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The use of soy in Norwegian fish farming – an industry perspective on sustainability in the food supply chain

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Summary

The Norwegian fish farming industry has experienced drastic changes since its beginning in the 1970s. In 50 years, it has evolved from a small-scale national industry to a global multibillion dollar business. This growth has been dependent on a move from a feed mainly based on marine raw materials to a feed dominated by soy. The industry has faced criticism for its reliance on and extensive use of Brazilian soy. The move away from marine raw materials was motivated by the need to protect global fish stocks; however, it has had unintended sustainability consequences. In response to the allegation from the environmental movement and media, the industry has had to evaluate its use of soy and role in the global market. As a result of these considerations, work began to get an agreement in place with the Brazilian suppliers of soy to ensure a deforestation-free food supply chain.

The thesis has sought to contribute to the understanding of how the Norwegian fish farming relate to its use of soy, and the criticism it has faced. The research questions of the project are 1) *How does the Norwegian fish farming industry evaluate its use of soy?* 2) *What type of image does the Norwegian fish farming industry want to convey?* and 3) *How does the Norwegian fish farming industry work to find alternatives to soy*?

The research questions have been explored through the theoretical vantage points of globalisation, food supply chains, corporate social responsibility, and sustainability. The fish farming industry's use of soy has been placed within the wider context of the global food supply chain it is a part of. A qualitative multiple case study has been conducted with interview data as the primary data source.

The main finding of this thesis suggests that while environmental concerns have become increasingly important, economic factors remain the most important in decision-making. The informants show a clear understanding of the current use of soy as sustainable referencing the agreements in place with its Brazilian suppliers. The negative perception of soy and the critique the industry has faced, stands in contrast to how the industry perceives itself. The informants describe an industry that is sustainability focused, forward leaning and future oriented. The development of alternative raw materials is presented as being a priority, yet the feed composition has changes little in recent years.

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All mistakes and shortcomings in the thesis are entirely my own

Maren Kristine Anmarkrud

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Abbreviations

ADSSSB – Aquaculture Dialogue on Sustainable Soy Sourcing from Brazil

CSR – Corporate Social Responsibility

ESG – Environmental, Social, Governance

FAO – Food and Agriculture Organisation of the United Nation

GHG – Greenhouse gas

LCA – Lifecycle analysis

LUC – Land use change

SC – Supply chain

SCM – Supply chain management

SPC – Soy protein concentrate

SSCM – Sustainable supply chain management

Content

1 Introduction

In 2016, the value of global salmon production reached 14.4 billion US dollars, a fourfold increase over 2004 (Irarrázaval & Bustos-Gallardo, 2019). Around 70% of the salmon consumed worldwide is farmed, and more than 90% of this is Atlantic salmon, with Norway being the largest producer of Atlantic salmon in the world (Marvin et al., 2020). Aquaculture is a relatively new area of food production, and yet in less than 30 years, it has matched the production from fisheries for food consumption (Irarrázaval & Bustos-Gallardo, 2019; Food and Agriculture Organization [FAO], 2016). The share of aquaculture in the global supply is expected to continue to expand; by 2030, aquaculture is projected to supply over 60% of fish for human consumption (World Bank, 2013).

Farmed salmon has become a crucial part of the food security policies of international organisations (Irarrázaval & Bustos-Gallardo, 2019). As the world population grows, demand for protein increases. The global population is expected to grow to nine billion by 2050, and to meet this growth, food production must increase by 70% by 2050 (Oosterveer & Sonnenfeld, 2012, p. 1). The environmental challenges the world is facing mean that the needed increase in food production will occur under challenging conditions. Unfarmed land is scarce, and water availability is decreasing (Oosterveer & Sonnenfeld, 2012). Native fisheries have been depleted, and fish farming has been identified as a key part of the solution (Irarrázaval & Bustos-Gallardo, 2019; FAO, 2016). Worldwide, the consumption of salmon has increased, partly due to specialised gastronomies, such as sushi, and the perception of salmon as an elegant and valued product (Irarrázaval & Bustos-Gallardo, 2019, p. 160).

In the past few decades, rapid growth has occurred in not only salmon production but also the production of all aquatic resources. This trend has been spurred primarily by the massive growth in aquaculture. The sector had an average annual growth rate of 8.1% between 2001 and 2011 (Ponte et al., 2014, p. 54). This massive growth in aquaculture, known as ‘the blue revolution’, is a global phenomenon (Ponte et al., 2014; Garlock et al., 2020) that has brought with it a myriad of changes. The challenges and obstacles aquaculture faces differ significantly from those faced by traditional fisheries (Irarrázaval & Bustos-Gallardo, 2019).

Fish farming is dependent on protein-rich feed. The composition of the feed used in Norwegian fish farming has drastically changed since the 1990s, with a significant decrease in marine raw materials. Fish oil and fish meal have largely been replaced by plant ingredients such as soy (Marvin et al., 2020). In the 2019/2020 harvest season, 240 million tonnes of soy were produced, with around 75% being used for animal feed. In the last two decades, the production of soy has more than doubled, a trend that is expected to continue (Kuepper & Stravens, 2022). In the feed for fish farming, soy protein concentrate (SPC), a refined soy product, is used. It has a higher protein content than soymeal, which is partly why it is preferred in animal feed (Peisker, 2001).

The move from marine raw materials to vegetal feed has been motivated by a concern for limited marine feedstocks. However, over time, it has become clear that the use of vegetal feed exerts unintended environmental and social consequences related to the production of soy (Hansen, 2019, p. 1). Soy is high in energy and protein, and through its importance in animal feed, it has become a key commodity on the global market (Almond et al., 2020). Brazil, the most important producer of soybeans for the European market, has been criticised for both environmental challenges and unsustainable resource use in its agricultural production. The country's soy production is part of a complex global food supply chain comprising both global trading companies and remote consumer countries (Eliasson et al., 2023). The land used for soy production in Brazil has been converted from forests, savannahs, and grasslands. Valuable habitats, such as the Amazon rainforest, the Cerrado, the Atlantic Forest, and the Gran Chaco, have been transformed to make way for agricultural production. The conversion of valuable habitats to agricultural land threatens natural ecosystems and biodiversity and drives climate change. Deforestation is a major problem, and globally, agriculture is responsible for 80% (Almond et al., 2020).

1.1 Aim of research and research questions

The aim of this research project is to examine the Norwegian fish farming industry's use of soy, specifically its usage of Brazilian soy, which has been widely criticised by the environmental movement and the media. The production of food is "actually deeply complex, influencing and influenced by natural, economic, and political factor that are both national and international in scope" (Pullman & Wu, 2012, p. 1). Globalisation can clearly be seen in agriculture and food production. Increasingly, food is being produced, traded, and consumed in a manner that

exhibits global dynamics (Oosterveer & Sonnenfeld, 2012, p. 15). Understanding the global system of which the fish farming industry is a part is therefore essential to understanding how it relates to the use of soy.

The main objective of the thesis is to analyse the fish farming industry's perspective on the critique and continued use of soy. The focus is on the industry as a whole; to 'expose' one company is not the aim of the project. My thesis is situated in the cross-section of economic and environmental geography and aims to contribute to the understanding of sustainability in food supply chains. The research questions of the project are 1) *How does the Norwegian fish farming industry evaluate its use of soy?* 2) *What type of image does the Norwegian fish farming industry want to convey?* and 3) *How does the Norwegian fish farming industry work to find alternatives to soy*?

1.2 Delimitation

Aquaculture is a rapidly growing industry, with a multitude of associated sustainability challenges. Parasites, diseases, escaped farmed fish, animal welfare, and the consequences of production for the local environment are amongst the concerns raised regarding aquaculture. My thesis focuses narrowly on the feed used in Norwegian fish farming and, more specifically, on soy as a crucial component of said feed. Because studying the entire fish farming industry, let alone the aquaculture industry, transcends the time and space constraints of this thesis, limiting the scope allows for a more in-depth inquiry into my chosen area of focus.

The focus of this thesis is the Norwegian fish farming industry's views on the use of soy and the considerations lying behind its choices, not the producers of soy in Brazil. The production of soy is discussed to contextualise the challenges associated with it and motivate why asking questions about the use of soy is warranted, but the focus is on importers rather than exporters.

It is important to understand the distinction between aquaculture and fish farming. Aquaculture is the cultivation of all types of organisms in all types of water environments. Marine aquaculture is the breeding, rearing, and harvesting of species that live in the ocean (NOAA, n.d). The farming of fish, shellfish, algae, and other organisms in seawater is an example of marine aquaculture (Misund, 2021), and farmed fish constitute three-quarters of total aquaculture by volume (FAO, 2016). 'Aquaculture' is an overarching term that includes all

forms of production of seafood, while ‘fish farming’ refers to a specific type of aquaculture. Norwegian aquaculture mainly comprises the farming of *salmonidae* (Misund, 2021).

Many Norwegian fish farming companies are highly integrated, with ownership of large parts of the supply chain, meaning that one company stands for the farming, harvesting, slaughter, secondary processing, and export of the finished product (Winther et al., 2013). Distinguishing between farmers, processors, and exporters therefore has little value. ‘Fish farming companies’ thus refers to all of these operations. In Norwegian fish farming both salmon and trout are produced, however, the production of trout is only 6% of the salmon production. Furthermore, in trout production some farmers use salmon feed (Aas et al., 2022a, p. 2). Salmon production and salmon feed is therefore the main focus of the thesis.

In this thesis, ‘soy’ is used as a general term referring to both soybeans and the products resulting from their crushing and processing, such as soybean meal and oil. However, I specifically refer to SPC, the product used by the fish farming industry.

1.3 Structure

Chapter 2 introduces the theoretical framework of the thesis, combining insights from globalisation literature, food supply chains, corporate sustainability, and sustainability literature. The methodology of the thesis is presented in Chapter 3, as are the process of data collection, ethics, positionality, and the analytical method of the thesis. In Chapter 4, the development of the Norwegian fish farming industry and soy production in Brazil is detailed. I present the analysis and the empirical findings of the data collected in Chapter 5. The analysis is discussed in relation to the theoretical framework in Chapter 6. In the final chapter, I present the main findings and reflect on the project as a whole.

2 Theoretical framework

To understand fish farming, the soy industry, and how they are connected, I use a food supply chain approach. Understanding globalisation is essential to grasping how modern supply chains came to be, and theories on globalisation are thus discussed in this chapter. As my project focuses the sustainability of the industry and its understanding of it, the concept of sustainability is also discussed. The concept of corporate social responsibility is also explored.

2.1 Globalisation

The economy has been profoundly changed by globalisation in recent years (Lanza et al., 2019). Since the 1960s, a range of 'space-shrinking' transportation and communication technologies have emerged. A 'time–space compression' is the result of these technological developments, as dramatic reductions in the cost of moving material, information, and capital across space have occurred. These changes have facilitated the process of globalisation (Mackinnon & Cumbers, 2011). The process of globalisation is ongoing and involves globe-spanning networks of exchange, as well as the integrations of regional economies, societies, and cultures into them (Robbins et al., 2010, p. 110).

