in manufacturing show a low direct dependency on ecosystem services. However, these industries have substantial upstream dependencies, as agricultural practices constitute a significant portion of their upstream activities.

Average aggregated dependency score	Scope 1	Upstream Scope 3
Crop and animal production	65 %	25 %
Manufacture of food products	27 %	28 %
Manufacture of beverages	29 %	20 %

Table 8: Food and Agriculture average dependency scores, broken down by EXIOBASE industry group and Scope. The average is weighted by each industry group's turnover. Source: GBS 1.4.9, October 2024, Blanche Houot

Average aggregated dependency score	Scope 1	Upstream Scope 3
Cultivation of paddy rice	71 %	36 %
Cultivation of sugar cane, sugar beet		34 %
Cultivation of cereal grains nec		23 %
Cultivation of wheat		23 %
Cultivation of vegetables, fruit, nuts		20 %
Cultivation of plant-based fibers		20 %
Cultivation of crops nec		20 %
Cultivation of oil seeds		18 %
Poultry farming	54 %	34 %
Pigs farming		30 %
Cattle farming		29 %
Raw milk		29 %
Animal products nec		27 %
Meat animals nec		24 %
Wool, silk-worm cocoons		21 %
Processed rice	27 %	38 %
Sugar refining		33 %
Processing vegetable oils and fats		31 %
Processing of meat cattle		31 %
Processing of meat pigs		30 %
Processing of meat poultry		29 %
Processing of Food products nec		28 %
Processing of dairy products		28 %
Manufacture of fish products		27 %
Production of meat products nec		22 %
Manufacture of beverages	29 %	20 %

Table 9: Food and Agriculture average dependency scores, broken down by EXIOBASE industry and Scope. The average is weighted by each industry's turnover. Source: GBS 1.4.9, October 2024, Blanche Houot.

As outlined in the Table 1: Turnover of the EXIOBASE industry groups included in the Food and Agriculture benchmark factsheet (data obtained from GBS 1.4.9 and therefore from EXIOBASE, 2011).

Perimeter of the factsheet for the dependencies analysis section, Scope 1 dependencies are determined based on the GICS process associated with each industry. Since industries related to crop and animal production are classified under large- and small-scale irrigated arable crop processes, they share the same ecosystem service dependencies. Similarly, industries engaged in food and soft drink manufacturing, classified under the "Processed Food and Drink Production" process, share the same Scope 1 dependencies. This uniformity in Scope 1 dependencies also applies to the rest of the industries within the Manufacture of beverages industry group.

As illustrated in

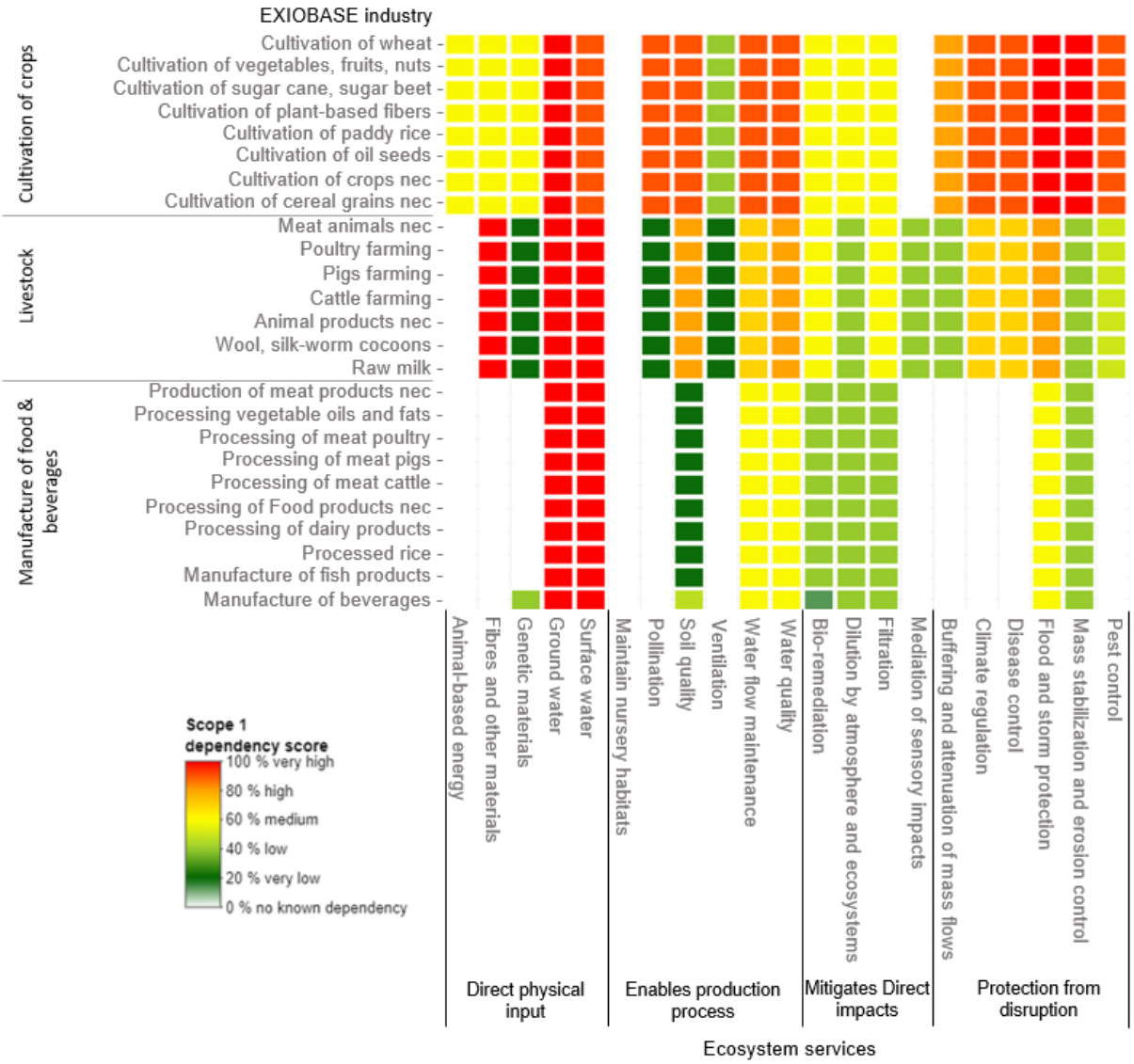


Figure 14, all industries exhibit a very high dependency on the availability of surface and ground water resources. Indeed, sufficient water is needed for crop growth, animals watering, general on-farm use (cleaning, sanitation, crop spraying), food production and beverage manufacture. Similarly, industries within the sector are reliant on water quality and the maintenance of water flow. Specifically, manufacturing industries demonstrate a medium dependency on these aspects, whereas the dependency is high for animal production industries and very high for crop production industries. Industries associated with crop cultivation show dependency scores exceeding 80% for numerous ecosystem services. This high reliance is intrinsically linked to the biodiversity-dependent nature of agricultural practices. Key ecosystem services critical to crop cultivation include pest control, mass stabilization and erosion control, flood and storm protection, disease regulation, climate regulation, soil quality maintenance, and pollination. Other industries also rely rather strongly on the “Flood and storm protection” ecosystem service, because as well as protecting crops, it protects animals, buildings and infrastructure from storms and floods. Some Scope 1 dependencies are “not known”. The ecosystem services included in this category are either services for which no data was found on the subject, or services on which the GICS process is effectively not dependent at all.

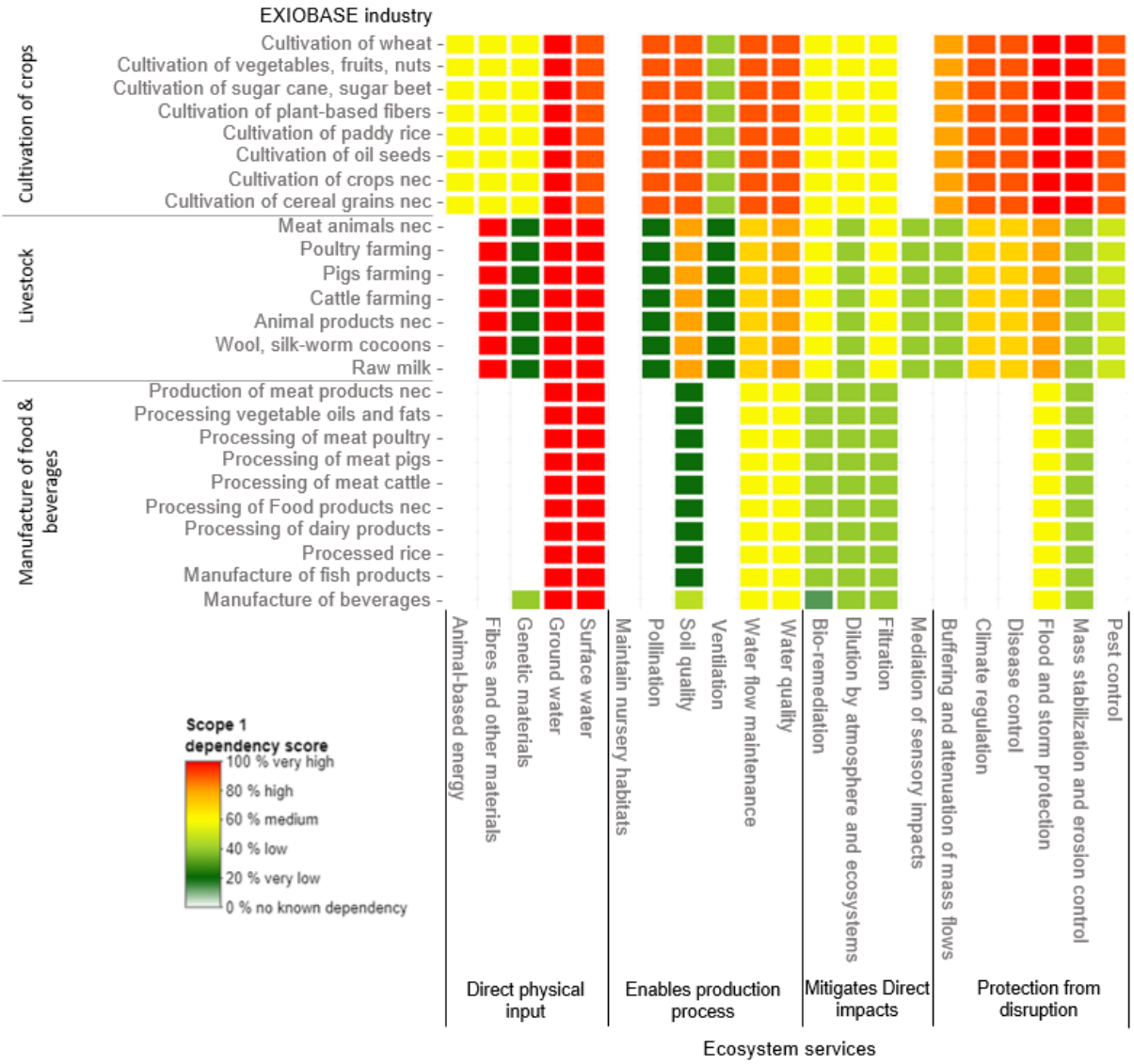


Figure 14: Scope 1 average dependency scores, broken down by EXIOBASE industry. Source: GBS 1.4.9, October 2024, Blanche Houot.

The upstream dependency score represents a weighted average of the dependency scores of all suppliers within the supply chain. This approach implies that a high dependency on a specific ecosystem service by one supplier may be mitigated by a

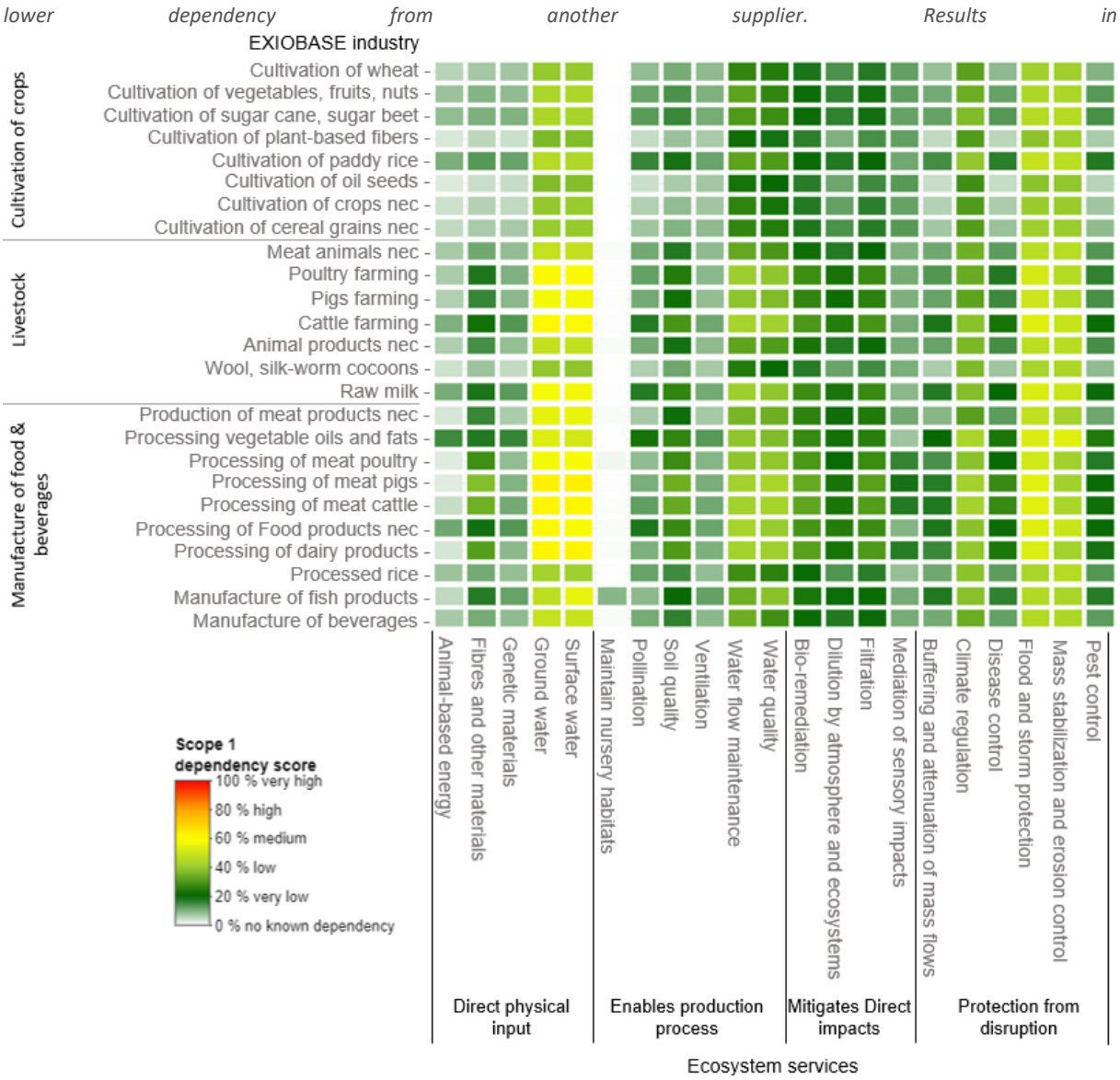


Figure 15 below illustrate that industries associated with crop cultivation exhibit "low" or "very low" average upstream dependency scores due to their position at the upstream end of the value chain, relying on a limited number of upstream industries. Industries linked to animal production demonstrate slightly higher upstream dependency scores. This is primarily due to the inclusion of upstream cultivation industries, which are essential for providing animal feed. Finally, industries involved in the manufacture of food products show more consistent upstream dependencies, leading to a "medium" upstream dependency score. This is explained by their position further downstream in the value chain and their reliance on inputs from the crop and animal production industries, highly dependent on ecosystem services.

Upstream activities from all industries of the sector rely rather strongly on the “Mass stabilisation and erosion control” ecosystem service: each one has an upstream dependency score between 40 % and 60 % for this ecosystem service. Indeed, it reduces soil loss and fertilizer runoff from cultivation sites, preventing damage to other ecosystems. It maintains soil and sediment quality, limiting damage to pastures, buildings and other infrastructure, and prevents exposed topsoil from being blown away by wind or washed away by rain. The upstream activities of all industries also depend on “Flood and storm protection” and water-related ecosystem services for the reasons mentioned above.

Dependencies are calculated on the basis of the share of purchases made from different sectors, and as manufacturing industries occupy a downstream position in the value chain, they have many upstream sectors other than agriculture to which they make purchases. This explains why their upstream dependencies are significantly lower than the Scope 1 dependencies of agricultural industries.

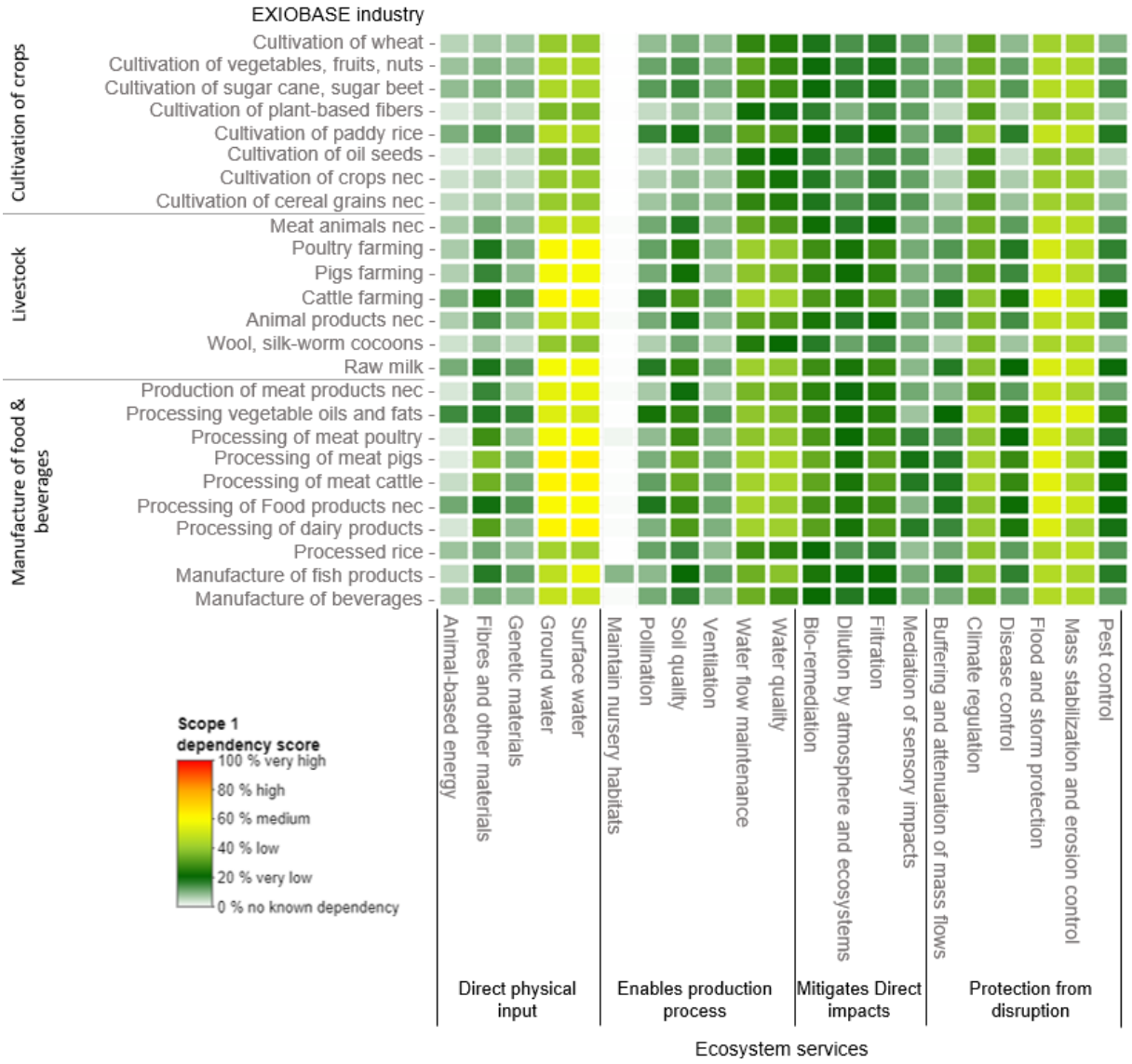


Figure 15: Upstream Scope 3 average dependency scores, broken down by EXIOBASE industry. Source: GBS 1.4.9, October 2024, Blanche Houot.

