



ON THE ROAD TO A BIODIVERSITY CONSCIOUS EU DAIRY SECTOR?

An Ex-post analysis of Dutch and Swedish policies



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Abstract

Biodiversity loss is an increasing threat bringing along many consequences, such as lowering ecosystem services necessary for nutrients in food and fresh water. Especially agriculture practices contribute to biodiversity loss through, among other things, land-use change and fertilizer use.

The dairy sector imposes a serious threat on biodiversity because of intensive land and fertilizer use. Since the 1970s, massive EU-wide initiatives have emerged to mitigate the effects of biodiversity loss due to agriculture practices. This paper wants to examine how policies of the Dutch and Swedish dairy industry match Europe's most recent updated strategy on biodiversity loss. The purpose of matching the policy frameworks of the member states to the EU level is to find out significant discrepancies. These identified gaps may then help understand the challenges dairy farmers face and find solutions and recommendations. We use a literature review and the ex-post policy analysis to compare the Dutch and Swedish commitments of the dairy industry to the key commitments of the EU Biodiversity Strategy for 2030.

Our findings for both cases show that there are several discrepancies between the EU Key-commitments and the Dutch and Swedish overall biodiversity policy frameworks measured on the dairy industry.

We found three main challenges the EU and both states face. First, the EU thinks globally but fails to consider that actions are taken locally. Second, the dairy sector faces unique problems that need certain policy customizations. And third, biodiversity policies are separated from climate policies.

In order to overcome these gaps, we suggest further research regarding the implementation of the biodiversity navigation wheel. It is a pragmatic decision framework that helps businesses to find the right biodiversity tool that could be applied to any sector and scenario. We further recommend that future research should concentrate on methods that clarify how to compare nationally to EU-wide policies to collect more data.

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Introduction

Biodiversity is not about individual species but can be described as the richness and diversity of all life. Agricultural landscapes, specifically grassland and cropland, occupy nearly 39% of the European land area and represent a crucial habitat for plants and animals (European Environment Agency, 2020). Many species depend on the agricultural landscape as their prime habitat. However, agriculture is widely recognised as a primary driver of global biodiversity loss (Tilman et al., 2017). The dairy sector is a massive threat to local biodiversity because of the intensive land use required, leading to habitat loss and fragmentation, directly impacting local biodiversity. Besides, the enormous amounts of nitrogen depositions that lead to acidification, eutrophication and ecotoxicity indirectly impact local biodiversity (Dise et al., 2011). However, massive national and EU-wide initiatives on making the agricultural sector and the dairy industry more biodiversity conscious and sustainable have emerged since the 1970s.

This report examines how policies of the Dutch and Swedish dairy industries match and compare to the EU Biodiversity Strategy for 2030 to find out the most significant discrepancies. This research will help the reader understand the challenges dairy farmers face, as they have to simultaneously maintain the continuity of the dairy industry while steadily decreasing their environmental impact to maintain socially accepted. Throughout this report, the guiding research question is: *How do the national policies in the dairy industry in Sweden and the Netherlands match the Key Commitments of the EU Biodiversity Strategy for 2030?*

Through ex-post policy analysis, this research compares the Dutch and Swedish commitments of the dairy industry to the key commitments of the EU Biodiversity Strategy for 2030. First, a concise literature review showcases the importance of biodiversity for a thriving EU dairy industry. Subsequently, the methodology section explains the analytical process of the ex-post policy analysis method created by the European Training Foundation. The assessment framework explains step by step how we conducted our research. Then, the Dutch and the Swedish regulations on biodiversity in the dairy sector are assessed and compared to EU key commitments. After elucidating our findings, a list of our recommendations for future revisions of the biodiversity strategy can be found. Last but not least, a concluding paragraph recapitulates our main ideas and gives propositions for further research.

Literature Review: The EU Dairy Sector and Biodiversity

The Importance of Biodiversity and the EU's Approach to protect it

Many tend to forget that biological diversity is essential. Our planet and our economy depend on it. When the natural environment is healthy and resilient, it protects and provides. Swift et al. (2004) defined four different ways biodiversity holds value for us humans. According to them, biodiversity has an intrinsic, utilitarian, serendipic and functional value for humankind (for a more detailed description of each value, see Swift et al., 2004). To address biodiversity loss, unsustainable use of ecosystems and the overall pressure on the environment, the EU has since the 1970s developed several policies on nature and the environment. Over the last decade, the EU put much effort into biodiversity loss mitigation and implemented several different policy guides, strategies and standards.

The EU Biodiversity Strategy for 2030 is a core part of the European Green Deal and a long-term, comprehensive, and ambitious effort to safeguard nature and reverse biodiversity loss (European Commission, n.d. a). The EU Biodiversity Strategy for 2030 is the primary biodiversity policy guide in the EU, and every member state must adhere to its dedications. The Biodiversity Strategy is closely tied to initiatives like the Natura 2000 Network, which aims to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under the Birds Directive and the Habitats Directive (European Commission, n.d. b). The Common agricultural policy (CAP), the Farm to Fork Strategy, and the Good agricultural and environmental conditions (GAEC) set the standards for achieving a sustainable food system for the EU. These initiatives consistently focus on preserving and protecting European biological diversity more and more.