Dicken (2015) presents two broad meanings of the concept 'globalisation', and it is important to distinguish between these different meanings. Firstly, globalisation can have an empirical meaning and refer to how the organisation and integration of the global economy have been altered through actual structural changes (Dicken, 2015, p. 3). The second meaning refers to the ideology behind the 'globalising project'. This is a neoliberal and free-market ideology (Dicken, 2015, p. 3). The two meanings can be confusing, as they are not separate. Being aware of the meaning being discussed is therefore crucial (Dicken, 2015, p. 3). In this thesis, both understanding of globalisation is deployed. However, it is important to keep in mind that defining globalisation remains contested, as few definitions seem to be able to encompass all the economic, political, cultural, and social facets of globalisation (Oosterveer & Sonnenfeld, 2012).

Globalisation consists of a series of complex processes that are multicentric, multiscalar, multitemporal, multiform, and multicausal (Dicken, 2015, p. 6). A globalising process entails not only extensive geographical spread but also a high degree of financial integration (Dicken, 2015). Globalising forces are certainly in effect, but a fully globalised world is not an end-state

that can be achieved. Rather, globalisation is a set of complex and indeterminate processes that have uneven outcomes across time and space (Dicken, 2015, p. 8). A hyperglobalist view on globalisation diminishes the importance of space and place, and some have argued that the 'space-shrinking' will lead to the 'death of distance' and finally to the 'end of geography' (Sokol, 2011, p. 33). However, space, place, and scale are equally, if not more, important in a globalised world (Sokol, 2011). The global and local are not necessarily contradictory; Massey (2004) argues that the global and local are mutually constituted and therefore do not belong in two different worlds (Massey, 2004; Oosterveer & Sonnenfeld, 2012).

Today, economies and "economic activities are connected across space through flows of goods, money, information, and people" (MacKinnon & Cumbers, 2011, p.3). However, these connections are not a modern phenomenon. Throughout much of human history, trade between distant people and places has occurred. What sets economic globalisation apart from historic trade is the significant increase in the volume and scale of global flows (MacKinnon & Cumbers, 2011). Economic globalisation is defined by Dicken (2015) as the functional integration of economic activity across borders. It is functional integration that distinguishes globalisation from internationalisation. Internationalisation is the spread of economic activity without the different forms of dependency between actors that occur in functional integration (Dicken, 2015). In recent decades, a significant expansion of the total value of world trade has occurred. This is one of the most apparent indicators of globalisation (Young, 2012). Economic globalisation is measured based on several key metrics, such as cross-border investment, trade, bank loans, supply chain development, and foreign direct investment (Coe & Yeung, 2019, p. 776). The term 'slowbalisation' has emerged to describe a period when several of these metrics have slowed or even reversed (Coe & Yeung, 2019, p. 776). The discursive 'big switch' in the politics of globalisation can seemingly be reflected in 'trade wars' of recent years and a move towards protectionism (Coe & Yeung, 2019).

Globalisation has come to be one of our time's most significant ideas (Jones, 2006, p.17). However, its influential role does not mean the concept is unproblematic. Globalisation is subject to debate, and counter-globalism movements have emerged due to growing concerns over increased social inequality and environmental destruction (Sokol, 2011; MacKinnon & Cumbers, 2011). It is often claimed that economic globalisation is beneficial for those who participate, but it is important to understand that globalisation is not a uniform process. The

impact of globalisation is uneven, as it unfolds unevenly over both time and space (Sokol, 2011, p. 140).

2.2 Sustainability

The significant changes and alterations of environmental systems are the grand societal challenges of our time (Hansen, 2019; Dryzek, 2013). A wide variety of terminology has been used to describe the responses to these changes. Sustainability, resilience, adaptation, and transformation are amongst the most influential concepts (Dryzek, 2013). Sustainability has emerged as a central concept to describe how environmental, economic, and social issues are connected (Janker et al., 2019). Despite the term's widespread use, no consensus exists in the literature on what it constitutes (Vos, 2007, p. 334); sustainability is a contested concept. People's and organisations' worldviews shape the theorisation of the concept, which influences how issues are presented and which solutions are proposed (Giddings et al., 2002, p. 187).

The most common definition of sustainability can be found in the Brundtland Commission report (Bailey, 2014): "… developments that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, chapter 2, point 1). What these 'needs' might be is rarely discussed when this definition is employed, and the definition therefore leaves much room for interpretation (Bailey, 2014, p. 23). To achieve the societal goal of sustainability, economic, social, and ecological development must occur (Barbier, 1987; Hansen, 2019).

The multitude of understandings of sustainability and sustainable development can, at times, make it difficult to analyse the concept. For the sake of discussion, Oosterveer & Sonnenfeld (2012) group together the different understandings of sustainable development and distinguish between three main views on sustainable development in agriculture. In the literature on sustainable development, the authors identify the *neoliberal*, *conservationist*, and *institutional reform* perspectives. The difference in these views is mainly in how they define the relationship between humans and the biophysical environment and, due to their understanding of this relationship, the interventions they recommend (Oosterveeer & Sonnenfeld, 2012, p. 41).

The neoliberal perspective on sustainable development views market mechanisms as the solution to environmental problems. Neoliberals argue that the price of resources will increase when they become scarce and that this will prompt a more effective use of the resource and be

an incentive to find alternatives (Oosterveer & Sonnenfeld, 2012). The neoliberal perspective further argue that it is the private sector that is best suited to face the challenge through its research and technological development. It views the role of the government as a supplier of the necessary arrangements needed for the market to function but claim that governmental interference outside of this makes the process less effective (Oosterveer & Sonnenfeld, 2012).

Ecosystems are prioritised in the conservationist perspective. In the view of this approach, human activities are limited by the environment, which sets clear boundaries. These boundaries not being respected and how economic and technological gains are prioritised are therefore perceived as fundamental issues in modern societies. Sustainability efforts are approached through scientists determining these environmental limits, governmental measures to ensure that they are not crossed, and environmental organisations observing the process and pressuring governments when necessary (Oosterveer & Sonnenfeld, 2012).

The institutional approach to sustainable development combines several perspectives, including ecological modernism and Marxism (Oosterveer & Sonnenfeld, 2012, p. 44). Institutional change is perceived as necessary to face the current environmental challenges. Proponents of this perspective argue that in the global food supply, there should be more institutional control over large transnational companies (Oostervver & Sonnenfeld, 2012).

In policy-oriented research, 'sustainability' has become an important and popular term to express what policies should achieve (Kuhlman & Farrington, 2010). As O'Brien (2019) observes, a shift in the discourse on sustainable development has occurred from debates on definitions to focus on specific goals, targets, and agendas and how to achieve them (O'Brien, 2019, p. 200). Dedeurwaerdere (2014) identifies that the focus of sustainability science has primarily been to aid in the attainment of the policy goal of sustainability (p.26). The concept of sustainability has been criticised for being too vague, making it hard to operationalise (Kirchherr et al., 2017, p. 2021).

Sustainability has, in the past 20 years, moved from being a buzzword to a mainstay concept (Ives et al., 2020, p. 208). Governments, big businesses, social reforms, and environmental activists have all embraced the concept and have all interpreted and defined it in their own way (Giddings et al., 2002). The usefulness of sustainability can be debated. While it points to the ecological and social crises of our time, its meaning and precision have been diluted through

overuse and misuse (Dyzek, 2013). Concepts with a great deal of traction are often employed by a multitude of stakeholders (Kirchherr et al., 2017, p. 2021). This rings true for sustainability, as well as concepts such as the circular economy and the green economy. Key questions then arise: does the variety of conceptualisations and understandings mean that the concept has lost its usefulness; has it become an empty vessel that can be filled with whatever meaning one would like? (Dryzek, 2013, p. 149). Dryzek (2013) argues that the variety of meanings should not result in the dismissal of the concept, as important concepts are often politically contested.

2.3 The industrial food production system

Industrial food production emerged during the twentieth century (Young, 2012). The desire to increase economic efficiency brought forth the industrialisation of the food sector. New technology, such as intensive mechanisation, has been integral to the process (Stuart & Woroosz, 2013). The dependence on the heavy application of petrochemical products is one of the defining characteristics of the industrial food production system (Young, 2012). The nature of agriculture makes it unsuitable for industrial-scale production. Declining soil fertility, insects, weeds, diseases, fungi, and bad weather are problems farmers have long struggled with, and industrial production, with its need for biological simplification and standardisation, exacerbates these problems (Weis, 2010). Pesticides, fertilisers, and herbicides have therefore become integral to today's food production. The prices of such products vary greatly; price fluctuation is consequently a vulnerability in food production (Young, 2012) The use of petrochemicals does not only influence food prices. To reduce prices in the manufacturing of fertilisers, industrial waste is used to secure the necessary micronutrients. If this waste is not properly handled, soil, plants, and humans can be significantly damaged (Gonçalves Jr. et al., 2014). Industrial agriculture is characterised by the production of monocultures and factory farms. Fertiliser, chemicals, and other waste runoff from such production impact terrestrial and aquatic ecosystems (Weis, 2010, p. 316).

Petrol has also become central to modern industrial farming. Machinery, irrigation systems, and the drying of grains are all dependent on petroleum. Furthermore, food chains in global food systems are powered by petroleum (Young, 2012). Oil is an integral part of the compression of time and space, and global transportation systems are built on petroleum (Weis, 2010). For many products, food miles comprise a large portion of the carbon footprint (Young, 2012). Through the industrialisation of farming, the corporate sector has emerged as a key player in global food production. Global corporations produce and sell all these inputs (petrochemicals,

machinery, etc.) and control the market. Their hold on the market is significant, and it continues to grow as globalisation intensifies (Young, 2012).

The industrial production of food is crucial in the deterioration of the very biophysical foundation agriculture depends on. Industrial agriculture leads to soil erosion, salinisation, loss of biodiversity, greenhouse gas emissions, and threats to crucial ecosystems such as pollination and soil formation. Furthermore, the overdraft of water is associated with industrial agriculture and is a danger to the continuing supply of water (Weis, 2010, p. 316). The Earth's climate systems are being pushed, and human activity has led to a rise in average global temperatures. Some have argued that this will allow for longer growing seasons and agricultural production in areas where the climate has previously been deemed unsuitable. However, the majority agrees that global warming presents a threat to agriculture. The possible impacts of rising temperatures are critical; this could affect germination and flowering, speed up growth cycles, enhance the survival of pests and diseases, and make heatwaves and droughts more frequent, all possibly resulting in less food (Weis, 2010, p. 331).

