Roadmap to Nature Positive: Foundations for the agri-food system

→ *Deep dive: Dairy production in Friesland, Netherlands*

World Business Council *for Sustainable Development*

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Executive Summary

The nature-related dependencies, impacts, risks and opportunities (DIROs) that global agri-food companies face today are highly local and require context-specific assessment, planning and action. Recognizing the inherent link between agriculture and landscapes, WBCSD has undertaken an initial series of nature-positive deep dives into distinct production systems.

This deep dive demonstrates nature-related DIROs, leading practices, context-specific resources and unresolved challenges for the dairy production system in Friesland, Netherlands. Our methodology aligns broadly with the locate, evaluate, assess and prepare (LEAP) risk and opportunity assessment approach recommended by the Taskforce on Nature-related Financial Disclosures (TNFD).

Table 1: **Summary of guidance findings, using the "locate, evaluate, assess and prepare" (LEAP) risk and opportunity assessment approach recommended by the Taskforce on Nature-related Financial Disclosures (TNFD)**

Locate *the interface with nature*	Evaluate *dependencies & impacts*	Assess *risks & opportunities*	Prepare *to respond & report*
Relevant for any company that sources, supplies, or finances dairy from the Friesland region, Netherlands. Focus of guidance is on agricultural production as the primary land-use stage, though upstream (inputs) and downstream (trading & distribution, processing & manufacturing, retail) activities were assessed with a lighter touch. *Geolocation & biomes:* 1,731 km² of grasslands (region is 5,740 km²) → Sown pastures and fields → Derived semi-natural pastures and old fields → Constructed lacustrine wetlands → Canals, ditches and drains **Biodiversity overall risk:** Medium-high **Biodiversity hotspot:** No **Includes key biodiversity areas (KBAs):** Yes **Water stress:** Low	**Production dependencies:** *Very high:* → Soil quality → Flood & storm protection *High:* → Ground water → Surface water → Water quality → Fibres & other materials → Mass stabilization & erosion control **Production impacts:** *Very high:* → Terrestrial ecosystem use → Water pollutants *High:* → Water use → GHG emissions → Non GHG air pollutants → Soil pollutants	**Risks:** → Climate change-driven weather patterns impacting grassland resilience, availability of high-quality roughage, soil health, drainage and level → Compliance to legislative requirements such as EU and Dutch nitrate regulations → Growth in dairy market share from efficient dairy systems to less environmentally friendly ones **Opportunities:** → Shift to circular and regenerative dairy systems → Improve grassland management to limit impact of variable mineral fertilizer and feedstuff prices	**Priority actions:** → Implement integrated and holistic nutrient management programs for the whole cycle → Support farmer's transition to paludiculture → Keep permanent grassland and deploy strategies for grassland renewal → Develop a manure management plan with storage option → Improve grass diversity (herb-rich grasslands, clovers) to improve soil quality → Develop circular processes that use waste streams better (for energy production, feed, etc) with a regional approach → Develop integrated premium and deals that support best practices from farmers → Deploy precision grazing options → Higher lifespan for dairy cows, with more lactations → Develop landscape-based economic diversification, supporting other in farm revenues (tourism, higher value product development) and more efficient use of land (cow/ha) → Align actors in all levels of the supply chain on shared goals and metrics

Introduction: *Landscape deep dives*

Introduction:
Landscape deep dives

To support the journey of agri-food companies to nature-positive system transformation, WBCSD has developed a Roadmap to Nature Positive: Foundations for the agri-food system for the row crop commodities subsector (row crops summary hereafter). This deep dive is one in a series of landscape studies that build upon the Roadmaps to Nature Positive: Foundations for all Businesses (foundations guidance hereafter).

The foundations Roadmap provides how-to guidance on applying High-level Business Actions on Nature in value chains, assessing and disclosing material risks and opportunities (aligned with the TNFD) and preparing to set science-based targets for nature (aligned with the Science Based Targets Network (SBTN)).

WBCSD has designed the foundations guidance for use along the complete agri-food value chain and across all stages of the corporate nature maturity journey. WBCSD addresses cross-sector framing, concepts and definitions in this guidance. These publications form a single package intended for joint use.

Nature-related dependencies, impacts, risks and opportunities (DIROs) are highly local and actions to address them are distinct from climate change mitigation, which generally includes more global considerations. Recognizing the inherent link between agriculture and the land, WBCSD has undertaken an initial series of nature-positive deep dives into distinct production landscapes.

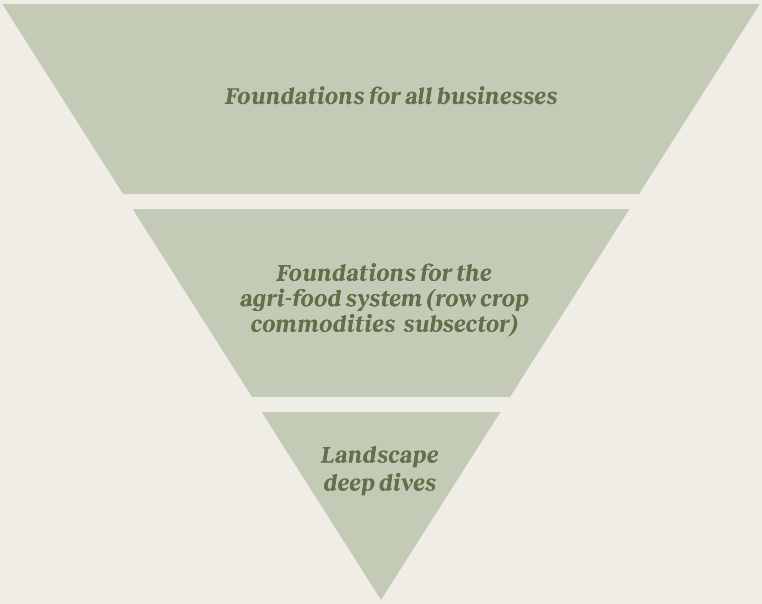
WBCSD member companies consider these sub-national regions – characterized by growing agricultural production/intensification or containing biodiversity hotspots – as high priority operating/sourcing regions. In other words, an agri-food company with global exposure would likely determine that these landscapes, if part of its value chain, require specific nature-related assessment, commitment and action.

Each deep dive explores key nature-positive questions for agri-food companies, aligned with the locate, evaluate, assess and prepare (LEAP) risk and opportunity assessment approach recommended by the TNFD:

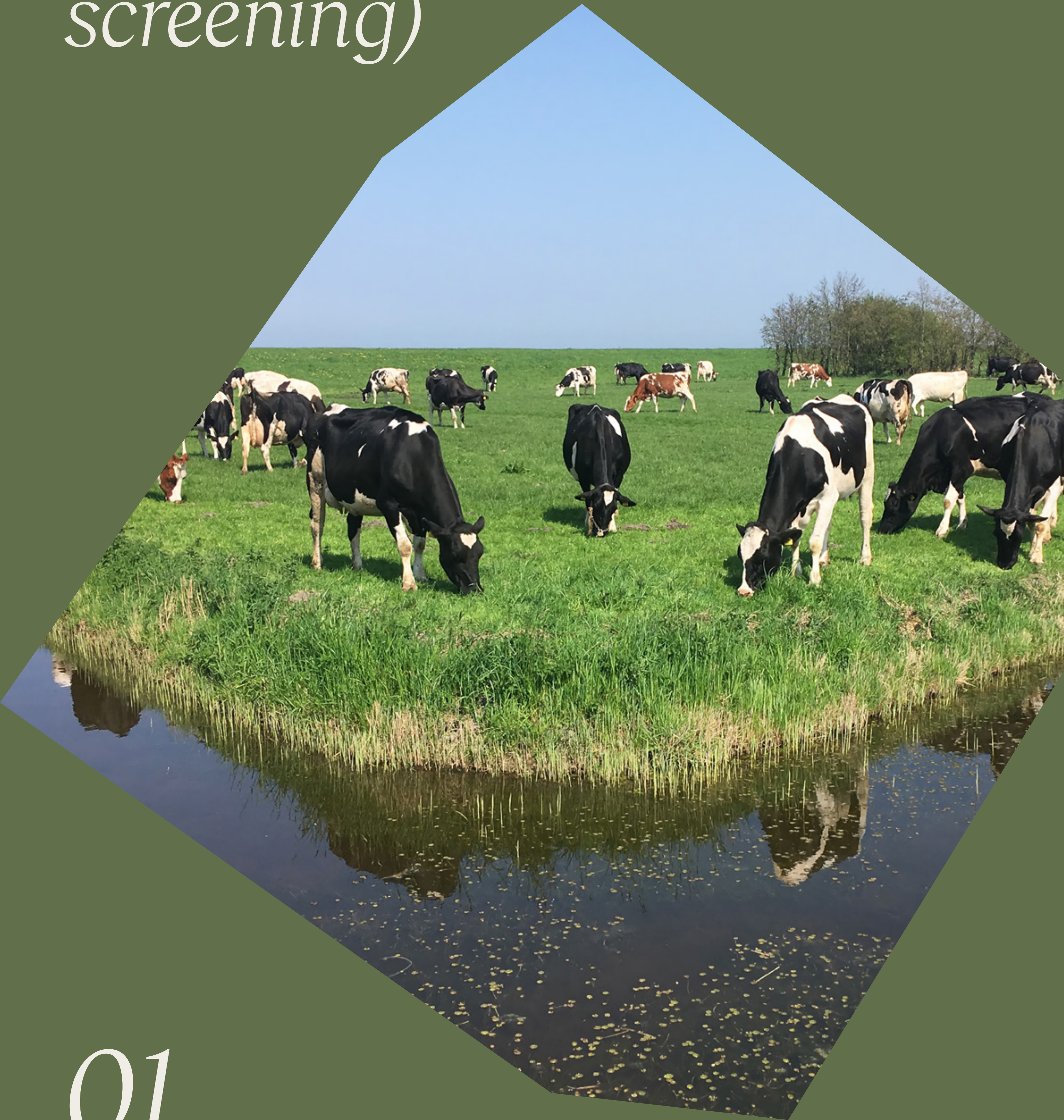
- **Scope and locate:** Where should I focus, both in my value chain and geographically?
- **Evaluate materiality:** What should I focus on, considering both nature-related dependencies and impacts?
- **Assess risks and opportunities:** Why does this matter for my business and key stakeholders?
- **Prepare to respond and report:** What actions should my company be taking, individually and collectively with others? What barriers and trade-offs do I need to consider? How should I approach nature-related disclosures?

