BIODIVERSITY MANAGEMENT IN FINNISH FOOD SECTOR COMPANIES

How managing biodiversity impacts is integrated in corporate sustainability

Lappeenranta–Lahti University of Technology LUT
Master's thesis in Circular Economy
2022
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Examiners: Associate Professor Mirja Mikkilä
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ABSTRACT

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Biodiversity Management in Finnish Food Sector Companies
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The objective of this thesis was to understand how managing biodiversity impacts is integrated in corporate sustainability in Finnish food sector. Agriculture and food sector is one of the biggest drivers for biodiversity loss. However, managing biodiversity and setting measurable targets to mitigate biodiversity loss is still developing.

A qualitative case study analysis was applied in this study. The data was gathered through semi-structured interviews and literature review of corporate sustainability reports. The case study sample included five largest Finnish food sector companies based on net revenue. Companies are representing dairy, meat and bakery sections in food industry.

Based on the findings, the case companies have started to integrate biodiversity in their corporate sustainability activities and the importance is expected to grow in the coming years. However, many current sustainability activities are primarily aiming to mitigate climate impact, and all case companies have committed to the Science Based Targets initiative for climate action.

Biodiversity management was included in all case companies' sustainability reporting, yet the extent of the topic varied between the companies. Identifying the right indicators, measuring impact, and setting targets for biodiversity loss mitigation is in early days in all the studied companies. The case companies are still lacking a clear and consistent way to measure biodiversity impact. Only few have mentioned qualitative goals in their reports, yet none of the companies have quantitative targets on biodiversity. All case companies are leveraging global frameworks such as UN Sustainable Development Goals and Global Reporting Initiative related to sustainability and biodiversity management and are planning to use a specific biodiversity framework to measure and track their impact on nature.

All case companies are internally working on the topic and are already starting to collaborate with different stakeholders. Collaboration within the sector was seen important; all the companies mentioned especially collaboration with farmers to be significant. Most concrete activity in the case companies related to the impact of primary production on biodiversity, is the promotion of regenerative farming methods. Engagement and communication with consumers, or even internally with the employees, is however challenging, because biodiversity is a complex topic and difficult to simplify for most audiences.

TIIVISTELMÄ

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Biodiversiteetin johtaminen suomalaisissa elintarvikealan yrityksissä
Biodiversiteettivaikutusten johtaminen osana yritysvastuuta

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Tämän tutkimuksen tavoitteena oli ymmärtää, miten biodiversiteetin johtaminen on integroitu osaksi yritysvastuuta suomalaisissa elintarvikealan yrityksissä. Maatalous ja ruokasektori ovat yksi suurimmista luontokadon aiheuttajista, mutta biodiversiteetin johtaminen ja mitattavien tavoitteiden asettaminen on alan yrityksissä vielä alkutekijöissä.

Tutkimus on kvalitatiivinen case-tutkimus, jonka tiedot kerättiin puolistrukturoiduilla haastatteluilla sekä tutkimalla case-yritysten yritysvastuuraportteja. Tutkimusotokseen kuului viisi suurinta suomalaista elintarvikealan yritystä liikevaihdolla mitattuna. Yritykset edustavat meijeri-, liha- ja leipomosektoria.

Tulosten perusteella case-yritykset ovat alkaneet integroida biodiversiteettiä yritysvastuutoimintaansa ja sen merkityksen odotetaan kasvavan tulevina vuosina. Monet nykyiset kestävän kehityksen toiminnot tähtäävät kuitenkin ensisijaisesti ilmastovaikutusten lieventämiseen, kaikki case-yritykset ovat sitoutuneet Science Based Targets -aloitteeseen ilmastonmuutoksen torjumiseksi.

Biodiversiteetin johtaminen on osa kaikkien case-yritysten vastuullisuusraportointia, mutta aiheen laajuus vaihteli yritysten välillä. Oikeiden mittareiden tunnistaminen, vaikutusten mittaaminen ja tavoitteiden asettaminen biodiversiteetin parantamiseksi on vielä alkuvaiheessa kaikissa tutkituissa yrityksissä. Yrityksiltä puuttuu selkeä ja johdonmukainen tapa mitata biodiversiteettivaikutuksia. Vain osa case-yrityksistä on maininnut laadulliset tavoitteet raporteissaan, kvantitatiiviset biodiversiteettitavoitteet puuttuvat vielä kaikilta. Kaikki case-yritykset hyödyntävät YK:n kestävän kehityksen viitekehystä (SDGs) sekä Global Reporting Initiative -ohjeistoa biodiversiteetin johtamiseen, ja aikovat jatkossa hyödyntää myös erityisesti biodiversiteetin mittaamiseen ja seuraamiseen keskittyvää viitekehystä.

Sidosryhmäyhteistyötä pidettiin tärkeänä ja kaikki case-yritykset mainitsivat erityisesti yhteistyön viljelijöiden kanssa merkittäväksi. Konkreettisin toiminta alkutuotannon biodiversiteettivaikutuksiin liittyen case-yrityksissä on uudistuvien viljelymenetelmien edistäminen. Toisaalta yhteistyö ja viestintä kuluttajien, ja jopa sisäisesti työntekijöiden kanssa nähtiin haastavana, koska aihe on moniulotteinen ja vaikeasti yksinkertaistettavissa.

ABBREVIATIONS

BES	Biodiversity and Ecosystems
BSAG	Baltic Sea Action Group
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FMCG	Fast Moving Consumer Goods
GDP	Gross Domestic Product
GRI	Global Reporting Initiative
IPBES	The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IUCN	International Union for Conservation of Nature
LUKE	Natural Resources Institute Finland
NGO	Non-Governmental Organization
OECD	Organization for Economic Co-operation and Development
UN	United Nations
UNEP	UN Environment Program
SBTi	Science Based Targets initiative
SBTN	Science Based Targets Network
SDG	Sustainable Development Goal
TBL	Triple Bottom Line
TEEB	The Economics of Ecosystems & Biodiversity

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1. Introduction

1.1. Concept of biodiversity

Rich biodiversity is fundamental to life on earth; however, we are currently losing biodiversity at an unprecedented rate all over the world (Lazarus, 2015). Human activity is causing major changes in the natural environment by overexploiting the assets of Earth to meet the needs of growing population. Earth's population has tripled from the 1950's (European Environment Agency, 2020) and especially in the Western world the economic growth has been based on an increasing use of natural resources. Due to this, biodiversity loss is accelerating drastically, threatening 1 million animal and plant species with extinction (IPBES, 2019). According to Food and Agriculture Organization FAO, more than 75% of the total global plant genetic diversity has been lost since the 1900s (FAO, 2010). Biodiversity decline disrupts all ecosystems, endangering for example the processes governing the climate system (Dasgupta, 2021). Together with climate change, the loss of biodiversity is a key threat to life on Earth.

> "Today, we ourselves, together with the livestock we rear for food, constitute 96% of the mass of all mammals on the planet. Only 4% is everything else – from elephants to badgers, from moose to monkeys. And 70% of all birds alive at this moment are poultry – mostly chickens for us to eat. We are destroying biodiversity, the very characteristic that until recently enabled the natural world to flourish so abundantly. If we continue this damage, whole ecosystems will collapse. That is now a real risk." *David Attenborough* (Dasgupta, 2021)

Biodiversity or biological diversity is the variety of life on Earth and the natural patterns it forms. It is a measure of variation at genetic, species and ecosystem level. (UNEP, 2020) There are three features of diversity of life forms that are significant: the number of unique life forms, the flatness of the distribution of life forms, and dissimilarities in the life forms (Dasgupta, 2021). The biodiversity we experience today is a result of 4.5 billion years of evolution, but increasing human influence is evident (UNEP, 2020).

Ecosystem services are the goods and services that biodiversity delivers. These are for example clean air, fresh water, nutrient cycling, photosynthesis, pollination of crops, materials, and energy – contributions that are essential to human existence. These services

are critical for food and energy production, medicines, variety of materials and extreme weather mitigation, but also for mental and physical well-being. (UNEP, 2008) Ecosystem services can be divided into four different types: supporting, regulating, provisioning and cultural services (Fisher, 2009). The World Economic Forum (2020) estimates that more than half of global GDP is highly or moderately dependent on nature and its services (World Economic Forum, 2020).

Human survival and development depend on biodiversity and ecosystem services, however, human impact on ecosystems have reached or even passed some of the planetary boundaries (Macellari, 2018). Biodiversity loss is a risk besides for human well-being, but also for businesses, as all businesses are either directly or indirectly dependent on nature (Skouloudis, 2019). The direct risks of biodiversity loss for businesses are, for example, challenges in availability and the price of raw materials (Sitra, 2022). However, the link between business and biodiversity might be difficult to understand as the changes in the natural environment are not taking place overnight, and especially the indirect negative impacts are complex to measure.

Governments and institutions are currently setting targets to recover biodiversity. As part of the European Green Deal, European Union has a biodiversity strategy which aims to recover Europe's biodiversity by 2030 for the benefit of people, the climate, the planet and the economy. The strategy underlines that biodiversity conservation has potential direct financial benefits in many sectors of the economy. But protecting and restoring nature cannot be achieved by regulation only, it requires actions also from citizens and businesses. (European Commission, 2020) Further, European Commission has proposed a new law for nature restoration with binding targets. This proposal aims to restore ecosystems, habitats and species across the EU's land and sea areas to enable long-term and sustained recovery of biodiverse and resilient nature. (European Commission, 2022)

Accordingly, private sector actors are now looking for the right tools to measure and manage the impact of their activities on nature. There are already various frameworks for companies to help them mitigate the biodiversity impacts of their business. These frameworks will be discussed in chapter three of this study.

1.2. Biodiversity and food sector

Today, the need to produce more food at lower cost is emphasized over the goal of delivering human and planetary health and well-being. Our current food system is driven by increased productivity to sustain food security for the growing population. However, the impact of food production on natural ecosystems and human health is not properly accounted for. The food system is incentivised with agricultural subsidies to increase yields, but the environmental costs such as pollution or loss of biodiversity, are discounted or ignored. (Benton, 2021)

An example of biodiversity loss and its link to food security and human well-being is the declining number of pollinators that are essential for food production. According to IPBES, the estimated global monetary value of food production directly dependent on pollinators is at $235–577 billion. (IPBES, 2019)

One of the biggest drivers for biodiversity loss is land use change, and over 80% of the land use change can be driven back to agriculture (Winkler, 2021). During the recent decades, the biggest loss of intact ecosystems has occurred in the tropics – which are the world's most biodiverse regions – mainly due to forests' land use change for the production of soy, cattle and palm oil. (Benton, 2021) Another great driver for biodiversity loss is greenhouse gas emissions, from which over 30% are originating in the global food system (Benton, 2021; Crippa, 2021).