Food has increasingly come to have both international and corporate dimensions (Clapp & Fuchs, 2009, p. 5). Through globalisation processes, national food economies are increasingly being integrated into global food systems. How food is produced, distributed, marketed, and consumed has significantly changed, resulting in a growing distance between food production and consumption. Increasingly interconnected agri-food networks have resulted in reduced consumer knowledge (Franz & Rolfsmeier, 2016, p. 272), and the commodification of agriculture and food has occurred through complex global supply chains (Clapp & Fuchs, 2009).

2.4 Food supply chains

Globalisation has created a new reality and new standards of competition regarding environmental and quality factors. Companies must adapt to the modern way of food production (Thomé et al., 2020). In response to this, new business strategies have emerged to increase both individual and collective efficiency (Thomé et al., 2020, p. 3). Supply chains (SC) and supply chain management (SCM) are amongst the concepts that have arisen to describe and explain the relationships between firms, suppliers, and consumers (Thomé et al., 2020). In a broad and simplistic sense, SC include two or more organisations that are connected through flows of materials, information, and finances. The organisations within the chain are legally separated

but dependent on each other (Stadtler, 2014). A SC is a network of organisations that consists of both upstream and downstream linkages. Value creation in the SC occurs through processes and activities that produce products and services (Christopher, 2016, p. 17).

SC consist of focal companies, suppliers, and consumers. The value of the product is incurred at different stages of production. Likewise, the environmental and social burdens are not equally spread out in the chain. The responsibility for the environmental and social performance of suppliers might be directed at the focal company of the SC (Seuring & Mueller, 2008), which is usually located at the end of the chain and contributes to the design of the product or services. This placement in the chain means that the focal company is often the one that is in direct contact with consumers. Furthermore, focal companies often have a leading role and rule or govern the chain (Seuring & Mueller, 2008, p. 1699). This environmental and social burden is often felt strongly by brand-owning companies, as they must face the pressure and demands of stakeholders (Seuring & Mueller, 2008). Stakeholders "are groups or individuals that have a valid interest in the activities and outcomes of a firm and on whom the firm relies to achieve its objectives" (Freeman et al., 2018, p. 1). In other words, stakeholders are actors who are both affected by and affect companies' behaviour (Wickert & Risi, 2019). Consumers, suppliers of goods and services, suppliers of capital, government officials, nongovernmental organisations (NGOs), the media, and the communities in which the companies operate are all examples of stakeholders that influence companies (Freeman et al., 2018). The pressure from stakeholders on brand-owning companies has led such companies to evaluate their entire SC and identify environmental and social problems in all parts of their operations (Seuring & Mueller, 2008).

The food supply chain has moved beyond simply being a short chain compromised of individual transfers to becoming more consolidated and encompass complex relationships between producers, processors, manufacturers, and retailers (Bourlakis & Weightman, 2008). A food SC can be defined as "a set of interdependent companies that work closely together to manage the flow of goods and services along the value-added chain of agricultural and food products in order to realise superior customer value and lowest possible cost" (Folkerts & Koehorst, 1997, p. 11). A food supply system connects different sectors of the economy. Agriculture, the food processing industry, and distribution are linked through food SC. At the same time, food production occurs in a market defined by consumers' rapidly changing preferences. Taking these different aspects together, it becomes apparent that food SC are complex (Palazzo & Vollero, 2022, p. 55). Previously, the different components of the chain – production,

processing, distribution, and consumption – were perceived as individual processes. In today's food chain, these components have become an interconnected system comprising companies with multifaceted relationships and processes of various natures (Folkerts & Koehorst, 1997, p. 12). Food SC can be distinguished into two main categories: 'fresh agricultural products', such as grains, fruits, and vegetables, and 'processed food products', such as fast food or soft drinks (Grimm et al., 2014). In this thesis, the focus is on the 'fresh agricultural products' category of food SC.

SCM is a tool used by companies at successive stages of production to manage reoccurring purchases (Crook & Combs, 2007, p. 546). In both academia and amongst corporate actors, SCM has gained increasing interest. Sustainable supply chain management (SSCM) can be defined as the management of the chain with a specific focus on economic, environmental, and social aspects, the three dimensions of sustainable development. Managing a chain entails governing the flow of capital, information, and materials. Furthermore, it involves overseeing and facilitating cooperation between the companies along the supply chain (Seuring & Mueller, 2008, p. 1700). This definition brings attention to three important aspects. Firstly, it emphasises the importance of cooperation between members of the supply chain. Secondly, the definition features the triple bottom line (TBL) approach (Govidan, 2018), which emphasises that for sustainability to be achieved, baseline performance must be realised in the economic, social, and environmental dimensions (Seuring & Mueller, 2008, p. 1700). Finally, the definition brings attention to the supply chain stakeholders (Govidan, 2018).

An important aspect of SCM for companies in the supply chain is *added value*, which can be defined as when the output value is higher than the input costs (Marmin et al., 2010, p. 151). In food SC, products become value-added in two ways. Firstly, raw materials can become value-added by being processed in a way that increases their value significantly above their market value. Secondly, they can add value by differentiating themselves from similar products on the market through their growth and processing practices (Pullman & Wu, 2012, p. 109).

2.4.1 Food supply chains and the environment

Both environmental change and climate change will be discussed in this thesis, and it is therefore necessary to understand the difference. Climate describes the conditions in a place and is closely related to the weather. Unlike a weather forecast that describes a short period of time, climate describes longer periods of general trends. Climate includes, amongst other

things, temperature, amount of precipitation, and frequency of extreme weather (Setsaas, n.d). Thus, climate change concerns long-term shifts in weather patterns and temperature (United Nations [UN], n.d). The environment describes a much larger picture and includes all possible conditions that affect a place. Climate, topography, biodiversity, and everything else that is a part of the surroundings constitute the environment. Climate is a part of the environment and contributes to creating it (Setsaas, n.d.).

There are inherent environmental problems in all parts of production, distribution, and consumption. The world as we know it is transformed by environmental change, and serious questions about the future of the current economic system and societal structures are raised in response to these problems (Leichenko & O'Brien, 2019, Dicken, 2015). Environmental problems and their potential implications pose a threat to almost every aspect of contemporary economic life. The world's current trading and economic systems must certainly change to face these issues (Dicken, 2015). A prominent feature of modern society is the rise of consumerism as a dominant ideology. The globalisation of consumer culture is a phenomenon with many facets, but at its core, it involves the spread of the ideals and practices of mass consumption (Leichenko & O'Brien, 2019, p. 90).

Food is indisputably necessary for human survival. Contradictorily, the production of food is currently undermining the environment this survival is underpinned by (Garnett, 2013, p. 29). Concerns about the environment, sustainability, food safety, and animal welfare have emerged in agricultural and agro-industrial practices in recent years as the consequences of food production have become clearer (Thomé et al., 2020, p. 2). Numerous studies show that food SC are jeopardising the functioning of the environmental systems the Earth depends on. Greenhouse gas emissions, pollution, unstable water extraction, deforestation, and biodiversity loss are all effects of food production, and the alternations of these functions all have considerable negative implications for human well-being (Garnett, 2013, p. 29). Simultaneously, food systems are struggling to fulfil their primary function, to effectively feed people. Major inequalities exist in today's food system, and the food produced is not distributed equally globally. In some parts of the world, obesity is a major health issue, while elsewhere, famines are a significant societal challenge. These challenges will only intensify as the world's population continues to grow (Garnett, 2013).

The challenge for the future is therefore twofold. On the one hand, the major environmental changes due to the current food production system must be addressed, and strategies must be developed to adapt to these changes (Garnett, 2013). The future food supply must develop ways of production that are sustainable and consider the health of the planet (Lang & Heasman, 2004). On the other hand, the development of new food systems must also ensure that the growing population of the world has access to foods that meet their nutritional needs (Garnett, 2013).

The question that then arises is, 'How does one address the question of sustainability in food systems?' How the problem is conceptualised greatly influences the solutions proposed. Three main perspectives on the issue and how it should be solved exist (Garnett, 2013). In the first perspective, the problem is framed as a production challenge. In this view, a need to change the production of food exists, which is done through technological innovations and managerial changes. The second perspective views the issue as a consumption challenge. This perspective emphasises the dietary drivers that determine food production and argues for demand restraints. (Garnett, 2013). In this view, the focus is on the consumer, the end point of the supply chain. Lastly, the socio-economic perspective focuses on how the food system is governed. The emphasis is not solely on production or consumption but on the relationships amongst the actors in the supply chain. These relationships are imbalanced and unequal, and this is the root cause of the current issues (Garnett, 2013).

2.4.2 Power in food supply chains

Economies are built on and structured by social relations, and it is consequently essential to acknowledge how these relationships are underpinned by power. Power plays a crucial role in all social relations, as it involves one actor's ability or capability to influence the actions and outcomes of others (MacKinnon & Cumbers, 2011, p. 18). Power is an integral part of economic relationships at all geographical levels (MacKinnon & Cumbers, 2011). To understand SC relationships, power is central: how does one gain power, and how is it used with other parties in the chain? These are key questions to understand the chain's dynamics (Reimann & Ketchen, 2017). Power in SC can be interpreted in myriad ways. In the theorisation of power, the different approaches are often competing (Devin & Richards, 2018, p. 202). The more narrowly focused approach views power in a normative sense and seeks to understand the nuances of power in business-to-business relationships. On the other hand, the political economy approach is

broader and examines power in the context of the capitalist market (Devin & Richards, 2018). In this thesis, both understandings of power are applied.

An important question in discussions about power is how to measure it (Beckley, 2018). Once again, there is no one simple answer, and there might be conflicting views depending on how one defines power (Devin & Richards, 2018). Defining and measuring power is difficult; as a phenomenon, it is highly context dependent and often unobservable. In other words, power is more easily experienced than defined or measured (Beckley, 2018, p. 8). Furthermore, it is highly complex, which makes it hard to operationalise (Reimann & Ketchen, 2017). In the supply chain literature, power has often been discussed in theoretical terms, and few studies have addressed how power dimensions are deployed in the chain (Matheus et al., 2017). In this thesis, the concept of power is operationalised by analysing interview data through the lens of Clapp & Fuchs's (2009) multifaceted approach to power in the theoretical discussion.

In the globalisation literature, including in the food sector, corporate power is often viewed as market share (Clapp & Fuchs, 2009). Clapp & Fuchs (2009), however, argue that focusing solely on the economic aspect of corporate influence results in a one-dimensional approach. Rather, a multifaceted approach is needed to understand the many ways in which power is employed by corporate actors. *Instrumental power* can be defined as directly impacting the behaviour of another actor (Renckens, 2020, p. 659). How an actor uses their influence to change the decisions of another actor is explained by scholars through this form of power. While such an understanding of power is useful in explaining direct power, it does not capture how power can be exercised by limiting other actors' options (Clapp & Fuchs, 2009, p. 8).