The deep dives explore nature-related DIROs, leading practices, context-specific resources and unresolved challenges for what SBTN considers high-impact commodities, meaning "raw and value-added materials used in economic activities with material links to the key drivers of biodiversity loss, resource depletion and ecosystem degradation."[1] These commodities are among those with the largest land-use footprint in areas of high conservation value, posing the greatest nature-related risk.[2]

Figure 1: WBCSD's initial nature-positive guidance for agri-food companies includes supporting deep dive assessments



Stage 1: *Assess (materiality screening)*



01.

Stage 1:
Assess (materiality screening)

Agri-food businesses (meaning any company engaged in this value chain) should first identify their main sectors, sub-sectors and parts of the value chain and their location. If a company sources, supplies or finances dairy from the Friesland region, this would be a priority location in its nature-positive strategy and this guidance will be relevant. Certain aspects of this guidance may also be relevant for dairy production in other landscapes but it is important to assess each location independently.

See Annex 1 for further details on this location and tools supporting this stage.

Stage 1.1 Scope & locate

Friesland, Netherlands

Experts worldwide consider the Netherlands as a dairy country. The largest user of land in the Netherlands,[3] the Dutch dairy industry, employs 46,000 people, creating €10.8 billion in export revenues[4] and managing over 0.9 million hectares (ha) of land.

Friesland, a region in the north of the Netherlands, has a long tradition in agrifood production, with around half of its landmass used for agriculture.[5] Dairy farming takes place mostly on the less fertile clay and peat soils of the Frisian pasture area, the Groene Hart rural area and the region of West Friesland.

Due to its sandy, peat and clay soil types and its maritime climate, which is favorable for dairy cows, much of Friesland's agriculture sector focuses on dairy production and crops for roughage. Some 83% of Friesland farms practice outdoor grazing, close to the country's average of 84%. A recent trend among pasture-based dairy farms is to keep their herd outside for shorter periods of time. In Friesland, there has been a decrease in the number of grazing hours per year. (1,775 hours per year in 2018 vs 2,003 in 2013).[6] This reduction in grazing time partly relates to farm expansion and the increased use of the partial grazing system.

The characterization of Dutch dairy farms is intensive, and Friesland is no exception. The region is the most productive dairy region in the Netherlands, with 17.6% of total Dutch milk production in 2022. As illustrated in Table 1, Friesland holds the largest number of dairy cows and has the highest number of surface grassland allocated for grazing. This means that its 1.67 livestock units (LSU) per hectare of utilized agricultural area (UAA) is close to the Dutch average of 1.77 LSU per hectare of UAA.[7] For comparison, in Europe the average LSU per hectare of UAA is 0.7.[8]

Figure 2: **Friesland is a region in the North of the Netherlands renowned for its dairy production**

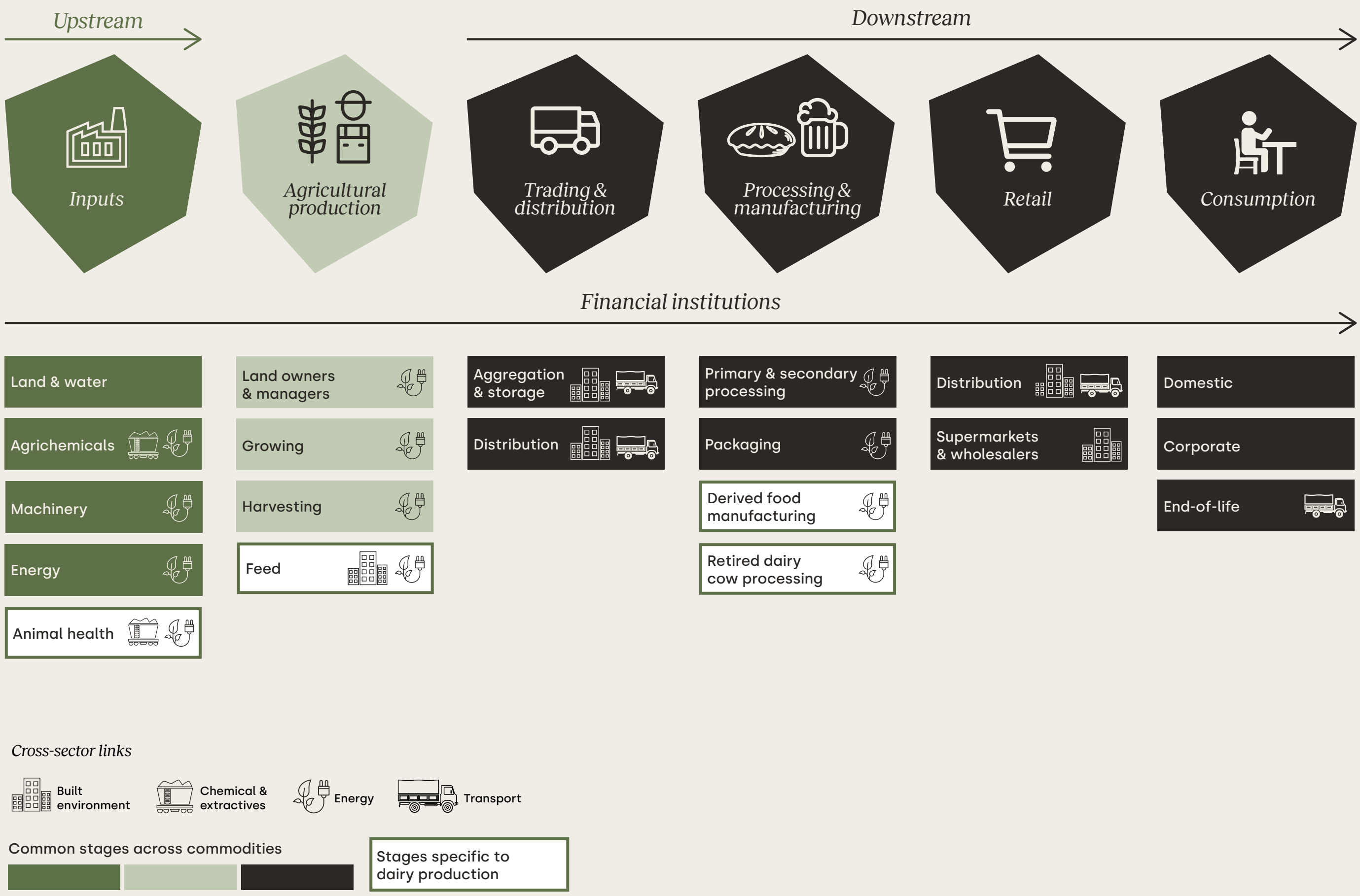
Table 1: **Friesland dairy farming key figures[9]**

Key figures	*2015*	*2022*
Surface grassland (km2)	1,807	1,725
Dairy cows (x 1,000)	292	297
Dairy cows per km2 grassland	162	172
Dairy farms	2,824	2,372
Dairy farms with outdoor grazing (%)	75	83

The dairy value chain

In alignment with TNFD and SBTN guidance, companies should assess their complete value chain, including direct operations and relevant upstream and downstream activities. This roadmap considers six value chain stages, grouped under three broad headings. The main focus is on agricultural production as the primary land-use stage, though we have assessed upstream and downstream activities with a lighter touch.

Figure 3: The generic dairy value chain, including key cross-sector links



Stage 1.2 Evaluate impacts & dependencies

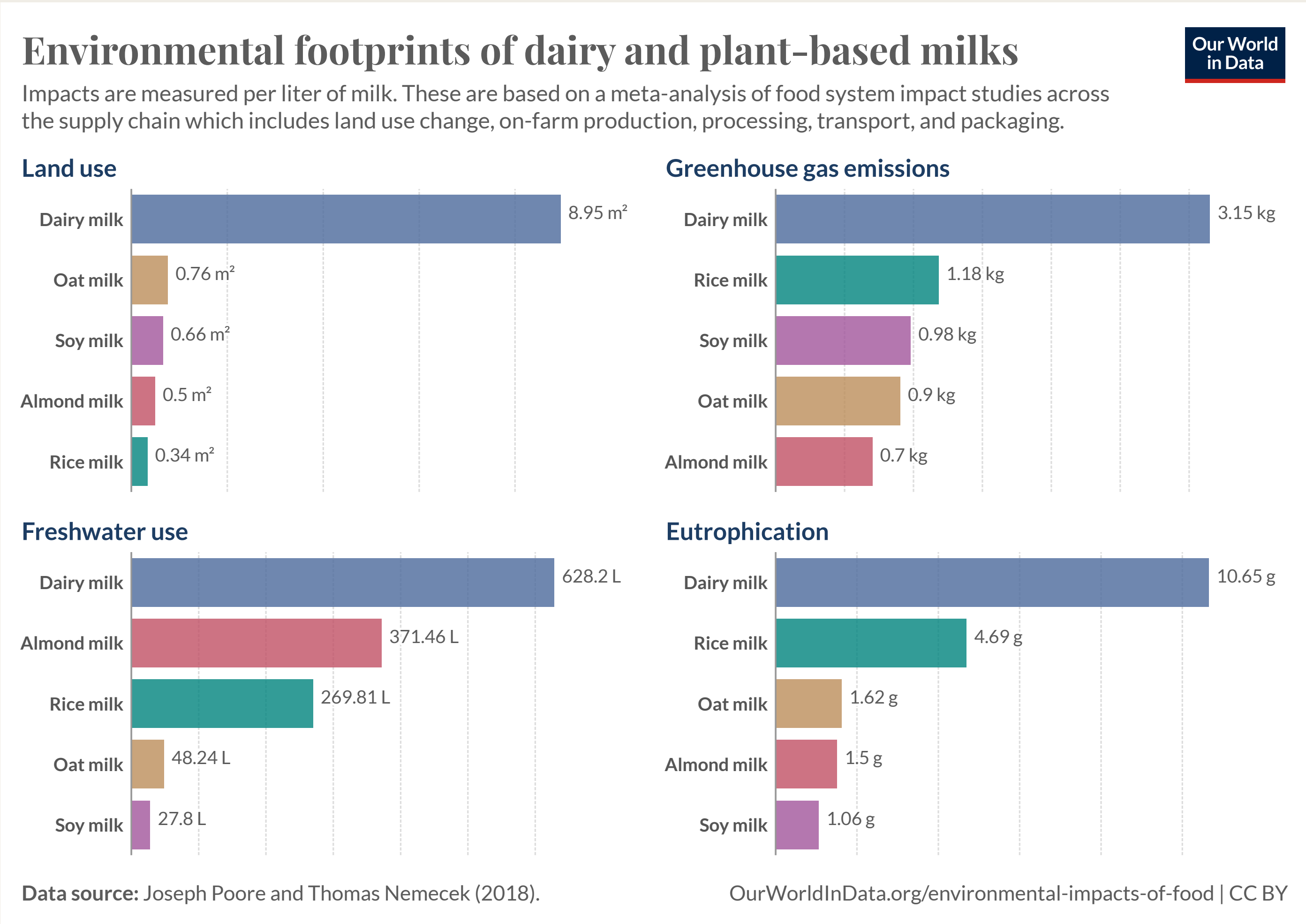
Agri-food companies should next prioritize the potentially high impacts and dependencies on nature typical for the business and associated value chains for further assessment. This section summarizes the process and key findings of WBCSD's landscape assessment, based on desk research and interviews with key local stakeholders throughout the private, public and civil society sectors.