The EU Dairy Sector and its importance for Biodiversity loss mitigation

Nature and agriculture are inextricably linked, and for agriculture, biodiversity is a unique, multi-level resource (Sizemore, 2015). Clergue et al. (2005) defined three critical biodiversity functions (patrimonial, agronomical, ecological) for agriculture. The authors state that biodiversity's patrimonial function connects people to the land, the agronomical function provides resistance to biotic and abiotic stress, and the ecological function is crucial for a resilient web of life.

The EU dairy sector is the second biggest agricultural sector in the EU, representing more than 12 % of total agricultural output (EPRS, 2018, p.1). According to the European Dairy Association, the European milk processing industry brought more than 10 Billion € the overall EU trade balance in 2019 (EDA, 2020). However, there is an increasing debate about

the impacts of dairy production on the environment, the functioning of essential ecosystem services and biological diversity. This debate has developed gradually and has recently gathered academic, policy, and societal attention. Targeted studies about the impacts of dairy systems on the environment (Villarreal Herrera, 2017; Sizemore, 2015; Van Laarhoven et al., 2018) steadily gain relevance in the general discussion about sustainable development and biodiversity conscious agriculture.

Van Laarhoven et al. (2018) explained why biodiversity is relevant to dairy farming and vice versa. First, the authors stated that the dairy farming industry's land treatment has a substantial impact on flora and fauna habitat. Three milk crises between 2007-2016 put extensive pressure on EU dairy farmers' revenues (European Commission, 2021 a). This compelled individual farms to increase their size to offset these lower incomes. Increasing cattle numbers impact the structure of the European dairy farming sector and, indirectly, have negative consequences on European biodiversity (Van Laarhoven et al., 2018). Mitigating environmental pressures by the dairy industry is therefore crucial for biodiversity protection. Besides, dairy farmers profoundly depend on natural resources and ecosystem services, which only function in a biologically diverse web of life. Biodiversity plays a critical role in providing dairy farmers with fibre, water, energy, and other genetic material. Additionally, It is key to regulating their water quality, pollution, pollination services, and flood control (Van Laarhoven et al., 2018).

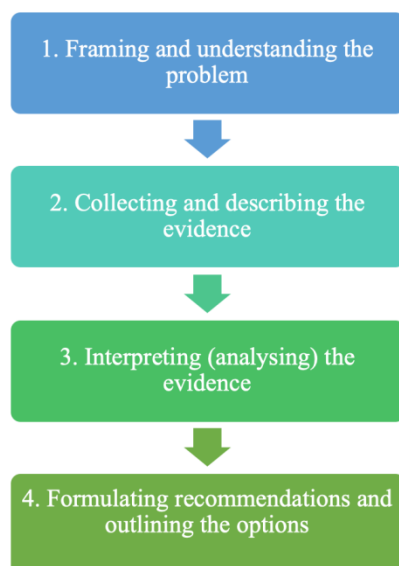
Nowadays, European dairy farmers face severe challenges relating to the volatile dairy market, ageing demographics of dairy producers, climate change, high consumer and society requirements and meeting the steady tightening of environmental targets set by the CAP (EPRS, 2018). Especially the CAP guidelines on phosphate and nitrogen production and greenhouse gas emissions are hard to attain without reducing cattle numbers and significant investments (Van Laarhoven et al., 2018). European Politicians and the general public are becoming increasingly interested in these landscape changes and the reduction in biological diversity. For example, the decline in the population of meadow birds due to dairy farms in the Netherlands quickly became part of local the political agenda (Tanis et al., 2019). Therefore, to sustain societal acceptance and long-term viability, the dairy industry must ensure the continuity of their farming practices by ensuring the interplay of social-ecological systems while simultaneously reducing environmental impact and safeguarding biodiversity.

Methodology

Ex-post (after adoption) policy analysis is a diverse, multidisciplinary and heterogeneous academic field with a wide range of analytical frameworks, approaches and perspectives. The method helps us ask different kinds of questions in which the scientific uncertainties surrounding biodiversity are only part of the issue. Therefore, an ex-post policy analysis can provide valuable lessons for the better design of future policy interventions. Besides, the approach can provide greater transparency about the work undertaken by policy institutions and allow successes to be measured and communicated (OECD, 2016).

Our research focuses on already implemented policies. Thus, an ex-post analysis was reasonable. We decided to implement an ex-post policy analysis framework proposed by the European Training Foundation. Their *Guide to Policy Analysis* (2018) describes four compact steps that we will apply to our two case studies. The European Training Foundation Policy Analysis framework is an approach defined by an EU agency and, thus, the perfect tool to assess policies and commitments by EU-member states. Unfortunately, there is no more concrete guide or framework on evaluating or comparing biodiversity policies on different governance levels.

The Four Steps in the ETF Ex-post Policy Analysis Process



Two case studies seemed the appropriate choice, considering this research's word limit and time constraints. Sweden and the Netherlands are considered to have sustainable dairy sectors (Sevenster, de Jong, 2008). Nevertheless, both countries experience extreme biodiversity loss due to the agricultural sector (IUCN, 2013). The respective case studies give a more detailed explanation of why both nations were chosen for this research.