The broader influence of corporate actors is encompassed in the *structural power* perspective. Structural power implies an actor's ability to affect the options available to policymakers and have an impact on agenda-setting (Renckens, 2020, p. 659). This view on power encourages taking a step back and examining the context in which alternatives become more or less acceptable before examining the actual bargaining (Clapp & Fuchs, 2009, p. 9). Clapp & Fuchs (2009) argue that globalisation has paved the way for a more dynamic type of structural power. In recent years, corporate actors have increasingly been put in positions where they make governance decisions. Through this shift, they either supplement or, in some instances, replace more traditional economic actors, such as national states and global institutions (Clapp & Fuchs, 2009, p. 9).

Dicken (2015) argues that the notion that globalising forces have stripped states of their power is misguided. The state has always played a fundamental role in shaping the world economy, and some states have used globalisation to increase their power (Dicken, 2015, p. 175). Globalisation has also been used by governments as justification for implementing domestic policies or not taking certain kinds of actions (Dicken, 2015). National states are still key players and must be considered to understand the global economy. However, corporate actors have gained a new role through globalisation and are in a position where they have strong influence over which private standards and labels are adopted by the industry. Understanding this dynamic type of structural power is essential to understanding the growing significance of CSR and private certification schemes and how they play a key role in the regulatory structures governing the global economy (Clapp & Fuchs, 2009).

Lastly, *discursive power* is how actors intend to impact how policies, ideas, and norms are framed. This is a more discreet form of power, and the party being influenced is not necessarily aware that power is being exercised (Renckens, 2020, p. 659). Two main insights into corporate power are exerted through a discursive approach. The first is that power goes beyond pursuing interests; it is also critical in creating them. In other words, corporate actors play a key role in how issues and problems are framed in public debates (Clapp & Fuchs, 2009). The second insight a discursive approach to power brings is how legitimacy is an integral part of discourse; for actors to have actual discursive power, they need political legitimacy. Corporate actors can achieve such political legitimacy through the trust the public has in the intentions and expertise of the company (Clapp & Fuchs, 2009, p. 11).

In SC relationships, power might be used to reap most of the direct benefits available in the exchange between actors (Reimann & Ketchen, 2017; Crook & Combs, 2007). The benefits of constructive collaborations and joint value creation between buyers and suppliers are emphasised in the literature on SCM (Reimann & Ketchen, 2017, p. 3). However, how the generated value is to be distributed is an important question, even in collaborative relationships. How value is distributed within the chain is greatly influenced by the power balance between actors (Reimann & Ketchen, 2017).

2.4.3 Trust in food supply chains

Collaboration is an important part of well-functioning food SC and a focus area for food SCM. In the agrifood literature, trust is highlighted as a key factor in reaching collaboration (Assis et al., 2022). Trust is central to understanding the innerworkings of a SC, but it is also a complex topic, as trust is difficult to define and is both dynamic and relational (Fleming et al., 2020, p. 1). Extensive literature on the conceptualisation of trust exists, but there is no universal language of trust. How trust is perceived differs by disciplinary perspective within the social sciences (Laha, 2022).

There is a broad polarisation between two contending interpretations of trust. The first approach stems from a neoclassical perspective on economic exchanges and applies a rational choice framework. The second approach stems from a deeper social position (Laha, 2022), and trust is regarded as the governance structures that are part of all social relations that occur between and amongst actors (Uzzi, 1997, p. 45). Trust can be conceptualised in a multitude of ways and refer to myriad relationships. Trust can be defined as an actor's willingness to rely on another actor based on confidence in them (Lewin & Johnston, 1997, p. 28).

The decision to trust someone is built on an assessment of the other actor. The trustor evaluates the other party's competence, integrity, and benevolence, and based on these assessments, trust is placed (Bachmann & Inkpen, 2011, p. 284). Trust is risky because the future cannot be predicted. The trustor may be wrong in their predictions of the future behaviour of the trustee. Several mechanisms lessen the risk of trust, with laws and legal agreements being amongst the most important (Lane & Bachmann, 1996).

In a SC, commitments are in place between the various parties. Trust is the expectation that buyers and sellers will abide by these commitments (Pullman & Wu, 2012, p. 24). In the global market, the lack of shared values presents a challenge for trust. Actors can, for instance, hold different attitudes towards standards for food safety and cleanliness. Good communication is essential for trust. Both parties might have integrity, but if clarity about expectations and commitments is lacking, trust may be hindered (Pullman & Wu, 2012). As the economy is becoming more globalised and trade occurs on the international scene, trust has become increasingly important in the last few decades (Fischer, 2012).

Companies have begun to recognise how traceability and transparency are integral to achieving brand equity, mitigating risks, ensuring food safety, and gaining the confidence of consumers (Sterling et al., 2015, p. 210). Traceability is defined as "… the ability to track any food, feed, food producing-animal or substance that will be used for consumption, through all stages of production, processing and distribution" (Thakur & Donnelly, 2010, p. 98). It can therefore be argued that traceability and transparency are key to gaining consumers trust and, consequently, important to ensuring political legitimacy.

2.4.4 Supply chain risk

Global SC have become large and densely interconnected due to globalisation and the potential cost reduction and increased operational efficiency achieved by splitting up production (Mizgier et al., 2015). The current global economy differs profoundly from that of the 1990s, in large part due to the spatial and organisational fragmentation of production, and this fragmentation continues to deepen (Coe & Yeung, 2015 p.2-3).

The world economy is highly interconnected. The new way of producing is inherently complex and characterised by uncertainty. Predictions are therefore difficult to make regarding breakdowns in the supply chain (Mizgier et al., 2015). Uncertainty increases the vulnerability of a supply chain, and this vulnerability increases even further when companies become dependent on other actors or organisations (Diabat et al., 2012, p. 3039). Uncertainties in supply and demand, as well as the globalisation of markets, have increased. Product and technology cycles have become increasingly shorter, and more complex global supply network relationships have emerged due to the increased use of manufacturing, distribution, and logistics partners. These developments have led to greater exposure to risk in the supply chain (Diabat et al., 2012, p. 3039).

There are multiple risks in business, three of which are relevant for SC: *supply risks*, *operation risks*, and *demand risks*. Supply risks focus on the flow of materials between suppliers and the focal company and the reliability of suppliers; this includes considerations about sourcing from a singular or multiple suppliers, as well as questions about having a centralised or decentralised sourcing strategy (Diabat et al., 2012). Operational risks concern the internal ability of companies to produce goods and services, upon which the profitability of a company depends. This risk may arise from a breakdown in manufacturing or technological issues. Lastly, demand

risks occur in the flow of goods from the company to the consumer. Obsolescence, stock-outs, and over-inventory are all examples of demand risks (Diabat, 2013).

2.5 Corporate social responsibility in agribusiness

Globalisation and political interventions have, as previously discussed, altered the space companies operate in. Companies have increasingly faced criticism for how they conduct their business and must adhere to new societal demands. Consumers are increasingly concerned about the ecological and social implications of production processes. The emergence of mass media and its growing significance have led to a larger focus on companies' transparency and how they are perceived (Luhmann & Theuvsen, 2016). Corporate social responsibility (CSR) has become a mainstream concept, a way for businesses to address the social, ethical, and environmental responsibilities they have towards society (Wickert & Risi, 2019).

Nevertheless, CSR is a contested phenomenon (Wickert & Risi, 2019, p. 1). There is no single widely agreed-upon definition of CSR, and many different ideas, concepts, and practical techniques have emerged under the CSR umbrella. Although differences in the conceptualisation of CSR exist, there are also similarities. The multiple approaches to the concept all aim to widen a firm's obligations to include more than just financial considerations (Freeman et al., 2010, p. 235) and describe how businesses incorporate social, environmental, and ethical responsibilities into their strategies, structures, and procedures (Wickert & Risi, 2019, p. 1). CSR refers to voluntary actions taken by a company (Albus & Ro, 2017). However, there is no consensus on what such responsibilities should entail or how to address them most appropriately. Furthermore, no agreement exists as to what role business should have in society (Wickert & Risi, 2019, p.1). There is a division amongst companies in terms of their motivation to engage in CSR. A distinction can be made between 'normative cases' and 'businesses cases', wherein the former, CSR is integrated due to an aspiration to do good, while the latter stems from self-interest. However, a company's motivation to integrate CSR into their strategies might be a combination of both (Smith, 2003).

The understanding of what CSR is has developed since its initial conception. The concept evolved from a focus on a company's headquarters to encompass its entire, often global, supply chain and production network. CSR is no longer limited to a focus on 'how money is spent' but rather has come to be fundamentally about 'how money is made' (Wickert & Risi, 2019, p. 2). Furthermore, the responsibility of companies has evolved from referring to liabilities to social

connections. Powerful global brands can no longer hide behind the excuse that there is no legal connection. Stakeholders, such as consumers and NGOs, expect companies to take responsibility for operations in their entire supply chain (Wickert & Risi, 2019). Our actions are partly based on the actions of others; therefore, the moral obligation of an actor extends to all those who are part of their activities (Young, 2004, p. 371).

The concept of CSR has been in use since its conception in the 1950s; however, in relation to agribusiness, it is relatively new (Luhmann & Theuvsen, 2016). Food companies are deeply dependent on and have a great influence on the economy, the environment, and society. The concept of CSR is therefore highly relevant for the sector (Hartmann, 2011, p. 297). Three challenges are specific to CSR in the food sector. Firstly, food production is contingent on natural, human, and physical resources, and food production highly impacts these resources. Secondly, food is a human need and a much-debated topic. Many people have strong views on what they eat. The food sector is faced with a complex set of requirements regarding the production of raw materials, the environment, and the social aspect of the entire supply chain. Finally, the structure of the food supply chain is both versatile and unique. The approach to CSR differs amongst small and large enterprises. The differences in approach indicate that there is potential for conflict regarding how to implement CSR in the food supply chain (Hartmann, 2011, p. 298). Previously, the aim of agriculture was to maximise productivity and profitability, but in more recent years, there has been a shift in ambitions. Agricultural aims now include the optimisation of a wide range of far more complex conditions. Rural development and environmental, social, and food consumption outcomes have come to be central aspects of agricultural objectives (Bos et al., 2013, p. 71).

Trust is integral to successful CSR. Regardless of whether the farmers, food processors, or retailers actually implement management strategies that incorporate ethical considerations, they also must be trusted by consumers and stakeholders. An issue that arises regarding the need for trust is information asymmetry. Corporate actors can emphasise certain aspects of their operations and downplay others. In communication with stakeholders, they can highlight excellent social or ecological performance. (Hartmann, 2011, p. 309). The visibility and accessibility of information are therefore of the utmost importance. Credibility also becomes an issue, and increasing the trustworthiness of CSR implementations can therefore involve a third party. Labels or certifications backed up by a third party are a common strategy to increase the credibility of a company (Hartmann, 2011, p. 309).