Food production's pressure on biodiversity is materializing from the food system as a whole, and it is visible in all levels: local farm level impact, landscape level and regional impacts, as well as global impacts. There is a variety of ways that current food production and agriculture alter ecosystems, disrupt the usual feeding, breeding or growing patterns of species, and destroy habitat. (Benton, 2021)

The current food system is influenced by the leading FMCGs and retailers, e.g., in the EU and UK, 40% of agricultural land use is influenced by the top 10 FMCGs and retailers. Given the size, these actors could be major drivers in building nature-positive food system. Today, there are globally only three crops – rice, maize, and wheat – that provide 60% of the world's food energy intake, even though these could be substituted by many locally relevant ingredients. To function properly, a nature-positive food system requires a better

understanding of local context and a more diverse mix of plants and livestock. (Ellen MacArthur Foundation, 2021b; Wani, 2021)

This research is focusing on biodiversity management within Finnish food sector companies and how managing biodiversity impacts is integrated in corporate sustainability. The objectives and research questions of this study are introduced in the following chapter.

1.3. Objectives and research questions of the study

Climate change has been widely discussed in the media in recent years, and its mitigation is high on the agendas of international institutions, national governments, and businesses. Biodiversity loss has not gained as much attention to date; however, biodiversity loss entails a risk to economy as all businesses depend on nature and its ecosystem services. The costs associated with biodiversity loss are significant; according to OECD (2019) estimation, the world lost $4-20 trillion per year between 1997 and 2011 in ecosystem services due to land use change, and $6-11 trillion per year from land degradation. (OECD, 2019)

Climate change and biodiversity loss have strong interlinkages; however, these challenges have been largely addressed separately (Shin et al., 2022). Climate change is accelerating biodiversity loss through droughts, flooding and wildfires, while the loss and unsustainable use of nature's resources is driving the climate change, hence these two challenges have also partially linked solutions (IPBES, 2019). Though climate change is one of the drivers of biodiversity loss, there are other drivers like land use change, direct exploitation of species, pollution, and invasive species. Hence mitigating climate change does not alone halt biodiversity loss.

Climate impact mitigation and carbon footprint calculations are already commonly included in companies' sustainability reports, but biodiversity impact calculations are still rare. Only the forerunners have set measurable targets on biodiversity loss mitigation and are creating roadmaps to nature-positive business. To this end, biodiversity as part of corporate sustainability management is not yet widely studied, as companies are just now starting to include the topic in the strategies and sustainability reporting.

The objective of this thesis is to understand how management of biodiversity is integrated into corporate sustainability in Finnish food sector. The research questions are:

a) how management of biodiversity is integrated into corporate sustainability

b) are biodiversity targets driven from company's business strategy and how these targets link to global sustainability / biodiversity frameworks

c) what kind of management tools would be required to successfully manage biodiversity

d) how companies are engaging with their stakeholders related to biodiversity, and what is the importance of the topic to various stakeholders.

1.4. Methodology and content of the study

This study focuses on Finnish food sector companies as food sector is one of the most significant regarding the pressure on biodiversity. Within the industry, five largest companies in Finland are selected as a sample for this case study, representing dairy, meat processing and bakery.

The methodology selected for this thesis is multiple case study analysis with qualitative research methods. Qualitative case study analysis was selected as it aims to give holistic and in-depth understanding on the selected research topic. Typical methods for data collection in qualitative research are interviews, surveys, observations, and information gathered from various documents, and these methods can be combined in different ways. Further for case studies, it is typical to collect data from people in their natural environment with interactive methods. For this study it was decided to combine data from the case companies' corporate sustainability reports and articles related to biodiversity with the data from semi-structured interviews.

The second chapter of this study describes the relationship of corporate sustainability and biodiversity, while also explaining how businesses are impacting biodiversity loss and how they can enhance it. Third chapter scrutinizes the leading global frameworks for analysing and measuring businesses' impact on biodiversity loss. The case companies' activities on biodiversity loss prevention are reflected in the context of global frameworks on managing

biodiversity. The methodology, data collection and structure of this study is described in chapter four, followed by the data analysis from the sustainability reports and the research interviews. Lastly the findings and learnings of the study are discussed before the conclusion and recommendations for the food sector actors.

2. Corporate sustainability and biodiversity

This chapter explains the connection of business and biodiversity in general before diving into the food sector case studies in chapter five. This chapter examines how businesses are impacting biodiversity loss and highlights the key drivers of biodiversity loss. Further is explained, how companies could enhance biodiversity, and how that would benefit the business. Typically, these activities fall under corporate sustainability in the organizations.

2.1. Corporate sustainability

Corporate sustainability is referring to the economic, environmental, and social responsibility of a company. Widely used model is the three pillars of responsibility by Elkington; Triple Bottom Line (TBL), which introduces a sustainable business model that takes equally people, planet and profit into account. Related to environmental responsibility, a company can be expected to operate so that it does not harm the environment, rather protects, and restores is. Biodiversity as a topic has arisen under the environmental responsibility in recent years.

2.2. Impact of business on biodiversity loss

There are major business-related drivers that cause biodiversity loss. Forerunner companies recognise the material risk that biodiversity loss entails to their operations and across many sectors, businesses are now making public commitments and adding their biodiversity performance on the sustainability reporting (Addison, 2020).

One essential cause for biodiversity loss is that for most of the natural resources there is no market or market price, hence they are considered free of charge, which is leading to the current non-sustainable use of natural resources (Sitra, 2022). For example, considering the food sector, intensive farming has negative impacts on the health and quality of soil, air, water sources and natural ecosystems. However, the cost of environmental degradation

resulting from food production has not been included in the food costs. (Benton, 2021) There are initiatives such as The Economics of Ecosystems & Biodiversity (TEEB), that aims to make nature's values visible and develop a structured approach to valuate the wide range of benefits provided by ecosystems and biodiversity in economic terms. Accountability of corporate impacts to biodiversity is a key parameter to confront environmental degradation. (TEEB, 2010; TEEB 2022)

Today's businesses are having an impact to nature and biodiversity loss through overconsumption of natural resources – more than 90% of biodiversity loss is due to extraction and processing of natural resources. In the past decades the global economy has grown in unprecedented pace, however, with significant environmental costs. In 2020, it was estimated that 1.6 Earths would be needed to regenerate the biological resources to meet the current global consumption rate. (Ellen MacArthur Foundation, 2021)

Companies are impacting biodiversity besides with their own direct activity, but also through the value chain, end use of the product, and investment decisions. Often the most significant impact takes place at the beginning, and in the end of the value chain (Natural Capital Coalition, 2016). For example, land use changes for cultivation of raw materials are increasingly occupying living space from animal and plant species, leading to declined populations and even to extinctions.

According to IPBES (2019) there are five key drivers for biodiversity loss:

1) changes in land and sea use
2) direct exploitation of species
3) climate change
4) pollution
5) invasive species.

Firstly, land use change is primarily driven by agriculture, forestry, and urbanization. Over one third of land surface and nearly three-quarters of freshwater resources are harnessed to crop or livestock production. (IPBES, 2019) Secondly, nature and its resources are used 1.75 times faster than the ecosystem can regenerate, disturbing habitats and overexploiting specific organisms (Ellen MacArthur Foundation, 2021).

Climate change is impacting nature and its ecosystems, and it has already negatively affected nearly half of threatened terrestrial mammals and a quarter of threatened birds (Ellen MacArthur Foundation, 2021). There are synergies in preventing climate change and biodiversity loss, however where climate impact and compensation is global, biodiversity loss always requires local activities (Sitra, 2022).

Pollution is another key driver for biodiversity loss. Industrial, mining, and agricultural activities have negative impacts on soil, freshwater, and marine water quality, disturbing vital habitats. Furthermore, globalization and for example global food chains increase alien species, posing risk to native species and ecosystem functions. (Ellen MacArthur Foundation, 2021)

2.3. Benefits for business of enhancing biodiversity

Businesses have a critical role in supporting international efforts to halt biodiversity loss, as private sector is both causing large proportion of the pressure on biodiversity, but also having the capacity to reverse global biodiversity loss (Addison, 2020; Burg, 2014). Businesses can enhance biodiversity by decoupling economic growth from the overconsumption of natural resources. This can be achieved by transforming linear economy – take-make-dispose model – to circular economy, where materials are kept in use as long as possible and the need for virgin raw material decreases. Concrete activities to mitigate biodiversity loss can for example include optimizing production processes to reduce raw material and water consumption, leveraging production side streams, and reducing waste and emissions. (World Economic Forum, 2020b)

For a company, biodiversity loss can materialize in physical, regulatory, financial, or reputational risks. Therefore, investing in biodiversity can help prevent liabilities and compensation claims, but also create efficiency and new revenue streams by responding to societal concerns and consumer preferences. (SBTN, 2020) Nature-positive business can create material and immaterial benefits to business, such as new products and markets, efficient operations, cheaper funding, improved brand, and reputation (Sitra, 2022).

Business risks related to biodiversity loss can be turned into opportunities with proactive actions. By assessing biodiversity impacts as part of environmental risks, company can better

manage raw material availability, price fluctuations, funding, and reputational risks. (Sitra, 2022) Additional benefits from enhancing biodiversity and striving for nature-positive business include stronger reputation among employees, consumers and society, increased confidence of investors, collaboration opportunities across value chain, and sustainable innovations. (SBTN, 2020b)

Pressure to take biodiversity impacts into account arise often from external stakeholders and through changes in the operational environment. Financial sector and insurance companies are increasingly emphasizing the businesses relationship to nature on their terms, and customers are demanding more sustainable goods and services. Extended stakeholders are nowadays more aware of the biodiversity impacts, hence reputational risks are severe if company's business is related to biodiversity loss. (Sitra, 2022)

According to the World Economic Forum (2020), global transition to nature-positiveness can create even over $10 billion economic benefit and 395 million new workplaces until 2030 (World Economic Forum, 2020).

3. Frameworks to assess businesses impacts on nature

Companies are looking for appropriate management tools aiming to increase measurability and transparency of their activities when including biodiversity management into corporate sustainability activities. Biodiversity indicators have been developed for specific business context, however many of them are not widely translatable across different contexts. (Addison, 2020)

Related to climate change, the Paris Agreement targets to limit global warming to 1.5°C, forming a global carbon budget to be divided among the nations. However, the variability and place-specificity of biodiversity requires more attention to details to ensure that biodiversity goals are framed clearly enough to generate a useful and effective framework for driving and monitoring progress. (Maron, 2021)

Despite the wealth of information and research on biodiversity loss, decision makers face a challenge in trying to navigate through it. A consistent analysis of multiple human pressures would provide a useful guide to assess whether we are moving towards or away from sustainability. Currently, no single metric is available to provide such a comprehensive view. (Lazarus, 2015)

Before going into case study deep dives in chapter five, a sample of the global frameworks for sustainability and biodiversity management is first examined. Six frameworks are selected for the purpose of this study, with the aim of clarifying how these can be applied to showcase companies' impact on nature and to take action to mitigate that. After short introduction of each framework, table 1 summarizes a description and purpose of each tool. Later, in the research synthesis chapter, the selected case companies are presented in reflection of how they leverage these frameworks.