Assessment Framework

1. Framing and understanding the problem

We want to examine how the national policy framework of the Dutch and Swedish dairy sector matches the targets by the EU Biodiversity Strategy for 2030. We use the EU Biodiversity Strategy for 2030 because it is the leading biodiversity policy guide for the European Union, and every member state has to adhere to those commitments. Table 1 shows the eight Key Commitments of the Biodiversity strategy for 2030 that are relevant for this research. The official website of the European Commission disclaims that Key commitments 5), 6), and 7) are related explicitly to agriculture. However, to get a more far-reaching evaluation of how national agricultural policies match EU-wide implemented standards, we decided to extend the list and add further key commitments that, in our opinion, are relevant to the agricultural. Key commitment 1) was included as agricultural land is crucial for creating trans-border ecological corridors (EEA, 2020). Key commitment 2) was included as agro-ecosystems represent on average 38% of the total surface area of the Natura 2000 network in the EU and, therefore, need detailed conservation objectives (European Commission, 2018). Key commitment 3) was included as agriculture is one of the main drivers of pollinator decline, and the EU actively tries to encourage the agricultural sector to act (European Commission, 2021 b). We included Key Commitment 4) as the agricultural sector is still the biggest user of pesticides (Pesticide Action Network Europe, n.d.). Key commitment 8) was included as the EU agricultural sector still implements many soil polluting activities but also profoundly relies on the ecosystem services the soil provides (European Commission, 2018).

All these Key commitments were formulated under two pillars defined by the EU Biodiversity strategy for 2030: Protecting nature in the EU and Restoring nature in the EU.

Pillar: Protecting nature in the EU	1) Create and integrate ecological corridors as part of a Trans-European Nature Network to prevent genetic isolation, allow for species migration and to maintain and enhance healthy ecosystems.
	2) Effectively manage all protected areas, defining clear conservation objectives and measures, and monitoring them appropriately
Pillar: Restoring nature in the EU	3) Reverse the decline of pollinators
	4) Reduce the use of chemical pesticides by 50% and reduce the use of more hazardous pesticides by 50%.
	5) Ensure that at least 10% of agricultural area is under high-biodiversity landscape features
	6) Place at least 25% of agricultural land under organic farming management, and significantly increase the uptake of agro-ecological practices
	7) Reduce the loss of nutrients from fertilisers by 50%, resulting in the reduction of fertilizer use by at least 20%.
	8) Make significant progress in remediating contaminated soil sites

Table 1: Relevant Key Commitments of the EU Biodiversity Strategy for 2030 for the Agricultural Sector

For each case study the need to assess how national policies of the dairy sector match the EU Biodiversity Strategy for 2030 is explained.

2. Collecting and describing the evidence

We collected the most recent policies to which the national dairy sector must adhere. Policies from the Natura 2000 project, the Good agricultural and environmental conditions standards, the Common agricultural cap, published reports from national agencies and official press releases from different ministries were included in our evidence collection. Policy targets of the national agricultural industry were included if we could not find more concrete policy objectives by the national dairy industry. The Swedish resources we could not access in English were translated by an online pdf translator tool.

3. Interpreting (analysing) the evidence

After collecting the commitments and policies on biodiversity by the Dutch and Swedish dairy sectors, we decided to examine how they match the Key Commitments of the EU Biodiversity Strategy for 2030. The targets within the national policies are compared to their relating Key commitments and categorized under three evaluation categories: Inferior, Equal, or Superior.

Evaluation Category	Definition
Inferior	A national policy is inferior to the EU Biodiversity Strategy for 2030 if less ambitious targets are explicitly formulated. A national policy is also considered inferior if the country explicitly mentioned it will not try or be able to reach EU-wide targets.
Equal	A national policy is equal to the EU Biodiversity Strategy for 2030 if they refer to EU-wide policies or formulate the exact same targets.
Superior	A national policy is superior to the EU Biodiversity Strategy for 2030 if more detailed or higher targets are formulated. A national policy is also considered superior if more ambitious targets are legally binding.

Table 2: The Evaluation categories and their definitions

Then, a graph is created for each case study to visualize how the national policies compare to each of the eight Key commitments.

4. Formulating recommendations and outlining the options

After having evaluated and compared all the collected national policies to the eight Key Commitments, recommendations how the Netherlands and Sweden could better implement the recommendations by the EU were formulated.

The Case Study of the Netherlands

Framing & understanding the problem

The Netherlands is one of the most sustainable countries in the world, based on the Environmental, Social, and Governance (ESG) scores (Duurzaam Ondernemen, 2019). However, in the domain of biodiversity mitigation, the Netherlands can still improve. A large part of Dutch soil is wet peat soil, and therefore provides perfect conditions for maintaining grassland (WUR, 2018). The WWF reports that since 1990 the number of wildlife animals on farmland has decreased almost 50%, as seen in figure 1. The cause of this is mainly because of developments in agriculture, such as the use of pesticides, monotonous grass fields, and early mowing in the cow farming fields (WWF, 2020).