As explained above, the average upstream dependency scores do not highlight potential high dependencies to some ecosystem services which can be occulted by other low dependencies. Therefore, it is interesting to have a look at the critical upstream dependency scores of each industry of the sector, which are displayed in Figure 16. These critical dependency scores can be read as the share of a company's value chain that is critically dependent, *i.e.* not substitutable, on at least one ecosystem service. A critical dependency is defined as a "High" or "Very high" dependency according to ENCORE. Each industry of the sector has a critical dependency score between 49 and 76 % and the total sector's dependency score reaches **73 %, meaning that this percentage of the sector's value chain is critically dependent on at least one ecosystem service.** Upstream crititcal dependencies are particularly high for crop production industries because their value chain also includes a

significant part of crop production itself. These industries are highly dependent on water, climate and soil-related ecosystem services, erosion control, pollination and pest and disease control.

Please note that the critical dependencies scores might change with future methodology updates.

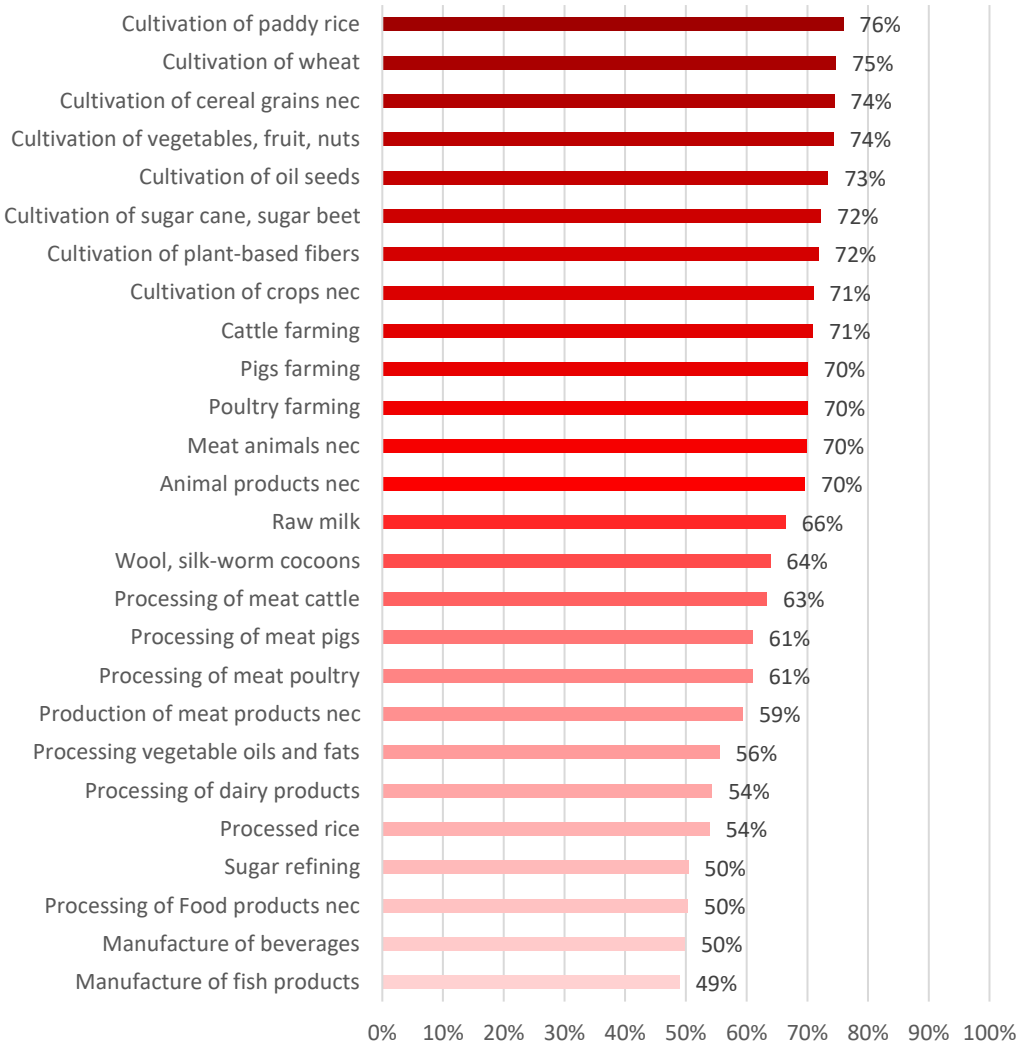


Figure 16: Food and Agriculture critical upstream dependency scores, broken down by EXIOBASE industry. The total sector critical dependency score is the average of the sector's industries' scores weighted by their turnover.

5. Trajectories for achieving international biodiversity targets

The Kunming-Montreal Global Biodiversity Framework (GBF) aims to reach at least a global no net loss of biodiversity in 2030 (interpreted as a global dynamic impact of 0 in 2030) and restore biodiversity between 2030 and 2050. CDC Biodiversité suggests interpreting the GBF using global MSA trajectories and distributing required efforts across economic sectors and companies. Four allocation systems encapsulate different ethical points of view that the society could consider when asking companies to contribute to biodiversity gains. This methodology focuses on the Scope 1 of each sector.

Table 10 below describes the data used in the calculation of each trajectory. Table 11 describes the demanded efforts for the Food and Agriculture sector for each of the four allocation systems. The dynamic impacts are expressed as a proportion of the 2020 dynamic impact of the sector (2020 is taken as the baseline year against which the trajectory is set). Finally, Figure 17 below represents the resulting impact reduction trajectories. General explanation about the Science-based targets is available in the general appendix.

The Food and Agriculture sector has a considerably high Scope 1 dynamic impact: 42 % of the total global dynamic impacts in 2020. This does not only affect the sovereignty trajectory but also all the others as the efforts are calculated in comparison with the 2020 dynamic impact of the sector. Therefore, to achieve similar reductions in dynamic impacts and comparable biodiversity gains as other, less impactful sectors, the Food and Agriculture sector will require less significant efforts due to its elevated 2020 dynamic impacts. As a result, the model targets a 2050 dynamic impact of -15 % relative to Food and Agriculture's 2020 dynamic impact for the efficiency allocation (Table 11), whereas less impactful sectors face significantly greater proportional reductions. For instance, the Wholesale and Retail sector is required to achieve a dynamic impact of -200,000 MSA.km² by 2050 under this efficiency trajectory, representing a substantial -27 000 % reduction compared to its 2020 dynamic impacts.

The four trajectory scenarios encapsulate different ethical points of view that society could consider when asking companies to contribute to biodiversity gains. The blue area on Figure 17 covers the wideness of the possible paths companies of the Food and Agriculture sector could have to follow to reach nature positive targets (CDC Biodiversité 2024). The sector could aim at reaching biodiversity gains between -15 % (efficiency allocation) and -1 800 % (sovereignty allocation) of its 2020 baseline in 2050.

Please note that for the efficiency allocation, only the absolute value of the restoration cost is expressed. Indeed, this measure is relevant when compared to the average restoration cost, weighted by the sector's turnovers, in absolute value. It encapsulates the sector's ease to achieve biodiversity gains by restoration.

Allocation	Approach	Parameter	Data source	Sector's figures	Comparison with global total
Equality	Everyone has the same right	Number of employees in the sector in Europe (thousand people)	Eurostat (2018)	**14 000**	**6.1 %** of the total global workforce
Efficiency	Cost-effectiveness	Cost of restoration (EUR/[MSA.m²])	CDC Biodiversité internal estimation	**10**	**5.5** global average (weighted by the sector's turnovers)
Capability	Industries' ability to pay	Turnover (MEUR)	EXIOBASE (2011)	**7 000 000**	**6.8 %** of the total global turnover
Sovereignty	Grandfathering	2020 dynamic impact (MSA.km²/year)	GBS computation	**104 000**	**42 %** of the total global 2020 dynamic impact

Table 10: Allocations and data used to draw sectoral trajectories.

Allocation	Absolute dynamic impact (MSA.km²)				%2020 dynamic impact of the sector		
Year	**2020**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Equality	104 000	0	-30 000	-260 000	0.0 %	-29 %	-250 %
Efficiency	104 000	97 000	84 000	15 000	93 %	81 %	-15 %
Capability	104 000	86 000	52 000	-210 000	83 %	50 %	-200 %
Sovereignty	104 000	0	-210 000	-1 800 000	0.0 %	-200 %	-1 800 %

Table 11: Food and Agriculture targeted absolute and relative dynamic impacts compared to its 2020 dynamic impacts, according to each allocation.

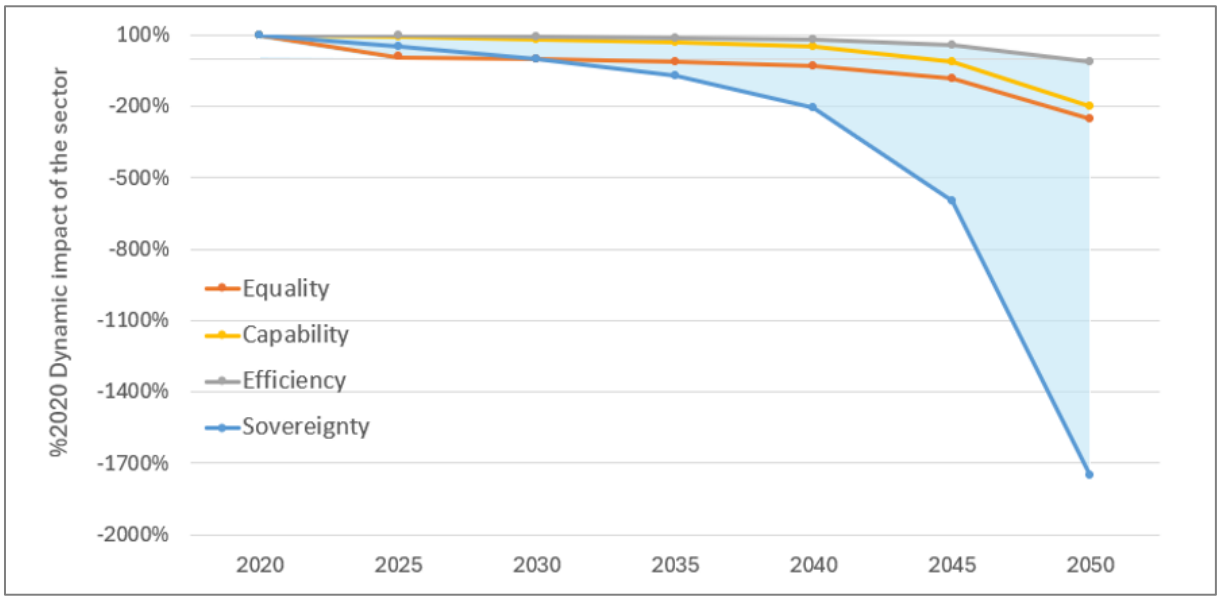


Figure 17: Targeted reduction of Food and Agriculture's dynamic impacts under different allocation systems

6. Biodiversity labels and certifications

6.1. Organic farming labels

Overview of the organic labels status

Organic farming has established itself as an important alternative to conventional farming, with consumers turning to it primarily for reasons of health, environmental protection and food safety and quality (Agence BIO 2024). While several definitions of organic farming exist, according to the International Federation of Organic Agriculture Movements (IFOAM) organic farming is a production system that preserves the health of soils, ecosystems, and people. It relies on ecological processes, biodiversity, and cycles adapted to local conditions, rather than on the use of inputs with harmful effects. IFOAM highlights that organic farming is a combination of tradition, innovation, and science, aimed at benefiting the environment, promoting fair relations, and ensuring a high quality of life for all stakeholders (IFOAM 2008).

Growth and Distribution of Organic Farmland

The global extent of organic farming has grown remarkably over the last two decades. According to a 2025 survey by FiBL (Research Institute of Organic Agriculture) and IFOAM, organic agricultural land covered 98.9 million hectares worldwide in 2023, representing 2.1% of total farmland. This marks a 2.6% increase compared to late 2022(FiBL and IFOAM – Organics International 2024). Notably, the growth of organic farmland has been substantial, expanding 6.6 times between 2000 and 2023 (FiBL and IFOAM 2025).

In 2023, Oceania led globally in organic farmland, representing over half of the world's total. Australia accounted for more than 99.7% of Oceania region's organic land, and 14.1% of the country's agricultural land is covered by organic land. It is primarily used for extensive grazing, with 48% of its organic exports going to the United States. Europe followed with 19.4 million hectares of organic farmland, trailed by Latin America, Asia, North America, and Africa. This distribution reflects the widespread adoption of organic practices across diverse regions (FiBL and IFOAM 2025).

Regulatory Frameworks for Organic Farming

The institutionalization of organic farming has also progressed significantly. As of 2022, 75 countries had fully implemented regulations governing organic farming, while 19 countries had established regulations that were not yet fully enforced. Additionally, 14 countries were in the process of drafting legislation to support organic agriculture (FiBL and IFOAM – Organics International 2024).

The table below details the choice of regulatory frameworks for our study on organic farming.

Label	Region	(FiBL and IFOAM 2025)
USDA Organic	USA	In 2023, the United States was the world's largest organic market, with retail sales of 59.0 billion euros, representing 43.2% of global organic retail sales.
Euroleaf	European Union	In 2023, the EU accounted for 34.1% of global organic retail sales, totalling 46.5 billion euros. This made EU the second-largest single market for organic products in the world (following the United States). 10.9% of the EU's total farmland was dedicated to organic farming.
AB	France	In 2023, France was the second European country with the largest organic farmland (2.8 million ha, including 1.5 million ha for arable crop), just behind Spain. It also held the second position in the European market with 12.1 billion euros in organic retail sales (behind Germany), and the fourth position world widely.
Bio-Siegel	Germany	In 2023, Germany was the largest organic market in Europe, with a total turnover of 16.1 billion euros, making it the second-largest organic market in the world after the United States. It also had the highest number of organic importers in Europe in 2022, totalling 1944 (FiBL and IFOAM – Organics International 2024).
Garanzia AIAB	Italy	In 2022, Italy had the third-largest organic farmland in Europe, covering 2.5 million hectares. It also led the EU in organic producers (84000) and processors (25000), out of 430000 and 89000 respectively.

Table 12: Factors influencing the selection of covered labels.

Euroleaf – European Union

The organic farming sector in the European Union has experienced significant growth in recent years, marked by an expansion in the area dedicated to organic cultivation, an increase in the number of organic holdings, and a rise in the overall number of registered organic operators (Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on Organic Production and Labelling of Organic Products and Repealing Council Regulation (EC) No 834/2007 2018). By 2023, over 430000 producers within the EU had obtained organic certification, reflecting the sector's development (FiBL and IFOAM 2025).

In the EU, organic products are distinguished by the **Euroleaf label**, which guarantees compliance with the Union's stringent organic farming standards. This label primarily emphasizes environmental sustainability and animal welfare criteria. However, it does not incorporate social criteria. The Euroleaf certification applies to a wide range of agricultural products, including both processed and unprocessed goods derived from crops and livestock—such as cattle, goats, sheep, poultry, pigs, and rabbits—as well as animal feed, seeds for cultivation, and wine (Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on Organic

Production and Labelling of Organic Products and Repealing Council Regulation (EC) No 834/2007 2018; 'Organic-Worldwide-2024.Pdf', n.d.).

The European Union's organic farming framework is governed by **Regulation (EU) 2018/848**, in force since January 1, 2022, which replaced the previous Regulation (EC) 834/2007. It is supplemented by various delegated acts, which provide detailed amendments and clarifications to the core regulation. These acts serve as "updates", ensuring the legislation remains relevant. Regulation (EU) 2018/848, the latest 2024 consolidated version incorporating the latest amendments (Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on Organic Production and Labelling of Organic Products and Repealing Council Regulation (EC) No 834/2007 2024), as well as a summary (European Parliament 2022) of the key points of this text are available online. In addition to the basic regulation, the EU has adopted several implementing regulations that specify how the principles and requirements of Regulation 2018/848 are to be applied in practice. These implementing regulations operate independently and are not integrated into the main text of the basic regulation. They provide detailed guidelines on topics such as production standards, certification processes, and labelling requirements, ensuring uniform implementation across member states.

For operators outside the European Union, a transition period has been granted from 1 January 2022 to 31 December 2024, to give them sufficient time to align their operations with the new regulatory framework. Since 1 January 2025, non-EU producers have been required to obtain EU-compliant organic certification under Regulation 2018/848 to export their organic products to the EU market.

The table below outlines the key requirements of the Euroleaf label that can contribute to the preservation and enhancement of biodiversity. Some comments by CDC Biodiversité discuss whether the requirements are binding or not, as well as how strictly they can be implemented through quantitative thresholds.