2.6 Summary: Theoretical framework

The theoretical framework has been developed with the research questions in mind: 1) *How does the Norwegian fish farming industry evaluate its use of soy?* 2) *What type of image does the Norwegian fish farming industry want to convey?* and 3) *How does the Norwegian fish farming industry work to find alternatives to soy?* The theoretical framework has brought together insights from globalisation, food SC, CSR, and sustainability literature.

The chapter aims to demonstrate the complexity of the global food system that the Norwegian fish farming industry is a part of. In this chapter, I have explained how globalisation has shaped the current global economy and its implications for food production. Applying a food supply chain approach allows for an investigation of the relationships between focal companies, suppliers, and consumers. Within this approach, I have underscored how power and trust operate in the food supply chain, as well as how they relate to the environment. I have argued that traceability and transparency in the food supply chain are integral parts of consumer trust. There are inherent risks to conducting business, and a focus on supply chain risks helps uncover the implications of such risks and how corporate actors deal with them.

The review of the conceptualisation of sustainability reveals a variety of meanings and understandings. Awareness of the multitude of understandings of the concept is integral to understanding the myriad responses it generates and how 'sustainability' can look so different in different situations. Theoretical attention has been given to the concept of CSR; such attention facilitates insight into how the industry perceives its role and self-evaluations.

3 Method and methodology

The dependability of any research is contingent on careful design and rigour. The research design is shaped by the aim of the research (Stratford & Bradshaw, 2021). My research questions consequently serve as the basis for my research design. In this chapter, I first present my research design. Secondly, I reflect on the data collection process, its strengths and weaknesses, and the challenges I faced. Thirdly, I present my analytical approach. Finally, I reflect on the ethical aspects of conducting research and how the project was shaped by my positionality.

A method is a mechanism for data collection and analysis, while methodology concerns what is researchable and how to conduct research (Baxter, 2021, p. 110). To conduct dependable qualitative inquiry, a consideration of research design and rigour is essential (Stratford & Bradshaw, 2021, p. 104). The aim of my master's thesis and my research questions are best answered through conducting qualitative or intensive research. Intensive research questions are open ended and attempt to reveal the how and why components (Stratford & Bradshaw, 2021).

3.1 Research design

To address the research questions, a qualitative multiple case study approach was pursued with two feed producers and six fish farming companies. A case study "involves the study of a single instance or small number of instances of a phenomenon to explore in-depth nuances of the phenomenon and the contextual influences on and explanation of that phenomenon" (Baxter, 2021, p. 109). The choice of research method is contingent on the research question the study attempts to address (Yin, 2012). One benefit of a case study is its ability to answer how, what, and why questions (Blome & Schoenherr, 2011; Crowe et al., 2011). As my research questions are exploratory in nature, I deemed a case study to be a fitting methodology. Furthermore, a case study approach provides a richness of information that is suitable for investigating complex phenomena (Blome & Schoenherr, 2011, p. 46). An argument for a multiple case study approach is that it facilitates an examination of theoretical concepts and explanations of phenomena on a broader basis (Baxter, 2021, p. 117). The trustworthiness and credibility of the explanations and conclusions presented in the thesis are enhanced as they are built on multiple cases.

A central question to ask when conducting case study research is, 'What is this a case of?' Vennesson (2008) emphasises that cases are not pre-existing entities waiting to be studied; rather, researchers make something into a case. This 'casing' occurs at various stages of the research process, but particularly at the beginning and end (p. 230). Identifying the case is a two-part process. Firstly, one must define the case (Yin, 2018). I am conducting a multiple case study, as I am studying more than two organisations in a similar manner (Yin, 2012). The two feed producers and the fish farming companies each represent a case. Additional actors have been interviewed, but these serve as providers of context and background. The case study consists of typical cases and aims to reveal ordinary conditions within the industry (Yin, 2012).

The second step is binding the case (Yin, 2018). An important part of casing is determining what this is not a case of. To study every aspect of a case is impossible, and it is therefore important to place boundaries on one's case (Baxter & Jack, 2008); doing so ensures that the scope of the study remains reasonable. This case study is limited in scope to the Norwegian companies in the fish farming food supply chain. The use of soy in animal feed is a complex phenomenon, and focusing on one link in the food supply chain was necessary to make the case researchable. Furthermore, the time frame and scope of a master's thesis do not allow for a thorough investigation of the entire food supply chain. However, an adequate analysis would not be possible without recognising the importance and influence of the other links in the supply chain. While the analysis and discussion are centred around the Norwegian actors, the global aspect of the industry and the situation and implications of soy production are key contextual factors that are addressed. 'What is this a case of?' is further discussed in the conclusion.

The main critique of the qualitative case study approach is its lack of generalisability. Generalisability, or transferability, as it is often referred to in qualitative research, pertains to the applicability of the findings to other cases of the phenomenon being studied (Baxter, 2021, p. 121). Proponents of the approach, on the other hand, argue that these concerns might be exaggerated, further arguing that if the research design is fitting and sufficient attention is given to the tension between concrete and abstract concepts, generalisation should not be a problem (Baxter, 2021). An important distinction to be made in discussions of transferability is between statistical and analytical generalisability. In the former, generalisability is generated through large probability samples, while in the later cases are selected deliberately, and the focus in theory development is on ensuring that it is neither too abstract nor too specific to the case (Baxter, 2021, p. 121). The possible transferability of my case is discussed in the conclusion.

The case study approach is underpinned by important philosophical assumptions about the nature of research. Most importantly, the approach assumes that an in-depth insight into one manifestation of the phenomenon is valuable. A case study is therefore an approach to research design and is a methodology rather than a method (Baxter, 2021, p. 110). A data collection strategy and analysis approach are therefore needed.

3.2 Data collection

The most important source of data for my project was in-depth interviews with key actors in the fish farming industry. Additionally, policy documents, sustainability reposts, and the websites of key companies, as well as government strategies and reports, were important. The data collection was conducted from August 2022 to December 2022.

3.2.1 Selection of informants and cases

An important decision to make is the selection of informants and cases. The different logics that underpin the approach to sampling are perhaps what best illustrate the difference between quantitative and qualitative research (Patton, 2015). As opposed to quantitative research, which generally depends on larger randomly selected samples, qualitative inquiries focus in depth on relatively small samples (Patton, 2015, p. 264). The foundation of qualitative inquiry is informant or case selection, as what one finds in one's inquiry is determined by the informants studied (Patton, 2015). As Morse (2007) puts it, to attain high-quality data, one must locate excellent informants (p. 231).

The type of sampling selected should follow and support inquiry into the questions asked (Patton, 2015). The aim of my thesis project is to gain insight into how fish farming companies consider their use of soy and how they wish to frame it. As such, key informants, key knowledgeables, reputational sampling, and purposive sampling seemed most fitting (Patton, 2015; Stratford & Bradshaw, 2021). In such a purposeful sampling strategy, one identifies people who possess great knowledge or influence and can therefore give insight into the inquiry issues (Patton, 2015). However, the logistics and financial and human resources available might affect the choice of sampling technique (Stratford & Bradshaw, 2021, p. 99). Resources, both in terms of funds and time, are often limited, and this influences researchers' decisions on what and whom to include and exclude (Stratford & Bradshaw, 2021, p. 101). As this is a master's

thesis, the time and space constraints of such a project did influence the number of informants recruited and the data collected.

To be able to answer the primary questions of this thesis, speaking to actors in the fish farming industry was a necessity. A methodical challenge researchers can face is the unwillingness of selected informants to be a part of the study (Dalen, 2019). England (2002) notes that gaining access to 'elites' can be difficult, and continual negotiation, bargaining, and compromise might be necessary. I quickly found recruiting informants to be both time consuming and challenging. Few of the fish farming companies listed their employees and their contact information on their websites. Therefore, finding the appropriate person to contact proved difficult. In some instances, I had to fill out a form to email the company. To get in contact with the companies, I therefore had to email the company switchboard. The switchboard then forwarded me to the employee they thought was best suited to answer my questions. In other words, due to the lack of information about the employees of companies I was interested in, I ended up purposively sampling companies rather than the actual informants, as the people I ended up interviewing were chosen by the company. Furthermore, the difficulty in reaching informants had implications for the selection of the cases. Consequently, while I approached the selection of informants with a purposeful sampling strategy, the choice of cases was shaped by who responded and was willing to grant me access.

The response rate was low. I contacted 24 companies and sent several follow-up emails to those who did not initially respond. After 3 months, 15 companies had responded; of those, six declined, and one had stopped responding to my emails. I ended up conducting interviews with eight companies in the fish farming industry. However, it is important to remember, as Dexter (2006) notes, that the aim is not to get interviews but to collect data. The circumstances of a refusal, how it is done, or the lack of a response can be valuable data (Dexter, 2006, p. 37). In the middle of my data collection period, a resource rent tax on aquaculture was proposed. This was met with strong reactions from the industry, and a debate around the tax occurred. It is possible that this contributed to the lack of responses, as this caused an upheaval in the industry. However, this is simply speculation, and the lack of responses could be due to other reasons.

In addition to the fish farming industry, I was interested in getting the perspective of the environmental movement and their view on the fish farming industry and its use of soy. Getting in touch with environmental organisations proved much easier than with companies in the fish

farming industry. I contacted three organisations, and they all agreed to participate in the project. I conducted interviews with Future in Our Hands, the Rainforest Foundation, and the Worldwide Fund (WWF).

As the interviews progressed, it became clear that the role of the state was also relevant for my project. Several of my informants mentioned the constraints of current legislation for innovation and the desire for the state to be more present in the upscaling of the production of alternative feed ingredients. I thus decided to contact representatives from the government, specifically from the ministry of trade, industry, and fisheries. I had a meeting with the ministry, and they provided me with background information. However, only politicians or official press releases can speak on behalf of the ministry. They are therefore not informants in the thesis and are not part of my data. Any reference to the views or opinions of the ministry of trade, industry, and fisheries in this thesis is from publicly available documents and statements. Furthermore, I also decided to include the employer organisation of the seafood industry in Norway, as they work to promote policies and legislation that benefit their members. I conducted one interview with a representative from the Norwegian Seafood Federation, which is affiliated with the Confederation of Norwegian Enterprise (NHO).

The corporate world is constantly changing, and one company was acquired and merged with another company after the interview was conducted. Consequently, the company I interviewed no longer exists. The time limits of this project do not allow for an investigation of the potential policy implications this might have. However, I have concluded that the data from this interview is still valuable, as it reflects views and attitudes in the industry at the time of data collection.