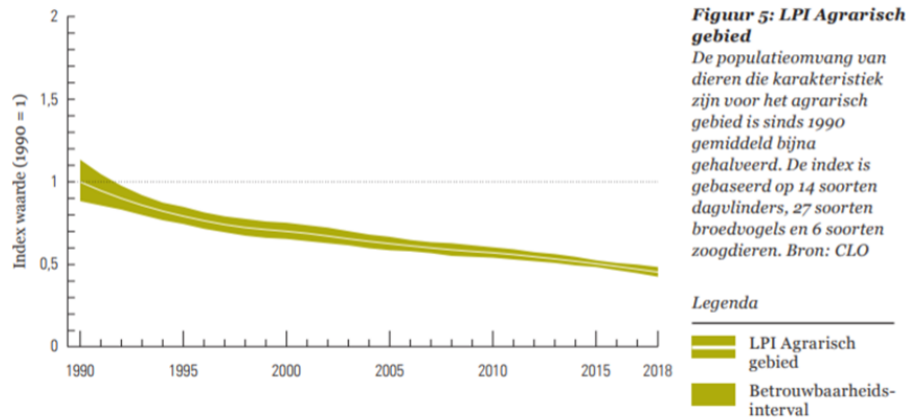


Figure 1. Decrease of biodiversity due to agriculture in the Netherlands.

In the Netherlands, the dairy sector is the largest land user in the country, and makes up 60% of the total agricultural sector (WUR, 2018). Therefore, the dairy sector plays such a large role in biodiversity loss mitigation in Netherlands (CBS, 2019). Since the year 2000 several nature activists began addressing the urgent issue of biodiversity loss due to the dairy sector, but not much changed. However, in the last decade, more and more regulations were implemented to regulate and promote a more biodiversity conscious dairy sector (WWF, 2020). As the Dairy sector plays such an important role in the Netherlands and has such a big impact on the local Biodiversity the Dutch Case is interesting to assess.

Collecting and describing the evidence

Guidelines of the Dutch governance

The Dutch government is obligated to implement all the regulations and strategies on agriculture and biodiversity, which the EU has agreed upon. All the member states of the EU have to adhere to the Common Agricultural Policy (CAP). However, the individual member states may determine their agricultural policies within the boundaries of the CAP (Rijksoverheid, n.d.). The Ministry of Agriculture, Nature and Food Quality (LNV) integrates the obligations of the EU and converts them into Dutch policies and guidelines (Rijksoverheid, n.d.).

The Dutch Government put several regulations in place to control the main drivers of biodiversity loss. Most of them are for the agricultural sector in general, such as for example the law on air quality, which includes threshold values for particulate matter (PM10 and PM2,5) and Nitrogen dioxide (NO2). Farmers also need an OBM, which is a report about activities that alter the environment. Next to this, specific regulations are applicable for the dairy industry. The Wet ammoniak en veehouderij (Wav) (law on ammonia and animal

husbandry) which controls the output of ammonia (Rijkswaterstaat, n.d.) was implemented only for the dairy sector. Due to law of odor nuisance there are threshold values for ammonia as well as nitrogen in place to which every dairy farmer has to adhere. Policies that have direct control over biodiversity relate to mowing, to cart manure, and soil derogation (yet unknown for 2022) (Rijksdienst, 2022).

Guidelines Dutch dairy organizations

All the Dutch dairy farmers are part of the Dutch Dairy Organisation (NZO). Together with a special committee for Sustainable Dairy Chains (DZK) they take a proactive role in promoting sustainable and biodiversity conscious behavior. They put together ambitions to which the farmers have to live up to. Besides, they want to put stricter regulations in place over time in order to mitigate climate change problems. They also set up specific guidelines to protect biodiversity and created an assessment tool called ‘Biodiversiteitsmonitor’ (Biodiversity monitor). This monitor concentrates on four different pillars of biodiversity, as seen in figure 2. The functional agrobiodiversity, which focuses on closing the nutrient cycle on a farm level. The diversity of landscape, which focuses on the different elements in a landscape. The diversity of species, which standards are focusing on the management of flora and fauna. And lastly, the regional biodiversity, which focuses on connecting farms and areas.