Paragraph		Requirements	CDC Biodiversité's comments
Chapter III – Production Rules			
Article 9 – General production rules		3. […] The following products and substances […] shall be allowed for use in organic production, provided that they are authorised pursuant to that Regulation: (a) safeners, synergists and co-formulants as components of plant protection products; (b) adjuvants that are to be mixed with plant protection products.	The composition of authorized products should be checked and combined with application thresholds.
		4. Ionising radiation shall not be used in the treatment of organic food or feed, and in the treatment of raw materials used in organic food or feed.	
Article 11 – Prohibition of the use of GMOs		1. GMOs, products produced from GMOs, and products produced by GMOs shall not be used in food or feed, or as food, feed, processing aids, plant protection products, fertilisers, soil conditioners, plant reproductive material, micro-organisms or animals in organic production.	
Annex II – Detailed production rules referred to in chapter III			
Part I: Plant production rules	1. General requirements	1.1 Organic crops, except those which are naturally grown in water, shall be produced in living soil, or in living soil mixed or fertilised with materials and products allowed in organic production, in connection with the subsoil and bedrock.	The Land use pressure is not necessarily reduced with organic rather than conventional agriculture.
	1.9. Soil management and fertilisation	1.9.2. The fertility and biological activity of the soil shall be maintained and increased: (a) except in the case of grassland or perennial forage, by the use of multiannual crop rotation including mandatory leguminous crops as the main or cover crop for rotating crops and other green manure crops; (b) in the case of greenhouses or perennial crops other than forage, by the use of short-term green manure crops and legumes as well as the use of plant diversity; and (c) in all cases, by the application of livestock manure or organic matter, both preferably composted, from organic production.	Crop rotation and the use of manure can reduce the need of synthetic fertilizer, and therefore pollution pressures. In addition, soil biodiversity is likely to benefit from these practices. However, GHG emissions linked to manure production and use should be compared with emissions of fertilizers production.
		1.9.3. Where the nutritional needs of plants cannot be met by the measures provided for in points 1.9.1 and 1.9.2, only fertilisers and soil conditioners that	The list of authorized fertilizers should be checked.

		have been authorised pursuant to Article 24 for use in organic production shall be used, and only to the extent necessary. […]	
		1.9.4. The total amount of livestock manure […] used in the in-conversion and organic production units shall not exceed 170 kg of nitrogen per year/hectare of agricultural area used. That limit shall only apply to the use of farmyard manure, dried farmyard manure and dehydrated poultry manure, composted animal excrement, including poultry manure, composted farmyard manure and liquid animal excrement.	The threshold of 170 kg per year and ha is not binding and cannot characterize organic agriculture. For instance, in the GBS, a pasture is considered man-made (ecosystem integrity of 30% MSA) if N-fertilizers (synthetic or manure) are spread. Therefore, the integrity level of an organic grassland can vary from 60% (moderately used) to 30% (intensively used). Regarding croplands, the latter are considered extensive in the GBS (ecosystem integrity of 30% MSA) when the quantity of N-fertilizers spread (synthetic or manure) is below 100 kg/ha (López Rodríguez et al. 2024; Kim et al. 2018), meaning that an organic cropland can be considered as intensive agriculture (ecosystem integrity between 5% and 10% MSA).
		1.9.6. Preparations of micro-organisms may be used to improve the overall condition of the soil or to improve the availability of nutrients in the soil or in the crops.	
		1.9.7. For compost activation, appropriate plant-based preparations and preparations of micro-organisms may be used.	
		1.9.8. Mineral nitrogen fertilisers shall not be used.	This requirement is binding and sets a quantitative threshold (prohibition). It should allow a reduction of pollution pressures. However, GHG emissions linked to manure production and use should be compared with emissions of fertilizers production.
	1.10. Pest and weed management	1.10.1. The prevention of damage caused by pests and weeds shall rely primarily on the protection by: natural enemies; the choice of species, varieties and heterogeneous material; crop rotation; cultivation techniques such as biofumigation, mechanical and physical methods; thermal processes such as	This requirement should allow the reduction of pollution pressures. However, the word “primarily” suggests that other methods could be allowed. Moreover, the suggested alternative methods may also negatively impact biodiversity. Mechanical and physical

		solarisation and, in the case of protected crops, shallow steam treatment of the soil (to a maximum depth of 10 cm).	methods require a more frequent use of machinery, which may increase GHG emissions.
Part II: Livestock production rules	1.7. Animal welfare	1.7.4. The number of livestock shall be limited with a view to minimising overgrazing, poaching of soil, erosion, and pollution caused by animals or by the spreading of their manure.	This requirement does not set quantitative thresholds and therefore does not allow to evaluate the possible impact reduction of such practices.

Table 13: Biodiversity-related requirements under Regulation (EU) 2018/848 on organic farming

Annex I – Rules on the stocking density and the minimum surface for indoor and outdoor areas for livestock […]	*This section contains tables with surface requirements for outdoor areas for bovine, ovine, caprine, equine, cervine, porcine animals, poultry and rabbits.*	

Table 14: Biodiversity-related requirements under Regulation (EU) 2020/464 consolidated text, laying down certain rules for the application of Regulation (EU) 2018/848 (source: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02020R0464-20211125&qid=1739270777225)

Requirements from national labels within the European Union

In the EU Member States, for products to be marketed under the organic label, their production must comply with the requirements of Regulation (EU) 2018/848. Although Euroleaf is the official EU label, countries have the option of creating national or private labels, provided that these meet at least the European standards and may include additional, stricter criteria. This multiplicity of labels, although intended to reinforce standards, can lead to confusion among consumers, who do not always understand the nuances between the different certifications and their specific requirements.
In EU Member States, for products to be in the market under the organic label, their while production has to comply with the requirements of Regulation (EU) 2018/848.

AB – France

The French AB (Agriculture Biologique) label predates the establishment of the Euroleaf certification and is managed by the French Ministry of Agriculture. It holds strong recognition and consumer trust within France and remains widely used. However, its use on product packaging is optional, as it closely aligns with the requirements set by Regulation (EC) 2018/848, which governs the Euroleaf label. As a result, the Euroleaf certification alone is generally sufficient for organic product labelling.
In the absence of specific European regulations, the Institut National de l'Origine et de la Qualité (INAO) has the authority to define national specifications for organic products. These specifications apply to all producers seeking to market their products as organic within the relevant categories. They include additional requirements for certain production methods, particularly for specific animal species (e.g., llamas, alpacas, ostriches, and snails), organic salt production, organic animal feed, and organic practices in commercial catering (Institut National de l'Origine et de la Qualité 2025).

On the other hand, the French AB label does not impose any requirements beyond those already set out in European regulation 2018/848, which would enable biodiversity to be preserved to a greater extent.

Bio-Siegel – Germany

Similarly, the German Bio-Siegel label, introduced in 2001 and managed by the Federal Ministry of Food and Agriculture is recognized and trusted within Germany. It aligns with Regulation (EU) 2018/848, and its use on packaging is optional (Controlunion 2025)

The Bio-Siegel label does not introduce any requirements in addition to those set out in the EU regulation that would be favourable to biodiversity. It focuses instead on maintaining alignment with the Euroleaf label while upholding its reputation as a trusted national certification.

Garanzia AIAB – Italy

The Italian **Garanzia AIAB** label, managed by the Associazione Italiana per l'Agricoltura Biologica (AIAB), represents a higher standard of organic certification compared to the baseline requirements of Regulation (EU) 2018/848 as products bearing this label must adhere to a set of stricter specifications.

An organic product guaranteed by AIAB (Associazione Italiana per l'Agricoltura Biologica) Italia follows a set of specifications with stricter rules than those set out in current European regulations on organic farming (AIAB 2025; 2020):

1. **100% organic farms**: The producing farms must comply with the organic farming products mandatory legislation over the entire farm area and for each animal reared.
2. **100% organic animal feed**.
3. **100% Italian raw materials**: Except for products like cocoa and coffee that cannot be cultivated in Italy, all agricultural and zootechnical raw materials must be of Italian origin.
4. The **ingredients of foreign origin are allowed in a maximum percentage of 35%** of the total agricultural ingredients. These must be certified organic, fair trade, and free from genetically modified organisms (GMOs).

The Garanzia AIAB label goes beyond the European organic standards by emphasizing local production, traceability, and ethical sourcing. While it does not introduce biodiversity-specific requirements beyond Regulation (EU) 2018/848, it emphasizes sustainability and environmental respect in general terms.

USDA Organic

The United States' organic farming framework is governed by the **USDA National Organic Program (NOP)** and codified in **7 CFR Part 205**. To be certified organic, producers must comply with the requirements outlined in the NOP regulations, which cover areas such as soil fertility, crop management, livestock practices, and the use of approved substances. These standards are notably designed to conserve biodiversity.
The full text of the NOP regulations, including the latest amendments, is available online in the Electronic Code of Federal Regulations (eCFR) under Title 7, Subtitle B, Chapter I, Subchapter M, Part 205.

This label is broadly aligned with the European label, but certain USDA organic certification criteria differ from those of the European Union. These differences may relate to authorised substances, production methods and certification processes, reflecting different priorities and approaches to organic farming in each region.

The table below outlines the key requirements of the USDA Organic label that can contribute to the preservation and enhancement of biodiversity. As for the Euroleaf label, some comments by CDC Biodiversité discuss whether the requirements are binding or not, as well as how strictly they can be implemented through quantitative thresholds.

Paragraph	Requirements	CDC Biodiversité's comments
Subpart B - Applicability		
205.105 Allowed and prohibited substances, methods, and ingredients in organic production and handling.	To be sold or labeled as "100 percent organic," "organic," or "made with organic (specified ingredients or food group(s))," the product must be produced and handled without the use of:	This requirement is binding and sets quantitative thresholds (prohibition) that should allow a reduction of pollution pressures.
	(a) Synthetic substances and ingredients, except as provided	
	(b) Nonsynthetic substances prohibited	
	(f) Ionizing radiation […]; and	
	(g) Sewage sludge.	
Subpart C – Organic Production and Handling Requirements		
205.202 Land requirements.	Any field or farm parcel from which harvested crops are intended to be sold, labeled, or represented as "organic," must: (c) Have distinct, defined boundaries and buffer zones such as runoff diversions to prevent the unintended application of a prohibited substance to the crop or contact with a prohibited substance applied to adjoining land that is not under organic management.	The buffer zone should be clearly defined to ensure prohibited substances do not meet organic production.
205.203 Soil fertility and crop nutrient management practice standard.	(a) The producer must select and implement tillage and cultivation practices that maintain or improve the physical, chemical, and biological condition of soil and minimize soil erosion.	This requirement should allow the preservation of soil-related ecosystem services but lacks quantitative thresholds and binding implementation rules.
	(b) The producer must manage crop nutrients and soil fertility through rotations, cover crops, and the application of plant and animal materials.	The use of manure can reduce the need of synthetic fertilizer, and therefore pollution pressures. However, GHG emissions linked to manure production and use should be compared with emissions of fertilizers production.
	(c) The producer must manage plant and animal materials to maintain or improve soil organic matter content in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, pathogenic organisms, heavy metals, or residues of prohibited substances.	This requirement should allow the preservation of soil-related ecosystem services and reduce pollution pressures but lacks quantitative thresholds.

	(e) The producer must not use: (1) Any fertilizer or composted plant and animal material that contains a synthetic substance not included on the National List of synthetic substances allowed for use in organic crop production; (2) Sewage sludge (biosolids) […]; and (3) Burning as a means of disposal for crop residues produced on the operation: Except, That, burning may be used to suppress the spread of disease or to stimulate seed germination.	This requirement is binding and sets quantitative thresholds (prohibition) that should allow a reduction of pollution pressures.
205.205 Crop rotation practice standard.	The producer must implement a crop rotation including but not limited to sod, cover crops, green manure crops, and catch crops that provide the following functions that are applicable to the operation:	Same effect as 205.203
	(a) Maintain or improve soil organic matter content;	
	(b) Provide for pest management in annual and perennial crops;	
	(c) Manage deficient or excess plant nutrients; and	
	(d) Provide erosion control.	
205.207 Wild-crop harvesting practice standard.	(b) A wild crop must be harvested in a manner that ensures that such harvesting or gathering will not be destructive to the environment and will sustain the growth and production of the wild crop.	This requirement does not set quantitative thresholds or binding implementation rules.
205.239 Mammalian and non-avian livestock living conditions.	(a) The producer of an organic livestock operation must establish and maintain year-round livestock living conditions, which accommodate the wellbeing and natural behavior of animals, including: (5) The use of yards, feeding pads, feedlots and laneways that shall be well-drained, kept in good condition (including frequent removal of wastes), and managed to prevent runoff of wastes and contaminated waters to adjoining or nearby surface water and across property boundaries. (6) Housing, pens, runs, equipment, and utensils shall be properly cleaned and disinfected as needed to prevent cross-infection and build-up of disease-carrying organisms.	
	(e) The producer of an organic livestock operation must manage manure in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, heavy metals, or pathogenic organisms and optimizes recycling of nutrients and must manage pastures and other outdoor access areas in a manner that does not put soil or water quality at risk.	Same as 205.203 (c)
205.240 Pasture practice standard.	(c) A pasture plan must be included in the producer's organic system plan, and be updated annually […] The pasture plan shall include a description of the: (7) Soil fertility and seeding systems. (8) Erosion control and protection of natural wetlands and riparian areas practices.	This requirement is not binding enough and does not ensure that the plan is effectively implemented. However, if implemented properly, the plan should

		allow the preservation of soil quality and erosion control ecosystem services
205.241 Avian living conditions.	(e) Manure management. The producer of an organic poultry operation must manage manure in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, heavy metals, or pathogenic organisms. The producer must also optimize recycling of nutrients and must manage outdoor access areas in a manner that does not put soil or water quality at risk.	Same as 205.203 (c)

Table 15: Biodiversity-related requirements for the USDA Organic label.

Studies carried out to assess the relevance and performance of organic labels

Organic farming is a well-established production method and has been extensively studied over the past decades, with numerous studies and meta-analyses conducted to evaluate its impacts. These analyses have significantly contributed to the credibility of organic labels by substantiating the environmental benefits they claim to offer.

A comprehensive meta-analysis published in 2015, which examined 396 studies, found that 80% of comparisons indicated significantly higher biodiversity in organic farming compared to conventional methods, while 16% showed no significant differences, and only 4% reported lower biodiversity in organic systems (Bavec and Bavec 2015). On average, organic farming was found to increase species richness by approximately 30% (Tuck et al. 2014). This positive effect has remained consistent over 30 years of research. The study also highlighted that the impact of organic farming on biodiversity varies depending on species and landscapes. Specifically, the benefits of organic farming were more pronounced in intensively managed landscapes, and the impact varied across different organism groups and crops (Tuck et al. 2014). Additionally, the positive effects on biodiversity were greater as the proportion of arable fields in the landscape increased (Bavec and Bavec 2015).

The International Federation of Organic Agriculture Movements (IFOAM) emphasizes that research has demonstrated organic systems' ability to support biodiversity conservation, as it has notably positively impacted the diversity and density of pollinators, beneficial insects, plants, and herbivores. Additionally, organic farming has been linked to increased species diversity, higher numbers of individuals, and improved reproduction rates of wild bees (IFOAM Organics Europe 2022).

In conclusion, the studies confirm the positive impact of organic farming on biodiversity, with an average increase in species richness of 30%, although this impact may vary depending on the specific context. While the majority of studies have focused on Northern and Western Europe and North America (Bavec and Bavec 2015), there is a recognized need for further research in tropical, subtropical, and Mediterranean climates (Tuck et al. 2014). This underscores the importance of continuing to investigate the biodiversity benefits of organic farming on a global scale, despite the substantial existing evidence.

Moreover, research into other labels within the Food and Agriculture sector is essential. Such efforts would not only enhance the credibility of these labels by guaranteeing their effectiveness, but also reduce consumer confusion by establishing clearer distinctions between the different certifications. This approach would ultimately support more informed consumer choices and promote sustainable agricultural practices.

Land sharing and land sparing

Organic farming has been shown to enhance biodiversity at the field level by reducing pesticide use, promoting crop diversification, and incorporating habitat-supporting features such as hedgerows and flower strips (IFOAM Organics Europe 2022). However, biodiversity assessments often focus on impacts per hectare, whereas evaluating biodiversity per unit of food produced presents a more complex picture. Organic farming typically requires more land to achieve yields comparable to conventional methods (Fraanje et al. 2018; Knapp and van der Heijden 2018), raising concerns about indirect land-use changes and associated biodiversity losses elsewhere. Indeed, 90% of tropical deforestation is linked to agricultural expansion (Textile Exchange 2023). This highlights the **land sharing versus land sparing debate**, which seeks to determine the most effective strategy for biodiversity conservation at the landscape scale.

The **land sharing** model, with which organic farming is often associated, integrates agroecological practices within agricultural lands, benefiting common species adapted to farmland environments (e.g., skylarks, butterflies) (Goulart et al. 2016; Bateman and Balmford 2023). However, its effectiveness is limited for specialized or threatened species that depend on large, continuous habitats (Phalan 2018). Additionally, given current consumption patterns, lower yields in agroecological farming systems may increase reliance on food imports, potentially driving environmentally damaging agricultural practices in other regions (Phalan 2018). Thus, any agroecological policy that results to yield reductions must account for this challenge and specify mitigation strategies, such as reducing overall consumption or managing the expansion of agricultural land.

Importantly, food imports resulting from lower domestic yields are not aimed at addressing global food security challenges. Hunger today is primarily an issue of access rather than insufficient production, as one-third of food intended for human consumption is lost or wasted (FAO 2015), and 40% of global cropland is dedicated to animal feed rather than direct human consumption (Ritchie and Roser 2019). Current import patterns reflect market demand rather than a fundamental necessity for food availability.

The **land sparing** approach focuses on increasing agricultural productivity on a smaller land area to restore and preserve larger areas of natural habitat. Some studies showed that high-yield farming combined with land sparing practices increases populations of wild threatened species (especially birds, insects and plants) more than does land sharing. Indeed, this approach favours rewilding, which benefits to many vulnerable species by reconstructing large habitats (Bateman and Balmford 2023). However, higher agricultural yields often lead to lower food prices, which can increase consumer demand. As consumption rises, production must expand to meet this growing demand, potentially driving the conversion of natural habitats into farmland (Fraanje et al. 2018). This phenomenon, known as the rebound effect, risks undermining the initial land savings intended for biodiversity conservation, as the pressure to convert additional natural habitats into agricultural land could persist or even intensify. To address this challenge, it is essential to implement **complementary policy measures**, such as land-use planning, limits on unnecessary production expansion, and strategies to curb overconsumption and regulate demand. Without such measures, the potential benefits of land sparing for biodiversity conservation may be significantly diminished.

Numerous studies have assessed the behaviour of species under these different agricultural strategies across various regions (Bateman and Balmford 2023), highlighting that the optimal balance between land sharing and land sparing depends on **ecological, socio-economic, and regional factors**. Rather than a strict dichotomy, an integrated approach tailored to local conditions is often recommended. A report from the UN Food Systems Summit's Scientific Committee advocates for a dual strategy: preventing agricultural expansion into intact ecosystems and restoring 15% of converted lands in priority areas to avoid up to 60% of expected extinctions (land sparing), while simultaneously maintaining at least 10–20% of semi-natural habitat per square kilometre to support ecosystem functions (land sharing) (DeClerck et al. 2023).