Table 1 List of informants

Informants	Description	Date
Future in Our Hands	Senior adviser	30.08.2022 (Asynchronous digital interview)
Rainforest Foundation	Senior adviser	15.09.2022
F1	Feed producer	19.09.2022 (Interview on Teams)
FF1	Fish farming company	22.09.2022 (Interview on Teams)
FF2	Fish farming company	26.09.2022
FF3	Fish farming company	05.10.2022 (Interview on Teams)
FF4	Fish farming company	13.10.2022 (Interview on Teams)
WWF EU policy office	Senior Forest Policy Officer	14.10.2022 (Interview on Teams)
F2	Feed producer	24.10.2022 (Interview on Teams)
FF5	Fish farming company	26.10.2022 (Interview on Teams)
FF6	Fish farming company	28.10.2022 (Interview on Teams)
Norwegian Seafood Federation	Interest organisation of the industry	09.12.2022

3.2.2 Interviews

To gain an understanding of the informants' experiences and worldviews and the meanings they ascribe to their own world, in-depth interviews are a suitable method (Valentine, 2001, p. 44). Since the aim of my thesis is to gain a better understanding of how the fish farming industry views itself and how they chose to present itself, I deemed in-depth interviews to be the most appropriate method.

I had originally planned to conduct my in-depth interviews in person. However, few of the industry's important actors' headquarters are situated in Oslo, and the lack of response made it difficult to plan longer trips. In addition to this, several of my informants had busy schedules and preferred doing the interviews on digital platforms. I therefore ended up conducting most of my interviews digitally, with a few exceptions. I also had one asynchronous digital interview where the informant answered questions over email. Digital interviewing has both advantages and challenges (Dunn, 2021, p. 176-177).

In face-to-face interviews, there are several spatial, temporal, and social barriers in place. One of the main advantages of digital interviewing is the potential to overcome such barriers that would otherwise restrict access to informants (Dunn, 2021, p.177). Doing the interviews over Teams allowed me to speak to companies based all over Norway. Fish farming companies are based in cities but also in small, remote places. If I had conducted all interviews in person, I would not have been able to speak to companies from such diverse locations. An advantage of conducting interviews over email is that the informants can be more detailed and reflective, as they have more time to consider their answers (Dunn, 2021). It is also time saving, as the answers are in written format and need not be transcribed.

On the other hand, several challenges are also associated with digital interviewing. The most important is the spatial and temporal displacement between interviewer and informants (Dunn, 2021, p. 177). It is harder to read the informants due to the loss of several visual cues. In the interviews I conducted on Teams, only the face or the upper body was visible, and body language was therefore hard to determine. In interviews over email, one receives no visual or paralinguistic cues (Dunn, 2021). Given my research topic, I found that these weaknesses did not impact my data in a significant way. It is of course important to ensure that the informants are comfortable, and visual cues are helpful in this. However, I was not asking personal or sensitive questions. I am interested in my informants not as private individuals but as professional employees and representatives of their companies. Their body language and the way they behaved were, therefore, not important for my thesis. Furthermore, while I was not able to see all visual cues, I saw enough that I would be able to notice if they were very uncomfortable. However, I did notice that the interviews that were conducted in person tended to be longer. There was little 'small talk' in the interviews conducted on Teams; they were more straight to the point. Lastly, a challenge with video call interviews is the technological aspect. Technical failures can disrupt or interrupt the interview. Digital interviews are dependent on

reliable internet access and digital literacy (Dunn, 2021). I experienced no technical difficulties when conducting the interviews, and both the informants and I were familiar with the digital platform on which the interviews occurred.

My interviews were semi-structured, and I developed three different interview guides: one for the environmental organisations, one for feed producers, and lastly, one for the fish farming companies. The interview guides were updated as the interviews unfolded, as topics emerged during the interviews, and as events at the time impacted the industry. The order in which the questions were asked differed in the interviews depending on when topics emerged naturally in the various interviews.

3.3 Documents and secondary literature

Secondary data has been collected as a complementary data collection strategy. A document is more than merely a description of an external reality; rather, documents are part of the development, shaping, and altering of reality (Asdal, 2015, p. 74). Asdal (2015) further argues that documents can help define relevant situations and establish issues. They reveal important aspects of the context in which they were written and the motives and interests of the key players. Governmental policy reports and strategies were important sources of information for the thesis, as they play an important role in regulating the industry.

Furthermore, fish farming companies' and feed producers' sustainability reports and websites are also important. Such documents can give an indication as to whether the findings from the interviews are applicable to Norwegian fish farming companies not included in the case study. An important clarification is therefore that whenever a fish farming actor is mentioned by name, this data is from reports or websites and not data collected in interviews. Data collected from documents was collected from all fish farming actors in Norway, not just the ones participating in the interviews.

Table 2 Governmental strategies and reports

Name of report/strategy	Publisher	Year
NOU 2019: 18	Finansdepartementet	2019
Et hav av muligheter	Nærings- og fiskeridepartementet	2021
Matnasjonen Norge	Landbruks- og matdepartement, Nærings- og fiskeridepartementet, og Helse- og omsorgsdepartementet	2021
Norway's Eight National Communication: Under the Framework Convention on Climate Change	Ministry of Climate and Environment	2023

3.4 Data processing

I recorded all the interviews I conducted and took notes during them. An interview is usually recorded to facilitate analysis, and these recordings are most often converted to text, as it would be close to impossible to conduct an analysis otherwise (Dunn, 2021). Transcribing should be done as soon as possible after the interview is conducted (Dunn, 2021), and I strived to do so. It is a time-consuming and, therefore, resource-intensive task to transcribe interviews. Despite this, I found the process of transcribing – and doing do as soon as possible after the interviews – useful in several ways. Firstly, as an unexperienced researcher and interviewer, listening to the interviews made me aware of phrasings that did not work, questions that were unclear, or if I should have waited longer before asking the next question, and I used that knowledge in subsequent interviews. Transcribing became a part of the learning process and made me a better interviewer. Secondly, several of my informants mentioned aspects I had not thought of myself, but in the moment, it was not always easy to take in everything that was said. Listening to the interviews afterwards gave me a better grasp on the topics discussed and made me able to

include the emerging topics in the interviews that followed. Lastly, I was able to conduct a preliminary form of analysis when engaging with the data again (Dunn, 2021).

The process of organising and processing the data material begins once the data is collected (Dalen, 2019). An important step in the process of analysis is the coding of the data material (Dalen, 2019). Data is deciphered, conceptualised, and assembled in new ways (Strauss & Corbin, 1990, p. 57). Coding is heuristic and exploratory, with no specific algorithms or formulas that must be followed (Saldaña, 2021, p. 12). Qualitative data is rarely presented in its entirety, and data reduction is therefore one of the purposes of coding (Cope, 2021). Coding is seldom done perfectly the first time. Data is coded and recoded, and the data becomes more refined as one continues to work with it. Coding can be described as cyclical, and one cannot draw conclusions after only one cycle of coding (Saldaña, 2021). A second cycle of coding helps reorganise and reconfigure the codes from the first cycle. Through this, a smaller and more select list of broader categories and concepts emerges (Saldaña, 2021, p. 297). I have used NVivo to code my data.

My interviews were conducted in Norwegian, and quotations used in the thesis are translated. In translations of interview data, the greatest risk is the alteration or loss of the original meaning. Metaphors can be hard to translate, as they do not necessarily have the same meaning in other languages. Likewise, slang, jargon, and regional linguistic characteristics can be hard to capture in another language (McKenna, 2022, p. 2). To ensure that my translations captured the original meaning, informants were sent both the original Norwegian quotation and the English translation. All quotations and translations used in the thesis were approved by the informants.

3.5 Methods for analysis

Thematic analysis (TA) is a commonly used method in social science and can be approached in a variety of ways (Fryer, 2022). TA is not a distinct analytical approach to qualitative research; rather, it is better understood as an umbrella term (Braun et al., 2018, p. 1). There are significant differences between the different approaches to TA, but there are also some shared characteristics. The approaches are theoretically flexible; they include procedures for coding and developing themes; analysis has the potential to be both deductive and inductively oriented; and meaning can be coded for both manifest and latent meaning (Braun & Clarke, 2021, p. 5). I followed the reflexive approach to TA as outlined by Braun & Clarke (2006) and Braun et al. (2018), with some insights from Fryer's (2022) critical realist approach to TA.

Familiarisation with the data is the first step in Braun & Clarke's (2006) model. This includes preparing the data for analysis; for me, this meant transcribing the interview data and uploading it into NVivo (Braun & Clarke, 2006; Fryer, 2022). Familiarisation with data occurs through reading and rereading the data, and initial thoughts and questions should be written down. A key step in this phase, in addition to transcription, was my research diary. The diary was a great tool for reflections over the research process and the data continuously throughout the project.

Initial codes are generated in the second step of the model. A more detailed and systemic engagement with the data occurs when generating codes (Braun et al., 2018). Codes can be *semantic*, such codes remain close to the language of the informant and describes the explicit meaning of the data. Semantic codes are often descriptive and 'surface' level (Braun et al., 2018). *Latent codes*, on the other hand, are more abstract and focuses on the deeper and more implicit meaning of the data (Braun et al., 2018). Initial coding is often semantic, and the latent codes become more apparent as the analysis develops (Braun et al., 2018). As previously stated, I used NVivo to code my data. Similarly to Braun et al. (2018), I found that the first cycle of coding consisted mainly of semantic or descriptive codes.

A descriptive approach can generate a huge number of codes. During the second cycle of coding, I found Fryer's (2022) approach to developing codes highly useful, and I followed the two slightly different processes involved in the development of codes detailed in this paper. Firstly, *standardisation* is the process of combining codes that are worded differently but have the same meaning. Through this process, a more systematic structure for codes emerges. Secondly, codes are developed through *consolidation*. This process involves considering one's descriptive codes and whether there are any general or theoretical terms that can be used to describe them (Fryer, 2022). I found that this approach not only helped me reduce the number of codes but also made the codes more analytical. It was a useful step in developing latent codes.

The active processes continue in the third phase, when themes are constructed. Braun et al. (2018) describes the process of constructing themes as being "… built, moulded, and given meaning at the intersection of data, researcher experience and subjectivity, and research question(s)" (p.12). This phase is still early in the research process, and prototypes or candidate themes are constructed and 'tested out'. The themes developed in this phase may not all 'survive' the early stages of development. Candidate types are effectively prototypes, and an

important phase is therefore the revising and defining of themes (Braun et al., 2018). In familiarising myself with the data and coding, an abundance of interesting themes emerged. However, while a theme might be interesting, that does not necessarily mean that it is a good theme. The research question(s) is the basis of a good theme. It should tell a story that is meaningful and helpful in understanding the data and that aids in addressing the research question (Braun et al., 2018). Revising and defining themes included considerations as to whether they were relevant for the research questions, and some themes were therefore discarded during this phase. It is impossible to include all aspects of the data in the finished report, and such evolutions of the data are therefore of great importance.

The last phase of production of the report (Braun & Clarke, 2006). This phase should be regarded as the final stage of analysis, as needed revisions of the themes, structure, and content can become apparent when you start to write (Braun et al., 2018). I found that the overall picture became clearer once I started to write, and connections between the different themes became more evident. An analytical narrative is needed to be able to illustrate the story one is trying to tell about the data. Simply describing the data is not sufficient; rather, the research question should serve as the basis for the argumentation (Braun & Clarke, 2006, p. 93). To ensure that my analysis and discussion are based on the aim of the thesis, the research has been at the forefront throughout the research process.