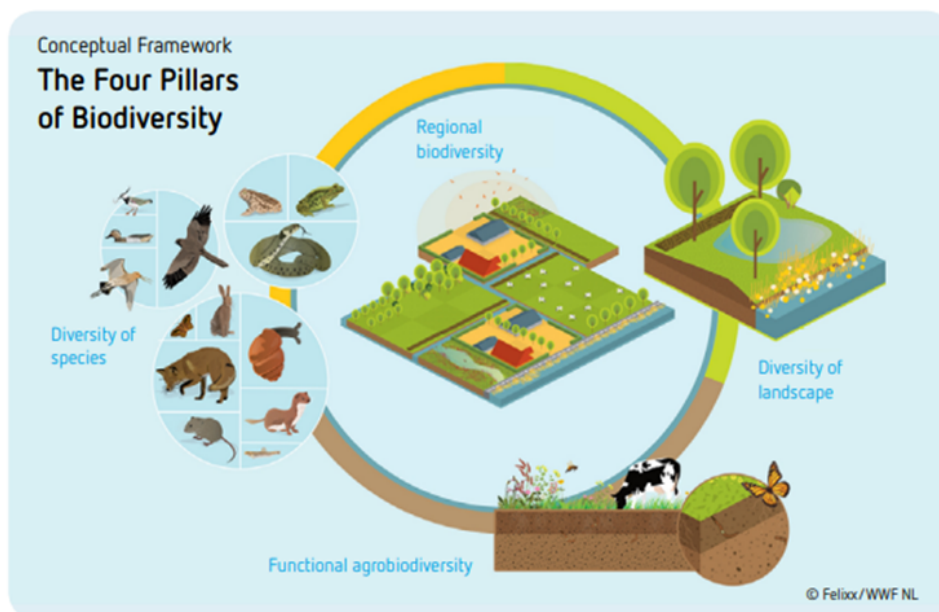


Figure 2. The four pillars of biodiversity

With these foundation pillars, they created seven key Performers Indicators (KPI). Each of the KPI's can be calculated and has guidelines that show which numbers or percentages are

favorable. Although the farmers are not obliged to follow these guidelines, the farmers who do can qualify for compensation.

Extra motivation for farmers

For Dutch farmers do more than comply to the basic guidelines, the Dutch government has created an agrarian collective in which farmers can register their environmental protection contributions. Depending on what they do, they can get financial compensation which is called the compensation for ANLb. This compensation method is not only for dairy farmers (Rijksoverheid, 2021).

For dairy farmers who cannot or do not want to join the ANLb, the ‘Beheerpakketen Biodiversiteit Melkveehouderij’ (BBM) (management packages biodiversity dairy farming) has been conducted. These packages are separated into the different KPI’s from the Biodiversity monitor. There are several different packages so that farmers have the freedom to decide which one is the most implementable for them. A few examples of indicators for these packages are the breeding possibilities for birds or nature-friendly cattle food. The more packages a farmer adheres to the bigger the compensations can be (BoerenNatuur, 2021).

The Dutch Policies of the Dairy Sector and the EU Key Commitments of the Biodiversity Strategy for 2030

Key Commitment 1.

The Netherlands wants to convert at least 80,000 hectares to protected nature areas to by 2027 (Rijksoverheid, 2021). In the Netherlands, every province is responsible to provide its share to the Dutch National Ecological Network (NEN). Therefore, they work closely together with dairy farmers. Dairy farmers, who live near a national reserve, need special permissions for environmentally harmful activities. Therefore, the Netherlands helps building an international natural network corridor (Kompas2020, 2020).

Key Commitment 2.

The Netherlands contains 21 national parks that are protected by environmental law (Rijksoverheid, n.d.). Next to that, The Netherlands has 162 Natura-2000 areas that are protected according to the Birds Directive and Habitats Directive. This means that every area has its own management program (Natura2000, n.d.). Dairy farms that in or near a protected area, need special authorisations (Kompas, 2020).

Key Commitment 3.

The Dutch national pollinator strategy is called ‘‘Bed & Breakfast for Bees’’. In The Netherlands more than half of the bee species are on the Red List, meaning that their survival is threatened. Agriculture has a "substantial economic interest in sufficient pollination" (Ministerie v Algemene Zaken, 2018). Therefore they have focused on three main themes: promoting biodiversity, nature-agriculture interaction, and honeybees. Their targets are shown in table 3 (Ministerie v Algemene Zaken, 2018).

Boost the number of bee species showing a stable or positive population trend according to Reemer et al. (2012) :	
2023	Reduce the number of species showing a downward or sharply downward trend by 30% and increase the number of species with an upward or sharply upward trend by 30% compared with 2012.
2030	Reduce the number of species showing a downward or sharply downward trend by 50% and increase the number of species with an upward or sharply upward trend by 50% compared with 2012.
Promote species diversity of bees	
2030	See a significant trend showing that the distribution of bees (in terms of area) has increased nationwide compared with 2012.
Guarantee efficient pollination	
2030	Pollination will no longer be a limiting factor in seed setting of food crops and wild plants in 90% of cases.

Table 3. Targets Dutch pollination strategy 2030

Key Commitment 4.

'Future vision crop protection 2030' explains how the Dutch government plans to reduce the use of hazardous pesticides. The goal is to create a decrease of pesticides in surface waters of 90% and in drinking waters of 95%. These targets also favour a profitable increase crop growing and protect local biodiversity in the water and soil. They also aim to minimize pesticide residue on food production (Gewasbescherming2030, 2019).

Key Commitment 5.

As of 2018, 11% of the Dutch agricultural land was covered by the Natura-2000 Network. Farmers with over fifteen hectares of farmland are required to use 5% of acreage as an ecological focus area (CBS, 2022).

Key Commitment 6.

In 2017 3.1% of agricultural land in The Netherlands is organic. In the dairy industry, it is only 1.9% (CBS, 2019). The minister of Agriculture, Nature & Food Quality has started to set up a

strategy for organic food production and consumption, which will come out in 2022 (Schouten, 2021).

Key Commitment 7.

Maximum levels of nitrate and phosphate are constituted in the law (RVO, 2022). Unclear is whether there is a reduction of 20%.

Key Commitment 8.

The Netherlands has a Soil Protection Act that is made to decrease the contamination of soil sites (Rijkswaterstaat, n.d.).