3.1. Science Based Targets for Nature

Science Based Targets Network (SBTN) is part of Global Commons Alliance, aiming to set the standard for measurable corporate action on nature. Science Based Targets initiative for Climate – to help companies reduce their greenhouse gas emissions – is already established

and more than 3 000 companies are taking climate action based on this guideline. (Science Based Targets, 2022)

Building on the established framework for reducing emissions, 'Science Based Targets for Nature - Initial Guidance for Business' has been launched. It provides companies a 5-step process (see figure 1) to understand and manage their biodiversity impact: assess, interpret & prioritize, measure, set & disclose, act, and track. (Science Based Targets Network, 2020b) Further, there is a world-wide pilot on-going to test the science-based nature targets, and 10 Finnish companies are included in the pilot led by FIBS and Sitra in Finland. This enhanced guideline is due to be published at the end of 2022. (FIBS, 2022)

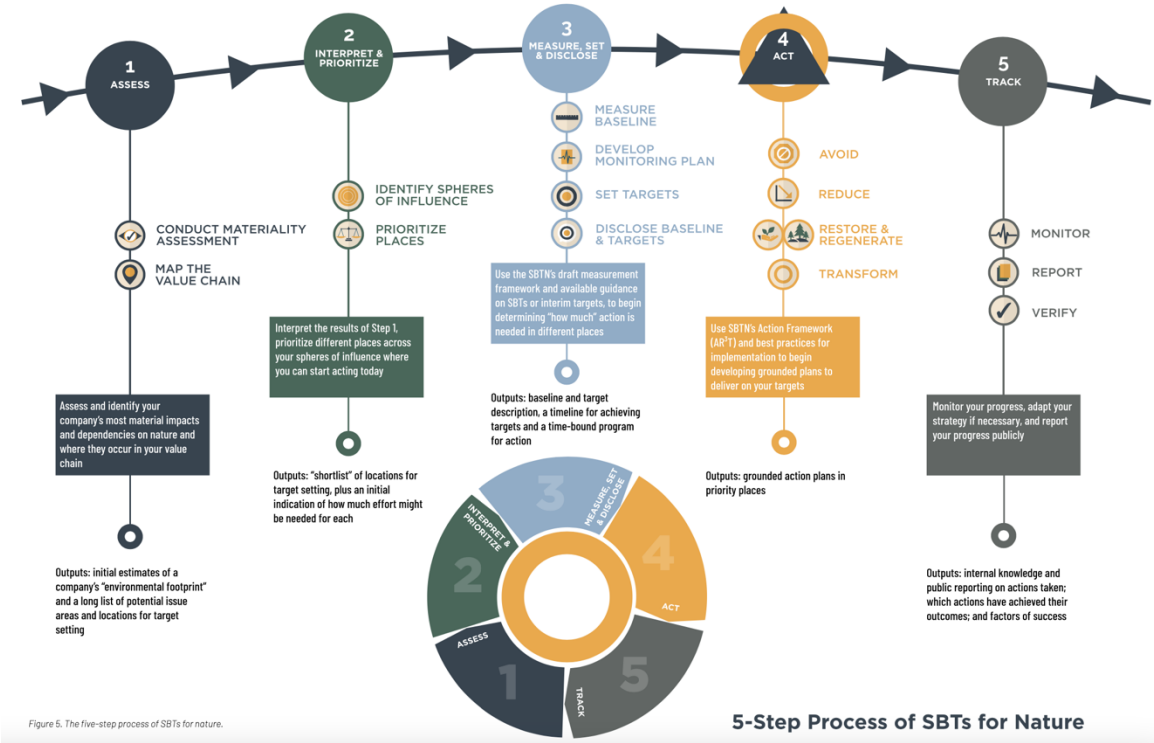

Figure 1. Five steps of SBT for Nature (Science Based Targets Network, 2020b).

3.2. Natural Capital Protocol

Natural Capital Protocol is a decision-making framework that enables organisations to identify, measure and value their direct and indirect impacts and dependencies on natural capital. Natural Capital Protocol's Biodiversity Guidance is similarly a stepwise approach to incorporate biodiversity into natural capital assessments, see figure 2. It guides businesses

and financial institutions through the process of including the value of biodiversity in their natural capital assessments and how to operationalize this information in internal decision-making. (Capitals Coalition, 2022)

The guidance is written for organizations who already recognize the importance of natural capital and wish to ensure that their assessments incorporate the value of biodiversity in a better way. It is also relevant for businesses and financial institutions who are managing their relationship with biodiversity and want to expand those considerations to a broader natural capital perspective. (Capitals Coalition, 2022)

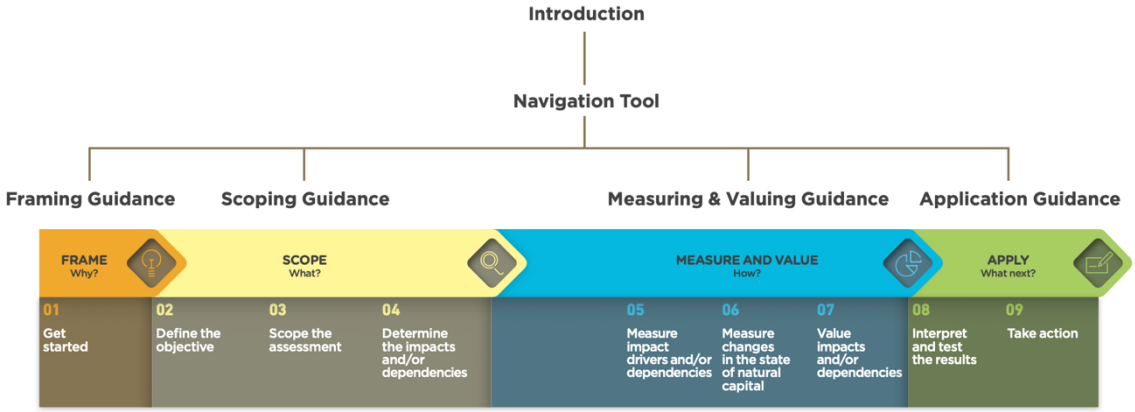

Figure 2. Natural Capital Protocol's Biodiversity Guidance (Capitals Coalition, 2022).

3.3. BES Management Model

International Union for Conservation of Nature (IUCN) is a democratic union that brings together organisations and experts to conserve nature and accelerate the transition to sustainable development. To this end, the UN Global Compact and IUCN have developed a framework for companies to explore the issue of Biodiversity and Ecosystems (BES) as it relates to their activities and corporate sustainability, see figure 3. (IUCN, 2019)

The objective of this framework is to contribute to the integration of BES into business activities and to position BES conservation among the private sector by engaging the top management of companies in the development, implementation and disclosure of BES policies and practices, to reduce risks, manage related impacts but also to seize opportunities. (IUCN, 2019)

The framework aims to assist the top leadership of companies in understanding the BES challenge and to enhance the formulation and structuring of BES practices, as part of corporate sustainability strategies that will contribute to achieving long-term profitability, as well as broader sustainability goals. (IUCN, 2019)

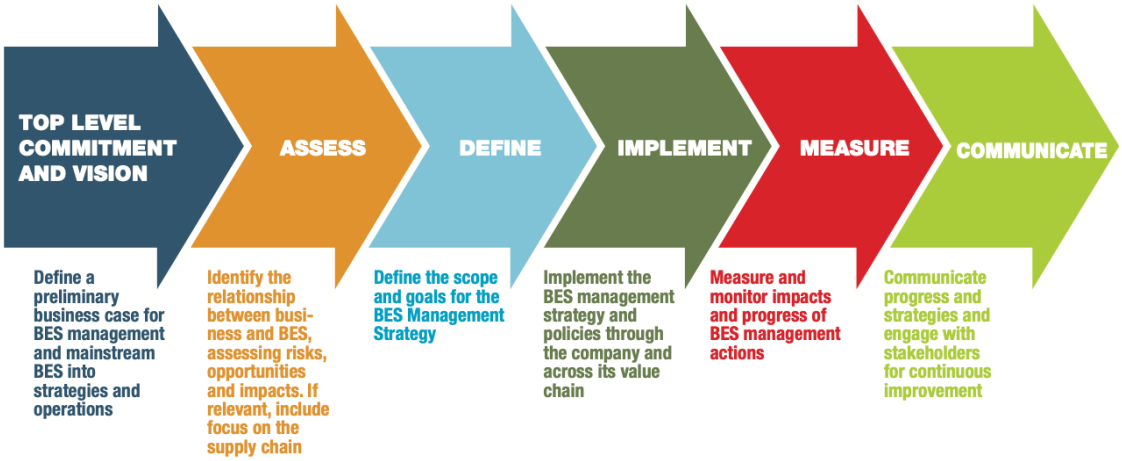

Figure 3. Biodiversity and Ecosystems (BES) Management Model (IUCN, 2019).

3.4. EU Business @ Biodiversity Platform

The EU Business @ Biodiversity Platform provides a forum for dialogue and policy interface to discuss the links between business and biodiversity at EU level. It is hosted by the European Commission with the aim to work with and help businesses measure and integrate the value of nature into business practices. (European Commission, 2021)

The platform aims to develop a generally accepted set of methods, indicators and criteria for corporate biodiversity measurement tools and approaches, as well as sector specific guidance for site based, value chain and finance sector companies. Further a standardised approach to measure corporate impacts and dependencies on biodiversity is in focus of the platform. (European Commission, 2021)

3.5. UN Sustainable Development Goals

United Nation's 2030 Agenda for Sustainable Development is a well-known framework to enhance sustainability. It provides both private and public sector actors a framework to more sustainable life. It has been broken down to 17 individual goals (SDGs) with strong interlinkages, see figure 4.

Especially related to biodiversity are two goals, SDG 14 'Life below water' and SDG 15 'Life on land'. The SDG 15 is devoted to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss". Additionally, SDG 14 is linked to biodiversity, as it aims to "conserve and sustainably use the oceans, seas and marine resources for sustainable development". (UN, 2022)

Figure 4. UN Sustainable Development Goals (UN, 2022).