The process outlined here – and in further detail in the row crops summary – applies to any agri-food company evaluating nature-related materiality in its operating or sourcing regions, while the specific findings below are relevant to those engaged directly or indirectly in Friesland. See the materiality matrixes (Table 4 and Table 5) for the primary outputs of this materiality screening, aligned with the structure and methods of the leading nature-related assessment tools and frameworks.

Overview

The largest environmental impact of Friesland's intensive pasture management dairy production is its impact on water quality due to high nitrate pollution, largely driven by manure surpluses. Nitrates contribute to the eutrophication of environments: in rivers, estuaries or coastal waters, excess nutrients encourage the proliferation of plants on the surface. This stimulates the activity of certain bacteria that consume the oxygen dissolved in the water, thus suffocating the other species present in the environment. Excess nitrate in the environment can affect human health directly, through food or water consumption, or indirectly through the ecological problems to which it contributes.

Figure 4: Global environmental footprints of dairy and plant-based milks[10]



Agri-production

Water pollution

Cow manure contains four primary contaminants that impact water quality and that lead to significant environmental and human health impacts: nitrogen, phosphorus, pathogens and organic matter.

Nitrogen and phosphorus pollution is due to manure surpluses; farmers often produce more manure than they can safely apply onto their land, which in turn creates nutrient-rich runoff leading to local and downstream water pollution. The role of nitrogen in water is receiving growing scrutiny due to its contribution to harmful algal blooms in coastal waters and to nitrates in drinking water. Nitrates are the primary contaminant that leaches to groundwater. Phosphorus transported from agricultural lands to surface waters can also promote eutrophication.

According to the European Commission, the total environmental costs of nitrogen pollution in Europe amounts to €70-320 billion per year, which is much higher than the estimated costs of reducing pollution at the source.[11] In comparison, the annual budget for the European Union's Common Agricultural Policy (CAP) in 2021 was €56 billion.[12]

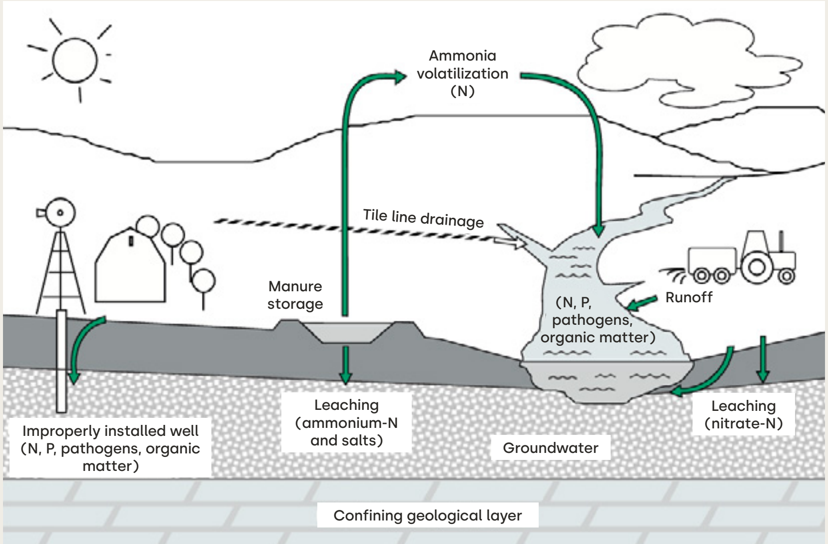
On average, a Dutch cow eats 55 kg of fresh grass and corn daily; the Netherlands also grows this grass and corn. Farmers supplement the cow's feed with 5 kg of compound feed.[13] But livestock use only part of the protein in their rations to produce meat or other animal products. They excrete the remaining protein as nitrogen in manure in the form of organic nitrogen (in feces) and in urea (in urine), which quickly transforms into ammonia (a gaseous form of nitrogen). In these forms, surface water runoff and erosion will likely transport it, or it will evaporate into the atmosphere (see Figure 5).

Although artificial fertilizer application is a source of nitrate pollution, in the Netherlands "nitrate pollution from agricultural sources" primarily refers to nitrate leaching associated with manure application. The European Union (EU) Nitrate Directive specifies measures related to that subject.[14]

Reports indicate that from 2016 to 2019, nitrate concentrations varied significantly across Dutch provinces, with several provinces identified as pollution hotspots for nitrate levels in groundwater and eutrophication. In Friesland, 23% of groundwater monitoring stations showed declining nitrate trends, while 85% of surface waters were eutrophic.

A 2021 study by Wageningen University revealed that, even under a "Maximum Environmentally Friendly Alternative" scenario, just over 60% of EU Water Framework Directive water bodies would meet the nitrogen and phosphorus concentration standards by 2027. This indicates that a substantial number of water bodies will not fully comply with nutrient concentration standards in surface water by then.[15] The EU Nitrates Directive aims to reduce water pollution from manure-driven nitrate contamination and prevent further pollution by setting a maximum manure application limit for Dutch farmers at 170 kg of nitrate per hectare, down from the previous 230 to 250 kg limit.[16]

Figure 5: Common pathways for manure contaminants to reach surface and groundwater[17]



Land-use change and soil degradation

In the Netherlands, peatlands make up 15% of the total agricultural land but emit 35% of all greenhouse gas (GHG) emissions from the agricultural sector.[18] Farmers intensively use most Dutch peatlands (including in Friesland) as grasslands for dairy farming by draining them to maintain a low surface water level in polder ditches.[19]

This delivers high productivity but causes severe damage to ecosystems and leads to high GHG emissions (peatland drainage leads to the decomposition of peat – plant remains – that releases CO_2). After drainage, peatland degradation will continue until the addition of water to the peat. Deep drainage will usually result in larger carbon losses over shorter periods of time but even shallow drainage may result in large losses over time.[20] Recent research shows that deep-drained peatlands in Friesland largely overlap.[21] The drainage of soils also leads to soil subsidence and creates the oxidation of organic matter in peatlands: where the peatlands once lay above sea level, they are now below sea level and soil subsides by a few centimeters every year in the most severely drained areas. This sinking of soil can also affect buildings and infrastructure.[22]

Soil compaction – which can occur due to intensive grazing, heavy farm machinery and poor soil management – can affect the productivity of permanent grassland. Reported negative impacts include a decline in crop yield, increased erosion and run-off, a decrease in soil biodiversity and limits to rooting depth.[23] Estimates show that the potential direct economic loss due to grassland compaction is €243–293 million annually for the 928,000 ha of grassland in agricultural use in the Netherlands.[24] Scientists still underestimate the consequences of soil compaction and how to best measure this impact is an ongoing debate among the scientific community.[25]

As climate change increases the intensity of rainfall cycles, the soil will increasingly become wetter, requiring more drainage. At the current peat decomposition and soil subsidence rate, most of the Dutch peatlands will have disappeared within two centuries. With the growing awareness of climate change and the high infrastructure costs on these unstable soils, the pressure from society to reduce peat decomposition is increasing, as is the requirement to care for other ecosystem services related to biodiversity and water quality.[26]

GHG emissions

According to the Organisation for Economic Co-operation and Development (OECD) calculations in 2018, around 14% of Dutch greenhouse gas emissions come from the agriculture sector.[27] Emissions from agriculture vary per activity but dairy cattle disproportionally emit GHGs compared to other agriculture activities (see Figure 6). In 2020, the dairy sector accounted for 36% of the country's agriculture-related GHG emissions. While emissions from dairy production are significant, it is important to note that grassland dairy production (such as in Friesland) generally has lower greenhouse gas emissions compared to intensive dairy production. In 2019 the Dutch dairy chain from cradle to farm gate emitted 20.3 million metric tons of CO_2-eq., of which dairy farms emitted 13.5 million metric tons CO_2-eq. directly.[28]

As illustrated in Figure 7, in dairy production, GHG emissions mostly take the form of methane (CH_4) (from manure and rumen fermentation and digestion) and nitrous oxide (N_2O) (from manure and soil).[30] Energy use – mainly through the use of fossil fuels during production and transportation on dairy farms – is not a key driver of on-farm emissions. There has been a reduction of the total farm carbon footprint in the Netherlands in recent years but it is not sufficient to meet the 2030 sector targets of the Dutch Climate Agreement for agriculture and land use.[31]

Figure 6: Percentage share in total value added and percentage share of emissions by the Dutch agricultural sector, 2020[29]

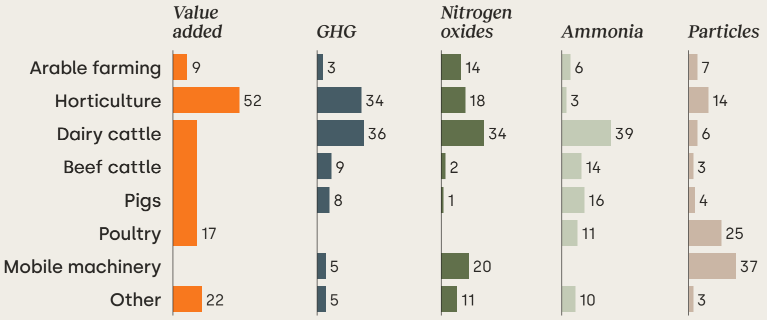
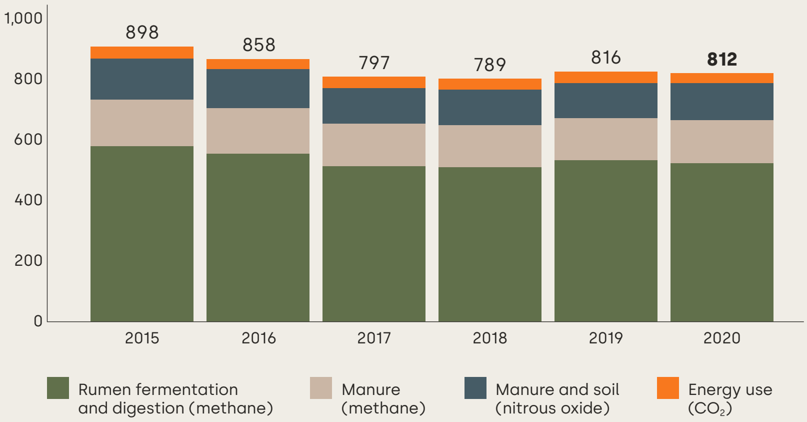


Figure 7: Share of on-farm emissions in Dutch dairy farming (grams of CO$_2$e per kg of measuring delivered by source)[33]



Considerations related to emissions in the dairy sector

The nitrification and denitrification process in soil and manure storage as well as the application of fertilizers and production of fodder crops emits nitrous oxide. Ruminants' stomachs mainly produce methane because of the microbial fermentation process (enteric fermentation) when digesting and emitting by eructation and flatulence. The rate of emissions depends on feed intake and digestibility. The anaerobic decomposition of animal manure also produces methane. Its emission rate depends on manure management in its storage and application methods.