Interpreting (analysing) the evidence

The Netherlands matches almost all the examined key commitments of the EU, as shown in figure 3. Only target 6, organic farming is far beneath the objective. On the other hand, the decrease in the use of pesticides and the increase in pollinator plans are far more superior. These results suggest that overall the targets of the EU are feasible and give motivation to the country to better their sustainability.

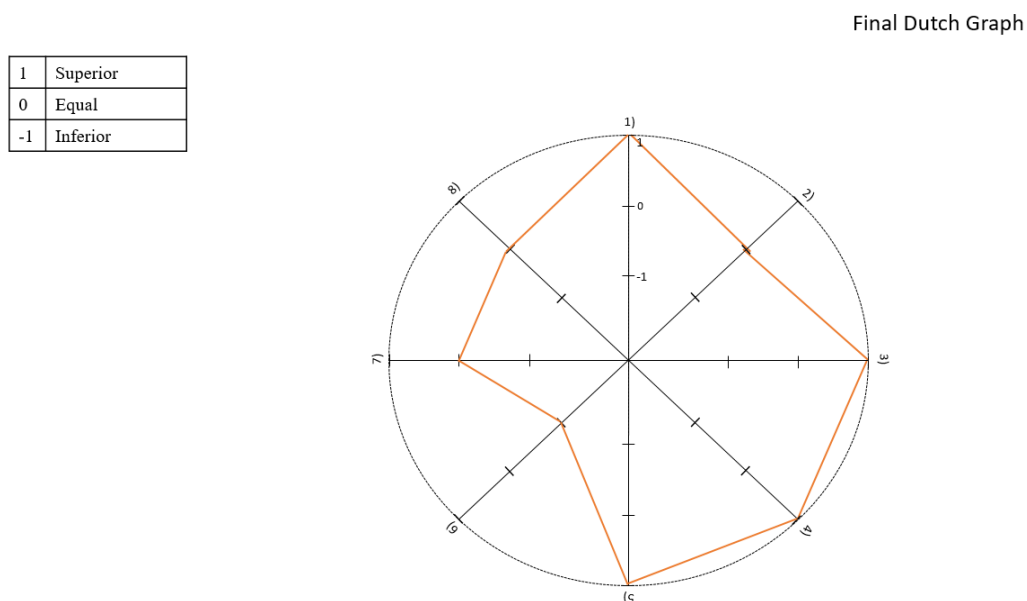


Figure 3. Comparison Dutch targets to the EU

Formulating, recommendations and outlining the options

The compensation methods of the national policies take into account that farmers get their space of freedom to act more sustainably according to their capabilities. The biodiversity monitor enables the examination of biodiversity, which is important for compensations. We see great opportunities in this method since it does not entwine the farmers into regulations, but preconditions are that the monitor works efficiently.

The Case Study of Sweden

Framing and understanding the Problem

There are three significant reasons why Sweden was chosen as our second case study. First, the Swedish Dairy sector is very intensive and has the highest milk yield in Europe (Lassen, 2013). At the same time, Sweden is one of the top EU member states regarding animal welfare and feeding regulations (Lassen, 2013).

Second, Sweden's Milk belt, situated in Sweden's south, where 70% of the dairy milk production is taking place, presents itself as a crucial spot for biodiversity. Sweden's south is dominated by various landscapes like open green fields, dense forests, and plenty of lakes, making out many different habitats (Government Offices of Sweden, 2022). The south is further associated with its dense population and its intensive agriculture practices, which create real threats for the biodiversity there. The dairy sector, or Sweden's milk belt, contributes a significant amount of pollution to these areas. At the same time, the sector plays a significant economic part in these areas, as they create the source of livelihoods.

The third reason is Sweden's position in a green Europe.

Sweden ranked second in the UN development report and the global Index (European Commission, 2020). Furthermore, Sweden topped the Global sustainability index (European Commission, 2020). Sweden tries to be a forerunner in environmental policies (SGI, 2020). Sweden's agriculture sector is also dominated by these ambitions and thus displays a unique policy framework determining the input and output of farms.

In a global comparison, Swedish dairy production is efficient in nutrient management, low use of inputs such as chemical fertilizers, crop protection and antibiotics (Krizan et al., 2021). Dairy production in Sweden is one of the strongest in inland agriculture practices (Sweden Statistics, 2018), and they rely heavily on other agricultural practices for their animal food supply chain.

Collecting and describing the evidence

Guidelines of Swedish governance and dairy sector

Besides following and contributing to Europe's Green policy (with the goal of sustainable development in mind), RDP, CAP, the Good Agriculture and Environmental Conditions (GAEC) and Natura2000 (Government Offices of Sweden, 2022), Sweden has a set of national specified policies instruments directed to agriculture practices and land protection. In 1998, the Swedish government published the Swedish Environmental Code (Swedish Government, 2022). With regards to the dairy sector and biodiversity, chapters 7[1] and 11[2] are of vital importance. They are about policies that aim to mitigate effects from hazardous chemicals used in agriculture practices to protect and create habitats (The Swedish Environmental Code, 1998). Since 1998, other policy instruments, alongside EU policies, have risen to adapt to increasing climate change consequences and problems. Overall, Sweden's policy framework (*Table 4*) surrounding agriculture is ambitious and strict. Their effective monitoring systems (e.g. Environmental Monitoring and Assessment) and cross-sectoral collaborations (e.g. The Ministry of Innovation and LRF Dairy Sweden[3]) made, among other factors, Sweden's agriculture one of the most sustainable in the world (Ministry of Enterprise and Innovation, 2019). As typical in Agriculture, the focus of Sweden's policies are on land use, water bodies quality, ecosystem services and biodiversity (Government Offices of Sweden, 2022). Additionally, Sweden focuses on animal welfare (Jordbruks Verket, 2021), awareness campaigns (LRF, 2021) and nutrition loss (Government Offices of Sweden, 2022), which are all present problems in the dairy industry. Taking Sweden's strong foothold in inland sustainable development and its ambitious position in Europe's and global green politics into account, we initially concluded that Sweden equals but more likely overthrows the EU's goals on biodiversity for 2030.