Land-sparing, by favouring the restoration of large natural spaces, would benefit to wild endangered species that need wide habitats (Bateman and Balmford 2023). Conversely, in regions where traditional agricultural landscapes support species adapted to low-intensity farming, land sharing may be more appropriate (Académie d'Agriculture de France 2023). However, neither strategy alone can fully address the global biodiversity crisis without tackling its underlying driver, which are **unsustainable consumption patterns**. Indeed, to meaningfully reduce agriculture's impacts on biodiversity, systemic changes in consumption are required. Reducing food waste, shifting toward less resource-intensive diets, and supporting sustainable food systems are critical levers for decreasing the overall demand for agricultural land. Ultimately, the decision between sharing and sparing strategies should be guided by local contexts, but the global solution lies in transforming how we produce, consume, and value food.

6.2. Other commodities labels

This paragraph relies on the position paper on labels published by CDC Biodiversité, entitled "Aligning labels with biodiversity frameworks: a call for quantitative and science-based approaches" (CDC Biodiversité 2025).

Environmental labels are designed to promote sustainability and are an important tool for companies to reduce their environmental footprint. Indeed, once companies have identified the most material commodities of their value chain, they often choose to select labelled products to initiate a process of impact reduction. However, one of the key criteria for labels to allow substantial and trackable impact reduction is the definition of quantitative thresholds. These ensure the effects of labels on biodiversity are measurable and can be integrated in a global impact reduction strategy (CDC Biodiversité 2025).

In this context, CDC Biodiversité assessed the relevance and the scientific robustness of 4 agricultural labels: RSPO (Palm Oil), Rainforest Alliance (Cocoa), RTRS (Soy) and Better Cotton (Cotton). For each label, the requirements have been classified according to the biodiversity aspect they target (pressures, ecosystem

services, species, protected areas, etc). Then, each requirement has been rated according to the following criteria:

- Are all the terms defined? This is necessary to ensure there is no misinterpretation of the requirement.
- Is a quantitative threshold defined? This is necessary to allow measurable impact reductions.
- Is the requirement binding? A requirement may set quantitative thresholds but not impose any constraint beyond existing regulations, which makes it inefficient.

An assessment grid was defined to rate the four labels following these criteria. Overall, the labels give precise definitions of the concepts they rely on but lack quantitative thresholds and are often not binding enough. However, the rating methodology could integrate the materiality for biodiversity aspects specific to each commodity *(e.g.* water use for cotton, land use for palm oil, etc). At the moment, it also does not take into account important criteria of label relevance, such as the label governance, potential scientific studies on the environmental outputs resulting of the use of labels, as well as requirements about traceability of targeted commodities. All these aspects must be present to ensure effective and measurable impact reductions and benefits for biodiversity.

7. Regenerative agriculture

7.1. Why talk about regenerative agriculture today?

Agriculture is an important driver of exceeding planetary boundaries, such as biochemical flows or biosphere integrity (Campbell et al. 2017). Therefore, there is an increasing demand for sustainable agricultural practices (Regeneration International, n.d.). In this regard, a variety of terms are used to describe food system transformations in global policy and development spaces (IPES Food 2022), such as agroecology, sustainable agriculture, and conservation agriculture. Among these, the term regenerative agriculture has emerged as a concept that aims not only to minimize environmental harm but also to contribute positively to ecosystems. However, the abundance of agricultural principles and concepts has led to significant confusion in public discourse.

The concept of regenerative agriculture is becoming increasingly widespread. In October 2023, the World Benchmarking Alliance (WBA) released its second iteration of the Food and Agriculture Benchmark, which ranks the sustainability performances of the 350 most influential companies. A key finding from this report is that regenerative agriculture has gained significant traction since their first iteration in 2021, particularly in terms of input use, with 51% of the assessed companies referencing it (World Benchmarking Alliance 2023). Additionally, an analysis of the frequency of regenerative agriculture in academic literature highlights its growing popularity over time, demonstrating that the concept has experienced a rapid and recent expansion (IPES Food 2022). The objective here is to explore the topic of regenerative agriculture and provide an overview of its current challenges and implications

7.2. The concept of regenerative agriculture

Regenerative agriculture is a holistic approach to farming that aims to restore and enhance ecosystems while producing food sustainably. According to the Chesapeake Bay Foundation, as shared by the FAO, regenerative agriculture is defined as “holistic farming systems that, among other benefits, improve water and air quality, enhance ecosystem biodiversity, produce nutrient-dense food, and store carbon to help mitigate the effects of climate change” (Chesapeake Bay Foundation 2020). This concept stands out as it goes beyond merely reducing environmental impacts, focusing instead on actively restoring ecosystems. Regeneration International further elaborates on this, describing regenerative agriculture as farming and grazing practices that reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity, leading to carbon drawdown and improved water cycles. They emphasize that regenerative systems benefit the environment, soil, plants, animal welfare, health, and communities, contrasting sharply with degenerative practices that harm these

aspects (Regeneration International 2023). Regenerative agriculture is usually grounded in five or six key principles that distinguish it from traditional or organic farming practices.

These principles include (Chesapeake Bay Foundation 2020; Regeneration International, n.d.; Giller et al. 2021):

- understanding the context of the farm operation,
- minimizing soil disturbance,
- maximizing crop diversity,
- keeping the soil covered,
- maintaining living roots year-round,
- and integrating livestock.

These principles collectively aim to create resilient agricultural systems that not only sustain but also regenerate natural resources. A number of regenerative agriculture practices are closely linked to agroecology, some principles of which some authors consider to be the foundation of regenerative agriculture, notably relatively to soil and biodiversity conservation (ReSoil 2025; Duru et al. 2022) .

However, the definition of regenerative agriculture may vary from a user to another. In their study “What Is Regenerative Agriculture? A Review of Scholar and Practitioner Definitions Based on Processes and Outcomes”, Newton and al. classify the uses of the “regenerative agriculture” expression thanks to a meta-analysis. Across the different papers they analyzed, some of them talk about the concept of regenerative agriculture without giving any definition of it. Others use a “process-based” definition, focusing on a list of agricultural practices that are included or excluded. Another identified definition type is “outcome-based”, focusing agricultural outcomes (such as changes in soil carbon, biodiversity, etc). Finally, definitions may mix both process and outcome points of view (Newton et al. 2020). The following section therefore focuses on the challenges of this lack of a precise definition.

7.3. The ambiguity and challenges of defining regenerative agriculture

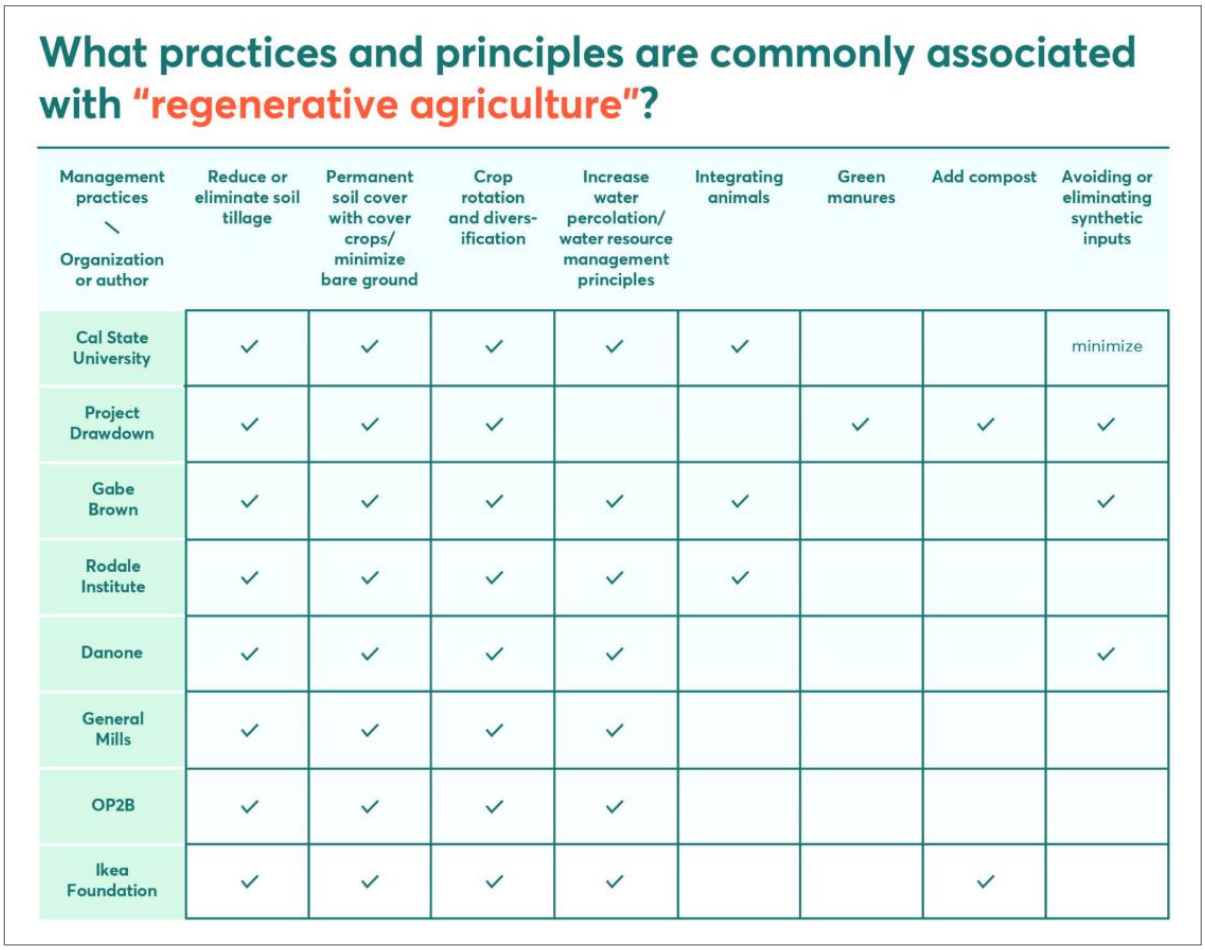
Oof the most significant challenges facing regenerative agriculture today is the lack of a clear and universally accepted definition. Unlike more established agricultural systems, regenerative agriculture is not governed by a consortium or a standardized framework, leaving its interpretation open to debate. While the term is increasingly used, it is often employed as a broad descriptor for sustainable farming practices rather than being precisely defined by scientific institutions. This ambiguity raises significant concerns about what truly constitutes regenerative agriculture and whether its practices deliver the promised environmental benefits.

The lack of a clear definition

Different organizations and corporations have proposed their own definitions, further complicating the landscape. According to IPES Food, regenerative agriculture has become a prominent term in corporate sustainability schemes, but it is often subject to "often-detailed but rarely comprehensive or consistent definitions," serving as a catch-all for practices focused on soil conservation and greenhouse gas mitigation (IPES Food 2022). Similarly, the Food and Land Use Coalition highlights that "there is no universally accepted definition of regenerative agriculture in the literature” and emphasizes the need for an outcome-based framework to measure, assess, and scale regenerative practices effectively (Food and Land Use Coalition 2023).

The absence of a precise definition means it is unclear which practices genuinely qualify as regenerative and which do not. Without quantified goals for biodiversity regeneration or environmental impact reduction, there is no guarantee that regenerative agriculture is achieving its intended outcomes. For example, among the 51% companies the World Benchmarking Alliance (WBA) found referencing to regenerative agriculture, only 9% disclosed data on optimizing fertilizer use, and a mere 4% reported on minimizing pesticide use (World Benchmarking Alliance 2023). This lack of transparency underscores the importance of quantifiable metrics to ensure accountability.

The table **Erreur ! Source du renvoi introuvable.** provided in the Food and Land Use Coalition's 2023 report i llustrates this confusion well. It groups various concepts and practices associated with regenerative agriculture, demonstrating the absence of a clear, unified definition. This visual representation highlights the fragmented nature of the term and the challenges it poses for implementation and evaluation.



Management practices \ Organization or author	Reduce or eliminate soil tillage	Permanent soil cover with cover crops/ minimize bare ground	Crop rotation and divers-ification	Increase water percolation/ water resource management principles	Integrating animals	Green manures	Add compost	Avoiding or eliminating synthetic inputs
Cal State University	✓	✓	✓	✓	✓			minimize
Project Drawdown	✓	✓	✓			✓	✓	✓
Gabe Brown	✓	✓	✓	✓	✓			✓
Rodale Institute	✓	✓	✓	✓	✓			
Danone	✓	✓	✓	✓				✓
General Mills	✓	✓	✓	✓				
OP2B	✓	✓	✓	✓				
Ikea Foundation	✓	✓	✓	✓			✓	

Figure 18: What practices and principles are commonly associated with "regenerative agriculture"? Source: Food and Land Use Coalition, 2023

The lack of a clear definition also makes it easy to confuse regenerative agriculture with other similar concepts like sustainable agriculture and agroecology. As noted by IPES Food, in UNFSS (UN Food Systems Summit) material, regenerative agriculture often appeared as a generic descriptor or even as part of the definition of nature-positive solutions. It was sometimes used interchangeably with 'sustainable agriculture'" (IPES Food 2022). This fluidity in terminology can lead to confusion and dilution of the concept's original intent.

The table below, included in the 2023 Food and Land Use Coalition report, illustrates how regenerative agriculture relates to other agricultural systems, emphasizing the overlap and interchangeability of these terms.

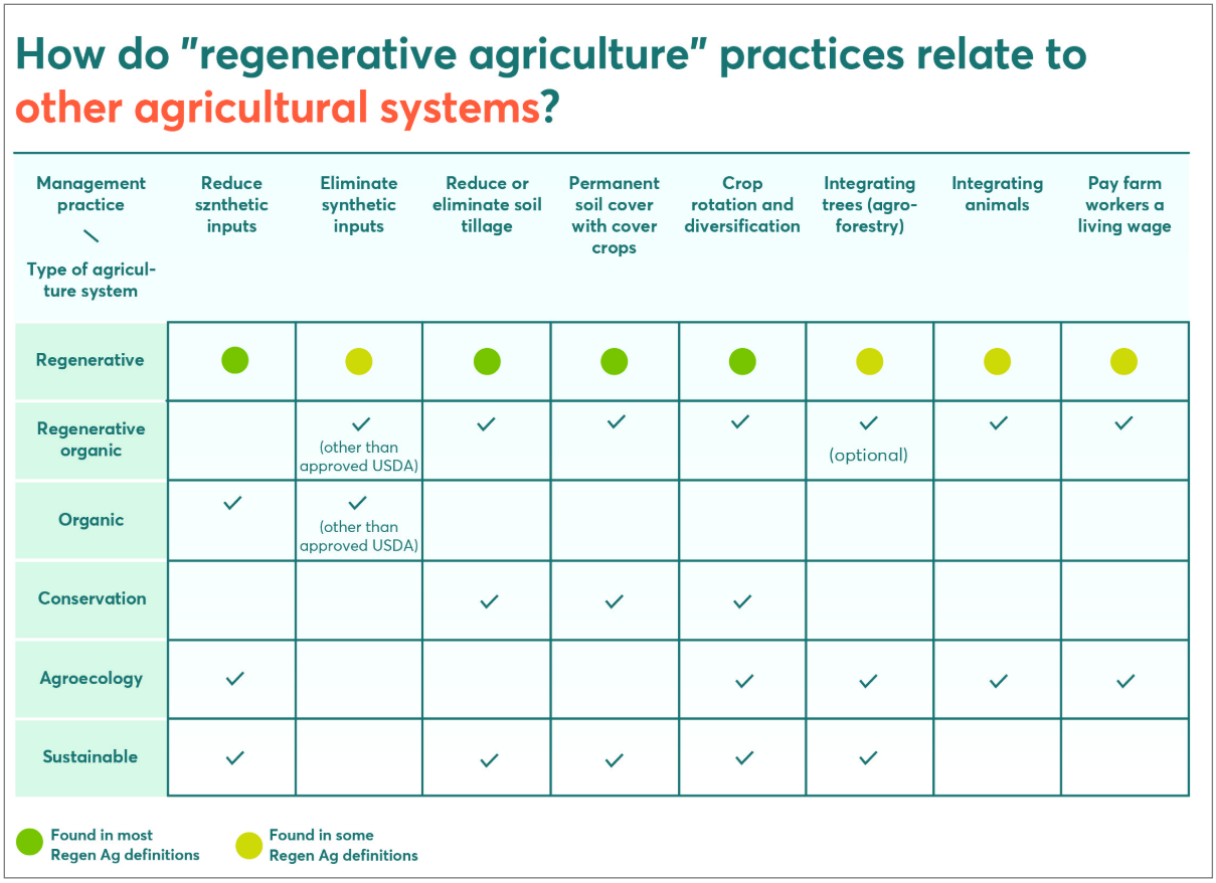


Figure 19: How do "regenerative agriculture" practices relate to other agricultural systems? Source: Food and Land Use Coalition, 2023

Corporate use and potential greenwashing

The undefined nature of regenerative agriculture allows actors to use it as an image management strategy, hiding behind a term without a comprehensive framework for systemic change. Major agrifood companies are actively promoting the concept of regenerative agriculture. Companies like Nestlé, PepsiCo, and Archer-Daniels-Midland (ADM) have unveiled strategies to adopt regenerative agriculture practices on a large scale (Nestlé 2025; PepsiCo 2025; ADM 2025). In the same vein, Walmart's CEO has stated, "We aim to take a significant part in reshaping global supply chains to make them regenerative" (IPES Food 2022).

This potential for greenwashing is a significant concern. Without clear definitions and quantifiable goals, companies can claim to be adopting regenerative practices without delivering measurable environmental benefits.

7.4. Benefits on biodiversity

The reversal of biodiversity loss is one of the key challenges of regenerative agriculture and is part of the definition of such practices (Giller et al. 2021; Chesapeake Bay Foundation 2020). Two studies ((Food and Land Use Coalition 2023; Giller et al. 2021) focus on the actual outcomes on biodiversity of several regenerative agriculture practices. The Food and Land Use Coalition's study relies on 127 meta-analytic reviews while Giller et al. synthetize the findings of three other research papers on the subject (Food and Land Use Coalition 2023; Giller et al. 2021; Burgess et al. 2019; McGuire 2018).

According to the two studies, some agricultural practices are significantly beneficial to biodiversity:

- Permaculture and cover crops that maintain soil cover: cover crops are shown increase the soil microbial community abundance and structure as well as the animal and plant diversity.
- Agroforestry, silvopasture or tree crops: agroforestry is said to enhance richness and abundance of animal and plant species.
- Crop rotation or multiple-species cover crops which foster plant diversity: crop-rotation and intercropping increase soil microbial community abundance, richness and diversity; Intercropping would also enhance animal (including pollinator, natural enemy and pests) species richness (among which pollinator) richness and abundance.
- Embedded natural structures would favor crop diversity, non-domesticated species richness, abundance and evenness for species like birds, insects, bacteria, fungi and mammals.

Many of these practices are also cited among agroecological ones: permaculture, agroforestry, cover or multi-species crops for instance (Ferguson and Lovell 2014; Jeanneret et al. 2021; Bezner Kerr et al. 2023).