The global warming potential (GWP) of each gas is a calculation of the effect of the different greenhouse gases on global warming. Methane from agricultural sources is 27.2 times more potent and nitrous oxide is 273 times more potent than carbon dioxide in terms of warming potential based on a 100 year horizon.[32]

Water use

Dairy farming is a major user of water as drinking water for livestock, during milking and for crop production. Globally, the average water footprint of milk is 1,020 m³/metric ton of milk. In the Netherlands, this footprint is much lower, only 528 m³/metric ton.[34] One reason for this is that the Netherlands has a suitable climate for dairy farming, generally having high milk yields.

Dairy famers use irrigation (primarily using groundwater) during periods when there is not enough precipitation to replenish the moisture in the soil. However, most of Friesland's water consumption is through evaporation.[35]

In the Netherlands, livestock farmers used more than half of the surface water and groundwater abstracted in agriculture in 2018 by, mainly for irrigation (78%) of pasture (for cattle feeding) and a minor portion (22%) as livestock drinking water. In 2018, surface water and groundwater use in livestock farming was more than double the level of 2017 because of a drought and unusual heat.[37]

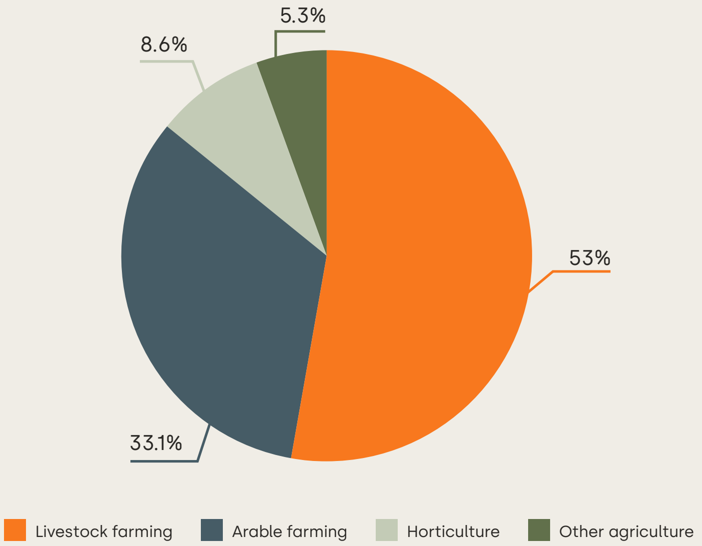
Until recently, dairy farms in the Netherlands did not require irrigation. In recent years, a few areas have needed it due to changing climatic patterns, including hotter and drier summers, requiring irrigation to reduce soil erosion and maintain the health of grasslands, which cattle depend on for foraging.

Biodiversity

All nature pressures may contribute to biodiversity loss in different ways: in Friesland, the dairy farming industry has a significant impact on peat meadow vegetation and bird fauna and the peat-forming fen ecosystems, characterized by species-rich grassland communities and dense meadow bird communities.[38]

With increased farm scale, intensive land use and nutrient pollution coupled with monoculture grasslands, biodiversity in agricultural areas continues to show a steady decline, as evidenced, among others, by the fact that the population size of breeding birds, mammals and butterflies fell by 40% between 1990 and 2013.[39] Intensive dairy farming can also harm insect biodiversity due to the higher number of cuts of grass per year.

Figure 8: Groundwater and surface water use in Dutch agriculture, 2018[36]



Renewing agricultural grasslands for improved yields and forage quality generally involves eliminating standing vegetation with herbicides, ploughing and reseeding.[40] Although application rates are lower than those of herbicides, farmers apply insecticides to feed crops, fungicides to soils and biocides in cow sheds.[41]

Despite meadow bird protection programs, a severe decline in these birds is taking place in the Netherlands. Research on Dutch dairy farms has hypothesized that pesticides and other agrochemicals may contribute to this decline through a negative impact on insect populations, a very important meadow bird food source, especially their chicks.[42]

Biodiversity – the variability among living organisms – is a key feature of nature, cutting across all other dimensions. All nature-related impact drivers can contribute directly or indirectly to biodiversity outcomes and, in turn, biodiversity affects the quality of many critical ecosystem services upon which agricultural production relies (such as soil health, bioremediation, etc.). See Annex 1 for further biodiversity screening data on this landscape.

Grassland diversity considerations

The area of the Netherlands covered by grassland has fluctuated between 900,000 and 1,000,000 hectares for years, making it the crop with the largest acreage in the country, representing 40% of total agricultural land. The industrialization of the Dutch agricultural landscape over the last several decades has led to the replacement of herb-rich meadows with monocultures of fast-growing ryegrasses planted on polders with groundwater levels lowered by efficient underground drainage systems.[43] Including herb-rich grasslands and clovers (for nitrogen fixation) has potential benefits for biodiversity, water and soil health.

Social issues

Despite numerous CAP reforms aimed at promoting more sustainable practices, the sector has not sufficiently mitigated its environmental impacts to protect biodiversity and the climate. Recent protests throughout Europe highlight the economic vulnerability of farmers, making the transition to a more ecological farming system risky.

Given the importance of the dairy sector in the Dutch economy and culture, farmers have usually met regulatory changes that disrupt business-as-usual with discontentment. In recent decades, the typical Dutch policy and political response to address environmental problems has been mainly reactive and incremental. Typically, they only address one problem at a time and the steps taken have not been efficient enough to solve the issues (such as manure surplus, ammonia emissions or nitrate losses), leading to the continual emergence of new policies placed on farmers.

Solving these issues is challenging and the scale of change needed to achieve such a sustainable transition has led the Dutch government to believe a livestock reduction is inevitable. The government proposed a fund of almost €25 billion to cover buy-out schemes for livestock farms, a policy unique in Europe (see section **Stage 2.3** on public policy for more on the scheme), improve water quality and biodiversity and significantly reduce greenhouse gas emissions.[45] However, with a change in government in July 2023, it is still unclear whether the aforementioned €25 billion will still be available, leaving many farmers unsure about what will happen to their business.

Spotlight on the Delta Plan for Biodiversity Recovery

The Delta Plan for Biodiversity Recovery is a strategy borne from the commitments of scientists, farmers' organizations, nature and environmental organizations, public authorities, banks and food supply chain partners.[44]

The plan's main objective is to halt and reverse biodiversity loss in the three main land-use forms of the Netherlands (agriculture, nature, public spaces, which collectively cover 90% of the country) by 2030.

The plan proposes a set of success factors that support and reward land users in agriculture, rural areas and public spaces when they make the right choices. It also aims to achieve cohesive results at the regional level to contribute to the recovery of biodiversity. Furthermore, it introduces the need for an integrated set of key performance indicators to provide land users with insights into their contributions to favorable biodiversity conditions.

The partners have yet to finalize indicators for all the types of regional landscapes and land users; however, land users in the dairy farming sector are already using a common set of key performance indicators (KPIs) (see **Spotlight on the Biodiversity Monitor for Dairy Farming**). Rather than measuring the resulting biodiversity impact itself, the KPIs measure biodiversity-based performance in the span of control of and users.

The plan aims to set up a monitoring system that provide insights into:

i. The trends in key biodiversity indicators at the national or landscape level

ii. The way that these indicators relate to the efforts and performance of land users in specific regional landscapes.

Upstream

The Dutch dairy sector has reduced its need for raw materials imported from outside Europe (such as soy and palm oil products) significantly over the past decade: a two-thirds reduction by 2025 compared to 2018. Since 2015, the requirements dictate the need for dairy farmers in the Netherlands to obtain feed exclusively from suppliers who have sourced sufficient quantities of responsibly-certified soy. As a result, the Dutch dairy industry became the first sector in the Netherlands to transition to using 100% responsibly-certified soy.[46]

The Dutch dairy sector refers to the "land-related dairy farming", or the mineral cycle for fodder and manure, and keeps it as closed as possible at the farm and local level. Farmers feed cattle grass, corn and other feed crops and use the manure from the herds to fertilize these crops. This creates short cycles, reducing the need to transport feed and manure over long distances.

The Netherlands enforces strict regulations to minimize antibiotic use in the dairy sector. Dutch farmers adhere to a farm treatment plan and veterinary prescriptions, using antibiotics solely to treat sick animals – regulations prohibit preventive use. When a cow receives antibiotic treatment, the system excludes its milk from production and continues to do so for a specified period post-treatment. To ensure no antibiotic residues are present, raw milk undergoes rigorous testing. Consequently, the dairy products available in stores are antibiotic-free.

This policy has led to positive outcomes, with the use of antibiotics going down by 47% in the 2009-2015 period.[47]

Downstream

The domestic market is responsible for approximately 30% of Dutch milk consumption. Farmers export the remaining 70%, most of which goes to the EU, especially to neighboring countries. Europe processes approximately 80% of all milk produced in the Netherlands into a dairy product. At the end of 2022, the Dutch dairy processing industry consisted of 26 businesses, with a total of 54 production locations, which processed approximately 14.1 billion kg of milk. Cheese production was responsible for the use of more than half of that milk.[51]

Milk processing is a significant contributor to the overall environmental footprint of dairy products, including high water consumption, water pollution from effluents, energy consumption and resulting GHG emissions and the generation of by-products (such as whey).[52] The dairy industry has high energy demand in process manufacturing due to intensive heating and cooling needs and in product distribution due to refrigeration and transportation requirements.[53] As illustrated in Table 3, dairy processing has the largest estimated energy use and GHG emissions compared to other downstream steps.[54]

Table 2: Daily average diet composition of a Dutch dairy cow[48]

Roughage	*Compound feed*	*Water*	*Vitamins and minerals*
55 kg: → 75% grass → 25% corn	**5 kg:** → 25% corn → 15% soy (Round Table on Responsible Soy – RTRS) → 10% citrus → 10% pulp → Palm kernel meal → 10% rapeseed meal → 5% beet pulp → 5% wheat → 20% by-products from the food industry	**100 L**	**100 g**

Spotlight on Nederlandse Zuivel Organisatie (NZO)

The Dutch Dairy Association (Nederlandse Zuivel Organisatie, NZO) is the trade association of the Dutch dairy industry, representing the interests of 13 dairy companies.[49] NZO members have made considerable headway in making Dutch milk more sustainable. For example, since 2015, the Round Table for Responsible Soy (RTRS) certified producers who supply 100% of the soy purchased by NZO companies. NZO also has a goal that, by 2025, the dairy farms themselves must produce 65% of protein either on or around their farms, leading to less impacts associated with land-use change, deforestation and conversion and transport.