3.6. Global Reporting Initiative

Global Reporting Initiative (GRI) is an independent, international organization that helps businesses and other organizations take responsibility for their impacts, by providing them with the global common language to communicate those impacts. The GRI Standards are the most widely used standards for sustainability reporting. (GRI, 2022)

The revision of GRI 304: Biodiversity 2016 aims to reflect global best practice on biodiversity management to support companies in addressing their impacts. Standard will enable an organization to publicly disclose its most significant impacts on biodiversity and how it manages them. This disclosure enhances transparency on the organization's impacts and increases accountability. (GRI, 2022)

3.7. Summary of the frameworks

To date there is a variety of frameworks to guide businesses on how to manage, measure and report their impact on biodiversity. However, common global method, similar to carbon footprint measurement, is still missing. For the purpose of this study, six frameworks are presented as examples, yet there are many more.

There are many similarities within the presented frameworks, especially in the first three; Science Based Targets for Nature, Natural Capital Protocol's Biodiversity Guidance and BES Management Model appear to be very similar, stepwise processes. The latter three are broader platforms, models, or guidelines. UN SDGs are included, even though the total scope is broader sustainability perspective, but there are specific goals that are focusing on biodiversity loss. Similarly, the GRI standard is a well-known reporting framework for broader sustainability performance but has specific standard focusing on biodiversity management. Table 1 summarises the presented frameworks, and later in the research synthesis chapter the frameworks are reflected with the case companies' corporate sustainability work.

Table 1. Biodiversity management frameworks

Framework	**Description**	**Purpose**
Science Based Targets for Nature	5-step process for organisations to understand and manage their biodiversity impact.	Use to supplement current strategy for addressing environmental issues or to begin exploring these issues for the first time. Build on existing environmental work that the company has done.
Natural Capital Protocol's Biodiversity Guidance	The Biodiversity Guidance is designed to help businesses better incorporate the value of biodiversity into natural capital assessments.	For organizations who already recognize the importance of natural capital and wish to ensure their assessments better incorporate the value of biodiversity. Also relevant for businesses and financial institutions who are managing their relationship with biodiversity and want to expand those considerations to a broader natural capital perspective.
BES Management Model	A framework for companies to explore the issue of Biodiversity and Ecosystems (BES) as it relates to their activities and corporate sustainability.	Framework to assist the top leadership of companies in understanding the BES challenge and to enhance the formulation and structuring of BES practices, as part of corporate sustainability strategies that will contribute to achieving long-term profitability, as well as broader sustainability goals.
EU Business @ Biodiversity Platform	The EU B@B Platform aims to develop a generally accepted set of methods, indicators and criteria for corporate biodiversity measurement tools and approaches, as well as sector specific guidance for site based, value chain and finance sector companies.	Helping businesses within the EU to better account for their impacts and dependencies on biodiversity and natural capital. A standardised approach to measure corporate impacts and dependencies on biodiversity is in focus of the platform.
UN Sustainable Development Goals	The UN 2030 Agenda for Sustainable Development provides a framework to enhance sustainability, both in private and public sector. Framework is broken down to 17 individual goals (SDGs) with strong interlinkages.	Especially the SDG's 14 'Life below water' and SDG 15 'Life on land' are guiding public and private sector actors to halt biodiversity loss.
Global Reporting Initiative	GRI 304: Biodiversity 2016 standard on biodiversity impact measurement and reporting.	Standard enables an organization to publicly disclose its most significant impacts on biodiversity and how it manages them. This disclosure enhances transparency on the organization's impacts and increases accountability.

4. Research design

This chapter describes the structure of the study, methodology and data collection. Selected case companies and the persons interviewed for this study are listed in the data collection chapter.

4.1. Structure

According to Puusa (2020) there are several phases in a qualitative study. The phases of qualitative research are however flexible; hence the phases can overlap. (Puusa, 2020) The first phase of the study is usually the selection of the topic. In this case, different research topics related to corporate sustainability and circular economy were considered. Biodiversity as a topic was selected as it is not yet as widely discussed or known as for example climate change. More specifically biodiversity management as part of corporate sustainability was selected to be studied. Due to time and resource limitations, the study was geographically limited to Finland and further to the food sector. The structure of this study is sketched in figure 5.

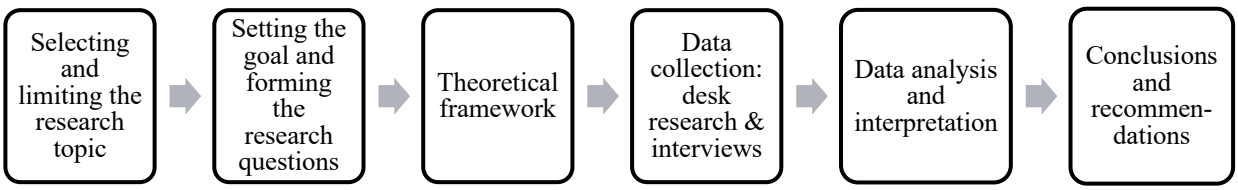

Figure 5. Structure of the study.

After concluding the topic and the limitations, research goal and the research questions were formulated. The number of research questions were narrowed down to four. In this phase, the methodology was decided to be a qualitative case study research.

Before the data collection, the theory of corporate sustainability and biodiversity especially related to food sector was studied, and the theory section of the study was written leveraging

earlier research and scientific publications related to the topic. Alongside with studying the theory, the case companies were selected and approached with interview request.

The actual data collection started with desk research where the sustainability reports and other online material of the selected companies were studied. For more thorough and holistic understanding of the topic, individual interviews with each case company were conducted. After the data collection phase, the data was analysed, interpreted, and synthesized before writing the conclusions of the study.

4.2. Methodology

This study is a multiple case study analysis, using qualitative research methods. Qualitative research typically aims to produce rich and detailed information about a phenomenon (Puusa, 2020). Aspers & Corte (2019) define qualitative research as an "iterative process in which improved understanding to the scientific community is achieved by making new significant distinctions resulting from getting closer to the phenomenon studied." (Aspers & Corte, 2019)

The most common methods of data collection in qualitative research are interviews, surveys, observations, and information gathered from various documents. These methods can be used alternatively, side by side or combined in different ways. (Puusa, 2020; Tuomi & Sarajärvi, 2018) Qualitative research method allows an exploratory nature for a study. Data is often collected from people who operate in their natural environment, with interactive methods, emerging data rather than prefigured data, and being fundamentally interpretive. (Cambell, 2014) An interview can be described as a conversation with a set goal. The conversation is initiated by the researcher; thus it is also led by the researcher. However, the interview is an interactive method, so the parties always influence each other. (Puusa, 2020)

There are five strategies identified as qualitative research methods: ethnographies, grounded theory, case studies, phenomenological research, and narrative research (Cambell, 2014). For this study, case study analysis was selected as a method. In a case study, the investigated phenomenon is described accurately and thoroughly. The research object can be an individual, a community, an organization, a city, a country, or a course of events. Typically, case study is a holistic analysis of a natural phenomenon. (Laine, 2015)

According to Eriksson & Koistinen (2014), case study examines one or more cases where the definition, analysis and solution is the main goal of the case study. Therefore, it is not self-evident how the examined cases are selected, limited and justified. Qualitative material is typical for the case study, but in addition to that, quantitative methods can be used. (Erikson & Koistinen, 2014)

For the purpose of this study, a multiple case study with qualitative methods was selected as a research technique to gain in-depth understanding of biodiversity management. As it is typical in a case study analysis, also for this study the data is collected from various sources i.e., the sustainability reports and individual interviews. Due to the limited resources the study was limited to five largest companies in the Finnish food industry based on net revenue.

4.3. Data

In qualitative research individual interviews, group interviews, documentary materials or observation in various forms are usually used to acquire data. This research is conducted by collecting and analysing data from the case companies' sustainability reports (year 2021) and other related on-line materials. To gain deeper understanding of the research topics, additional data was collected via semi-structured interviews with case company representatives. For the theory part of the study, available research and scientific publications were studied.

The case study sample included five largest Finnish food sector companies based on net revenue (here in alphabetical order): Arla, Atria, Fazer, HKScan and Valio (TEM, 2020). After desk research on the sustainability reports and biodiversity related on-line articles, the companies were contacted via e-mail and phone to request the interviews. All contacted companies were willing to be interviewed and semi-structured interviews with company representatives were conducted via Teams platform. The interview questions were shared beforehand via e-mail and all interviews were conducted in June 2022. See the interviewees in table 2.

Table 2. Interviewees of this study

Company	**Title**
Arla Oy	Head of Sustainability
Atria Oyj	EVP, Sustainability
Fazer Group	Director Sustainability and Quality, Group Procurement
HKScan Group	VP, Corporate Responsibility
Valio Oy	Development Manager, Primary production

The interview requests were initially sent to the Head of Sustainability of the five selected case companies, but two of them appointed another person in their sustainability team for the interview. As the study was finalized, the interviewees were given the possibility to comment the case text to ensure no misinterpretations occurred in the text.

5. Biodiversity management in Finnish food sector companies

World Economic Forum (2022) has researched global risks for societies and businesses. Three most severe risks identified within the next 10 years were:

- non-successful activities in climate change
- extreme weather conditions
- biodiversity loss.

(World Economic Forum, 2022)

This study was conducted among business leaders, and it indicates that biodiversity loss has reached the top of mind within business management. Thus, going forward the impacts of biodiversity loss on nature will certainly be more widely managed and reported.

According to UN Environment Programme research paper, the global food system is the primary driver of biodiversity loss, hence the way of producing food needs to urgently transform to halt biodiversity loss. Further destruction of ecosystems will threaten the ability to sustain human populations. (Benton, 2021)

Therefore, it is interesting to understand, how managing biodiversity impacts is currently integrated in corporate sustainability in the food sector. The following chapters focuses on the earlier mentioned research questions by examining the sustainability reports of the selected companies as well as interviewing the company representatives leading the sustainability activities. This research is focused on three sub-sectors in the Finnish food industry: dairy, meat processing and bakery.

5.1. Dairy

5.1.1. Case 1: Arla

Arla Oy is a Finnish dairy company that belongs to the international Arla Foods group. Arla provides a variety of dairy products, from milk to food preparation products and snacks. Arla Oy has 390 employees, and its turnover was 323 million euros in 2020. (Arla, 2022) The

data for this study is collected from Arla Foods group sustainability report as well as from the interview with Arla Oy's Head of Sustainability.

Under corporate sustainability management, Arla Foods' environmental ambitions cover three themes: better climate, clean air & water, and more nature. Within 'more nature' ambition, the goal is to 'increase biodiversity and access to nature.' This will be achieved mainly by implementing actions to improve biodiversity and soil health in farms. Arla Foods' sustainability report states:

> "In 2021, we have taken additional steps to learn how regenerative dairy farming practices can help improve soil health, carbon capture, water quality and biodiversity." (Arla Foods, 2021)

Arla has recognized biodiversity as a relevant topic within corporate sustainability; a topic that the company can have influence on, but also one that impacts the business. Arla has started to examine what are the activities that they can do to support rich biodiversity.