Implemented Policy Instruments by the Government	Industry Policies
Rural Development Programs (RDP)	KRAV
Common Agriculture Policies (CAP)	Greppa Näringen – Focus on Nutrients
Swedish Environmental Code (Chapter 7, 11)	The Climaker
Swedish Climate Policy Framework	
Swedish Rural Network	
Advice on plant nutrients – “Greppa näringen”	
Aid for manure gas	
Natura 2000	
Swedish EPA	
GAEC	

Table 4. Sweden’s Policy Framework consists of governmental and industry policy instruments

Sweden's food production is undergoing a constant structural transformation to meet environmental goals by 2045 (Krizan et al., 2021). These structural changes are primarily evident in the dairy sector (Krizan et al., 2021). Taking the findings from stage one as a starting point, we focused on the targets and goals they were trying to achieve. For that, we looked at several data sets (e.g., Sweden Statistics) and reports that encompassed more details on the practical outcomes of the policy implementation. The subsequent analysis yielded several country-specific results and allowed us to comprise a table to set up the eight EU key commitments against Swedish policies (*Table 5*). Despite Sweden's thorough policy framework and ambitious net-zero goal for 2045, we found several policy targets that are equal and inferior to the Key commitments.

The Policies of the Swedish Dairy Sector and the EU Key Commitments of the Biodiversity Strategy for 2030

Key commitment 1.

Not much is disclosed about the dairy sector and dispersal corridors. In general, Sweden adopted Natura2000 and the GAEC 7 that states policies to retreat land and make way for corridors (European Commission, 2022).

Key commitment 2.

Sweden implemented Natura2000 and dedicated chapter 7 of the Swedish Environmental Code to protect nature, land and preserve habitats (Swedish Government, 2022). Additionally, Sweden implemented several national laws and policies fostered by Sweden's Environmental Protection Agency (EPA) (e.g., Nature reserves). Both policy instruments protect 14,52% of Sweden's land area (UNEP-WCMC, 2022).

Key commitment 3.

Sweden joined the Willing to Pollinators coalition, a group of countries and organizers who believe that country-led politics are the key to protecting pollinators (Promote Pollinators, 2022).

Key Commitment 4.

Sweden has several policy instruments implemented to reduce hazardous chemicals. Besides CAP and RDP, Sweden's dairy sector has several policy instruments implemented to mitigate fertilizer use and to raise awareness of their consequences (Government Offices of Sweden, 2022). Especially awareness campaigns have led to an average 6% decrease in nitrogen use on dairy farmers (The Climakers, 2021).

Key Commitment 5.

The Swedish Environmental Code, the Swedish EPA, and the RDP commutatively formulate the target to put 19% of agricultural land under protection (Government Offices of Sweden, 2022).

Key Commitment 6.

The RDP, the climate action plan, and subsidies for KRAV certificated farms are an elaborate framework to increase organic management. However, although Sweden ranks high under organic farm practices, their policies ensure that “only” 18% of farmland is managed organically, with less than 13% output in the dairy sector (The Farm Consultancy Group, 2021).

Key Commitment 7.

The Swedish board of agriculture, the federation of Swedish farmers and Environmental Support schemes (among others) (Government Offices of Sweden, 2022) are all instruments to ensure food quality and reduce nutrient loss. Through several policies and awareness

campaigns in the dairy sector, the proportion of farmers who accounts for their forage analysis has increased from 62% to 92% (The Climakers, 2021).

Key Commitment 8.

The Swedish government encloses several policy frameworks regarding soil erosion and water management (e.g. Swedish environmental code, EPA). These plans aim to get 14% and 16% of agricultural land under contract to increase soil quality (Government Offices of Sweden, 2022).

Interpreting (analysing) the evidence

Comparing the EU key commitments to the national policies, the results show that the Swedish policy framework is in many targets superior but that there are also targets equal and one inferior. The Swedish policy framework is inferior to the targets of key commitment 6. Organic farms have struggled to run smoothly, as farmers find it increasingly challenging to finance organic agriculture practices *and* meet demand (LRF, 2021).