Other practices appear to be neutral, meaning that no positive nor negative effect on biodiversity is observed. This is for instance the case for cultivar mixtures (planting several varieties of the same species in a field), organic agriculture, reducing the use of mineral fertilizers as well as using organic ameniments (manure, mulch, biogas residue), which maintain biodiversity richness and abundance at their current level.

Finally, the outcomes on biodiversity of some practices have not been demonstrated, as is the case for integrated crop-livestock systems (for instance rotational grazing or pasture cropping) or soil inoculation of fungi and rhizobacteria. However, these practices remain interesting from other points of view, such as yield for cultivar mixtures or carbon sequestration for organic agriculture and the use of organic ameniments (Food and Land Use Coalition 2023; Giller et al. 2021).

The Food and Land Use Coalition highlights some recommendations for further research regarding biodiversity: include more countries of the Global South in the evidence base and a wider variety of farming systems; include evidence that clarify the link between biodiversity and yield over time by looking at soil biodiversity and not only surface biodiversity; include the effects on broader landscape and not only at the farm level; Include consistent metrics to better compare a study to another as well as ensure all important biodiversity aspects are covered (richness, abundance, evenness, etc) (Food and Land Use Coalition 2023).

Overall, the regenerative agriculture concept encapsulates many practices, which seem to provide positive biodiversity outcomes and at least improve climate and soil-related ecosystem services provision, which contributes to the overall health of ecosystems.

7.5. How to promote large-scale regenerative agriculture

The Food and Land Use Coalition (FOLU) has identified "scaling productive and regenerative agriculture" as one of the ten critical transitions to transform food and land use (Food and Land Use Coalition 2019). The FOLU lists some levers to increase regenerative agriculture spread, involving not only farmers, but public actors and financial institutions. The main proposed actions are the following:

- “Shift agricultural subsidies towards regenerative farming”: e.g. reducing support to market prices for chemical fertilizers; reorient “perverse subsidies” as payment for farmers who contribute the ecosystem services regeneration.
- “Use other public finance to incentivise regenerative farming”: e.g. taxing non-responsible practices or subsidizing ecological ones; show example to citizens through public procurement from regenerative agriculture sources.
- “Share information through better open-source networks and training”: e.g. providing traingins for specific farmers contexts, favouring farmer-to-farmer peer-learning,

- "Increase R&D spending and innovation": e.g. in bio-fertilizers, Internet of Things technologies, irrigation water recycling systems.
- "Engage business and investors": e.g. for businesses, make long-term investments in farmers that favor natural capital protection for businesses and choose procurement models that encourage regenerative agriculture.

On top of that, studies and research should be promoted to assess the actual outcomes of regenerative agriculture practices on the environment, and especially on biodiversity. Quantified measurements would allow businesses and financial institutions in the agricultural sector to integrate these practices in the construction of trajectories to reduce negative impacts as well as generating positive impacts on biodiversity.

D. EUROPEAN REGULATION

1. The EU Taxonomy

The EU taxonomy is a core element of the EU's sustainable finance framework, enhancing market transparency by directing investments toward activities critical for the transition. It is a classification system providing science-based criteria for economic activities aligned with a net-zero trajectory by 2050 and the broader environmental goals than climate (Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the Establishment of a Framework to Facilitate Sustainable Investment, and Amending Regulation (EU) 2019/2088 (Text with EEA Relevance) 2020).

Benchmark sectors studied by CDC Biodiversité generally align with the activities covered by the EU taxonomy. However, activities within the Food and Agriculture sector are excluded from the taxonomy's scope as they are not considered to contribute to any of the six climate and environmental objectives set out below.

Indeed, in order to qualify as environmentally sustainable, activities should contribute to at least one of the six climate and environmental objectives (Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the Establishment of a Framework to Facilitate Sustainable Investment, and Amending Regulation (EU) 2019/2088 (Text with EEA Relevance) 2020):

1. Climate change mitigation
2. Climate change adaptation
3. Sustainable use and protection of water and marine resources
4. Transition to a circular economy
5. Pollution prevention and control
6. Protection and restoration of biodiversity and ecosystems

The Taxonomy Regulation also sets out 4 overarching conditions that an economic activity must:

1. Making a substantial contribution to at least one environmental objective
2. Doing no significant harm to any of the other five environmental objectives
3. Complying with minimum safeguards
4. Complying with the technical screening criteria set out in the Taxonomy delegated acts

2. EU Farm to Fork strategy

In May 2020, the European Commission introduced the **Farm to Fork Strategy** as part of the **European Green Deal**, outlining a comprehensive policy framework to transition toward sustainable food systems. The strategy aims to establish a fair, healthy, and environmentally-friendly food system notably by reversing the loss of biodiversity (European Commission 2020b).

The strategy outlines a holistic approach to transforming the food chain to benefit consumers, producers, the climate, and the environment. Its key objectives include ensuring sustainable food production and security, promoting sustainable practices across food processing, wholesale, retail, hospitality, and food services, and encouraging sustainable consumption patterns by facilitating the shift to healthy, eco-friendly diets. Additionally, it targets the reduction of food loss and waste and aims to combat food fraud across the supply chain to ensure transparency and integrity.

While not yet fully enshrined in mandatory regulations, the strategy identifies key actions targeting various stages of the food supply chain, from production to consumption, as well as measures to minimize food loss and waste (European Commission 2020a). Key targets to be achieved by 2030 include (European Commission 2020b):

- Reducing the use and risk of chemical pesticides and the use of more hazardous pesticides by 50%
- Reducing nutrient losses by at least 50% while ensuring no deterioration in soil fertility. This will reduce the use of fertilizers by at least 20%
- Reducing by 50% the sales of antimicrobials for farmed animals and in aquaculture
- Reaching at least 25% of the EU's agricultural land under organic farming

3. EU Circular Economy Action Plan

In March 2020, The European Commission published A new Circular Economy Action Plan For a cleaner and more competitive Europe to announce a European policy framework to transition towards sustainable value chains. It is part of the European Green Deal and aims at setting norms and sustainable business models to avoid waste generation, reduce resource consumption and greenhouse gases emissions. The initiatives are not yet part of a mandatory regulation, but the plan already lists examples of actions that will be part of a policy framework, at different steps of products life cycle and for different kinds of products. The actions not only target economic actors, but also consumers and citizens organizations. Key products have been identified as a priority in terms of waste generation reduction. Further actions should be put in place to set a robust second-hand raw materials market within the EU. The plan is part of the EU's drive to promote the circular economy at a global level, as in the 2030 Sustainable Goals. (COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A New Circular Economy Action Plan For a Cleaner and More Competitive Europe 2020).

This new action plan tackles the entire value chain of products and covers the Food and Agriculture sector as the Food, water and nutrients product group was identified for its environmental impact and circularity potential.

The following part of the EU Circular Economy Action Plan describes the specific actions that can be set for the Food, water and nutrients key product, as well as the Packaging key product as it participates in the food and beverage manufacturing processes. The boxes contain the text directly extracted from the EU Circular Economy Action Plan.

Food, water and nutrients

While the food value chain is responsible for significant resource and environmental pressures, an estimated 20% of the total food produced is lost or wasted in the EU. Therefore, in line with the Sustainable Development Goals and as part of the review of Directive 2008/98/EC38 referred to in section 4.1, the Commission will propose a **target on food waste reduction**, as a key action under the forthcoming EU Farm-to-Fork Strategy, which will address comprehensively the food value chain.

The Commission will also consider specific measures to increase the **sustainability of food distribution and consumption**. Under the sustainable products initiative, the Commission will launch the analytical work to

determine the scope of a legislative initiative on **reuse to substitute single-use packaging, tableware and cutlery by reusable products** in food services.

The new Water Reuse Regulation will encourage circular approaches to **water reuse in agriculture**. The Commission will facilitate water reuse and efficiency, **including in industrial processes.**

Furthermore, the Commission will develop an Integrated Nutrient Management Plan, with a view to ensuring **more sustainable application of nutrients and stimulating the markets for recovered nutrients**. The Commission will also consider reviewing directives on wastewater treatment and sewage sludge and will assess natural means of nutrient removal such as algae.

Packaging

The Commission's objective is to allow only reusable or recyclable packaging in the EU market by 2030. A directive to set packaging requirement is to come, tackling the following issues:

- **reducing (over)packaging and packaging waste**, including by setting targets and other waste prevention measures;
- driving design for re-use and recyclability of packaging, including considering **restrictions on the use of some packaging materials for certain applications**, in particular where **alternative reusable products** or systems are possible or **consumer goods can be handled safely without packaging;**
- considering **reducing the complexity** of packaging materials, including the number of materials and **polymers** used.

The Commission will establish rules for the safe recycling into food contact materials of plastic materials other than PET. […]

4. EU Pesticide regulation

The European Parliament adopted in October 2009 the **Regulation 1107/2009**, a text regulating the sale, use and control of **plant protection products** within the European Union. It is complemented by the sustainable use directive (Directive 2009/128/EC) which sets out rules for the sustainable use of pesticides (Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 Establishing a Framework for Community Action to Achieve the Sustainable Use of Pesticides (Text with EEA Relevance) 2009). This regulation aims to ensure a high level of protection for human and animal health, as well as the environment, by establishing stringent criteria for the approval and use of pesticides (Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 Concerning the Placing of Plant Protection Products on the Market and Repealing Council Directives 79/117/EEC and 91/414/EEC 2009). It repeals and replaces the earlier Council Directives 79/117/EEC and 91/414/EEC, modernizing the legal framework for the marketing of plant protection products.

The regulation is directly linked to biodiversity conservation within the agriculture sector, as it places a strong emphasis on reducing the environmental impacts of plant protection products. Under Regulation 1107/2009, the approval of pesticides is contingent upon rigorous environmental assessments that notably evaluate potential risks to non-target species, *e.g.* beneficial insects, birds, and aquatic ecosystems. These assessments ensure that the use of plant protection products does not harm biodiversity*, e.g.* vital pollinators like bees, which are critical to ecosystem health and agricultural productivity. On a broader scale, it should not have immediate

or delayed harmful effects on animal health, have no unacceptable effects on plants or the environment and do not cause unnecessary suffering or pain to vertebrates (Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC 2009). Additionally, the regulation outlines strict guidelines for the approval and use of plant protection products, including setting limits on residues in food and ensuring that the products do not pose unacceptable risks to the environment or human health.

Furthermore, the regulation encourages the development and use of integrated pest management strategies that prioritize sustainable farming practices and reduce reliance on chemical treatments. By promoting alternatives to chemical pesticides, such as biological control methods and crop management, the regulation seeks to minimize the negative impact of pest control on ecosystems.

By setting strict guidelines for the approval and use of plant protection products, this regulation helps minimize negative impacts on ecosystems, contributing to the broader goals of the EU Biodiversity Strategy for 2030, which seeks to halt biodiversity loss and promote nature-positive farming practices. This regulation aligns with the EU's commitment to promoting sustainable agriculture and protecting biodiversity while ensuring food safety and security.

5. EU deforestation regulation

The European Parliament adopted in May 2023 the Regulation 2023/1115, a text regulating the placing and making available of products containing eight commodities that can entice deforestation or forest degradation. These commodities are **cattle, cocoa, coffee, oil palm, rubber, soya and wood**. This regulation entered into force in December 2024 for large companies and later in 2025 for SMEs. It states that these eight primary agricultural commodities as well as all derived goods from them that are sold on the European market or produced on the European land **should not have induced the deforestation of natural areas since the 31st, December 2020**. Every business trading the targeted products should report and demonstrate that they are deforestation-free by a due-diligence statement (European Parliament 2023).

This law will therefore encourage farmers and food producers to make sure the targeted range of products does not damage natural forests.

E. SCIENCE BASED TARGETS FOR NATURE

The **Science Based Targets Network** (SBTN) is developing **science-based targets for nature** (SBTs) aimed at companies and cities to help them address their environmental impacts comprehensively. These impacts include biodiversity, land, freshwater, and oceans, alongside climate goals outlined by the Science Based Targets initiative (SBTi).
SBTs are defined by the SBTN as measurable, actionable, and time-bound goals, grounded in science, enabling stakeholders to align their activities with planetary boundaries and societal sustainability objectives. The overarching aim is to enable businesses and cities to align their efforts with scientific thresholds that ensure a safe and equitable operating space for humanity while supporting global goals for sustainable development. These targets are essential to limit global warming to 1.5°C and emphasize that preventing and reversing nature loss is critical to achieving this aim. (Science Based Targets Network 2025)

The SBTN target-setting framework consists of five steps:

1. Assess – Analyse and estimate environmental impacts.
2. Prioritize – Define target boundaries and prioritize actions.
3. Set targets – Establish and validate measurable goals.

4. Act – Develop and implement an action plan.
5. Track – Measure progress, report results, and verify outcomes.

Each phase is supported by detailed methodologies, tools, and resources to assist companies through the process. Technical guidance is available for all steps, including the third step, "Set Targets," which provides methodologies for setting freshwater targets and land targets with partial coverage of biodiversity considerations. Guidance helps companies quantify their environmental impacts across their operations and value chains and then move to precise action at landscape-level (Science Based Targets Network, n.d.).

The following sections provide information on SBTN's Freshwater and Land targets, focusing on aspects relevant to the Food and Agriculture sector. The boxes include extracts from the Technical Guidance for Step 3: Measure, Set & Disclose (Version 1.1).

Please note that, in SBTN's technical guidance:

- The terms "required," "shall," or "must" are used throughout to indicate what is required for targets to conform with the criteria.
- The terms "recommended" and "should" are used to indicate a recommendation, but not a requirement.
- The related terms "may" or "can" are used to indicate an option that is permissible or allowable.

Freshwater targets

The Freshwater target focuses on the issues of water use, specifically withdrawals from surface water bodies (rivers and lakes) and groundwater (aquifers), and freshwater pollution resulting from nitrogen and phosphorous. More pressures will be addressed in the future.

Introduction Step 3: Freshwater

The Sectoral Materiality Tool applied in Step 1: Assess defines which sectors are likely to have material impacts on freshwater quantity and quality. In general, business sectors that rely on agricultural products in parts of their value chain are likely to be subject to science-based targets for Freshwater Quantity and Quality. In addition, sectors where water is incorporated into a product (e.g., the food and beverage industry) and/or used for industrial processes or cooling purposes are likely to be subject to Freshwater science-based targets for at least Freshwater Quantity. [...]

All upstream sourcing of agriculture on SBTN's High Impact Commodities List (HICL) in scope must be estimated at least to sub-national level. Water quality and quantity must be assessed using one of the available approaches.

Step 3b. Baseline pressure calculation

3.2 Baseline values on relevant pressures

3.2.2 Freshwater quantity baseline value

Upstream. For a company's upstream value chain, the baseline value may be calculated using either primary or secondary data sources. For companies using secondary data sources (particularly the case for companies sourcing from agricultural suppliers), companies can use the information they collected in Step 1: Assess and Step 2: Interpret & Prioritize, such as the number of products/commodities produced, to estimate water consumption using tools such as blue-water footprint(s) to convert product/ commodity production into units of volume of blue water used per time (see Table 2 in section 2). Data from representative sites can also be

utilized as a secondary data source for estimating pressure if the company can show that those sites are representative.

Steps 3c & 3d. Environmental thresholds identification and Freshwater Quantity target setting

3.3. Setting Freshwater Quantity targets

3.3.3 Timestep for Freshwater Quantity targets

Companies may use annual or monthly time periods for their surface Freshwater Quantity targets, dependent on their baselining methodology. [...]The decision to use monthly vs. annual targets will likely depend on the type of company setting targets. For example, agricultural irrigation withdrawals that vary widely on a seasonal basis may be better suited to monthly targets than some types of direct operations whose water withdrawals are relatively constant over the course of the year.

3.3.5 Validation criteria for Freshwater Quantity targets

Figure 8: Freshwater quality targets. Science-based targets for Freshwater Quality focus on pressures associated with loads of nitrogen (N) and phosphorus (P) to surface water bodies. Targets for toxic chemicals and other freshwater quality parameters will be developed in future iterations. Companies that can influence N and P concentration levels within a basin are key actors that should consider setting a water quality target. [...] Nitrogen and phosphorus runoff can negatively affect water quality, with further knock-on effects on human health, food production, animal habitats, and recreational values of landscapes. [...] Companies operating in the agricultural sector, or sourcing from this sector, have an important role to play in setting these targets to reduce pressures and improve ecosystem health.

Appendix A: Freshwater Response Options.

This is a non-exhaustive list of possible response options companies may consider in their attempt to meet the Freshwater science-based targets they have set. Further guidance will be provided in the first release of the methods for Step 4: Act. Many response options have co-benefits not only in terms of water quality and quantity but for land too, for example in terms of quality and quantity as well as for biodiversity, and other realms (e.g., terrestrial). It is important to note that collective action for water stewardship is strongly advised as a means to engage proactively in partnerships and landscape-level initiatives. This is because there are likely to be freshwater-related challenges that cannot be effectively tackled on a company-by-company basis. [...]

Table A.1: Freshwater response options.

Avoid, Reduce, Regenerate, Restore, Transform (AR^3T) classification	Freshwater Response Option
Reduce	Reduce nutrient runoff by promoting/adopting agricultural best management practices such as regenerative agriculture
Restore/Regenerate	Implement regenerative agriculture to regenerate degraded agricultural landscapes

Land targets

The first science-based targets for land comprise a suite of three targets designed to work together to incentivize synergistic actions that contribute to nature goals in land systems:

- No conversion of natural ecosystems
- Land footprint reduction
- Landscape engagement

Executive summary

The Land Footprint Reduction target applies only to large agricultural companies at this stage—primarily due to data constraints, but also due to their outsized impact on nature. It asks companies to reduce their absolute land footprint or intensity of existing footprint in line with the global estimated agricultural land reduction that is required to meet global nature, climate, and Sustainable Development Goals, totalling 500 million hectares by 2050.

Introduction

The Land targets are designed to work together to incentivize the most important actions needed to achieve nature goals in land systems: halting conversion of natural ecosystems (Target 1), freeing up agricultural land for increased ecological productivity (Target 2), and improving the ecological and social condition of landscapes, including working lands, to enhance ecosystem structure, composition, and function and the social systems that depend on such landscapes (Target 3). [...] In particular, the Landscape Engagement target (Target 3) works to ensure that companies appropriately balance the need to use land more efficiently while avoiding unsustainable forms of agricultural intensification (e.g., overuse of fertilizers and chemical inputs, irrigation practices that deplete freshwater resources) and building resilience through the restoration of ecosystems and within working lands. [...]

Climate and nature goals can, and must, be achieved holistically. As a result, SBTN requires companies that are required to set Land targets to complement those targets with a target on land-based GHG emissions and removals following the SBTi forest, land, and agriculture (FLAG) methodology requirements (see SBTi FLAG). Therefore, a company that wants to set Land targets must also be committed to emissions reductions through SBTi should they qualify based on SBTi guidance. [...]