> "It is about the total responsibility of dairy production, which causes besides carbon emissions, also impacts biodiversity, water system and society. We want to understand the total responsibility and level up the conversation about carbon emissions to wider environmental impact." (Azbel, 2022)

Arla Foods' materiality analysis was conducted according to the GRI guidelines with the aim to understand the most relevant issues to Arla's internal and external stakeholders. Food safety, animal care and greenhouse gas emissions are high priorities, but also biodiversity has moved up and continues to stay in focus, see figure 6. (Arla Foods, 2021)

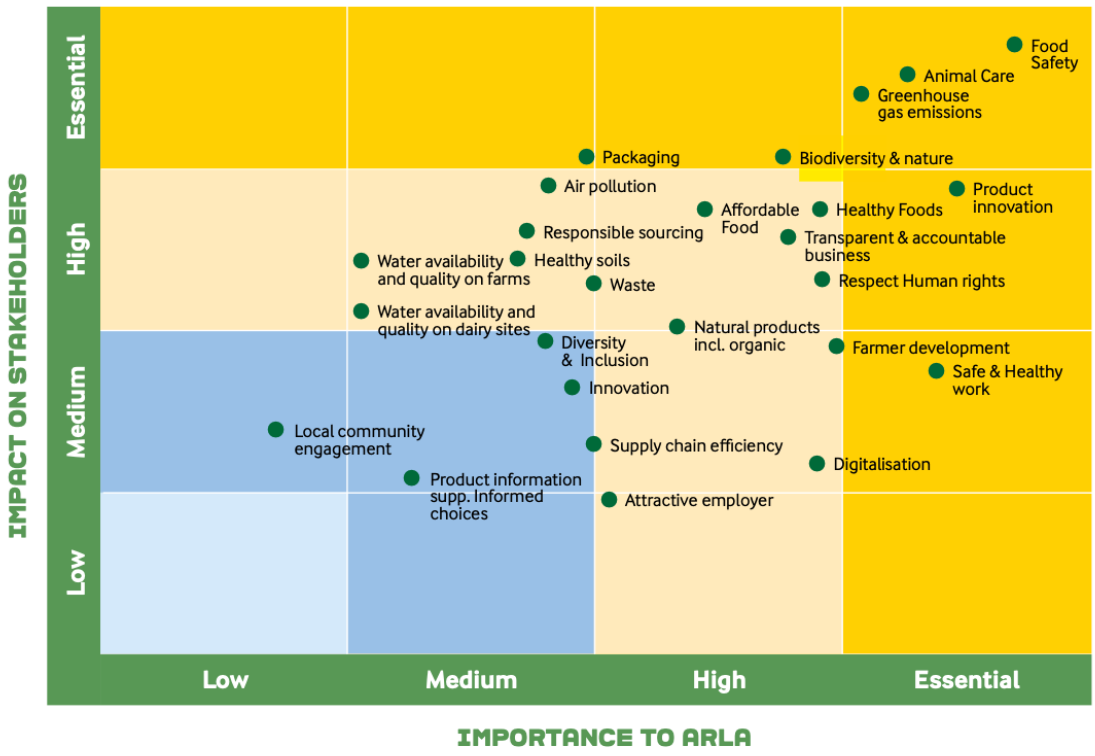

Figure 6. Arla's materiality analysis (Arla Foods, 2021).

Feedback from stakeholders is showing growing interest, especially from research and school communities. However, consumers are not yet setting too much pressure directly to Arla Oy on biodiversity. (Azbel, 2022)

> "We recognize the significance of businesses sustainability; if we want to make dairy also in the future, we must act sustainably for the climate and nature." (Azbel, 2022)

Last year Arla Foods has launched new business strategy where sustainability is one cornerstone. To this end, the group aims to contribute to the United Nations Sustainable Development Goals (SDGs), prioritizing its focus on SDGs related to food, environment, and climate. SDG 15 'Life on Land' is one of the goals in focus related to environmental sustainability. (Arla Foods, 2021)

For the climate impact mitigation, Arla Foods is leveraging the Science Based Targets initiative (SBTi) framework, and the company's emission reduction target was approved by the SBTi as consistent with the reductions required to limit global warming to 1.5°C. Biodiversity management and targets actualize especially through Arla's ambition on

sustainable dairy farming, where the target related to biodiversity is qualitative: *build more diverse, robust and accessible local agricultural landscape to increase biodiversity and access to nature.* (Arla Foods, 2021)

Arla Foods has developed electronic self-assessment tools for the farm performance data capturing to see how farmers contribute to the company's goals related to carbon reduction, biodiversity, and animal welfare. Regarding biodiversity and soil health the company sends yearly surveys with 50+ questions to the Arla farmers. In addition to this data, the farmers collect soil samples to be analysed in third party laboratory. Further, Arla's organic farmers are required to implement at least seven biodiversity and five soil health measures every year which they can choose from a catalogue of measures including information about how to measure and manage improvements. (Azbel, 2022; Arla Foods, 2021)

Arla aims to take a leading role in developing and scaling regenerative farming strategies and showcasing the positive impact of dairy farming on nature and climate. The company has initiated work to gain more knowledge about regenerative farming practices that can enrich soil, increase biodiversity, improve water quality, and enhance ecosystem services, such as carbon sequestration, nutrient cycling, food productivity and climate resilience. (Arla Foods, 2021)

> "In Finland we have collaboration forums with farmers where we support and advise them, as we want to understand their work and reality. There is lot of research going on and we are leveraging that to get objective information." (Azbel, 2022)

Regarding the challenges related to biodiversity work, Azbel mentions measurability, target setting and place-specificity. This means that biodiversity is different depending on location, hence target setting and quantification is difficult and performance in biodiversity is hard to measure. Even more difficult is when biodiversity impact happens very far, often in these cases the company needs to trust different certificates. Further challenge according to Azbel is communication, especially to consumers. The topic is so manifolded and complex that it is hard to communicate to consumers in an understandable way.

> "For example, the soil can be different even within same farm, and it depends also on what plant variety is cultivated or grown. Biodiversity metrics might need to vary for different sectors or even for different plant variety within food sector." (Azbel, 2022)

Other issue is to understand the forthcoming law, regulations and frameworks; and for example, how biodiversity impact appears in public sourcing criteria in the near future. (Azbel, 2022)

To support the biodiversity management in companies, it would be helpful to have a toolbox with best practices. To compare different products regarding the biodiversity impact is difficult for companies. In sectors with long value chains, the impact can take place at a long distance, which makes it difficult to address directly. Science based targets for nature would be helpful guideline. Companies need to understand how to achieve a good level and further, targets and activities should be comparable in between organisations. (Azbel, 2022)

5.1.2. Case 2: Valio

Valio is a Finnish dairy company founded in 1905. The company has net sales of 1.7 billion euros and it is Finland's biggest food exporter. Valio's products are found in 60 countries and the company has subsidiaries in Sweden, the Baltics, USA and China. Valio employs a total of 25 000 people at dairy farms and 4 000 professionals at Valio. Valio is owned by 4 000 Finnish dairy farmers. (Valio, 2022b)

At Valio, responsibility is one of the key values and the business strategy outlines it to be included in all activities and all markets: "Responsibility for the environment, the economy, people and society is embedded in everything we do." Responsibility at Valio means sustainable milk production, climate efficiency, circular economy, and animal welfare. Further, sustainable dairy production includes reduction of emissions, growing carbon sinks, working to increase biodiversity and creating circular economy solutions. (Valio, 2021)

> "Biodiversity is given much consideration in the guidelines for good Valio milk production. We aim to increase the biodiversity-friendly activities at farms and to reduce negative impacts." (Valio, 2022)

When looking at the concrete actives to secure biodiversity, Valio's report is mentioning carbon farming practices, organic milk production, and the grassland grazing of dairy cattle. Valio aims to support dairy farmers in planning and implementing activities that improve biodiversity, and farmers can apply for support in biodiversity actions. In 2021, support was granted to 13 farms for biodiversity pastures, flower meadows and wetlands. (Valio, 2021)

Another example is the surveys of valuable natural sites at farms with the goal to increase dairy farmers' awareness of the farm's biodiversity and opportunities and ways to promote it. "The advisory service has received excellent feedback from farmers, and magnificent areas of high natural value have been discovered at the farms." (Valio, 2021)

To define relevant sustainability topics for Valio, the company has conducted a materiality assessment based on the GRI standard guidelines. Altogether 16 topics arise from the assessment and those were categorized under the three sustainability pillars i.e., triple bottom line; planet, people, and profit, and further linked to the UN Sustainable Development Goals. Nine out of the 17 SDGs were linked to Valio's sustainability topics, SDGs 14 and 15 were included under 'planet and animals' category. Biodiversity was one of the relevant sustainability topics according to the assessment, however not positioned among the areas with the largest impact on stakeholders and business, see figure 7. (Valio, 2021)

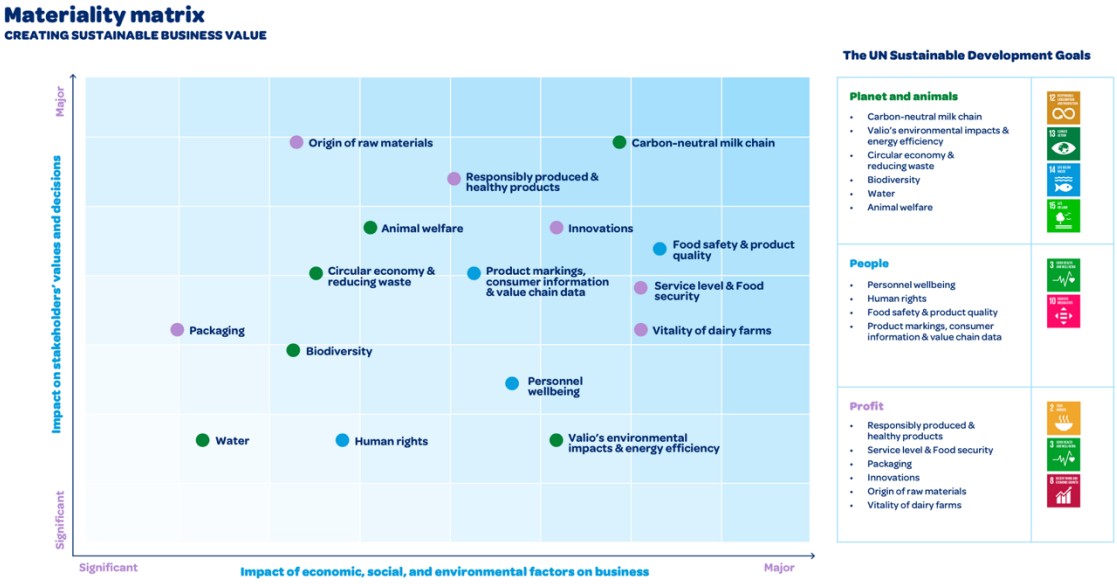

Figure 7. Valio's materiality analysis (Valio, 2021).