Key commitments 1 and 2 are equal to the Swedish policy framework. Sweden's policy instruments on Key Commitment 1 are created by the European Commission. Not much Data was found regarding own initiatives, thus we conclude that Swedish policies are equal to the European level. The same reasoning applies for key commitment 2, with the addition that, despite its initiatives, the EU policy frameworks are still the main source Sweden uses as policies to further address this commitment (Government Offices of Sweden, 2022). Sweden's policy framework scores are superior in key commitments 3, 4, 5,7, and 8. This leads back to Sweden's overall position in working towards a greener future. During the research, it became evident that Sweden pays a central focus on Nutrient loss, fertilizer use and animal welfare (Government Offices of Sweden, 2022). Often, the policies overlap and complement each other (e.g., Sweden's regulation on fertilizer use automatically reduces nutrition loss from nitrogen). Moreover, policies regarding water pollution, fertilizer use, animal welfare and nutrients are broadcasted to farmers in "packages" by organizations like Grappa Närigen (The Climakers, 2022). These extra efforts pay off by superior performance. The comparison is summarized in figure 4.

1	Superior
0	Equal
-1	Inferior

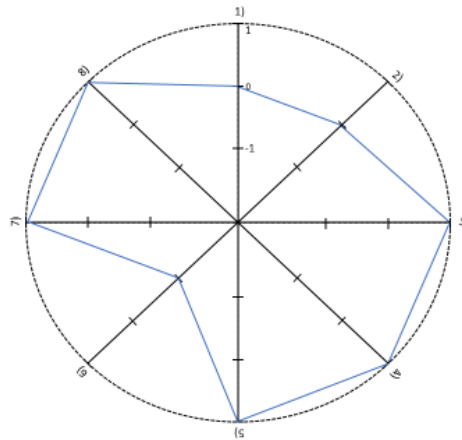


Figure 4. Comparison Dutch targets to the EU

Formulating, recommendations and outlining the options

The EU is an organ that thinks globally, while Sweden acts nationally and faces, like many other countries, certain innate challenges and problems. A problem specific to the dairy sector is the increasing corn prices. Despite the best efforts of the government, we found that animal food is still one of the main drivers for land-use change and fertilizer use. Furthermore, changes in biodiversity and ecosystem services following changes in land use are rarely measured and accounted for in the food value chain seeking to meet consumer preferences (Cederberg et al., 2018). Last, but not least, we found that organic farming practices are cost-efficient in the long term but the initial cost-increase are beyond budgets (LFR, 2021). Dairy farms are crucial for rural economic livelihoods. Many parts of Sweden are sparsely populated areas. These sites make farms an important income source for inhabitants in rural areas. With these aspects in sight, Sweden customized their targets, which does not necessarily measure up to EU goals or the other way around.

Conclusion and Recommendation

To answer our research question, the results of the literature review and policy analysis have shown that there are a couple of discrepancies between EU key commitments and national policies.

Looking after both cases, it becomes evident that the EU Biodiversity Strategy for 2030 has certain weaknesses and challenges. First, we see that the EU thinks globally and not locally.

Because of this, there is a lack of public participation tools and a focus on national *and* industry-specific needs. **For example**, Dairy farmers currently lack the financial aid and the capacity to become fully organic (The Farm Consultancy Group, 2021).

Second, an additional obstacle is a rising demand for dairy products, increasing the need and monetary incentives for farmers to keep up with demand. But there has yet to be a sector-specific tool to measure biodiversity loss along the supply chain of dairy farms.

Third, biodiversity policies are increasingly separated and differently from climate policies.

In the Dutch case it is seen that a biodiversity monitor, **as a tool**, was helpful to assess the biodiversity, and therefore motivation to set specific targets. European wide, a Biodiversity navigation wheel could be used to determine which monitor is best to use per area. It is an innovation aided by the European Commission. It is a pragmatic decision framework that helps businesses to find the right biodiversity tool that could be applied to any sector and scenario. Farmers would have the possibility to implement their specific needs into the framework and the framework would come up with an ideal biodiversity measurement tool (European Commission, 2022). However, for that framework to work efficiently, more data is needed. Additionally, as the dairy sector is also becoming more and more part of the global market, an EU-wide biodiversity cloud for every industry sector and unified taxonomy would be a useful addition to the global level.

As for farmers, we saw in the Sweden case that asking for more input and a better exchange in the policymaking progress, for example through awareness campaigns, could be helpful to improve agriculture practices.

Limitations

Through the research process, several limitations became obvious. There is a possibility that language barriers made us overlook policies that could have been valuable for this research as many of the Swedish resources had to be translated.

Besides, due to time constraints, we were only able to analyze two of the 27 EU-member states. Although useful recommendations on how the EU Biodiversity strategy for 2030 could yield higher results and be easier to implement in a specific sector could be deducted from the two case studies, a more elaborate ex-post policy analysis that compares the policies protecting biodiversity from every EU-members dairy sector would have produced a more extensive recommendation list.

Another limitation is that we did not consider the actual mitigation impacts each national policy had on local biodiversity as no impact assessments for the majority of policies

could be found. Additionally, the data search strategy implemented is not systematically reproducible.

Further Research

Further research could assess a method or framework that clarifies how to compare nationally to Eu-wide policies. Besides, as explained in our limitation section, an ex-post policy analysis that compares the policies protecting biodiversity from every EU-member dairy sector to the Biodiversity strategy for 2030 would complement and add to our research. In addition, ex-post policies analyses that compare the policies protecting biodiversity in other sectors could be valuable.

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