3.6 Ethical considerations

At the outset of any research project, it is important that the researcher recognise the responsibilities they have to the informants in the project. Confidentiality, consent, and data management are amongst the responsibilities researchers must consider (Dwyer & Limb, 2001). Researchers processing personal data in Norway must complete a notification form with Sikt (known as NSD before January 2023), which then assesses the data processing plan, ensuring it is in accordance with data protection legislation. One must send in the form at least 30 days before data collection begins (Sikt, n.d). My application was approved on 25 August 2022. In addition to getting approval from Sikt, the project must comply with the General Data Protection Regulations (GDPR). The personal data I collected included names, employment, email addresses, and voice recordings. Voice recordings will always be classified as red data and must be processed securely. I used Nettskjema-diktafon to record my interviews, a secure solution that the university recommends (University of Oslo, n.d.).

A researcher must obtain permission before involving people in their research. Informed consent is therefore necessary. As a part of the NSD application, my information letter was read through and approved. The information letter was sent by email when informants were initially contacted. When conducting in-person interviews, I brought with me a physical copy of the letter. In the interviews conducted over Teams I made sure the informants had familiarised themselves with the content of the letter.

The fish farming companies and feed producers did not want to be identifiable to others. Anonymity was a condition for the interviews. There are various methods to ensure anonymity (Catungal & Dowling, p. 33). In this thesis, I have masked identifying characteristics such as names of firms and informants, locations, gender, and age. The environmental organisations and the employer organisation did not request to be anonymised and are named in the thesis.

3.7 Positionality and ensuring rigour

Throughout the research process, I have attempted to adhere to a critical reflexivity approach. Such an approach acknowledges that the research process, researchers, and informants occur within ongoing power relations and are shaped by social differentiation (Catungal & Dowling, 2021, p. 25). The aim of critical reflexivity is not to remove the researcher or their impact as an actor but rather to understand how research is shaped by the researcher's positionality. Being reflexive entails examining oneself and one's situation and analysing it as if one were studying it. Furthermore, reflexivity requires checking in with oneself throughout the research process (Catungal & Dowling, 2021).

I kept a research diary during the project, as this is a useful tool to develop a more reflexive research practice. A research diary details the research process, how the researcher experiences conducting research, observations, and reflections. While field notes, such as maps, conversations, and observations, are qualitative data, a research diary is a place where one can document their feelings throughout the project, such as challenges, difficulties, frustrations, excitement, and accomplishments. Emotional accounts are of value, as they can be of great help in unpacking power relations in the research process (Catungal & Dowling, 2021).

In all research, power issues are present. In the relationship between the researched and the researcher, power is often perceived as being distributed unevenly. The researcher is often thought to hold the most power (Mohammad, 2001). However, this is highly dependent on both

the researcher and the researched. Given my research question and the appropriate informants that followed, the majority of the interviews I conducted can be described as 'elite' or 'expert'. This mode of research, also called studying up, involves informants who, due to their political, cultural, or economic power, hold higher positions of power relative to the researcher (Catungal & Dowling, 2021, p. 24). As a student conducting research, one engages in situations where social roles and subject positions are limited while doing fieldwork. Students often have an inferior position when approaching those who know and belong (Sæther, 2006). I experienced that the relationship between myself and the informants was asymmetrical, and the informants held a higher social position.

Researching 'elites' can bring forth dilemmas, difficulties, and concerns that differ from those arising when doing research on less powerful groups (England, 2002). However, Smith (2006) argues that little evidence exists to support the notion that 'elite' interviews bring with them areas of concern that are specific to them. She further argues that these problems seem to be potential challenges that all interviewers might have to face (Smith, 2006, p. 652). This is an interesting and important discussion. At the same time, I found, as McDowell (1998) notes, that I was dealing with people "… sometimes keen to demonstrate their relative power and knowledge and your relative powerlessness and ignorance" (p.2137). In several of the interviews, I felt somewhat overrun with informants 'taking over' the conversation. It made me feel unsure and sometimes affected how critical the questions I asked were. A researcher is not simply a researcher. As a postgraduate student, I am a relatively unexperienced researcher. Furthermore, I am young and female. Had I been a male tenured professor, I might not have experienced the interview situation in the same way. However, not all the interviews were experienced this way, and I do not necessarily believe that the informants acted in this manner purposefully. In the end, I received the needed data, despite some interviews being less critical.

Informant checking is an important strategy to ensure rigorous research. This process allows the informants to stay involved in the project and gives them the opportunity to vet or authorise transcripts from interviews (Dunn, 2021). Informant checking is a key step in ensuring the trustworthiness of qualitative data (Birt et al., 2016). All my informants requested that I vet direct quotations from the interviews used in the thesis. While the informant checking process is undoubtedly important, it is also critical to acknowledge that informants' right to read a researcher's work can lead to a form of censorship (Bradshaw, 2001, p. 207). It is important to

note that some informants made editorial changes to the direct quotes during informant checking. Similarly, some quotes were removed from the thesis at the request of informants.

The researcher's life story and positionality influence the fieldwork (England, 1994). The environment and environmental concerns are topics I personally care about and influence the choices I make in my personal life. Through reflecting on and being aware of them, I hope I have been able to conduct data collection and analysis without my personal biases colouring it. When developing my interview guide, I worked on making open and unassuming questions. However, I found that the companies often expected me to be critical of their operations and answered accordingly. This might be due to my academic background – that it is expected that a human geographer has a critical point of view.

If findings from qualitative research are to gain acceptance, evaluation is crucial (Baxter & Eyles, 1997). Through ensuring rigour, the trustworthiness of one's work is established, which can be achieved through practices such as triangulation, informant checking, and reflexivity (Stratford & Bradshaw, 2021). I have attempted to ensure rigour through the triangulation of multiple sources, methods, and theories. Throughout the master's thesis, I checked in and discussed my thesis with my supervisor, and the informants reviewed text with direct quotes. Reflexivity is an essential part of rigorous research, and I have detailed above how I have approached this. A transparent and approachable account of how the data is collected and analysed must be part of the presentation of interview-based research (Dunn, 2021, p. 176). It is through this transparency that trustworthiness and the wider applicability of the findings can be established (Dunn, 2021). I hope that through detailed data collection and data processing, as well as reflections around my own positionality, I have been able to ensure rigour in my research.

4 The evolution of the Norwegian fish farming industry and its feed

Context is key to fully understanding a case. The contextual influences are crucial to include, as they can significantly influence the studied phenomenon (Baxter, 2021). In this chapter, the historical development of the Norwegian fish farming industry and the feed used is detailed. Secondly, soy production in Brazil is discussed. Lastly, the interconnected world economy and how it affects the agricultural commodity market is presented.

4.1 The Norwegian fish farming industry

The history of fish farming is a story of large structural changes, globalisation, technologisation, modernisation, and professionalisation. The development of the fish farming industry showcases the political, economic, and societal change that has occurred in the last 50 years (Pettersen, 2018, p. 286). Fisheries have always been a backbone of the Norwegian economy. Today, the petroleum industry is the most important export sector in Norway, but for nearly 1000 years, fish was the largest export. From a historical perspective, the 'oil fairytale' is just a phase in Norwegian history (Winther, 2019). The emergence of fish farming in the 1970s signified the renewed importance of fish for the Norwegian economy.

In the 1970s, fish farming emerged as an additional activity for farmers in rural coastal areas and was mainly of importance to local communities (Pettersen, 2017). Concessions have been necessary to operate since 1973 (Alsos et al., 2003). The distribution of concessions was used as a political tool to strengthen coastal communities and prevent fish farming from becoming a centralised, big business. The regulations for the concessions stated that a company could only own one concession and that the owner should belong to the local community. This resulted in almost all the facilities being registered as sole proprietorships. However, the law was changed in 1991, opening the door for outside capital and ownership concentration through mergers and acquisitions (Steinset, 2017).

Through the 1990s, the number of companies producing fish halved. This trend has continued through the 2000s, while the number of concessions for salmon and rainbow trout has increased in the same period. In 2015, the 10 largest companies produced almost 70% of fish for human consumption; 20 years earlier, the equivalent share was under 20% (Steinset, 2017). The number of major companies that have been traded has increased in recent years. The ownership of these companies has consequently been scattered across a diverse set of both international

and Norwegian actors. Significant ownership stakes are held by international funds in several companies. However, in most Norwegian fish farming companies, the majority ownership is Norwegian (NOU 2019:18). The growth in fish farming continued through the 1980s, and in 1991, the revenues from fish farming were larger than those from traditional fisheries for the first time. Today, the value of farmed fish is almost three times greater than the value of traditional fisheries (Steinset, 2017). Farmed salmon has become one of Norway's key exports, and the fish farming industry supplies products to a global market (NOU 2019:18).

Aquaculture has seen massive growth in not only Norway; no food production sector is growing faster than aquaculture internationally (Hansen, 2019), with China being the largest player. However, in the production of farmed salmon, Norway is the largest exporter (Steinset, 2017). Between 52% and 55% of the world production of Atlantic salmon measured in live weight between 2015–2019 was produced in Norway (Eidem & Melås, 2021). The rapid increase in the fish farming industry has spurred a debate around the sustainability of such growth. As part of this debate, the Norwegian fish farming industry has been criticised for its emissions, dependency on Brazilian soy, pollution, and problem with salmon louse (Eidem & Melås, 2021).

Historically, fish meal and fish oil were the two most important components of the feed. Salmon is a carnivorous species, and fish oil and fish meal are ingredients that represent the 'natural' diet of the species (Shepherd et al., 2017). These ingredients originate from fish or parts of fish that are safe for human consumption but are not marketed as food for commercial reasons (Hansen, 2019). However, it became clear in the 1990s that the overdependence on a limited variety of feed ingredients was a weakness (Shepherd et al., 2017). Furthermore, the expansion of the aquaculture industry led to an increase in demand for fish meal and fish oil, and concerns about limited marine feedstock arose (Forbord & Hansen, 2020; Hansen, 2019). Environmental organisations warned of the potential consequences of further growth in the industry (Forbord & Hansen, 2020). Feed prices were high, and the industry needed more 'effective' feed (Forbord & Hansen, 2020; Hansen, 2019). It became clear to the industry that dependence on feedstuffs derived from capture fisheries presented limitations for growth, and efforts were initiated to replace the marine sources (Boissy et al., 2011).