NZO, in association with LTO Nederland (the Dairy Farming department of the Dutch Federation of Agriculture and Horticulture), also published the climate-sensible dairy sector in the Netherlands report,[50] which outlines the Dutch dairy sector's action plan for an energy-neutral dairy farming sector in 2030.

Table 3: Estimated energy use and GHG emissions for milk transport, processing and production of packaging: average values for Europe[55]

Dairy downstream steps post farm gate	*CO_2 emissions* (kg CO2-eq./kg milk at farm gate)	*Percentage share* %
Transport from farm to dairy	0.016	10.39
Dairy processing	0.086	55.84
Packaging	0.038	24.68
Transport from dairy to retail	0.014	9.09
Total	**0.154**	**100**

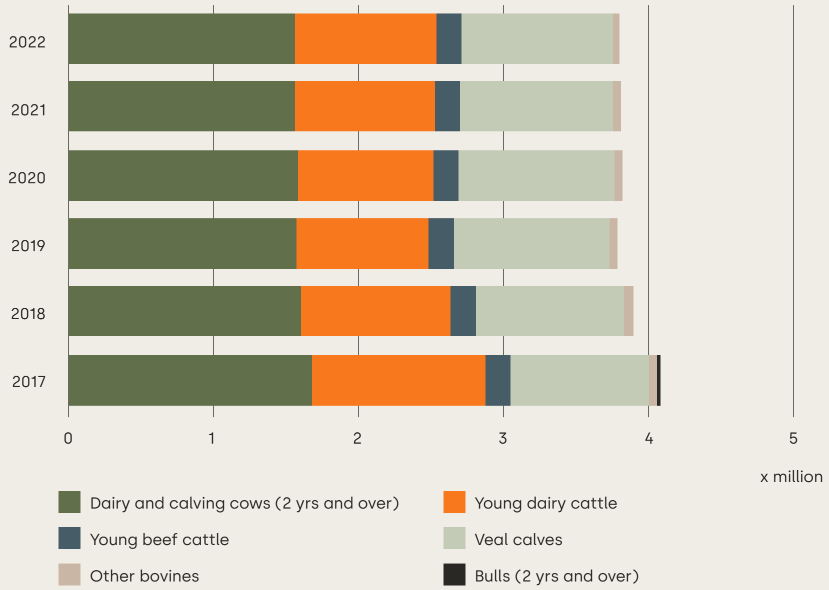
Seen as a "by-product" of the dairy industry, another downstream process of note is the slaughtering, processing and sale of retired dairy cows (referred to as "cull dairy cows") and bull calves as beef and veal meat. Dairy cows can only produce milk once they give birth and thus must birth a calf every year to continue producing. Dairy farmers will keep some heifers to restock or expand dairy herds, while they filter bull calves into veal and leather production. Dutch farmers raised over 1 million calves for meat consumption in 2022.[56]

When dairy cows become unproductive, farmers decide to cull them (usually after 6-7 years in the Netherlands) and sell them for their meat. In the Netherlands, cull dairy cows account for 42% of national meat production.[57] By using a dairy cow for its production of human-consumable protein in its milk and meat, the farmers spread the methane production (and other environmental impacts) for dairy cows across more units of protein.[58]

Looking ahead

Worsening climate change impacts disrupt seasonal weather patterns. On the one hand, droughts may affect dairy farms that depend on grassland ecosystems. Drought causes the root growth to stagnate, hampering grazing due to a shortage of grass and farmers may have to supply cows with more supplementary feed than at current rates as the level of protein in the grass goes down. Feed prices will increase and storage issues may develop for manure that farmers don't apply to the soil as the grass requires less manure.[60] On the other hand, winters are increasingly wet, with grasslands becoming waterlogged and requiring farmers to keep cattle indoors for longer periods to avoid increased soil compaction, leading to higher feed costs for farmers as cows feed less on grasslands.

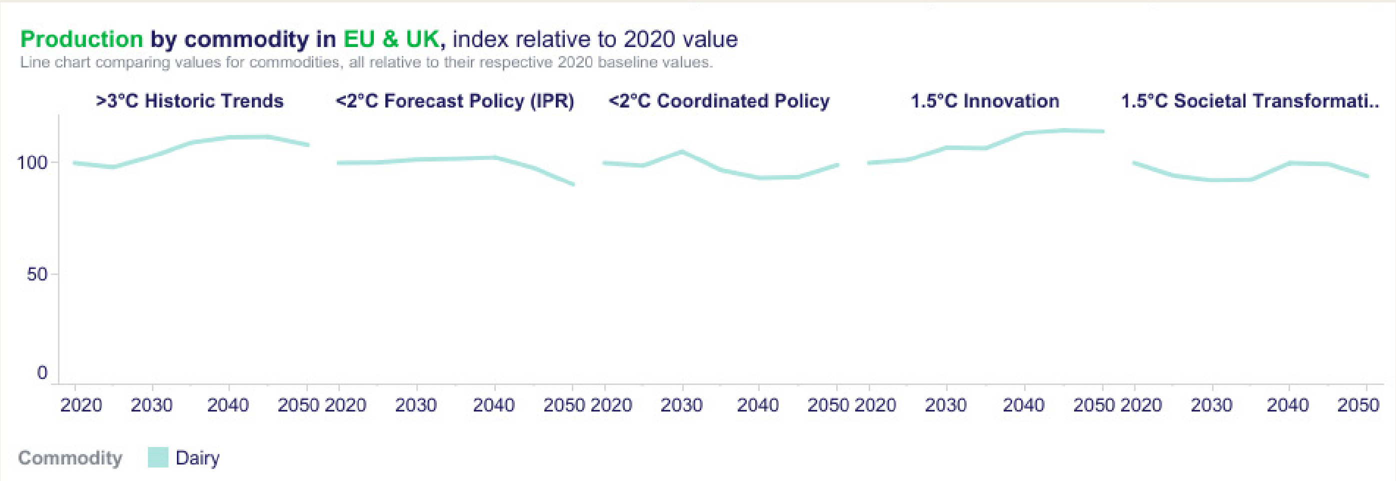
Figure 9: 2022 Dutch cattle herd stock[59]



Farm activities will likely see these two changes in terms of bigger, more consolidated farms with a limit on the number of livestock per hectare[61] (through farm closures and the government farm buy-out scheme – see **Stage 2.3** public policy for more on the scheme) and smaller farms that diversify activities (including tourism, artisanal cheeses, nurseries, etc.) to sustain their farming activity.

Dairy production throughout the broader European region may increase or decrease in the coming decades, depending on different policy and innovation scenarios, as documented in WBCSD's **Climate Scenario Catalogue**.

Figure 10: Production projections for the EU and UK dairy under five different climate transition scenarios.[62]



→ ***Note:*** See the **row crops summary** for more on this tool.

Materiality matrixes

Table 4 and Table 5 illustrate the results of the landscape materiality screening conducted, which we intend to be a starting point for refinement by any agri-food company engaged in this landscape and commodity. This generalized assessment only highlights those dependencies and impacts evaluated to have potentially high or very high materiality (according to the methods used in the ENCORE (Exploring Natural Capital Opportunities, Risks and Exposure) tool and the SBTN Sectoral Materiality Tool for Step 1a) with the rationale that these are the most likely to require further risk and opportunity evaluation and to inform the development of priority actions and targets.

Arrows indicate ratings of nature-related dependencies and impacts relative to the livestock-related considerations in the TNFD Draft sector guidance – Food and agriculture, meaning the major differences to consider at this landscape level compared with a more generalized global screening. The tables align with the classifications available in the ENCORE tool and the Global Assessment Report on Biodiversity and Ecosystem Services by the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES).

Table 4: Dairy in Friesland – Key dependencies

Value chain stages	Direct physical inputs				Enable production processes					Mitigate direct impacts				Protect from disruption					
	Fibers & other materials	Genetic materials	Groundwater	Surface water	Pollination	Soil quality	Ventilation	Water flow maintenance	Water quality	Bio-remediation	Dilution by atmosphere & ecosystems	Filtration	Mediation of sensory impacts	Buffering & attenuation of mass flows	Climate regulation	Disease control	Flood & Storm Protection	Mass stabilization & erosion control	Pest control
Inputs			Compound feed manufacturing ↑	Compound feed manufacturing ↑															
Dairy production	Grassfields and roughage		Milk washing, cooling, heating ↓	Milk washing, cooling, heating ↓		Essential for grassfields health ↑			Critical for consumption by dairy cow ↓								Facilities exposure to weather	Essential to maintain grassland health and soil structure	
Trading & distribution															Operations affected by temperatures		Facilities exposure to weather		
Processing & manufacturing			Needed for operations	Needed for operations					Important for operations and product quality ↑										
Retail																			

High materiality | **Very high materiality** | ↑ ↓ **Rating difference vs. TNFD Draft Sector-Guidance Food & agriculture; SBTN Sectoral Materiality Tool; ENCORE**

Table 5: **Dairy & in Friesland – Key impacts**

Value chain stages	*Impacts*											
	Land-/water-/sea-use change			**Resource exploitation**		**Climate change**	**Pollution**				**Invasive species & others**	
	Terrestrial ecosystem use	**Freshwater ecosystem use**	**Marine ecosystem use**	**Water use**	**Other resource use**	**GHG emissions**	**Non-GHG air pollutants**	**Water pollutants**	**Soil pollutants**	**Solid waste**	**Disturbance**	**Biological alterations/ interferences**
Inputs	Compound feed manufacturing ↑	Compound feed manufacturing ↑		Compound feed manufacturing ↑			Compound feed manufacturing ↑					
Dairy production	Land-use change (peat draining)	Land-use change (peat draining)		Animal consumption, milking, grassland irrigation (when needed) ↓		Rumen fermentation and digestion	Ammonia & waste management	Manure runoff & leaching ↑	Manure runoff & leaching	Manure, bedding materials, feed leftovers		
Trading & distribution	Land clearing for transport infrastructure ↓						Fuel use in transport				Noise and light pollution	
Processing & manufacturing				Industrial processes & in products ↑			Industrial processes	High concentration of organic matter in waste water ↑	High concentration of organic matter in waste water ↑	Packaging		
Retail												

High materiality | **Very high materiality** | ↑ ↓ **Rating difference vs. TNFD Draft Sector-Guidance Food & agriculture; SBTN Sectoral Materiality Tool; ENCORE**

Stage 1.3 Assess risks & opportunities

Agri-food companies should next assess nature-related risks and opportunities for the business and for key stakeholders to prioritize further action. The process outlined in the row crops summary will be relevant for any agri-food company assessing its nature-related risks and opportunities. The summary also contains corresponding findings applicable across global agricultural commodities. The findings here will be relevant for those engaged directly or indirectly in dairy production in Friesland.