How to determine if your company must set Target 1: No Conversion of Natural Ecosystems.

There are two criteria that companies should assess to understand if they are required to set this target:

1. Terrestrial ecosystem use or change is material according to Step 1's materiality screening; OR
2. 20% or more of their GHG emissions come from a sector that has land sector activities (e.g., agriculture, forestry, and other land use (AFOLU) emissions. [...]

How to determine if your company must set Target 2: Land Footprint Reduction.

A company is required to set a Land Footprint Reduction target if it meets the following criteria:

1. Terrestrial ecosystem use or change is material according to Step 1a materiality screening; AND
2. It produces or sources agricultural products, i.e., it is included in Land Footprint Reduction; AND
3. It is required to set an SBTi FLAG target; AND
4. One or both of the following applies:
   a. It has a baseline agricultural land footprint of 50,000 hectares or more as calculated using Chapter 7 of the draft GHGP Land Sector and Removals Guidance;
   b. It has 10,000 or more full-time-equivalent employees. [...]

How to determine if your company must set Target 3: Landscape Engagement.

A company is required to set a Landscape Engagement target if:

1. Terrestrial ecosystem use or change OR soil pollution are material according to Step 1a materiality Screening.

Target 1: No Conversion of Natural Ecosystems

1.3. Accounting for conversion of natural ecosystems and remediation requirements

1.3.1. Land use change – scale

Information on traceability from the latest Afi guidance. For companies that purchase agricultural or forestry commodities, traceability is necessary to determine the origin of the materials in their supply chains and ascertain when land use change (LUC) took place in these locations of origin. Traceability may be facilitated by internal company systems, business-to-business disclosure by suppliers, third-party certification programs, or other methods for attaching information about origins to product volumes. Traceability to the production unit of origin is preferable in most cases and allows for the highest level of supply chain control and the most precise LUC accounting. However, recognizing that full traceability to production units is not always available, and that in some contexts a sourcing area or jurisdiction may be the most relevant scale for managing deforestation and conversion risks, this guide also explains how deforestation/conversion and associated emissions can be estimated at an area level.

1.3.3. Land use change – at sourcing area level

When allocating LUC at an area level to specific commodity volumes, all LUC related to agriculture (for crop or livestock products), forestry (for forest products), and hard commodities for relevant sectors must be included in the analysis. Consideration of all commodity-related LUC allows companies and others to best account for varied LUC trajectories or indirect LUC pressures, providing an appropriately conservative approach to allocation.

Target 2: Land Footprint Reduction

2.1. What is a Land Footprint Reduction target?

Global models indicate that agricultural land footprint reduction of the scale required to achieve global nature goals is possible through a combination of sustainable crop and livestock productivity gains where there are yield gaps, reduced food loss and waste across value chains, more circular use of natural resources, and—in high-income countries—shifts toward healthier, more sustainable and less-land-intensive diets.

2.2. How to set a Land Footprint Reduction Target

2.2.2. Select a method for the allocation of Land Footprint Reduction

There are two methods for setting a Land Footprint Reduction target: the absolute reduction approach and the intensity reduction approach. Absolute and intensity targets each have advantages and disadvantages. [...] For both types of Land Footprint Reduction targets, there is a risk that they incentivize unsustainable types of agricultural intensification, and/or that these targets incentivize consumer companies to shift their sourcing from lower- to higher-yielding areas. Annex 2b helps companies manage trade-offs and unintended consequences through response option planning, the setting of complementary environmental targets, and social safeguards.

2.5. Why is the Land Footprint Reduction target needed?

Expansion of agriculture, forestry, and other human land uses (e.g., mining, infrastructure) is the leading driver of natural ecosystem conversion, which in turn drives biodiversity loss and global warming and ultimately undermines the critical ecosystem services on which humans rely for protection, livelihoods, materials, food, and fresh water. [...]SBTN has focused this Version 1.0 Land Footprint Reduction target solely on agricultural land (including cropland and pastureland) since it is the world's largest use of land, and there is strong evidence (as summarized in Annex 2a) demonstrating the scale of reductions required in agricultural land occupation for nature and climate goals that provides a scientific basis for the target.

Target 3: Landscape Engagement

3.1. What is a Landscape Engagement target?

The intention of landscape engagement is to enable regenerative, restorative, and transformational actions in landscapes that are relevant for a company's operations and supply chains. The third Land target therefore complements Target 1 and Target 2, which are focused on the avoidance and reduction of impacts.

The Landscape Engagement target requires companies to:

1. Engage in either
   - One landscape initiative that is equivalent to a 10% coverage of the company's estimated land impact area footprint.
     − The 10% coverage is recommended following the SBTN Step 2 Guidance, which recommends companies to use the outcome of their land-use target boundary rankings (combined with biodiversity) and to address the top 10% of areas within the target boundaries for land use and change and soil pollution.
     − The prioritized list of Step 2 should include, for each target boundary, sites that cover at least 10% of the total direct operations and upstream target boundaries (respectively).

   OR
   - Two landscape initiatives, regardless of their size, in materially relevant landscapes.
2. Select landscapes following the two approaches to selection of material landscapes listed in section 3.2.1.
3. Evaluate the prioritized landscape initiatives ensuring that these initiatives comply with the key criteria for validated landscape initiatives identified in section 3.2.3.
4. Commit to a substantial improvement of the ecological and social condition and metrics of the landscape.
5. Develop an action plan for engagement in the landscape(s).

3.2.6. Relationship with other land, climate, and freshwater targets

Landscape Engagement and target 2: Land Footprint Reduction. Companies that set a Land Footprint Reduction target must appropriately balance the need to use land more efficiently with avoiding unsustainable forms of agricultural intensification (e.g., overuse of fertilizers and chemical inputs) that would reduce the ecological integrity of the landscape and would therefore conflict with outcomes of the Landscape Engagement target. Landscape engagement offers a framework in which the land freed up to achieve a Land Footprint Reduction target is used for achieving broader nature and climate goals. For instance, it may be possible to ecologically restore land removed from agricultural production, which can have positive impacts on ecological integrity, biodiversity, soil quality, and freshwater quality, and can increase carbon sequestration if well balanced with local needs.

Please note that SBTi is a separate but related initiative for companies setting and implementing science-based targets for climate.

F. NACE REV. 2 (EUROSTAT 2008)

This section contains extracts from the NACE rev. 2 classification (EUROSTAT 2008) and details the sectors covered by the Food and Agriculture benchmark factsheet.

Section A – Agriculture, Forestry and Fishing

01 Crop and animal production, hunting and related service activities

This division includes two basic activities, namely the production of crop products and production of animal products, covering also the forms of organic agriculture, the growing of genetically modified crops and the raising of genetically modified animals. This division includes growing of crops in open fields as well in greenhouses.

Group 01.5 (Mixed farming) breaks with the usual principles for identifying main activity. It accepts that many agricultural holdings have reasonably balanced crop and animal production, and that it would be arbitrary to classify them in one category or the other.
This division also includes service activities incidental to agriculture, as well as hunting, trapping and related activities.
Agricultural activities exclude any subsequent processing of the agricultural products (classified under divisions 10 and 11 (Manufacture of food products and beverages) and division 12 (Manufacture of tobacco products)), beyond that needed to prepare them for the primary markets. The preparation of products for the primary markets is included here.
The division excludes field construction (e.g. agricultural land terracing, drainage, preparing rice paddies etc.) classified in section F (Construction) and buyers and cooperative associations engaged in the marketing of farm products classified in section G. Also excluded is the landscape care and maintenance, which is classified in class 81.30.

01.1 Growing of non-perennial crops

This group includes the growing of non-perennial crops, i.e. plants that do not last for more than two growing seasons. Included is the growing of these plants for the purpose of seed production.

01.11 Growing of cereals (except rice), leguminous crops and oil seeds

This class includes all forms of growing of cereals, leguminous crops and oil seeds in open fields. The growing of these crops is often combined within agricultural units.
This class includes :

- growing of cereals such as:
  - wheat
  - grain maize
  - sorghum
  - barley
  - rye
  - oats
  - millets
  - other cereals n.e.c.
- growing of leguminous crops such as:
  - beans
  - broad beans
  - chick peas
  - cow peas
  - lentils
  - lupines
  - peas
  - pigeon peas
  - other leguminous crops

- growing of oil seeds such as:
  - soya beans
  - groundnuts
  - castor bean
  - linseed
  - mustard seed
  - niger seed
  - rapeseed
  - safflower seed
  - sesame seed
  - sunflower seed
  - other oil seeds

This class excludes:

- growing of rice, see 01.12
- growing of sweet corn, see 01.13
- growing of maize for fodder, see 01.19
- growing of oleaginous fruits, see 01.26

01.12 Growing of rice

01.13 Growing of vegetables and melons, roots and tubers

This class includes:

- growing of leafy or stem vegetables such as:
  - artichokes
  - asparagus
  - cabbages
  - cauliflower and broccoli
  - lettuce and chicory spinach
  - other leafy or stem vegetables
- growing of fruit bearing vegetables such as:
  - cucumbers and gherkins
  - eggplants (aubergines)
  - tomatoes
  - watermelons
  - cantaloupes
  - other melons and fruit-bearing vegetables
- growing of root, bulb or tuberous vegetables such as:
  - carrots
  - turnips
  - garlic
  - onions (incl. shallots)
  - leeks and other alliaceous vegetables
  - other root, bulb or tuberous vegetables
- growing of mushrooms and truffles
- growing of vegetable seeds, including sugar beet seeds, excluding other beet seeds
- growing of sugar beet
- growing of other vegetables
- growing of roots and tubers such as:
  - potatoes
  - sweet potatoes
  - cassava
  - yams
  - other roots and tubers

This class excludes:

- growing of chillies, peppers (capsicum sop.) and other spices and aromatic crops, see 01.28
- growing of mushroom spawn, see 01.30

01.14 Growing of sugar cane

This class excludes:

- growing of sugar beet, see 01.13

01.15 Growing of tobacco

This class excludes:

- manufacture of tobacco products, see 12.00

01.16 Growing of fibre crops

This class includes:

- growing of cotton
- growing of jute, kenaf and other textile bast fibres
- growing of flax and true hemp
- growing of sisal and other textile fibre of the genus agave
- growing of abaca, ramie and other vegetable textile fibres
- growing of other fibre crops

01.19 Growing of other non-perennial crops

This class includes the growing of all other non-perennial crops:

- growing of swedes, mangolds, fodder roots, clover, alfalfa, sainfoin, fodder maize and other grasses, forage kale and similar forage products
- growing of beet seeds (excluding sugar beet seeds) and seeds of forage plants
- growing of flowers

- production of cut flowers and flower buds
- growing of flower seeds

This class excludes:

- growing of non-perennial spices, aromatic, drug and pharmaceutical crops, see 01.28

01.2 Growing of perennial crops

This group includes the growing of perennial crops, i.e. plants that lasts for more than two growing seasons, either dying back after each season or growing continuously. Included is the growing of these plants for the purpose of seed production.

01.21 Growing of grapes

This class includes:

- growing of wine grapes and table grapes in vineyards

This class excludes:

- manufacture of wine, see 11.02

01.22 Growing of tropical and subtropical fruits

This class includes:

- growing of tropical and subtropical fruits:
  - avocados
  - bananas and plantains
  - dates
  - figs
  - mangoes
  - papayas
  - pineapples
  - other tropical and subtropical fruits

01.23 Growing of citrus fruits

This class includes:

- growing of citrus fruits:
  - grapefruit and pomelo
  - lemons and limes
  - oranges
  - tangerines, mandarins and clementines
  - other citrus fruits

01.24 Growing of pome fruits and stone fruits

This class includes:

- growing of pome fruits and stone fruits:
  - apples
  - apricots
  - cherries and sour cherries
  - peaches and nectarines
  - pears and quinces
  - plums and sloes
  - other pome fruits and stone fruits

01.25 Growing of other tree and bush fruits and nuts

This class includes:

- growing of berries:
  - blueberries
  - currants
  - gooseberries
  - kiwi fruit
  - raspberries
  - strawberries
  - other berries
- growing of fruit seeds
- growing of edible nuts:
  - almonds

- cashew nuts
- chestnuts
- hazelnuts
- pistachios
- walnuts
- other nuts

- growing of other tree and bush fruits:
  - locust beans

This class excludes:

- growing of coconuts, see 01.26

01.26 Growing of oleaginous fruits

This class includes:

- growing of oleagious fruits :
  - coconuts
  - olives
  - oil palms
  - other oleaginous fruits

This class excludes:

- growing of soya beans, groundnuts and other oil seeds, see 01.11

01.27 Growing of beverage crops

This class includes:

- growing of beverage crops:
  - coffee
  - tea
  - maté
  - cocoa
  - other beverage crops

01.28 Growing of spices, aromatic, drug and pharmaceutical crops

This class includes:

- growing of perennial and non-perennial spices and aromatic crops:
  - pepper (piper sop.)
  - chillies and peppers (capsicum sop.)
  - nutmeg, mace and cardamoms
  - anise, badian and fennel
  - cinnamon (canella)
  - cloves
  - ginger
  - vanilla
  - hops
  - other spices and aromatic crops
- growing of drug and narcotic crops

01.29 Growing of other perennial crops

This class includes:

- growing of rubber trees for harvesting of latex
- growing of Christmas trees
- growing of trees for extraction of sap
- growing of vegetable materials of a kind used primarily for plaiting

This class excludes:

- growing of flowers, production of cut flower buds and growing of flower seeds, see 01.19
- gathering of tree sap or rubber-like gums in the wild, see 02.30

01.3 Plant propagation

01.30 Plant propagation

This class includes the production of all vegetative planting materials including cuttings, suckers and seedlings for direct plant propagation or to create plant grafting stock into which selected scion is grafted for eventual planting to produce crops.

This class includes:

- growing of plants for planting
- growing of plants for ornamental purposes, including turf for transplanting
- growing of live plants for bulbs, tubers and roots; cuttings and slips; mushroom spawn
- operation of tree nurseries, except forest tree nurseries

This class excludes:

- growing of plants for the purpose of seed production, see 01.1, 01.2
- operation of forest tree nurseries, see 02.10

01.4 Animal production

This group includes raising (farming) and breeding of all animals, except aquatic animals.

This group excludes:

- farm animal boarding and care, see 01.62
- production of hides and skins from slaughterhouses, see 10.11

01.41 Raising of dairy cattle

This class includes:

- raising and breeding of dairy cattle
- production of raw milk from cows or buffaloes

This class excludes:

- processing of milk, see 10.51

01.42 Raising of other cattle and buffaloes

This class includes:

- raising and breeding of cattle and buffaloes for meat
- production of bovine semen

01.43 Raising of horses and other equines

This class includes:

- raising and breeding of horses, asses, mules or hinnies

This class excludes:

- operation of racing and riding stables, see 93.19

01.44 Raising of camels and camelids

This class includes:

- raising and breeding of camels (dromedary) and camelids

01.45 Raising of sheep and goats

This class includes:

- raising and breeding of sheep and goats
- production of raw sheep or goat milk
- production of raw wool

This class excludes:

- sheep shearing on a fee or contract basis, see 01.62
- production of pulled wool, see 10.11
- processing of milk, see 10.51

01.46 Raising of swine/pigs

01.47 Raising of poultry

This class includes:

- raising and breeding of poultry:
  - chickens, turkeys, ducks, geese and guinea fowls
- production of eggs from poultry
- operation of poultry hatcheries

This class excludes:

- production of feathers or down, see 10.12

01.49 Raising of other animals

This class includes:

- raising and breeding of semi-domesticated or other live animals:
  - ostriches and emus
  - other birds (except poultry)
  - insects
  - rabbits and other fur animals
- production of fur skins, reptile or bird skins from ranching operation
- operation of worm farms, land mollusc farms, snail farms etc.
- raising of silk worms, production of silk worm cocoons
- bee-keeping and production of honey and beeswax
- raising and breeding of pet animals (except fish):
  - cats and dogs
  - birds, such as parakeets etc.
  - hamsters etc.
- raising of diverse animals

This class excludes:

- production of hides and skins originating from hunting and trapping, see 01.70
- operation of frog farms, crocodile farms, marine worm farms, see 03.21, 03.22
- operation of fish farms, see 03.21, 03.22
- boarding and training of pet animals, see 96.09
- raising and breeding of poultry, see 01.47

01.5 Mixed farming

01.50 Mixed farming

This class includes the combined production of crops and animals without a specialised production of crops or animals. The size of the overall farming operation is not a determining factor. If either production of crops or animals in a given unit is 66% or more of standard gross margins, the combined activity should not be included here, but allocated to crop or animal farming.

This class excludes:

- mixed crop farming, see groups 01.1 and 01.2
- mixed animal farming, see group 01.4

01.6 Support activities to agriculture and post-harvest crop activities

This group includes activities incidental to agricultural production and activities similar to agriculture not undertaken for production purposes (in the sense of harvesting agricultural products), done on a fee or contract basis.

Also included are post-harvest crop activities, aimed at preparing agricultural products for the primary market.

01.61 Support activities for crop production

This class includes:

- agricultural activities on a fee or contract basis:
  - preparation of fields
  - establishing a crop
  - treatment of crops
  - crop spraying, including by air
  - trimming of fruit trees and vines
  - transplanting of rice, thinning of beets
  - harvesting
  - pest control (including rabbits) in connection with agriculture
- maintenance of agricultural land in good agricultural and environmental condition
- operation of agricultural irrigation equipment

This class also includes:

- provision of agricultural machinery with operators and crew

This class excludes:

- post-harvest crop activities, see 01.63
- drainage of agricultural land, see 43.12
- landscape architecture, see 71.11
- activities of agronomists and agricultural economists, see 74.90
- landscape gardening, planting, see 81.30
- organisation of agricultural shows and fairs, see 82.30

01.62 Support activities for animal production

This class includes:

- agricultural activities on a fee or contract basis:
  - activities to promote propagation, growth and output of animals
  - herd testing services, droving services, agistment services, poultry caponising, coop cleaning etc.
  - activities related to artificial insemination
  - stud services
  - sheep shearing
  - farm animal boarding and care

This class also includes:

- activities of farriers

This class excludes:

- provision of space for animal boarding only, see 68.20
- veterinary activities, see 75.00
- vaccination of animals, see 75.00
- renting of animals (e.g. herds), see 77.39
- pet boarding, see 96.09

01.63 Post-harvest crop activities

This class includes:

- preparation of crops for primary markets, i.e. cleaning, trimming, grading, disinfecting
- cotton ginning
- preparation of tobacco leaves, e.g. drying
- preparation of cocoa beans, e.g. peeling
- waxing of fruit

This class excludes:

- preparation of agricultural products by the producer, see corresponding class in groups 01.1, 01.2 or 01.3
- post-harvest activities aimed at improving the propagation quality of seed, see 01.64
- stemming and redrying of tobacco, see 12.00
- marketing activities of commission merchants and cooperative associations, see division 46
- wholesale of agricultural raw materials, see 46.2

01.64 Seed processing for propagation

This class includes all post-harvest activities aimed at improving the propagation quality of seed through the removal of non-seed materials, undersized, mechanically or insect-damaged and immature seeds as well as removing the seed moisture to a safe level for seed storage. This activity includes the drying, cleaning, grading and treating of seeds until they are marketed. The treatment of genetically modified seeds is included here. This class excludes:

- growing of seeds, see groups 01.1 and 01.2
- processing of seeds to obtain oil, see 10.41
- research to develop or modify new forms of seeds, see 72.11

Section C – Manufacturing

10 Manufacture of food products

This division includes the processing of the products of agriculture, forestry and fishing into food for humans or animals, and includes the production of various intermediate products that are not directly food products. The activity often generates associated products of greater or lesser value (for example, hides from slaughtering, or oilcake from oil production).