Based on the materiality assessment, sustainable business focus areas were defined, and targets were set on each of these areas. In total nine focus areas were discovered and one of them was biodiversity recovery. Valio's target for biodiversity in 2021 was to *create a biodiversity roadmap that brings together a number of individual measures into a target-oriented package*. According to the sustainability report, the roadmap was completed in December 2021, and it contains three sub-areas:

- Dairy farm measures linked to the sustainability programme.
- Valio's measures.
- Consumer and customer measures related to products and campaigning.

The biodiversity roadmap outlines: 'We are verifying the nature-positive impacts through research, and we want to communicate the impacts openly. We are developing and offering products that strengthen biodiversity.' (Valio, 2021) According to Nokka, although the biodiversity roadmap has not been published, it is already internally used in daily operations. (Nokka, 2022)

Unlike many other business focus areas at Valio, biodiversity did not have quantitative targets in 2021. Valio is already leveraging the Science Based Targets initiative (SBTi) framework in mitigating its climate impact and the company has been selected as one of the pilot companies in Finland to test the Science Based Targets for Nature. This guideline is currently tested in many countries and the guideline is due to be published by the end of 2022. (Nokka, 2022; FIBS, 2022)

> "We hope to get major input from the SBT for Nature initiative, such as framework and tools for measurement. It is good to be in the pilot so that we can get first-hand knowledge also from other pilot companies and get to influence the final guidelines ourselves. When the SBT for Nature pilot is concluded, we can work on setting more specific targets for Valio." (Nokka, 2022)

Despite the lacking targets, many activities to positively impact biodiversity are already in progress at Valio. For example, the company is increasing grazing at farms; and this activity will be measured, and specific targets will be set in the near future. Another example is carbon farming which is also having positive impact not just for climate, but also on biodiversity. (Nokka, 2022)

Valio wants to act proactively and ahead of regulation in the way they support biodiversity through sourcing, own production and how to influence the market. Primary production is the hot spot regarding biodiversity, but other areas concern own production and the market.

> "Related to sourcing, we can do close collaboration with Finnish farmers, however the so-called risk-products coming from longer distance, are more difficult to understand, measure and have impact on – often we need to rely on certificates. Social responsibility has been in the focus regarding these value chains, but biodiversity is coming." (Nokka, 2022)

Valio has piloted farm specific biodiversity tool, but SBT for Nature pilot should clarify what kind of tools could be used by the management.

> "We have done comparison on the existing tools, but we have not yet decided what to use, hoping that the pilot should bring clarity on the framework. Additional challenge has been about how to educate consumers if they are interested in choosing products that support biodiversity i.e. how do we communicate the biodiversity impact of different products." (Nokka, 2022)

Valio's key stakeholders are owners (i.e., cooperatives and dairy farmers), suppliers of goods and services, personnel, financiers, customers, consumers, organizations (trade union, NGOs), trade associations, as well as societal decision-makers, media, authorities, and research facilities & universities (Valio, 2021). According to the materiality matrix (figure 6), biodiversity is not among the major topics when assessing impact on stakeholders' values and decisions. Valio is further listing the stakeholders' expectations per segment as well as how the company aims to response on these expectations. Only related to two segments; *customers* and *organizations,* biodiversity is directly referred to. However, related to *financiers*, managing sustainability risks was mentioned, which can be accomplished by active biodiversity management among other things.

5.2. Meat processing

5.2.1. Case 1: Atria

Atria is a listed food company, focused on meat processing. In 2021, Atria's net sales were approximately 1.5 billion euros, and Atria has 3 700 employees in Finland, Sweden, Denmark and Estonia. Atria was founded in 1903. (Atria, 2022)

Atria declares sustainability to be an integral part of Atria Group's strategy, business operations and daily work. Responsibility at Atria is managed and developed systematically across the company and reflected in the operations at all levels. (Atria, 2021)

> "Our work for responsibility is guided by ambitious goals: a carbon-neutral food chain, clean and safe products, and the general well-being of people. We are working towards these goals through three priorities: the Planet, Product and People." (Atria, 2021)

Atria's assessment of material responsibility was conducted alongside of the sustainability strategy update in 2021. In line with the company wide responsibility management, the materiality assessment engaged people from all business areas representing the key processes and functions that are central to the implementation of the company's strategy. Additionally, the views of consumers and decision-makers were included through surveys. (Atria, 2021)

The company is using the GRI standard framework to report its responsibility work, and it is further aligning sustainability work with the UN Sustainable Development Goals as well as the UN Global Compact. (Atria, 2021) The sustainability report names carbon-neutral food chain as the most important environmental responsibility goal, yet biodiversity has become another strong focus area (Atria, 2022). However, biodiversity targets are not yet concluded at Atria.

> "We have investigated existing calculation methods, but there are not yet proper, established methods that we could leverage. For example, calculation done in other parts of Europe might not be suitable for Finland as here the livestock is grazing a lot. Therefore, setting numeric or even qualitative targets is too early." (Leino, 2022)

Related to climate change mitigation, Atria has committed to the Science Based Targets initiative (SBTi), and further the company is one of the 10 pilot companies in the Science Based Targets for Nature pilot programme in Finland.

> "We are looking forward to the results of this pilot, to gain the basic understanding and tools for biodiversity management." (Leino, 2022)

Regarding challenges related to biodiversity work, Leino mentions the insufficient calculation methods.

> "There are various models, but the scene is unclear. Often the approach is rather to measure the negative impacts even though the positive should be included as well. In general, the lack of consistent information is a big challenge, hence knowledge management on this topic is difficult as there is still so incoherent information. A lot of research is yet needed." (Leino, 2022)

Tools and metrics, ways to calculate and show the progress are needed to view and manage biodiversity comprehensively, according to Leino. To enhance these, Atria is in a project with LUKE (Natural Resources Institute Finland) to examine how food sector can improve biodiversity and how to measure biodiversity in the food chain. Further, it is expected that

the Science Based Targets for Nature bring these practices along and clarify the best activities on farms to progress on biodiversity. (Leino, 2022)

E-learning course prepared in collaboration with Baltic Sea Action Group (BSAG) is a good example of a concrete tool to increase knowledge of regenerative farming to enhance biodiversity. In further BSAG collaboration with primary production farmers related to sustainable farming methods, Atria is developing co-operation between livestock farms and crop farms with the aim of improving nutrient circulation by developing manure use. Additionally, the initiative aims to make more efficient use of existing arable land, reduce greenhouse gas emissions, increase the cultivation of domestic protein crops, and promote crop rotation. (Atria, 2021; Leino, 2022)

Further related to primary production, Atria is looking into what are the impacts of animal husbandry on biodiversity and advising on how these farms can enhance biodiversity. According to various research, the most important thing for consumers is the well-being of animals. The investors and finance sector are not yet talking about biodiversity impact, even though other sustainability topics like climate and social matters are well in their radar.

> "With customers, both retail and food service, we have good discussions and even one concrete initiative to collaborate on reporting of biodiversity. However, this work is still in the beginning, but surely, we will proceed a lot in the coming couple of years." (Leino, 2022)

5.2.2. Case 2: HKScan

HKScan is a listed food company, focused on meat processing. The company employs 7 000 professionals and the home markets cover Finland, Sweden, the Baltics and Denmark. In 2021 HKScan's net sales was 1.8 billion euros. HKScan was founded in 1913. (HKScan, 2022)

The company's responsibility approach is stated to concern the entire food chain, from farms to consumers; and advanced responsibility work is the basis of HKScan's strategy. At HKScan, mitigating climate impact is comprehensively reported, whereas maintaining biodiversity is said to support climate work. Related to environmental management, the aim is to reduce environmental impacts and promote sustainable use of natural resources. (HKScan, 2021)

> "We are committed to maintaining and promoting biodiversity in our primary production. On farms, biodiversity can be promoted by placing particular emphasis on the development of field farming and animal grazing practices. In field farming, key measures for carbon sequestration and biodiversity are, for example, maintaining crop rotation and optimising the use of nutrients and plant protection products. Vegetation cover maintains soil health and underground biodiversity." (HKScan, 2021)

HKScan has conducted a materiality assessment in 2019 where the company defined material responsibility themes based on stakeholder analysis. Five identified themes are grouped under two priority areas; nature and people. These are environment, animal welfare, healthy food, personnel, and farming community. Biodiversity is not as such mentioned, however some of the activities listed under the material themes will support richer biodiversity. (HKScan, 2021)

The company is leveraging the GRI standard framework for reporting and linking its sustainability efforts to the UN SDGs. The SDG 15, 'Life on land' related to biodiversity is one of the four identified focus SDGs on environmental impact. (HKScan, 2021)

HKScan has not yet set specific biodiversity targets. The biggest environmental target is to reach net zero carbon by 2025 regarding own production, and for the whole supply chain by 2040. Within the means to reach this target, there are many activities that also support biodiversity. For example, related to primary production, regenerative farming and carbon sequestration enhance biodiversity. Another example is sustainable and recyclable packaging materials, which boost biodiversity at least indirectly.

> "All in all, thinking how natural resources are used most effectively according to the circular economy principles is helping us to mitigate biodiversity impacts." (Lehtonen, 2022)

According to Lehtonen, managing biodiversity as a topic is still underdeveloped in general; regarding law, governance, frameworks from EU – and how these should be nationally implemented. Retail sector either has not yet been able to set measurable targets, hence the industry is still in the beginning of evaluating the materiality, understanding how to measure, and what kind of targets to set. (Lehtonen, 2022)

Despite of the immature guidelines, biodiversity is being discussed internally at HKScan to frame what it means in the company's context. Understanding the materiality related to biodiversity is the first challenge, as the topic is so manifolded. But also, how to measure the impact, how to showcase the development and the performance concretely. Further, how

to prioritize what to communicate to stakeholders, how to communicate the concrete progress and how to do this clearly so that everyone understands is another challenge according to Lehtonen. (Lehtonen, 2022)

Related to tools needed to manage biodiversity, Lehtonen calls for a workshop model to identify what is relevant for the company and its stakeholders, and a framework to support the management. Biodiversity will be vital part of corporate sustainability management – how to manage it so that the company has visibility on different sites and could report and communicate the impacts clearly.