Given the material issues linked to terrestrial ecosystem use, freshwater ecosystem pollution, high GHG emissions and soil quality, the main risks and opportunities for agri-food companies involved in this landscape also revolve around these primary drivers of nature pressures.

Risks

Physical risks

Physical risks to farm operations include the growing effects of climate change that can provoke both extreme droughts, impacting the resilience of grasslands. It can also influence the availability of high-quality roughage and more intense rain periods, affecting the soil drainage and level.

For example, USDA Foreign Agricultural Service and Global Agricultural Information Network has estimated that the 2018 drought reduced the average annual income of dairy farms by €24,500, mainly due to higher feeding costs.[63] The unusually dry summer in 2022 saw similar effects. Ongoing nitrate pollution resulting in low water quality for the region is also a point of concern, as is the need to find an adequate destination for current levels of manure production.

Transition risks

As for many agri-food value chains, transition risks may include lost revenue, profitability or financing if customers, consumers or lenders move away from producers or even entire regions that they perceive as unsustainable or unethical (meaning with regard to nutrient pollution or carbon emissions). This can also put at risk a company's legal or community license to operate. Compliance with EU and Dutch nitrate regulations, in the context of stricter environmental laws and targets, is a transition risk that not all farmers will be able to cope with: around 3% of dairy farms close every year in the Netherlands, with consolidation also occurring.[64]

In 2022, the shortfall in milk production in the main export regions and extremely high-cost levels in the entire dairy chain (such as the costs of fertilizer, feed and energy) strongly affected the global dairy market. Less supply and high cost meant that the market prices for dairy products reached record highs.[65]

Although the consumption of dairy alternatives has been increasing, at a global level, projections show that growth in world milk production will increase by 22% for the ten-year period 2019-28, with a large share of the increase coming from Pakistan and India. Over the projection period, expectations are for the EU's share in global exports of dairy commodities to increase from 27% to 29%.[66] This growth in dairy market share from emerging countries may lead to a production shift from more environmentally-friendly and efficient dairy systems (such as the Netherlands) to less efficient ones.[67]

Opportunities

Business opportunities for companies involved in the Dutch intensive, grassland-based system include the benefits of avoiding the aforementioned risks through careful planning and investment, increased revenue, profitability and financing options through improved practices (such as circular and regenerative) and the shifting of business models to meet changing consumer and stakeholder demands.

Although currently unbalanced, the dairy sector traditionally features circular principles: soil nutrients enable grass to grow, cows graze on this grass to produce milk, cows release urine and dung containing valuable nutrients and soil fauna beak down these nutrients and become available again for growing grass, closing the nutrient cycle. Circular economies both inside and outside a single farm have great potential for new business opportunities aligned with environmental goals by focusing on closing resource loops in dairy operations (therefore reducing costs) and enhancing natural capital.

Impact and dependencies illustrative example

Figure 11: Interconnections between key dependencies and impacts related to one key impact area – nutrient surplus – in conventional dairy production in Friesland and the resulting risks for farmers and agri-food companies

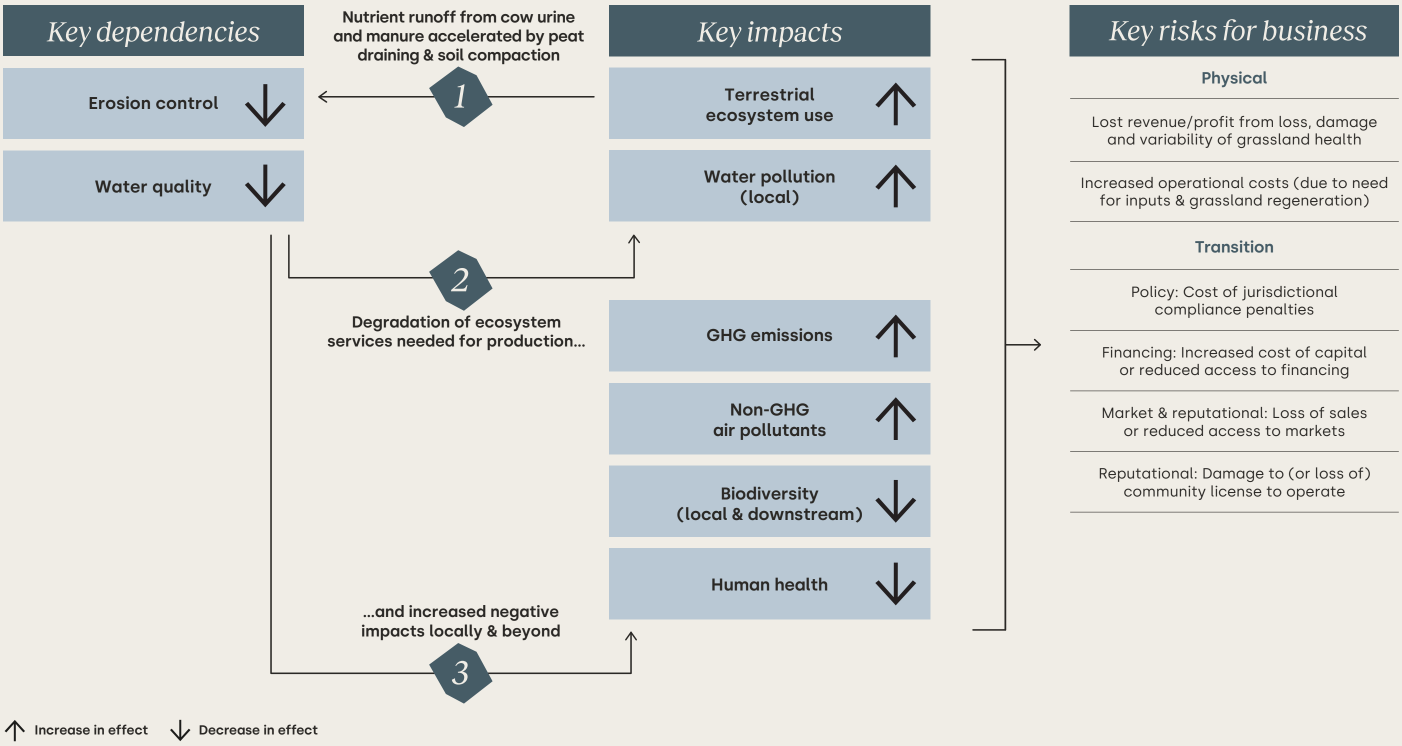
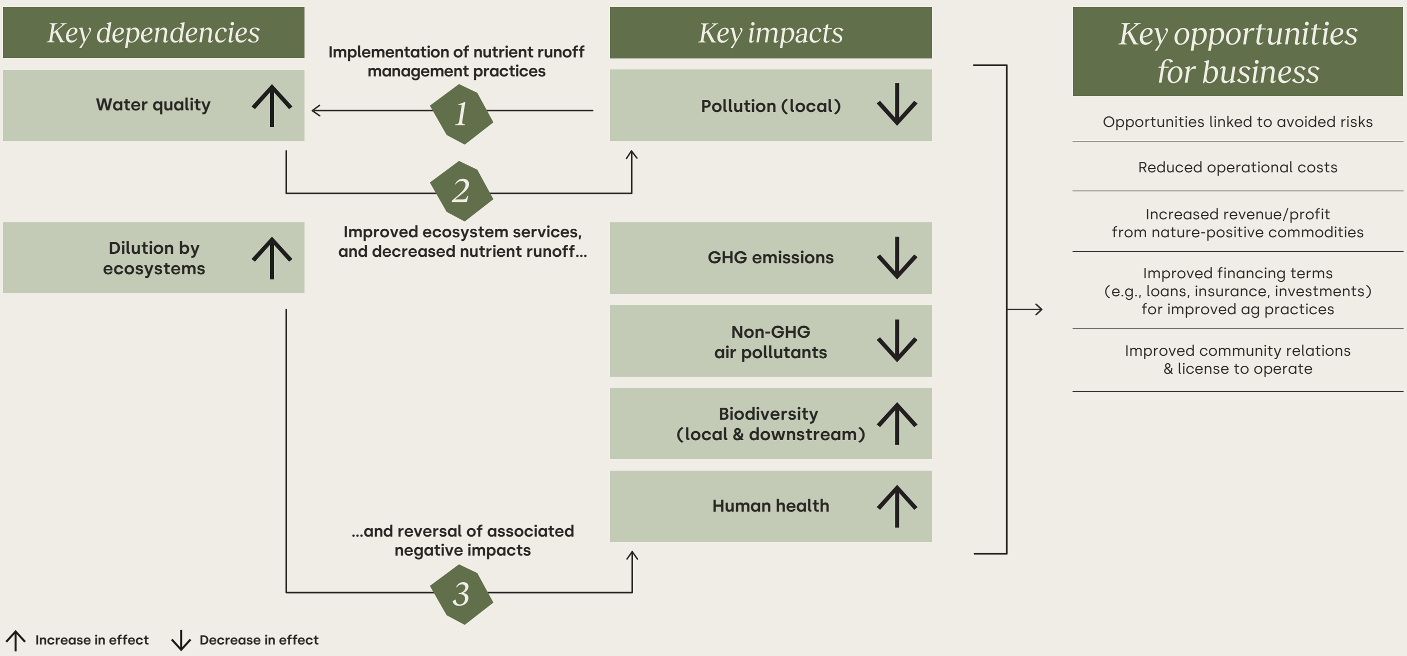


Figure 12: Interconnections between key dependencies and impacts in a more nature-positive dairy production system and the resulting opportunities for farmers and agri-food companies



Stage 2: *Commit and transform (targets for priority actions)*

02.

Stage 2:
Commit and transform (targets for priority actions)

Stages 2.1 & 2.2 Set science-informed targets and take priority actions

Based on the materiality screening, agri-food companies should identify the existing and additional priority actions needed to avoid and reduce negative impacts and promote opportunities to restore and regenerate nature.

Companies should set time-bound, specific, science-informed corporate-level targets and linked indicators to track progress on reducing the priority impact drivers on nature.

Improve agricultural practices

To reduce nutrient pollution, agri-food companies should focus on improving manure management and application by reducing its use on fields, reducing animal density on land or by finding alternative destinations for manure (for instance, energy generation, application in different farms as nutrients, etc.) or by storing it for more appropriate moments.