This division is organised by activities dealing with different kinds of products: meat, fish, fruit and vegetables, fats and oils, milk products, grain mill products, animal feeds and other food products. Production can be carried out for own account, as well as for third parties, as in custom slaughtering.
Some activities are considered manufacturing (for example, those performed in bakeries, pastry shops, and prepared meat shops etc. which sell their own production) even though there is retail sale of the products in the producers' own shop. However, where the processing is minimal and does not lead to a real transformation, the unit is classified to wholesale and retail trade (section G).
Preparation of food for immediate consumption on the premises is classified to division 56 (Food and beverage service activities).
Production of animal feeds from slaughter waste or by-products is classified in 10.9, while processing food and beverage waste into secondary raw material is classified to 38.3, and disposal of food and beverage waste in 38.21. This division does not include the preparation of meals for immediate consumption, such as in restaurants.

10.1 Processing and preserving of meat and production of meat products

10.11 Processing and preserving of meat

This class includes:

- operation of slaughterhouses engaged in killing, dressing or packing meat: beef, pork, lamb, rabbit, mutton, camel, etc.
- production of fresh, chilled or frozen meat, in carcasses
- production of fresh, chilled or frozen meat, in cuts

This class also includes:

- slaughtering and processing of whales on land or on specialised vessels
- production of hides and skins originating from slaughterhouses, including fellmongery
- rendering of lard and other edible fats of animal origin
- processing of animal offal
- production of pulled wool

This class excludes:

- rendering of edible poultry fats, see 10.12
- packaging of meat, see 82.92

10.12 Processing and preserving of poultry meat

This class includes:

- operation of slaughterhouses engaged in killing, dressing or packing poultry
- production of fresh, chilled or frozen meat in individual portions
- rendering of edible poultry fats

This class also includes:

- production of feathers and down

This class excludes:

- packaging of meat, see 82.92

10.13 Production of meat and poultry meat products

This class includes:

- production of dried, salted or smoked meat
- production of meat products:
  - sausages, salami, puddings, "andouillettes", saveloys, bolognas, pâtés, rillettes, boiled ham

This class excludes:

- manufacture of prepared frozen meat and poultry dishes, see 10.85
- manufacture of soup containing meat, see 10.89
- wholesale trade of meat, see 46.32
- packaging of meat, see 82.92

10.2 Processing and preserving of fish, crustaceans and molluscs

10.20 Processing and preserving of fish, crustaceans and molluscs

This class includes:

- preparation and preservation of fish, crustaceans and molluscs: freezing, deep-freezing, drying, cooking, smoking, salting, immersing in brine, canning etc.
- production of fish, crustacean and mollusc products: fish fillets, roes, caviar, caviar substitutes etc.
- production of fishmeal for human consumption or animal feed
- production of meals and solubles from fish and other aquatic animals unfit for human consumption

This class also includes:

- activities of vessels engaged only in the processing and preserving of fish
- processing of seaweed

This class excludes:

- processing and preserving of fish on vessels engaged in fishing, see 03.11
- processing of whales on land or specialised vessels, see 10.11
- production of oils and fats from marine material, see 10.41
- manufacture of prepared frozen fish dishes, see 10.85
- manufacture of fish soups, see 10.89

10.3 Processing and preserving of fruit and vegetables

10.31 Processing and preserving of potatoes

This class includes:

- processing and preserving of potatoes:
  - manufacture of prepared frozen potatoes
  - manufacture of dehydrated mashed potatoes
  - manufacture of potato snacks
  - manufacture of potato crisps
  - manufacture of potato flour and meal

This class also includes:

- industrial peeling of potatoes

10.32 Manufacture of fruit and vegetable juice

This class includes:

- manufacture of fruit or vegetable juices

This class also includes:

- production of concentrates from fresh fruits and vegetables

10.39 Other processing and preserving of fruit and vegetables

This class includes:

- manufacture of food consisting chiefly of fruit or vegetables, except ready-made dishes in frozen or canned form
- preserving of fruit, nuts or vegetables: freezing, drying, immersing in oil or in vinegar, canning etc.
- manufacture of fruit or vegetable food products
- manufacture of jams, marmalades and table jellies
- roasting of nuts
- manufacture of nut foods and pastes

This class also includes:

- manufacture of perishable prepared foods of fruit and vegetables, such as:
  - salads; mixed salads, packaged
  - peeled or cut vegetables
  - tofu (bean curd)

This class excludes:

- manufacture of fruit or vegetable juices, see 10.32
- manufacture of flour or meal of dried leguminous vegetables, see 10.61
- preservation of fruit and nuts in sugar, see 10.82
- manufacture of prepared vegetable dishes, see 10.85
- manufacture of artificial concentrates, see 10.89

10.4 Manufacture of vegetable and animal oils and fats

This group includes the manufacture of crude and refined oils and fats from vegetable or animal materials, except rendering or refining of lard and other edible animal fats.

10.41 Manufacture of oils and fats

This class includes:

- manufacture of crude vegetable oils: olive oil, soya-bean oil, palm oil, sunflower-seed oil, cotton-seed oil, rape, colza or mustard oil, linseed oil etc.
- manufacture of non-defatted flour or meal of oilseeds, oil nuts or oil kernels
- manufacture of refined vegetable oils: olive oil, soya-bean oil etc.
- processing of vegetable oils: blowing, boiling, dehydration, hydrogenation etc.

This class also includes:

- manufacture of non-edible animal oils and fats
- extraction of fish and marine mammal oils
- production of cotton linters, oilcakes and other residual products of oil production

This class excludes:

- rendering and refining of lard and other edible animal fats, see 10.11
- manufacture of margarine, see 10.42
- wet corn milling, see 10.62
- manufacture of corn oil, see 10.62
- production of essential oils, see 20.53
- treatment of oil and fats by chemical processes, see 20.59

10.42 Manufacture of margarine and similar edible fats

This class includes:

- manufacture of margarine
- manufacture of melanges and similar spreads
- manufacture of compound cooking fats

10.5 Manufacture of dairy products

10.51 Operation of dairies and cheese making

This class includes:

- manufacture of fresh liquid milk, pasteurised, sterilised, homogenised and/or ultra heat treated
- manufacture of milk-based drinks
- manufacture of cream from fresh liquid milk, pasteurised, sterilised, homogenised
- manufacture of dried or concentrated milk whether or not sweetened
- manufacture of milk or cream in solid form
- manufacture of butter
- manufacture of yoghurt
- manufacture of cheese and curd
- manufacture of whey
- manufacture of casein or lactose

This class excludes:

- production of raw milk (cattle), see 01.41
- production of raw milk (sheep, goats, horses, asses, camels, etc.), see 01.43, 01.44, 01.45
- manufacture of non-dairy milk and cheese substitutes, see 10.89

10.52 Manufacture of ice cream

This class includes:

- manufacture of ice cream and other edible ice such as sorbet

This class excludes:

- activities of ice cream parlours, see 56.10

10.6 Manufacture of grain mill products, starches and starch products

This group includes the milling of flour or meal from grains or vegetables, the milling, cleaning and polishing of rice, as well as the manufacture of flour mixes or doughs from these products.

Also included in this group are the wet milling of corn and vegetables and the manufacture of starch and starch products.

10.61 Manufacture of grain mill products

This class includes:

- grain milling: production of flour, groats, meal or pellets of wheat, rye, oats, maize (corn) or other cereal grains
- rice milling: production of husked, milled, polished, glazed, parboiled or converted rice; production of rice flour
- vegetable milling: production of flour or meal of dried leguminous vegetables, of roots or tubers, or of edible nuts
- manufacture of cereal breakfast foods
- manufacture of flour mixes and prepared blended flour and dough for bread, cakes, biscuits or pancakes

This class excludes:

- manufacture of potato flour and meal, see 10.31
- wet corn milling, see 10.62

10.62 Manufacture of starches and starch products

This class includes:

- manufacture of starches from rice, potatoes, maize etc.
- wet corn milling
- manufacture of glucose, glucose syrup, maltose, inulin etc.
- manufacture of gluten
- manufacture of tapioca and tapioca substitutes prepared from starch
- manufacture of corn oil

This class excludes:

- manufacture of lactose (milk sugar), see 10.51
- production of cane or beet sugar, see 10.81

10.7 Manufacture of bakery and farinaceous products

This group includes the production of bakery products, macaroni, noodles and similar products.

10.71 Manufacture of bread; manufacture of fresh pastry goods and cakes

This class includes:

- manufacture of bakery products:
  - bread and rolls
  - pastry, cakes, pies, tarts, pancakes, waffles, rolls etc.

This class excludes:

- manufacture of dry bakery products, see 10.72
- manufacture of pastas, see 10.73
- heating up of bakery items for immediate consumption, see division 56

10.72 Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes

This class includes:

- manufacture of rusks, biscuits and other dry bakery products
- manufacture of preserved pastry goods and cakes
- manufacture of snack products (cookies, crackers, pretzels etc.), whether sweet or salted

This class excludes:

- manufacture of potato snacks, see 10.31

10.73 Manufacture of macaroni, noodles, couscous and similar farinaceous products

This class includes:

- manufacture of pastas such as macaroni and noodles, whether or not cooked or stuffed
- manufacture of couscous
- manufacture of canned or frozen pasta products

This class excludes:

- manufacture of prepared couscous dishes, see 10.85
- manufacture of soup containing pasta, see 10.89

10.8 Manufacture of other food products

This group includes the production of sugar and confectionery, prepared meals and dishes, coffee, tea and spices, as well as perishable and specialty food products.

10.81 Manufacture of sugar

This class includes:

- manufacture or refining of sugar (sucrose) and sugar substitutes from the juice of cane, beet, maple and palm
- manufacture of sugar syrups
- manufacture of molasses
- production of maple syrup and sugar

This class excludes:

- manufacture of glucose, glucose syrup, maltose, see 10.62

10.82 Manufacture of cocoa, chocolate and sugar confectionery

This class includes:

- manufacture of cocoa, cocoa butter, cocoa fat, cocoa oil
- manufacture of chocolate and chocolate confectionery
- manufacture of sugar confectionery: caramels, cachous, nougats, fondant, white chocolate
- manufacture of chewing gum
- preserving in sugar of fruit, nuts, fruit peels and other parts of plants
- manufacture of confectionery lozenges and pastilles

This class excludes:

- manufacture of sucrose sugar, see 10.81

10.83 Processing of tea and coffee

This class includes:

- decaffeinating and roasting of coffee
- production of coffee products:
  - ground coffee
  - soluble coffee
  - extracts and concentrates of coffee
- manufacture of coffee substitutes
- blending of tea and maté
- manufacture of extracts and preparations based on tea or maté
- packing of tea including packing in tea-bags

This class also includes:

- manufacture of herb infusions (mint, vervain, chamomile etc.)

This class excludes:

- manufacture of inulin, see 10.62
- manufacture of spirits, beer, wine and soft drinks, see division 11
- preparation of botanical products for pharmaceutical use, see 21.20

10.84 Manufacture of condiments and seasonings

This class includes:

- manufacture of spices, sauces and condiments:
  - mayonnaise
  - mustard flour and meal
  - prepared mustard etc.
- manufacture of vinegar

This class also includes:

- processing of salt into food-grade salt, e.g. iodised salt

This class excludes:

- growing of spice crops, see 01.28

10.85 Manufacture of prepared meals and dishes

This class includes the manufacture of ready-made (i.e. prepared, seasoned and cooked) meals and dishes. These dishes are processed to preserve them, such as in frozen or canned form, and are usually packaged and labelled for re-sale, i.e. this class does not include the preparation of meals for immediate consumption, such as in restaurants. To be considered a dish, these foods have to contain at least two distinct ingredients (except seasonings etc.).

This class includes:

- manufacture of meat or poultry dishes
- manufacture of fish dishes, including fish and chips
- manufacture of vegetable dishes
- manufacture of frozen or otherwise preserved pizza

This class also includes:

- manufacture of local and national dishes

This class excludes:

- manufacture of fresh foods or foods with less than two ingredients, see corresponding class in division 10
- manufacture of perishable prepared foods, see 10.89
- retail sale of prepared meals and dishes in stores, see 47.11, 47.29
- wholesale of prepared meals and dishes, see 46.38
- activities of food service contractors, see 56.29

10.86 Manufacture of homogenised food preparations and dietetic food

This class includes:

- manufacture of foods for particular nutritional uses:
  - infant formulae
  - follow-up milk and other follow-up foods
  - baby foods
  - low-energy and energy-reduced foods intended for weight control
  - dietary foods for special medical purposes
  - low-sodium foods, including low-sodium or sodium-free dietary salts
  - gluten-free foods
  - foods intended to meet the expenditure of intense muscular effort, especially for sportsmen
  - foods for persons suffering from carbohydrate metabolism disorders (diabetes)

10.89 Manufacture of other food products n.e.c.

This class includes:

- manufacture of soups and broths
- manufacture of artificial honey and caramel
- manufacture of perishable prepared foods, such as:
  - sandwiches
  - fresh (uncooked) pizza
- manufacture of food supplements and other food products n.e.c.

This class also includes:

- manufacture of yeast
- manufacture of extracts and juices of meat, fish, crustaceans or molluscs
- manufacture of non-dairy milk and cheese substitutes
- manufacture of egg products, egg albumin
- manufacture of artificial concentrates

This class excludes:

- manufacture of perishable prepared foods of fruit and vegetables, see 10.39
- manufacture of frozen pizza, see 10.85
- manufacture of spirits, beer, wine and soft drinks, see division 11

10.9 Manufacture of prepared animal feeds

10.91 Manufacture of prepared feeds for farm animals

This class includes:

- manufacture of prepared feeds for farm animals, including concentrated animal feed and feed supplements
- preparation of unmixed (single) feeds for farm animals

This class also includes:

- treatment of slaughter waste to produce animal feeds

This class excludes:

- production of fishmeal for animal feed, see 10.20
- production of oilseed cake, see 10.41
- activities resulting in by-products usable as animal feed without special treatment, e.g. oilseeds (see 10.41), grain milling residues (see 10.61) etc.

10.92 Manufacture of prepared pet foods

This class includes:

- manufacture of prepared feeds for pets, including dogs, cats, birds, fish etc.

This class also includes:

- treatment of slaughter waste to produce animal feeds

This class excludes:

- production of fishmeal for animal feed, see 10.20
- production of oilseed cake, see 10.41
- activities resulting in by-products usable as animal feed without special treatment, e.g. oilseeds (see 10.41), grain milling residues (see 10.61) etc.

11 Manufacture of beverages

This division includes the manufacture of beverages, such as non-alcoholic beverages and mineral water, manufacture of alcoholic beverages mainly through fermentation, beer and wine, and the manufacture of distilled alcoholic beverages.

This division excludes:

- production of fruit and vegetable juices, see 10.32
- manufacture of milk-based drinks, see 10.51
- manufacture of coffee, tea and mate products, see 10.83

11.0 Manufacture of beverages

11.01 Distilling, rectifying and blending of spirits

This class includes:

- manufacture of distilled, potable, alcoholic beverages: whisky, brandy, gin, liqueurs etc.
- manufacture of drinks mixed with distilled alcoholic beverages
- blending of distilled spirits
- production of neutral spirits

This class excludes:

- manufacture of non-distilled alcoholic beverages, see 11.02-11.06
- manufacture of synthetic ethyl alcohol, see 20.14
- manufacture of ethyl alcohol from fermented materials, see 20.14
- merely bottling and labelling, see 46.34 (if performed as part of wholesale) and 82.92 (if performed on a fee or contract basis)

11.02 Manufacture of wine from grape

This class includes:

- manufacture of wine
- manufacture of sparkling wine
- manufacture of wine from concentrated grape must

This class also includes:

- blending, purification and bottling of wine
- manufacture of low or non-alcoholic wine

This class excludes:

- merely bottling and labelling, see 46.34 (if performed as part of wholesale) and 82.92 (if performed on a fee or contract basis)

11.03 Manufacture of cider and other fruit wines

This class includes:

- manufacture of fermented but not distilled alcoholic beverages: sake, cider, perry and other fruit wines

This class also includes:

- manufacture of mead and mixed beverages containing fruit wines

This class excludes:

- merely bottling and labelling, see 46.34 (if performed as part of wholesale) and 82.92 (if performed on a fee or contract basis)

11.04 Manufacture of other non-distilled fermented beverages

This class includes:

- manufacture of vermouth and the like

This class excludes:

- merely bottling and labelling, see 46.34 (if performed as part of wholesale) and 82.92 (if performed on a fee or contract basis)

11.05 Manufacture of beer

This class includes:

- manufacture of malt liquors, such as beer, ale, porter and stout

This class also includes:

- manufacture of low alcohol or non-alcoholic beer

11.06 Manufacture of malt

11.07 Manufacture of soft drinks; production of mineral waters and other bottled waters

This class includes manufacture of non-alcoholic beverages (except non-alcoholic beer and wine):

- production of natural mineral waters and other bottled waters
- manufacture of soft drinks:
  - non-alcoholic flavoured and/or sweetened waters: lemonade, orangeade, cola, fruit drinks, tonic waters etc.

This class excludes:

- production of fruit and vegetable juice, see 10.32
- manufacture of milk-based drinks, see 10.51
- manufacture of coffee, tea and maté products, see 10.83
- manufacture of alcohol-based drinks, see 11.01, 11.02, 11.03, 11.04, 11.05
- manufacture of non-alcoholic wine, see 11.02
- manufacture of non-alcoholic beer, see 11.05
- manufacture of ice, see 35.30
- merely bottling and labelling, see 46.34 (if performed as part of wholesale) and 82.92 (if performed on a fee or contract basis)

G. SOURCES

1. Sources of the factsheet

Aizen, Marcelo A., Lucas A. Garibaldi, Saul A. Cunningham, et Alexandra M. Klein. 2009. « How Much Does Agriculture Depend on Pollinators? Lessons from Long-Term Trends in Crop Production ». Annals of Botany 103 (9): 1579-88. https://doi.org/10.1093/aob/mcp076.

Bain. 2023. « Does a Purpose Help Brands Grow? » Bain, novembre 13. https://www.bain.com/insights/does-a-purpose-help-brands-grow-ceo-sustainability-guide-2023/.