> "How to leverage the data and information that is generated through the biodiversity work to support commitments and reporting. Management would need to be able to commensurate, set the base line, measure and to show progress." (Lehtonen, 2022)

A lot of research is being done at the moment; there are big projects going on in regenerative farming, carbon sequestration, animal welfare and new packaging. Biggest impact comes through primary production; hence a lot of collaboration is required with farmers. Also, collaboration with other stakeholders like fertilizer providers, universities and research institutes is needed to support farmers and their knowhow on how to farm effectively but with less environmental impact. (Lehtonen, 2022)

> "We are piloting HKScan's operating model of sustainable agriculture on 80 pilot farms in Finland, Sweden and Denmark. In the Agrofood Ecosystem project, we use digitalisation and data to explore how we can reduce climate impact of primary production, support biodiversity and animal welfare, and prevent water eutrophication. We will scale best practices to all our home markets. The measures promote the carbon neutrality goal of our Zero Carbon plan." (HKScan, 2021)

In the sustainability report, related to the stakeholder engagement topics, biodiversity as such was not mentioned. In general, environmental impact of food production was mentioned on the customer, contract farmers and NGO sections. (HKScan, 2021)

5.3. Bakery

5.3.1. Case 1: Fazer

Fazer is a Finnish food company that operates in bakery, confectionery, non-dairy and plant-based food markets, with net sales of 1.1 billion euros. Fazer's products are exported to more than 40 countries and the company operates in seven countries, employing 6 000 people. Fazer was founded in 1891. (Fazer, 2022b)

Fazer states to have 'sustainability at the core of everything we do'. Biodiversity as a topic is mostly linked to sustainable sourcing, thus Fazer's work on halting biodiversity loss is most strongly showcased in its way to support suppliers on sustainable farming practices. (Fazer, 2021) These practices are supported through Fazer's Grain vision, which includes 10 principles, most of them related to biodiversity.

Fazer's grain vision means in practice developing sustainable farming practices to support both environmental and social sustainability (Mattson, 2022):

> "As one of the largest buyers of flour and consumer of grain in the Baltic region, we must do better for the planet and its people. By 2025, we project that all grain used by Fazer in consumer goods in Finland and Sweden will fulfil the sustainable grain farming principles." (Fazer, 2021)

Fazer has concluded a materiality analysis to find out the main concerns of its relevant stakeholders, like customers, partners, and employees. It also considers the global megatrends when identifying relevant sustainability topics. The identified interests were grouped under four sustainability ambitions, see figure 8. Biodiversity was recognised as one major topic, showing *very high* significance to Fazer, and *high* significance to its stakeholders. (Fazer, 2021)

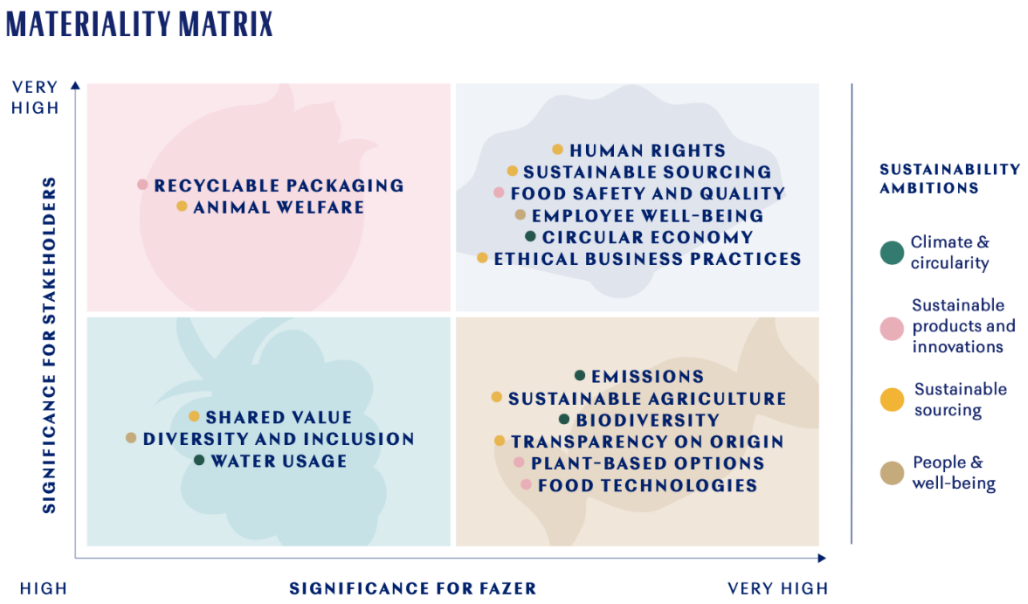

Figure 8. Fazer's materiality analysis (Fazer, 2021).

Further, also Fazer has reflected its sustainability work against the UN SDGs and found eight SDGs that are linked to Fazer's sustainability ambitions. Both SDG 14 and SDG 15 that support halting biodiversity loss are included. Fazer is using the GRI standard as a reporting framework. It has also committed to the Science Based Targets initiative (SBTi) on its climate impact mitigation. (Fazer, 2021)

Despite many activities that enhance biodiversity, specific biodiversity targets have not yet been set at Fazer. According to Mattson there is still work to be done before Fazer is able to outline all related activities and can set targets. In general, measuring biodiversity impact is still in its infancy. There are so many things that are impacting biodiversity, no one metric can be applied. On the other hand, a lot of research is going on currently, hence measuring biodiversity will get sharper going forward. (Mattson, 2022)

Education is one important factor; the actors need to understand what biodiversity means in general, what does it mean in a specific farm, and what are the activities that one single farmer can do. Fazer wants to proceed in alignment with the upcoming law and to promote to the stakeholders what kind of opportunities this brings. (Mattson, 2022)

Collaboration with BSAG on regenerative farming e-learning course is seen as important long-term investment, to offer free education to farmers on climate and biodiversity-friendly

farming. Preventing eutrophication in the Baltic Sea area is another way Fazer is offering guidance to farmers. (Fazer, 2022) In addition to the e-learning course to the farmers, Fazer has also conducted individual audits and surveys to the farms, to understand the farming methods they have implemented. There are no clear criteria yet, it is still to be formed, hence all the activities are still voluntary for the farmers. (Mattson, 2022)

> "Standardization is important, and we are looking into farming criteria related to food sector raw materials, but also related to regenerative farming. We need to get to the level of having enough general information for the farmers to see what the activities are to support biodiversity, how to implement them and how to follow the progress from implemented activities, i.e., what has changed regarding biodiversity. However, we need to be mindful that the cycles are long, change does not happen in couple of years." (Mattson, 2022)

Consumers are not yet widely connecting biodiversity with specific products, but surely questions start to come from consumers as well. For now, consumers are expecting the grain to be domestic, which is sort of a proof of quality, as it is easier to understand what happens in the near environment. Retail and food service customers on the other hand are already more aware about the requirements, yet they rarely talk specifically about biodiversity, but it is something to be expected. (Mattson, 2022)

5.4. Synthesis of the case study

Sustainability in general appears to be high on every case company's strategy and strongly integrated into daily operations. Respectively, all companies have identified the importance of biodiversity and are taking actions to understand the implications of their business to biodiversity loss. Some of the companies are already reporting more extensively on the biodiversity impact, whereas others are taking the first steps based on the sustainability reports from 2021. However, in the interviews it became clear that the importance of the topic is increasing, and activities related to biodiversity management are proceeding in all companies.

Some of the companies have set qualitative targets on biodiversity, but none of them has yet quantitative targets. Despite the lack of clear frameworks and targets all companies have started the work to enhance biodiversity. Most concrete activities are related to primary

production, like regenerative farming methods or increasing grassland grazing, thus collaboration with farmers is seen very important in all case companies.

Even though the materiality of biodiversity is recognized, the topic still is complex and even vague for many companies. Challenges are related for example to indicators, measurability, target setting and communications. In addition, related to the long value chains and ingredients coming from distance, measurability is even more complex and the ways to impact biodiversity loss are limited.

These challenges are also acknowledged in other research. For example, according to Smith, biodiversity goals must recognize businesses interdependencies with biodiversity, individually, collectively and through their entire value chain. Besides improved measurement and reporting, companies need to have clear standards to understand which actions are meaningful in enhancing biodiversity. (Smith, 2020)

All interviewees mentioned that they are still lacking a clear and consistent way to measure biodiversity impact and that the impact is hard to generalize. Various calculation models already exist, but many are still insufficient and often the approach is solely to measure the negative impacts even though the positive impact should be included as well. Other issue is to understand the forthcoming law and regulation regarding biodiversity conservation. Clear guidelines and coherent information are needed according to the interviews.

Nevertheless, none of the companies is passively waiting for the regulation or sufficient information but are proactive based on the best current knowledge. Despite the incompleteness and challenges, every interviewee was positive that biodiversity frameworks and ways to measure will be sharper and more functional in the near future.

Considering the five key drivers of biodiversity loss introduced in chapter 2.2 (changes in land and sea use, direct exploitation of species, climate change, pollution, invasive species), the case companies are strongly focusing on climate change mitigation. However, the biggest driver, land use change which is primarily driven by agriculture was not getting attention based on the interviews. Another biodiversity driver, pollution was not discussed either, even though agriculture has significant impact regarding soil and water pollution. The food companies could take a stronger role in mitigating biodiversity impact in the value chain, by addressing these drivers directly. Nevertheless, related to primary production and improving soil health, regenerative farming methods were in strong focus in many case companies.

Due to the strong dependencies in the food value chain, one key to successful biodiversity work is collaboration among different actors in the sector. Many companies mentioned regenerative farming as one key activity to halt biodiversity loss. As a concrete example of the partnerships, many of the case companies were collaborating with Baltic Sea Action Group (BSAG) to provide knowhow for farmers on regenerative agriculture and improving soil health. On the other hand, engagement with consumers was not extensive yet, however customers (retail and food service) are already starting to have their own requirements for suppliers.

In reflection to the biodiversity and sustainability frameworks presented in chapter 3, three of the six guidelines were in use in all case companies: Science Based Targets, UN Sustainable Development Goals and Global Reporting Initiative framework (see table 3). However, important to note that the Science Based Targets initiative is currently in use related to mitigating climate impact, not yet regarding biodiversity, except for the two companies (Atria and Valio) that are in the global pilot program. Related to the SDGs, all companies were specifically taking actions on the SDG 15 ‘Life on land’ related to biodiversity and many were also mentioning SDG 14 ‘Life below water’ in their reporting. This is critical, as Finland as a country still has ‘significant challenges remaining’ related to both SDG 14 and 15, according to the latest Sustainable Development Report (Sachs, 2022). Also globally, achieving the UN Sustainable Development Goals will require massive effort and investments in agriculture to transform the current food systems (Maron, 2021).

Furthermore, all the case companies are using the GRI framework for the materiality analysis and to report their performance on overall sustainability and biodiversity. According to Addison (2020), the GRI indicators are well describing the activities that the companies are implementing to minimize their biodiversity impacts; however, it does not tell if the business is achieving positive biodiversity outcomes. (Addison, 2020) This point was also criticized by the interviewees.