Improving grassland management is a strategy with high potential to improve the environmental performance of a dairy farm as grasslands contribute to various provisional and non-provisional ecosystem services. Economic factors, such as variable mineral fertilizer and feedstuff prices, are also driving the current interest in more efficient grassland management on dairy farms. Producing more home-grown protein by using available grasslands can reduce the use of, and dependency on, these external inputs and an efficient conversion of these feed sources into milk could increase farm profitability.[68]

Grassland management covers a broad spectrum of different practices, including fertilization, harvesting and grazing strategies. Among these are keeping permanent grassland and deploying strategies for grassland renewal that don't require removal to protect soil (and support their potential as carbon sinks). The establishment of grass-clover swards is another promising grassland management strategy, with expected benefits such as mineral nitrogen fertilizer savings, increased protein self-sufficiency and reduced GHG emissions.[69] One of the main characteristics of clover, contributing directly and indirectly to these benefits, is symbiotic N2 fixation. Grass-clover swards could improve forage quality because of the higher protein content of clover, while simultaneously contributing to various ecosystem services including above- and belowground biodiversity.[70]

A circular dairy sector in the Netherlands, with a regional approach, would enable the better management of natural capital, closing nutrient, water, carbon and waste cycles while promoting biodiversity, optimizing land use and safeguarding farmer income.

Companies can support the advancement toward a circular dairy sector by improving environment-specific criteria, such as:

- → Reducing the overuse of synthetic fertilizers, imported feed and antibiotics
- → Recycling nutrient release from manure, water, wastes and other by-products such as whey
- → Extending cow lifespans for high "lifetime milk production" or expanding local feed production
- → Increasing the amount of feed grown in and around farms, minimizing dependence on external inputs
- → Turning nutrient-rich manure slurry into fertilizer
- → Using methane digesters to capture and convert methane into biogas
- → Recycling water used for milk processing

They should also consider socioeconomic criteria to ensure continuous systemic improvements and collaboration throughout the value chain:

- → Innovating with new technologies, business models and alternative revenue sources
- → Leading by implementing best practices, sharing know-how, setting targets or raising awareness
- → Collaborating with other farmers, researchers, consumers and other stakeholders[71]

This will require the development of premium end markets that recognize regions and producers who are following best practices to move the system toward a circular one.

Landscapes & restoration

Taking a landscape approach reflects an understanding of farms as an active part of local ecosystems, communities and cultures, recognizing that they both rely on critical ecosystem services and create impacts beyond the farm boundary. Agri-food companies should embed landscape approaches as a guiding theme in their nature-positive strategies – including investing in landscape conservation and restoration programs in and beyond their value chains, with a particular focus on areas of high conservation value (HCV).

Due to social and policy pressure to reduce eutrophication, soil degradation and subsidence, as well as emissions from drained peatlands, attention has increased for the concept of paludiculture – the productive land use of wet and rewetted peatlands that preserves the peat soil and thereby minimizes CO_2 emissions and subsidence.[72] However, there has rarely been any comparison between the performance of paludiculture and drainage-based agriculture. Incentivizing farmers to change their practices to a more sustainable use of peatlands such as paludiculture will require fundamental financial support from companies through in-kind investment and pay premiums.

Without utilizing the co-benefits of ecosystem services and accounting for the societal costs from ecosystem disservices, including greenhouse gas emissions and nitrogen pollution, it is not likely that farmers will have the incentive to change the current farming system to the wetter alternatives.[73]

Upstream and downstream

Upstream actors should focus on ensuring deforestation- and conversion-free inputs (mostly soy and corn) in their animal feed composition and invest in the research and development of feed options that support better digestion for the animals, better nutrition and lower GHG emissions.

The efforts of downstream actors should focus on efficient energy use and the use of sustainable energy sources, as detailed in the Sustainable Dairy Chain (Duurzame Zuivelketen[74]) and NZO's climate-sensible dairy sector in the Netherlands report.[75]

Stage 2.3 Transform the system

Agri-food companies should identify additional actions needed to transform business models and business activities. These actions should address barriers and improve the enabling environment (policy, financing, technology, infrastructure).

Companies should consider both direct operations and their wider sphere of influence (such as priority upstream and downstream value chains and landscape-specific stakeholders and customers).

Spotlight on the Biodiversity Monitor for Dairy Farming

The **Biodiversity Monitor for Dairy Farming** is a tool that uses common metrics to quantify efforts by dairy farmers to improve biodiversity both on their own farms and beyond.

FrieslandCampina, Rabobank and WWF-NL developed the Monitor in close collaboration with dairy farmers, researchers, agricultural environmental organizations and preservation societies.

The Monitor uses seven key performance indicators (KPIs) to measure the influence of individual dairy farms on biodiversity on the farm and beyond. The KPIs focus on protecting and enhancing four pillars of biodiversity: functional agrobiodiversity, diversity of landscape, diversity of species and regional biodiversity.

The KPIs make it possible to monitor the role of dairy farmers in the preservation of the landscape and the environment using a standardized system. In addition to providing metrics to assess the impact on the environment (both positive and negative), the Monitor proposes specific measures dairy farmers can take to improve biodiversity. These include measures such as increasing the amount of permanent grassland in the building plan, overseeding clover in the grassland and postponing the first mowing.

This ensures that the Monitor provides an action perspective for dairy farmers, while not being prescriptive of the type of actions farmers must implement, ultimately allowing for performance-based rather than management-based payments. The Monitor consequently provides the basis for a system to calculate the losses and gains of biodiversity towards a "net positive impact" type goal.

Though this project focuses on the sector overall (and not individual farms), the Monitor provides an underlying and pre-determined set of KPIs on which to base biodiversity metrics by aggregating across farms, with associated datasets to calculate baselines. Companies can also use this tool to reward dairy farmers through supply chain partners and other stakeholders. Farmers can reduce their operating costs through sustainable management while at the same time benefiting from lower interest rates, a better market price or more advantageous lease conditions.

With the success of the Biodiversity Monitor for Dairy Farming, the arable farming sector has received the inspiration to create a Biodiversity Monitor specifically for arable farming in the Netherlands.

Business strategy, market development & financing

For private sector stakeholders linked to this production system, there are ample opportunities to support the shift to a nature-positive system, with a strong focus on aligning different players in the value chain to use the same metrics (such as the Biodiversity Monitor) and reward systems (such as pay premiums, payments for ecosystem services (PES), technical assistance, special financial conditions for loans and investments, etc.).

Individual companies, sector groups and the entire value chain must send stronger signals for the adoption of nutrient management policies that go beyond the minimum legal requirement and improve the monitoring of farm-level practices and outcomes.

Public policy

As part of the Dutch government's effort to reduce nitrogen emissions by at least 55% by 2030, it proposed a farm buy-out scheme under which it will buy the businesses of Dutch livestock farmers categorized as "regular" or "peak" polluters. It determines these categories based on total nitrogen leakage and proximity to protected nature areas. The purchase price will be between 100% to 120% of the value of their business, with the farmer still able to retain the land. To reduce nitrogen emissions, the government is also proposing to increase the extensification of farming operations, particularly the limit on the number of livestock per hectare.

Even though all farmers must draw up annual fertilization plans before the growing season and have had to establish an automated system for the real-time accountability of manure transport since 2023, it is unclear how the Netherlands will meet the current goals for manure application and nutrient management.[77] By 31 December 2025, farmers will have a limit of 170 kg of nitrogen per hectare and per year in all areas and will also have to comply with other objectives of the European Green Deal, including the Zero Pollution Action Plan, reducing nutrient losses by 50% in 2030, a reduction of 20% in fertilizers and preserving soil fertility, to name a few.

For nutrient cycles, a single farm is too small to be the only territorial unit considered for policies and actions. Adequately addressing the issues at hand will require regional and landscape-based approaches, particularly in an intensively farmed region such as Friesland. Businesses throughout the value chain must incorporate this more holistic approach and public policy by establishing preferential terms for landscape-based approaches and EU regulations must support them.

The EU Nature Restoration Law (EU NRL)[78] – approved in June 2024 – legally binds EU member states to restore at least 20% of the EU's land and sea areas by 2030 and all ecosystems in need of restoration by 2050, notably including peatlands. As restoring drained peatlands is one of the most cost-effective ways to reduce emissions in the agricultural sector, EU countries must restore at least 30% of drained peatlands by 2030 (at least a quarter rewetted), 40% by 2040 and 50% by 2050 (with at least one-third rewetted).

Peatlands cover a total of 35 million hectares in the European Union, 11 million of which are agricultural (6.4 million (58%) for cropland and about 4.6 million (42%) for grassland).[79] However, rewetting will remain voluntary for farmers and private landowners under the EU NRL.[80] Policy support will therefore need to come from elsewhere to incentivize farmers to switch from peat-draining practices to paludiculture; a change in practices to close the yield gap could help realize this through CAP payments to keep peatlands wet.[81]

Maturity progression: nature-positive dairy production in Friesland

WBCSD's foundations guidance includes the core concept of a corporate nature maturity progression, from starting to developing, advancing and ultimately leading. The general progression, aligned with the SBTN Action Framework, is from "do no harm" to "do more good" to "transform the system". A set of criteria aligned with the High-level Business Actions on Nature defines each stage. The intent is to meet companies where they are today and support their advancement toward leading practices.

The following progression illustrates the highest priority issue in catalyzing nature-positive system transformation in this landscape: increasing nutrient cycling to advance toward a circular dairy sector.