CDC Biodiversité. 2020. GBS Review: Quality assurance. Final version. https://www.cdc-biodiversite.fr/wp-content/uploads/2023/01/Quality-Assurance.pdf.

European Commission. 2020. « Farm to Fork Strategy for a Fair, Healthy and Environmentally-Friendly Food System ».

FAO. 2008. Scoping Agriculture, Wetland Interactions: Towards a Sustainable Multiple-Response Strategy. Édité par Adrian P. Wood et Gerardo E. van Halsema. FAO Water Reports 33. Food and Agriculture Organization of the United Nations.

FAO. 2015. Food Wastage Footprint & Climate Change. http://www.fao.org/nr/sustainability/food-loss-and-waste.

FAO. 2019. The State of the World's Biodiversity for Food and Agriculture. Avec Dafydd Pilling, Julie Bélanger, et Commission des ressources génétiques pour l'alimentation et l'agriculture. FAO Commission on Genetic Resources for Food and Agriculture Assessments.

FAO. 2025. « Guidance on Integrated Pest Management for the World's Major Crop Pests and Diseases ». mai 8. https://doi.org/10.4060/cd4890en.

Guidehouse Europe. 2024. Biogases towards 2040 and beyond A Realistic and Resilient Path to Climate Neutrality.

Houšková, Beata, Rastislav Bušo, et Jarmila Makovníková. 2021. « Contribution of Good Agricultural Practices to Soil Biodiversity ». Open Journal of Ecology 11 (01): 01. https://doi.org/10.4236/oje.2021.111007.

International Finance Corporation. 2012. Performance Standards on Environmental and Social Sustainability.

IPBES. 2019. « Global Assessment Report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services ». 1144.

Pantera, A., M. R. Mosquera-Losada, F. Herzog, et M. den Herder. 2021. « Agroforestry and the Environment ». Agroforestry Systems 95 (5): 767-74. https://doi.org/10.1007/s10457-021-00640-8.

Persefoni. 2024. « Food & Beverage Carbon Footprint: Emissions Profile Insights - Persefoni ». Persefoni, juin. https://www.persefoni.com/blog/emissions-profile-food-beverage.

POSITION OF THE EUROPEAN PARLIAMENT adopted at first reading on 19 April 2023 with a view to the adoption of Regulation (EU) 2023/… of the European Parliament and of the Council on the making available on the Union market and the export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010, Acte juridique No. EP-PE_TC1-COD(2021)0366 (2023).

Ritchie, Hannah, et Max Roser. 2019. « Half of the World's Habitable Land Is Used for Agriculture ». Our World in Data. https://ourworldindata.org/global-land-for-agriculture.

Science Based Targets Network. s. d. « Overview ». Science Based Targets Network. Consulté le 15 janvier 2025. https://sciencebasedtargetsnetwork.org/companies/take-action/.

UNEP. 2024. « ENCORE ». ENCORE. https://encorenature.org/en.

Waite, Richard, et Jessica Zionts. 2022. 7 Opportunities to Reduce Emissions from Beef Production. mars 7. https://www.wri.org/insights/opportunities-reduce-emissions-beef-production.

World Resources Institute. 2018. Creating a Sustainable Food Future: A Menu of Solutions to Feed Nearly 10 Billion People by 2050. Washington, DC.

2. Sources of the sectoral appendix

Académie d'Agriculture de France. 2023. 'Biodiversité / Économie de terre et partage des terres, Land sharing, Land sparing'. January 25. https://www.academie-agriculture.fr/actualites/academie/seance/academie/biodiversite-economie-de-terre-et-partage-des-terres-land.

ADM. 2025. *2025 Regenerative Agriculture Report*.

Agence BIO. 2024. *Organic Worldwide 2024 International Publication by Agence BIO 2024 Edition*. Montreuil.

AIAB. 2020. 'DISCIPLINARE per l'utilizzo del marchio "garanzia AIAB Italia"'.
AIAB. 2025. 'Garanzia AIAB Italia'. https://aiab.it/garanzia-aiab-italia-en/.
Bateman, Ian, and Andrew Balmford. 2023. 'Current Conservation Policies Risk Accelerating Biodiversity Loss'. June 21. https://www.nature.com/articles/d41586-023-01979-x.
Bavec, Martina, and Franc Bavec. 2015. 'Impact of Organic Farming on Biodiversity'. In *Biodiversity in Ecosystems - Linking Structure and Function*, edited by Yueh-Hsin Lo, Juan A. Blanco, and Shovonlal Roy. InTech. https://doi.org/10.5772/58974.
Bezner Kerr, Rachel, Julio C Postigo, Pete Smith, et al. 2023. 'Agroecology as a Transformative Approach to Tackle Climatic, Food, and Ecosystemic Crises'. *Current Opinion in Environmental Sustainability* 62 (June): 101275. https://doi.org/10.1016/j.cosust.2023.101275.
Boucher, Doug, Pipa Elias, Lael Goodman, Calen May-Tobin, Kranti Mulik, and Sarah Roquemore. 2012. *Grade A Choice - Solutions for Deforestation-Free Meat*. Union of Concerned Scientists. https://www.ucsusa.org/sites/default/files/2019-09/Solutions-for-Deforestation-Free-Meat.pdf.
Burgess, Graves, Harris, and Deeks. 2019. *Regenerative Agriculture | Identifying the Impact; Enabling the Potential*. SYSTEMIQ.
Campbell, Bruce Morgan, Elena Benett, Douglas Beare, and Jason Hall-Spencer. 2017. 'Agriculture Production as a Major Driver of the Earth System Exceeding Planetary Boundaries'. *ResearchGate*, ahead of print, October. https://doi.org/10.5751/ES-09595-220408.
CDC Biodiversité. 2020. *GBS Review: Quality Assurance*. Final version. https://www.cdc-biodiversite.fr/wp-content/uploads/2023/01/Quality-Assurance.pdf.
CDC Biodiversité. 2021. *Sectoral Biodiversity Footprint Benchmarks - Technical Annex*. 1.0. https://www.cdc-biodiversite.fr/wp-content/uploads/2022/05/Fiche-benchmark-Annexe-technique.pdf.
CDC Biodiversité. 2024. *Global Biodiversity Score: Accounting for Positive and Negative Impacts throughout the Value Chain*. No. 49. With Joshua Berger, Manon Bézard, Julie Bonnet, et al. MEB's Report. Paris, France. https://www.cdc-biodiversite.fr/wp-content/uploads/2024/01/DOSSIER-MEB-49-GBS-MD-WEB.pdf.
CDC Biodiversité. 2025. 'Position Paper | Aligning Labels with Biodiversity Frameworks: A Call for Quantitative and Science-Based Approaches'. June. https://www.cdc-biodiversite.fr/wp-content/uploads/2025/06/2025.06.23-Position-paper_Aligning-labels-with-biodiversity-frameworks.pdf.
Chesapeake Bay Foundation. 2020. 'Regenerative Agriculture'. https://www.cbf.org/issues/agriculture/regenerative-agriculture.html.
COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A New Circular Economy Action Plan For a Cleaner and More Competitive Europe (2020). https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN.
Controlunion. 2025. 'EU Organic Certification'. Germany. https://controlunion-germany.com/en/certification-programs/eu-organic-certification.
DeClerck, Fabrice A. J., Izabella Koziell, Tim Benton, et al. 2023. 'A Whole Earth Approach to Nature-Positive Food: Biodiversity and Agriculture'. In *Science and Innovations for Food Systems Transformation*, edited by Joachim von Braun, Kaosar Afsana, Louise O. Fresco, and Mohamed Hag Ali Hassan. Springer International Publishing. https://doi.org/10.1007/978-3-031-15703-5_25.
Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 Establishing a Framework for Community Action to Achieve the Sustainable Use of Pesticides (Text with EEA Relevance), CONSIL, EP, 309 OJ L (2009). http://data.europa.eu/eli/dir/2009/128/oj/eng.
Duru, Michel, Jean-Pierre Sarthou, and Olivier Therond. 2022. 'L'agriculture Régénératrice : Summum de l'agroécologie Ou Greenwashing ?' *Cahiers Agricultures* 31 (17): 10p. https://doi.org/10.1051/cagri/2022014.
European Commission. 2020a. 'COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A Farm to Fork Strategy for a Fair, Healthy and Environmentally-Friendly Food System'. May 20. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0381.
European Commission. 2020b. 'Farm to Fork Strategy for a Fair, Healthy and Environmentally-Friendly Food System'.
European Parliament. 2022. 'EU Rules on Producing and Labelling Organic Products'. EUR-Lex, January 1. https://eur-lex.europa.eu/EN/legal-content/summary/eu-rules-on-producing-and-labelling-organic-products-from-2022.html.
European Parliament. 2023. 'Regulation - 2023/1115 - FR - EUR-Lex'. https://eur-lex.europa.eu/eli/reg/2023/1115/oj/fra.

F. Astudillo, Miguel, Gunnar Thalwitz, and Fritz Vollrath. 2015. 'Life Cycle Assessment of Silk Production - a Case Study from India'. In *Handbook of Life Cycle Assessment (LCA) of Textiles and Clothing*. UK. https://doi.org/10.1016/B978-0-08-100169-1.00011-3.

FAO. 2008. *Scoping Agriculture, Wetland Interactions: Towards a Sustainable Multiple-Response Strategy*. Edited by Adrian P. Wood and Gerardo E. van Halsema. FAO Water Reports 33. Food and Agriculture Organization of the United Nations.

FAO. 2015. *Food Wastage Footprint & Climate Change*. http://www.fao.org/nr/sustainability/food-loss-and-waste.

FAO. 2017. 'Livestock Solutions for Climate Change'. FAO.

FAO. 2022. *Greenhouse Gas Emissions from Agrifood Systems. Global, Regional and Country Trends, 2000-2020.* No. 50. FAOSTAT Analytical Brief Series. FAO.

FAO. 2025. 'Guidance on Integrated Pest Management for the World's Major Crop Pests and Diseases'. May 8. https://doi.org/10.4060/cd4890en.

Ferguson, Rafter Sass, and Sarah Taylor Lovell. 2014. 'Permaculture for Agroecology: Design, Movement, Practice, and Worldview. A Review'. *Agronomy for Sustainable Development* 34 (2): 251–74. https://doi.org/10.1007/s13593-013-0181-6.

FiBL, and IFOAM. 2025. *The World of Organic Agriculture. Statistics and Emerging Trends 2025.*

FiBL, and IFOAM – Organics International. 2024. *The World of Organic Agriculture - Statistics and Emerging Trends 2024*. FiBL & IFOAM – ORGANICS INTERNATIONAL.

Food and Land Use Coalition. 2019. *Growing Better : Ten Critical Transitions to Transform Food and Land Use*.

Food and Land Use Coalition. 2023. *Aligning Regenerative Agricultural Practices with Outcomes to Deliver for People, Nature and Climate*. https://www.foodandlandusecoalition.org/knowledge-hub/regenag-people-nature-climate/.

Fraanje, Walter, Tara Garnett, and Sam Lee-Gammage. 2018. *What Is the Land Sparing-Sharing Continuum?* Food Climate Research Network. https://doi.org/10.56661/4d83249a.

Giller, Ken E, Renske Hijbeek, Jens A Andersson, and James Sumberg. 2021. 'Regenerative Agriculture: An Agronomic Perspective'. *Outlook on Agriculture* 50 (1): 13–25. https://doi.org/10.1177/0030727021998063.

Global Forest Review. 2024. 'Deforestation Linked to Agriculture Indicator'. World Resources Institute, April 4. https://research.wri.org/gfr/forest-extent-indicators/deforestation-agriculture.

Goulart, Fernando F., Sonia Carvalho-Ribeiro, and Britaldo Soares-Filho. 2016. 'Farming-Biodiversity Segregation or Integration? Revisiting Land Sparing versus Land Sharing Debate'. *Journal of Environmental Protection* 07 (07): 1016–32. https://doi.org/10.4236/jep.2016.77090.

IFOAM. 2008. 'Definition of Organic Agriculture'. https://www.ifoam.bio/why-organic/organic-landmarks/definition-organic.

IFOAM Organics Europe. 2022. *Organic Agriculture and Its Benefits for Climate and Biodiversity*. Brussels.

Ingrao, Carlo, Rossana Strippoli, Giovanni Lagioia, and Donald Huisingh. 2023. 'Water Scarcity in Agriculture: An Overview of Causes, Impacts and Approaches for Reducing the Risks'. *Heliyon* 9 (8): e18507. https://doi.org/10.1016/j.heliyon.2023.e18507.

Institut National de l'Origine et de la Qualité. 2025. 'Qu'est-ce que l'agriculture biologique ?' https://www.inao.gouv.fr/connaitre-agriculture-biologique.

International Finance Corporation. 2012. *Performance Standards on Environmental and Social Sustainability*.

IPES Food. 2022. *Smoke and Mirrors: Examining Competing Framings of Food System Sustainability: Agroecology, Regenerative Agriculture, and Naturebased Solutions.*

Jeanneret, Ph., S. Aviron, A. Alignier, et al. 2021. 'Agroecology Landscapes'. *Landscape Ecology* 36 (8): 2235–57. https://doi.org/10.1007/s10980-021-01248-0.

Kim, HyeJin, Isabel M. D. Rosa, Rob Alkemade, et al. 2018. 'A Protocol for an Intercomparison of Biodiversity and Ecosystem Services Models Using Harmonized Land-Use and Climate Scenarios'. *Geoscientific Model Development* 11 (11): 4537–62. https://doi.org/10.5194/gmd-11-4537-2018.

Knapp, Samuel, and Marcel G. A. van der Heijden. 2018. 'A Global Meta-Analysis of Yield Stability in Organic and Conservation Agriculture'. *Nature Communications* 9 (1): 3632. https://doi.org/10.1038/s41467-018-05956-1.

López Rodríguez, Susana, Lenny G. J. van Bussel, and Rob Alkemade. 2024. 'Classification of Agricultural Land Management Systems for Global Modeling of Biodiversity and Ecosystem Services'. *Agriculture, Ecosystems & Environment* 360 (February): 108795. https://doi.org/10.1016/j.agee.2023.108795.

McGuire, Andrew. 2018. *Regenerative Agriculture: Solid Principles, Extraordinary Claims*. April 4. https://csanr.wsu.edu/regen-ag-solid-principles-extraordinary-claims/.

Nestlé. 2025. 'Regenerative Agriculture'. https://www.nestle.com/sustainability/nature-environment/regenerative-agriculture.

Newton, Peter, Nicole Civita, Lee Frankel-Goldwater, Katharine Bartel, and Colleen Johns. 2020. 'What Is Regenerative Agriculture? A Review of Scholar and Practitioner Definitions Based on Processes and Outcomes'. *Frontiers in Sustainable Food Systems* 4 (October). https://doi.org/10.3389/fsufs.2020.577723.

'Organic-Worldwide-2024.Pdf'. n.d. Accessed 27 January 2025. https://www.agencebio.org/wp-content/uploads/2024/07/Organic-Worldwide-2024.pdf.

PepsiCo. 2025. 'PepsiCo's Regenerative Agriculture Guidelines'. https://www.pepsico.com/docs/default-source/sustainability-and-esg-topics/pepsico-regenerative-agriculture-guidelines.pdf.

Persefoni. 2024. 'Food & Beverage Carbon Footprint: Emissions Profile Insights - Persefoni'. Persefoni, June. https://www.persefoni.com/blog/emissions-profile-food-beverage.

Phalan, Benjamin T. 2018. 'What Have We Learned from the Land Sparing-Sharing Model?' *Sustainability* 10 (6): 6. https://doi.org/10.3390/su10061760.

Ranganathan, Janet, Daniel Vennard, Richard Waite, et al. 2016. *Shifting Diets for a Sustainable Food Future*. World Resources Institute. http://www.worldresourcesreport.org.

Regeneration International. 2023. 'The Definition of Regenerative Agriculture'. *Regeneration International*, December 22. https://regenerationinternational.org/2023/12/22/the-definition-of-regenerative-agriculture/.

Regeneration International. n.d. 'Why Regenerative Agriculture?' Blog. *Regeneration International*. Accessed 28 February 2025. https://regenerationinternational.org/why-regenerative-agriculture/.

Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC (2009). https://eur-lex.europa.eu/legal-content/EN/LSU/?uri=oj:JOL_2009_309_R_0001_01.

Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 Concerning the Placing of Plant Protection Products on the Market and Repealing Council Directives 79/117/EEC and 91/414/EEC, 309 OJ L (2009). http://data.europa.eu/eli/reg/2009/1107/oj/eng.

Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on Organic Production and Labelling of Organic Products and Repealing Council Regulation (EC) No 834/2007, 150 0J L (2018). https://eur-lex.europa.eu/eli/reg/2018/848/oj/eng.

Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on Organic Production and Labelling of Organic Products and Repealing Council Regulation (EC) No 834/2007, 150 OJ L (2024). http://data.europa.eu/eli/reg/2018/848/2024-12-01/eng.

Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the Establishment of a Framework to Facilitate Sustainable Investment, and Amending Regulation (EU) 2019/2088 (Text with EEA Relevance), 198 OJ L (2020). http://data.europa.eu/eli/reg/2020/852/oj/eng.

ReSoil. 2025. 'Agroécologie et Agriculture Régénératrice - Quelles Différences ?' ReSoil. https://www.resoilag.com/blog/agroecologie-et-agriculture-regeneratrice---quelles-differences.

Ritchie, Hannah, and Max Roser. 2019. 'Half of the World's Habitable Land Is Used for Agriculture'. *Our World in Data*. https://ourworldindata.org/global-land-for-agriculture.

Science Based Targets Network. 2025. 'Science Based Targets Network'. https://sciencebasedtargetsnetwork.org/.

Science Based Targets Network. n.d. 'Overview'. Science Based Targets Network. Accessed 15 January 2025. https://sciencebasedtargetsnetwork.org/companies/take-action/.

Textile Exchange. 2023. 'Preferred Fiber and Materials Matrix Methodology Version 3.0'. August.

The Secretariat of the Convention on Wetlands. 2021. *Wetlands and Agriculture: Impacts of Farming Practices and Pathways to Sustainability*. The Secretariat of the Convention on Wetlands. https://www.ramsar.org/sites/default/files/documents/library/bn13_agriculture_e.pdf?

The Woolmark Company. 2019. 'Wool and Greenhouse Gas'. February.

Tuck, Sean L., Camilla Winqvist, Flávia Mota, Johan Ahnström, Lindsay A. Turnbull, and Janne Bengtsson. 2014. 'Land-use Intensity and the Effects of Organic Farming on Biodiversity: A Hierarchical Meta-analysis'. *The Journal of Applied Ecology* 51 (3): 746–55. https://doi.org/10.1111/1365-2664.12219.

World Benchmarking Alliance. 2023. 'Food and Agriculture Benchmark'. World Benchmarking Alliance. https://www.worldbenchmarkingalliance.org/publication/food-agriculture/.