Table 3. Biodiversity management frameworks in reflection with the case companies

Framework	**Description**	**Purpose**	**Case company reflection**
Science Based Targets for Nature	5-step process for organisations to understand and manage their biodiversity impact.	Use to supplement current strategy for addressing environmental issues or to begin exploring these issues for the first time. Build on existing environmental work that the company has done.	Atria and Valio are in the global pilot program. All 5 case companies are leveraging the SBT for Climate measurement for carbon reduction.
Natural Capital Protocol's Biodiversity Guidance	The Biodiversity Guidance is designed to help businesses better incorporate the value of biodiversity into natural capital assessments.	For organizations who already recognize the importance of natural capital and wish to ensure their assessments better incorporate the value of biodiversity. Also relevant for businesses and financial institutions who are managing their relationship with biodiversity and want to expand those considerations to a broader natural capital perspective.	Not mentioned.
BES Management Model	A framework for companies to explore the issue of Biodiversity and Ecosystems (BES) as it relates to their activities and corporate sustainability.	Framework to assist the top leadership of companies in understanding the BES challenge and to enhance the formulation and structuring of BES practices, as part of corporate sustainability strategies that will contribute to achieving long-term profitability, as well as broader sustainability goals.	Not mentioned.
EU Business @ Biodiversity Platform	The EU B@B Platform platform aims to develop a generally accepted set of methods, indicators and criteria for corporate biodiversity measurement tools and approaches, as well as sector specific guidance for site based, value chain and finance sector companies.	Helping businesses within the EU to better account for their impacts and dependencies on biodiversity and natural capital. A standardised approach to measure corporate impacts and dependencies on biodiversity is in focus of the platform.	Not mentioned.
UN Sustainable Development Goals	The UN 2030 Agenda for Sustainable Development provides a framework to enhance sustainability, both in private and public sector. Framework is broken down to 17 individual goals (SDGs) with strong interlinkages.	Especially the SDG's 14 'Life below water' and SDG 15 'Life on land' are guiding public and private sector actors to halt biodiversity loss.	All case companies are linking their corporate sustainability work with the UN SDGs and are taking actions on SDG 15. Many were also mentioning SDG 14 in their reporting.
Global Reporting Initiative	GRI 304: Biodiversity 2016 standard on biodiversity impact measurement and reporting.	Standard enables an organization to publicly disclose its most significant impacts on biodiversity and how it manages them. This disclosure enhances transparency on the organization's impacts and increases accountability.	All case companies are using GRI framework to report their performance on overall sustainability and biodiversity.

6. Discussion

According to the studied literature and consistent with this study, biodiversity is gaining more and more attention among the private sector actors. Businesses are recognizing the direct and indirect implications of biodiversity loss for the business and are interested in setting targets to halt biodiversity loss and reporting their progress. (Addison, 2020; Smith, 2020) One of the main challenges is the lack of information and insight on how to collect useful information, and on the other hand the uncertainty about the impact of the activities. (Overbeek, 2013)

This study focused on four research questions; the first one exploring how managing biodiversity impacts is integrated in corporate sustainability. Based on the sustainability reports as well as the interviews, biodiversity is becoming an integral part of corporate sustainability in the case companies and the importance is expected to grow in the coming years. All companies are internally working on the topic, and are already collaborating with different stakeholders, especially with farmers and educational or research institutes. It was also recognized, that even though many current sustainability activities are aiming to mitigate climate impact, many of these are at least indirectly also beneficial for biodiversity. Reporting on biodiversity activities vary to some extent in between the companies, as some are already reporting more extensively than others. However, biodiversity management is a vital part of their sustainability activities, and the topic was included in all companies' sustainability reports.

Second research question was about the biodiversity targets whether those are driven from company's business strategy and how these targets link to global sustainability / biodiversity frameworks. All companies have sustainability in the core of their business strategy as they have recognized the risks of unsustainable performance for the future of the business. However, biodiversity target setting is still in early days in all the companies. Only few have mentioned qualitative goals in their reports such as "*build more diverse, robust and accessible local agricultural landscape to increase biodiversity and access to nature"* or "*create a biodiversity roadmap that brings together a number of individual measures into a target-oriented package*", but none of the companies have yet quantitative targets on biodiversity. All the interviewees saw that this needs to change in the near future.

The importance of having clearly defined goals on biodiversity is also identified in other research and literature on the topic. Additionally, multiple goals are needed due to the complexity of the issue. Different biodiversity levels need to be considered: genes, populations, species and ecosystems. These facets have strong interlinkages; hence goals need to be developed holistically rather than in isolation. Compared with the climate goals, the intrinsic variability and place-specificity of biodiversity needs to be considered. (Diaz, 2020; Maron, 2021) In line with this study, earlier studies also point out the difficulty in measuring the outcomes for biodiversity resulting from business activity. (See e.g., Silva 2019)

All companies are leveraging global frameworks and guidelines such as UN SDGs and GRI and are planning to use a specific biodiversity measurement and target setting framework such as Science Based Targets for Nature – however this guideline is still work in progress and expected to be published later this year. The implementation of this framework might be potential as all case companies are already leveraging SBTi to mitigate climate impact, hence the SBT for Nature could be seen as a natural next step for these companies.

Regarding the management tools for successful biodiversity management all interviewees mentioned the lack of feasible framework and measurement tools for their purposes. Many companies were still expecting for the scene to get clearer, especially a more standardized approach for the ways to measure biodiversity impacts. Workshops around the topic and toolboxes for companies to support the biodiversity work were desired. Similarly based on the literature review, biodiversity measurement is seen as a complex issue; hence it is challenging for the businesses to understand which indicators they should use to manage their biodiversity performance (Addison, 2020). Based on the interviews, commensurability is another issue as biodiversity can differ even within one farm between different field sectors.

Lastly was examined how the companies engaged with their stakeholders related to biodiversity, and what is the importance of the topic to the stakeholders. As the value chains can be long, collaboration within the sector was seen important; all the companies mentioned especially the collaboration with farmers significant. On the other hand, engagement, and communication to consumers or even internally to the employees was challenging, as the topic is so complex that it is difficult to simplify for communicational purposes.

This study was limited to food industry and geographically to Finland. The case companies were selected based on net revenue; thus, five largest actors were included, with the assumption that larger companies are ahead of the SMEs regarding biodiversity activities, but also because they have more influence on the food system due to their size. The companies were representing three different sub-sectors: dairy, meat processing and bakery. The selected companies are based in Finland, however some of them are part of an international corporation. This is the case for example with Arla Oy, hence some of the biodiversity activities reported in the sustainability report occurred in Denmark or in Sweden, and not necessarily all were yet implemented in Finland. As the number of the case companies is relatively small (five), the results and observations cannot be generalized to concern the whole Finnish food sector. However, this study aims to give recommendations based on the learnings for the food sector companies that are just starting to work on their biodiversity impact.

To get as comprehensive data as possible, the research was conducted in two phases; first the sustainability reports were examined, followed by the interviews among the sustainability representatives in the companies. Semi-structured interviews were conducted on Teams platform and the interviewees received the interview questions in advance via e-mail. All interviews were conducted in Finnish, and all interviews were conducted in planned schedule within 3 weeks' timeframe and without any technical complications. The interviews were worthwhile to gain deeper understanding on the situation and to see that the companies are currently moving fast forward on this topic.

The study was able to achieve its objectives by answering composed research questions based on combined data from the sustainability reports and the interviews. In order to deepen the understanding on biodiversity management in Finnish food sector, wider sample of case companies could be studied and for example different segments based on company size could be compared. Also, a comparison between different industries might be fruitful e.g., comparing forest, textile, or energy sector with food sector. Furthermore, it would be interesting to deepen the study on different biodiversity frameworks, their benefits and challenges to biodiversity reporting and especially how the positive impact on biodiversity could be consistently reported.

The literature review as well as the case study show that food sector companies will face significant business risks if companies are not acting on biodiversity loss promptly. This

study aims to contribute to increase the knowledge on the topic and advise especially those food sector companies that are just starting to gain interest and focus on biodiversity management as part of corporate sustainability.

7. Conclusions

Next to climate change, biodiversity is the one of the most critical topics for humankind survival. Whereas climate change mitigation has established its position in the public discussion and corporate sustainability management, biodiversity has started to gain more and more attention. And for a good reason, as our lives and along with that all businesses are dependent on biodiversity and the ecosystems it supports.

According to the findings of this study, major Finnish food sector companies are already aware of the importance of rich biodiversity on their current and future existence. The companies have started planning and implementing specific activities to halt biodiversity loss and are working towards monitoring the progress through measurable indicators and targets.

Based on the learnings of this study, three steps would be recommendable for the food sector companies that have not yet included biodiversity in their strategy and corporate sustainability activity, or are just starting to gain interest in the topic:

1) Build on the sustainability work that your company is already executing

Sustainability should be considered holistically bearing in mind that many environmental challenges and solutions are often interlinked. Most companies have already started to work on greenhouse gas emissions reduction to mitigate climate change – at the same time this activity also halts biodiversity loss as climate change is one of biggest drivers for biodiversity loss. Other big drivers for biodiversity loss, where the food sector has significant impact, are land use change and pollution. Exploring how to reduce these in the value chain will benefit biodiversity. In addition, many companies have started the shift from linear to circular business model, which aims to reduce the need for virgin raw materials, hence decreasing the pressure on natural resources.

2) Collaborate with the significant actors in your company's value chain

Especially in the food sector, the value chain and its total impact on biodiversity should be viewed holistically since the actors depend on each other. Most of the biodiversity impact in food production is generated in primary production, hence the collaboration and sharing best practices and knowledge in the value chain is critical and benefit all actors. Leverage also

the research from universities and research institutes to gain the latest knowledge on the topic.

3) Leverage existing frameworks and tools to build biodiversity roadmap and set measurable targets

A lot of research is currently conducted in Finland and globally on the best ways to frame biodiversity management and to measure the impact. All frameworks or tools are not suitable for every company but look for the forerunners in the food sector to see which ones they have found feasible. Even though the frameworks, tools and legislation are still partly on their way and the knowledge is not comprehensive, it is advisable to start acting now instead of waiting for the picture to become totally clear. Science Based Targets for Nature could be a useful guidance to start to measure, address and track company's impact on biodiversity.

Going further, it would be interesting to study more deeply how circular economy approach at food sector enhances biodiversity. As the current global food chain is inevitably unsustainable and not able to feed the growing number of people, food sector must transform. Decoupling economic growth from the overconsumption of natural resources is essential to maintain biodiversity. By applying circular economy principles in producing and consuming food would bring us closer to a nature-positive, regenerative food production, that would not only improve biodiversity, but also human health and well-being.

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