Table 6: Maturity progression matrix – illustrative corporate maturity progression on nature-positive and circular practices on and around farms in Friesland, Netherlands

	Corporate nature maturity levels		
	Starting (Do no harm)	***Developing/advancing*** (Do more good)	***Leading*** (Transform the system)
Policy & stakeholder engagement	Comply with all jurisdictional regulations on land-use, nutrient pollution, local (or certified) sourcing practices	Focus on increasing productivity and efficiency (increased production from each animal) from different research areas and practices, while managing environmental impacts	Lead pre-competitive coordination, civil society partnerships, trade associations & policy advocacy to catalyze food system transformation Align actors in all levels of the supply chain on shared goals and metrics Develop landscape-based economic diversification, supporting other on-farm revenues (tourism, higher value product development) and more efficient use of land (cows/ha)
Business strategy	Develop & deploy local inputs & technology to decrease dependencies on external inputs and imports Use deforestation and conversion-free feed inputs (soy and corn, mostly) Avoid soil compaction Reduce ammonia emissions and nitrogen soil surplus Reduce manure application on the fields or by storing it for more appropriate moments	Research and develop feed options that support better digestion for the animals, better nutrition and less emissions, including: Improve grass diversity (herb-rich grasslands, clovers) to improve soil quality Keep permanent grassland and deploy strategies for grassland renewal Develop a manure management plan with storage option Deploy precision grazing options to reduce methane emissions Higher lifespan for dairy cows, with more lactations	Develop circular processes that use waste streams better (for energy production, feed, etc) with a regional approach Implement integrated and holistic nutrient management programs Develop integrated premiums that reward farmers for best practices on climate, biodiversity, animal health and welfare, and outdoor grazing Support farmer's transition to paludiculture
Illustrative commitments	Use 100% sustainably certified soy and palm products in the feed sector (RTRS) Apply regulatory requirements of kg of manure per ha per year - maximum manure application level of 170 kg N per ha	By 2030, achieve 0.8 Mt CO2-eq reduction of methane by means of measures in the areas of animal, feed, manure storage and manuring A minimum longevity (when cows leave the farm) equal to the average longevity of 2018 (5 years, 6 months and 20 days) at 90% of the dairy farms (70% by 2025) Dairy farmers will harvest, by 2025, at least 65% of the required protein from their own land (or from nearby Livestock farms must have manure storage capacity for at least six months	By 2030 etablish a regional economy diversification plan approved by relevant stakeholders with specific commitments by sector From 2022 onwards, 60% of farmers will work with other land users and landowners towards biodiversity objectives at the regional level
Key references	Nitrates Directive (EU Commission) Sustainable feed ambitions (Nevedi) Standard for Responsible Soy Production (RTRS) Sustainable dairy indicator dashboard (Kringloopwijzer)	Sustainable Dairy Chain objectives (Duurzame Zuivelketen) Biodiversity Monitor for the Dairy Farming Sector (Duurzame Zuivelketen)	Foqus Planet programme (FrieslandCampina) payment program Biodiversity Monitor for the Dairy Farming Sector (Duurzame Zuivelketen) Delta Plan for Biodiversity Recovery (IUCN NL, MVO Nederland)

Key trade-offs & remaining barriers

Nature-positive system transformation in the dairy sector in Friesland involves several important yet unresolved trade-offs and barriers. Agri-food companies across the value chain play a critical role in collaborating with the full range of stakeholders to address and resolve these challenges. By doing so, they will drive change at the speed and scale needed for the region's nature, people and economy to thrive.

To reach EU environmental goals, Dutch dairy farmers will need to either reduce herd sizes or increase the size of grassland available for grazing. However, the high costs of land (and of farming) and the lack of availability make it a difficult trade-off for farmers.

It is necessary to create more readily available alternatives for manure disposal that do not translate into excessive costs for farmers. There is a strong move towards a circular economy on farms and in regions, for instance with energy generation from biodigesters, but this will require significant investments.

Businesses should funnel more investment into feed efficiency and feed enhancers to decrease enteric fermentation. Many technological solutions have emerged recently in the field, with research by groups such as the Greener Cattle Initiative[82] (over dairy cow genetics, rumen microbiome, dairy cow nutrition), the Sustainable Dairy Partnership[83] and the EU Commission LIFE-Dairyclim,[84] testing feeding strategies to decrease methane emissions and the carbon footprint of dairy cows in Belgium, Luxembourg and Denmark, highlighting the role of precision grazing techniques and grazing management practices.[85] Yet, it is still necessary to fine tune animal welfare, productivity and economic results for farmers to promote efficient methane diets.

The nitrogen cycle is complex. When choosing monitoring indicators and policies, there must be considerable analysis of trade-offs, particularly between water and air pollution, as the balance of different forms of nitrogen can change in a system depending on the interventions. It requires an integrated approach to prevent unexpected effects on an aspect of the system when the focus aims at another aspect.

Scientists are still underestimating the consequences of soil compaction and the community is having an ongoing debate about how to best measure this impact.[86] The lack of a common indicator or reference value to measure and report the impact of soil compaction on soil health remains a barrier to scaling positive outcomes in this area.

Stage 3: *Disclose (initial disclosures)*

03.

Stage 3:
Disclose (initial disclosures)

Initial disclosures can build on existing nature-related reporting practices and may include the methodologies and outputs of a company's materiality assessment, value chain mapping, interim target-setting and progress on actions.

As a company's nature journey matures, disclosure ambitions and granularity should increase.

For companies linked to Friesland dairy production, nature-related disclosures may be necessary to meet legal standards such as the EU Common Agricultural Policy and EU Nitrate Directive through annual corporate sustainability reporting and as part of voluntary certification schemes such as Meadow Milk, On the Way to PlanetProof, Beter Leven, etc.

The TNFD's sector-specific guidance for the Food and agriculture sector (which covers the SASB industry standards for meat, poultry and dairy (FB-MP)) provides a framework, process and recommended metrics for corporate disclosure that are relevant for this landscape and align with other leading voluntary frameworks, such as CDP, the European Corporate Sustainability Reporting Directive (CSRD), the Global Reporting Initiative (GRI) and the IFRS International Sustainability Standards Board (ISSB). The SBTN High Impact Commodity List is also instructive in this process.

In general, corporate reporting should include the value chain and landscape-specific assessments demonstrated in this deep dive, including acknowledgement of existing gaps and barriers as we outline in the previous section. The aim should not be perfection or full value chain data coverage but rather a materiality-led approach with transparency about the process, findings and progress. The key questions to consider may include:

- What are stakeholders (financial and other) actually looking for?
- What is in the company's control to manage and measure?
- What falls in its broader spheres of influence?

Sticking closely to leading consensus-driven disclosure frameworks will help ensure a transparent and credible approach.

Annexes

Annex 1: Landscape profile

Key considerations for the **Scoping** and **Locate** steps of corporate value chain nature assessment, as recommended in the locate, evaluate, assess and prepare (LEAP) approach from the Taskforce on Nature-related Financial Disclosures (TNFD) – including sector and subsector identification according to the Sustainability Accounting Standards Board (SASB) **Sustainable Industry Classification System** (SICS), commodity presence on the Science Based Targets Network (SBTN) **High Impact Commodity List**, relevant biomes, the identification of biodiversity risks, water stress and other considerations. See the **Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES) glossary** for definitions of key terms.

Location		***Sources***
Friesland, Netherlands		
Geolocation	1,731 km² of grasslands (region is 5,740 km²)	
Biomes	Sown pastures and fields (T7.2) Derived semi-natural pastures and old fields (T7.5) Constructed lacustrine wetlands (F3.2) Canals, ditches and drains (F3.5)	*TNFD guidance* *Global Ecosystems Typology tool*
Biodiversity overall risk	Medium-High	*WWF Risk Filter*
Biodiversity hotspot?	No	*Critical Ecosystem Partnership Fund (CEPF)*
Includes key biodiversity areas (KBAs)?	Yes	*WWF Risk Filter*
High water stress?	Low	*World Resources Institute (WRI) Aqueduct*

Commodity cycle		***Sources***
Dairy		
SICS sector	Food & beverage	
SICS industries – upstream	Chemicals *Industrial machinery & goods* *Insurance, commercial banks*	*SASB*
SICS industries – direct operations	Meat, poultry & dairy	
SICS industries – downstream	Processed foods Transportation – rail, road, marine Food retailers & distributors	
High-impact commodity list?	Yes	*SBTN*

Note: Sectors in italics could be relevant but we did not assess them as unique to this deep dive.

Annex 2: Further reading

Beter Leven/Better Life label scheme

This star-rating scheme indicates the animal-friendliness of the systems used to rear livestock for the production of meat, eggs and dairy produce. The higher the number of stars, the more attention animal welfare gets.

Biodiversity Monitor for Dairy Farming

This tool provides insight into the actions of dairy farmers to strengthen biodiversity on their farms and beyond. It also aims to develop new revenue models throughout the supply chain to reduce dairy farmers' dependence on government funding.

Duurzame Zuivelketen: Grazing Agreement

This agreement – signed by 83 organizations up and down the dairy value chain – aims to increase the rate of cows grazing and at least maintain the level of dairy farms with grazing as it was in 2012. Dairy farms that graze receive a grazing premium paid by dairy companies to farms.

EU Nature Restoration Law

The first continent-wide, comprehensive law of its kind, it aims to restore ecosystems, habitats and species throughout the EU's land and sea areas in order to:

- enable the long-term and sustained recovery of biodiverse and resilient nature
- contribute to achieving the EU's climate mitigation and climate adaptation objectives and
- meet international commitments

EU Nitrates Directive

The directive requires EU Member States to monitor the quality of waters and to identify areas that drain into polluted waters or at risk of pollution. These concern waters that due to agricultural activities are eutrophic or could contain a concentration of more than 50 mg/l of nitrates.

FrieslandCampina and Circle Economy: Circular Dairy Economy

This discussion paper presents insights into the potential of circular dairy farming from a Dutch perspective.

Nederlandse Zuivel Organisatie: Climate-sensible dairy sector in the Netherlands

The report outlines the Dutch Dairy Sector's action plan for an energy-neutral dairy farming sector in 2030.

SAI Platform Sustainable Dairy Partnership

The partnership provides a consistent global approach to dairy sustainability in commercial relationships between dairy buyers and processors. It reduces the burden of buyer-specific programs and audits, restoring focus on what really matters: continuous improvement on dairy farms.

Stichting Weidegang Meadow Milk Quality Mark

Farms where cows graze in meadows for at least 120 days a year from spring to autumn, at least 5h/day, or at least 120 days and 720 hours a year, can receive this quality mark.

Dairy companies collect and process this milk separately. Partly due to increasing demand from the market, the switch to pasture grazing is becoming more common.

WBCSD Climate Drive

- **Reduce CH4 & N2O emissions with livestock manure management**
- **Reduce enteric fermentation emissions from ruminant animals**

Acronyms and abbreviations

CAP	EU Common Agricultural Policy
CSRD	EU Corporate Sustainability Reporting Directive
DIRO	dependencies, impacts, risks and opportunities
EU NRL	EU Nature Restoration Law
GHG	greenhouse gas
GRI	Global Reporting Initiative
GWP	global warming potential
ha	hectare
HCV	high conservation value
ISSB	International Sustainability Standards Board
KPI	key performance indicator
LEAP	locate, evaluate, assess, prepare approach of the Taskforce on Nature-related Financial Disclosures
LSU	livestock unit
NZO	Nederlandse Zuivel Organisatie
OECD	Organisation for Economic Co-operation and Development
PES	payment for ecosystem services
SASB	Sustainability Accounting Standards Board, now part of the International Financial Reporting Standards (IFRS) Foundation
SBTN	Science Based Targets Network
SICS	SASB Sustainable Industry Classification System
TNFD	Taskforce on Nature-related Financial Disclosures
RTRS	Round Table on Responsible Soy
UAA	utilized agricultural area

Endnotes

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