Salmon is a carnivore, and by nature is not adapted to a diet based on vegetal raw materials. Replacing marine protein and oil with vegetal protein and oil is not unproblematic, and finding adequate vegetal alternatives proved difficult (Hansen, 2019). Through heavy research investments, the composition has been changed. Initially, around 90% of the feed ingredients came from marine raw materials; today, marine raw materials represent around 23% of the ingredients (Aas et al., 2022b). A key feature of the change in composition is the dominant role SPC has come to play. In 2020, SPC represented 20.9% of the ingredients in the feed and had the highest proportion in the composition (Forbord & Hansen, 2020). During the last decade, the composition of salmon feed has changed substantially, but in a 2020 review, Aas et al. (2022a) found minor changes from the previous review in 2016. While there were minor changes to the composition, there was an increase in the amount produced in 2020 compared to 2016 (Aas et al., 2022b).

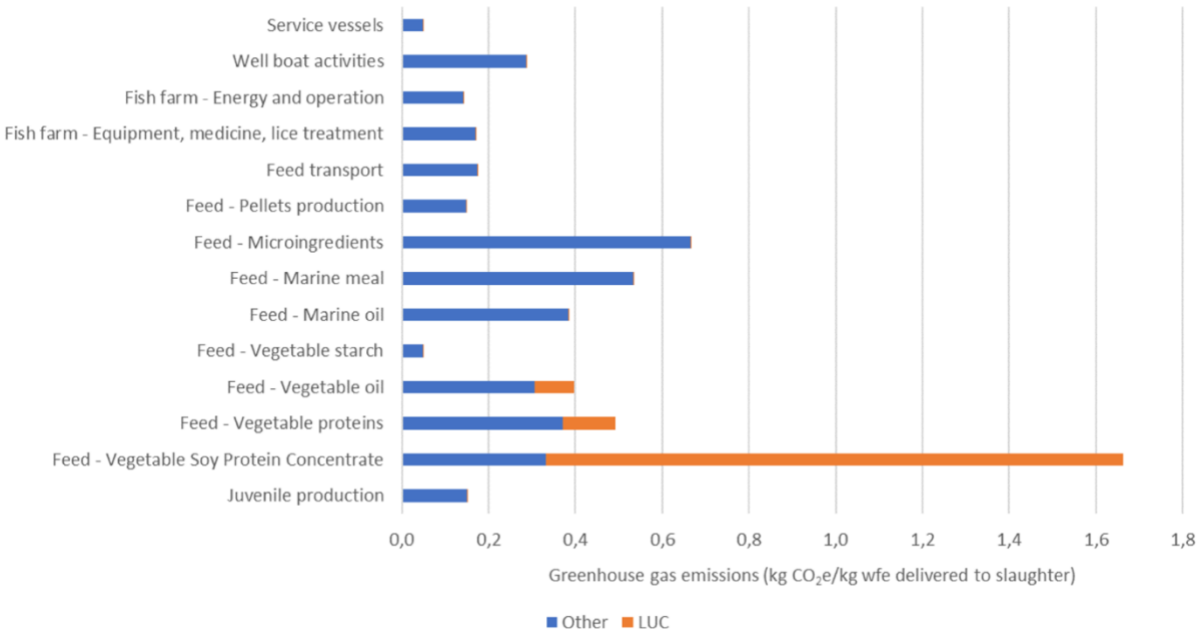

Figure 1 Detailed greenhouse gas emissions per kilo farmgate salmon on different activities and feed inputs, indicating the contribution from LUC separately (Winther et al., 2020)

Feed is the most important economic and environmental input factor and the largest contributor to greenhouse gas (GHG) emissions in the fish farming industry (Aas et al., 2022b; Winther et al., 2020). The only exception to this is products that are airfreighted. In salmon products that are delivered to wholesalers, 73–80% of the GHG emissions are due to the feed. (Winther et al., 2020). Winther et al. (2020) conducted a lifecycle analysis (LCA) of Norwegian farmed

salmon. LCA has become a standard method for the analysis of environmental systems (Boissy et al., 2011, p. 62). In Figure 1, a detailed breakdown of the carbon footprint of farmed salmon is presented. The importance of feed production and land use change (LUC) in particular is apparent in this breakdown (Winther et al., 2020).

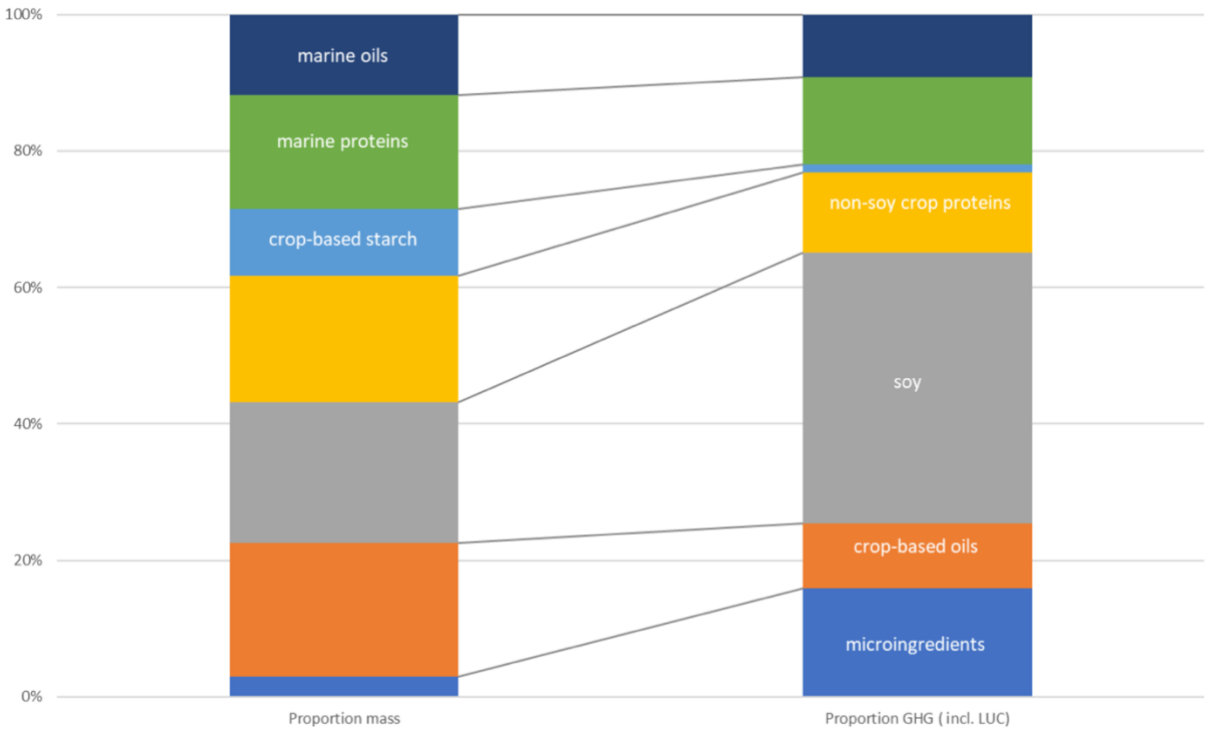

Figure 2 Relative contribution to gas and greenhouse gas emissions, respectively, of different components of salmon feed per kg of LW salmon (Winther et al., 2020).

Looking further into the different components of the feed, some stand out. Figure 2 reveals that soy and microingredients' contribution to the footprint is much higher than the volumes used. SPC comprises 21% of the total ingredients of salmon feed, whereas it represents almost 40% of the carbon footprint of the feed (Winther et al., 2020). Winther et al. (2020) conclude that to reduce salmon farming's climate impact, changes must occur at every stage of production. Feed producers and subcontractors must be included in restructurings. The focus of the industry should be on a move towards low-emission technology and work on finding low-impact raw materials (Winther et al., 2020, p. 68). In their LCA of Atlantic salmon, Boissy et al. (2011) similarly find that if the demand for sustainability continues, the development of feed must focus on the co-optimisation of the environmental impacts, cost, and nutritional characteristics of the ingredients (p. 69).

The profitability of the Norwegian fish farming industry has been extraordinarily high in the past 10 years, and in recent years, a discussion around the taxation of the industry has emerged (Misund et al., 2020). In September 2022, news broke that the government was proposing a resource rent tax on aquaculture starting in January 2023. The production of salmon, trout, and rainbow trout is covered in the proposal. The taxation on the resource rent in the proposal is at an effective rate of 40%. A tax-free allowance of production between 4,000–5,000 tonnes is granted in the proposal as a way of ensuring that only the largest actors will be affected by the resource rent tax (Ministry of Finance, 2022). The design of the proposed resource rent tax is a cash flow tax. The revenues will be calculated differently for salmon, trout, and rainbow trout. A norm price is used to establish the revenues from salmon, while the actual sale prices will be the basis for revenues from trout and rainbow trout. A norm price is set based on the commodity price of salmon (Ministry of Finance, 2022). Local communities make natural resources available, and an important part of the proposal is the guarantee that these will receive a portion of the resource rent. Half the revenues will go to the municipal sector, according to the government's proposal (Ministry of Finance, 2022).

Norwegian aquaculture reacted strongly to the proposed taxation, and the proposal led to heated public debate. Layoff notices were sent to workers in fish processing by several of the largest companies. Their reasoning was that the resource rent tax had destroyed the market for long-term, fixed-priced contracts (Hatland et al., 2022). However, this view on the implications of the tax is challenged. The industry has been accused of using the resource rent tax as an excuse to shut down fish processing production. The mayor of Kvænangen, a coastal town in Northern Norway, argues that the billion-dollar industry can afford to invest even after the tax (Larsen & Tronsen, 2022). In November 2022, the Ministry of Finance invited the five largest companies to an emergency meeting, but they all declined to participate. The meeting went ahead on 18 November, with only the trade organisations there to represent the industry. The largest disagreement between the government and the industry is that revenues from salmon are based on market prices (Bjørnestad & Skjeggestad, 2022).

4.2 Brazilian soy production

The world's largest producers of soy are the US, Brazil, and Argentina, and they produce approximately 80% of soybeans globally combined (Weis, 2010). Most of the soy produced globally is used in animal feed. SPC is a key ingredient in the feed consumed by farmed salmon. In Norway today, fish feed producers are the largest importers of soy (Future in Our Hands &

Rainforest Foundation Norway, 2018). Norway has a strict policy when it comes to genetically modified (GM) food (Helse- og omsorgsdepartementet, 2021). Foodstuffs and feed raw materials produced from genetically modified organisms are not allowed to be sold or marketed unless approved by the Norwegian Food Safety Authority. There are currently no approved food or feed products under the Food Act (Mattilsynet, 2021). Hence, the soy imported to Norway must be GM-free. The requirement concerning GMs limits the possible soy suppliers that fish feed producers can import from. Soy imported to Norway is predominately from Brazil for this very reason. As most of the soy imported to Norway is Brazilian, I focus in the following section on soy produced in Brazil.

Deforestation, or LUC, is the conversion of natural biomes for the cultivation of cash crops. Plantation agriculture comes at the expense of existing nature. Tropical deforestation is often associated with coffee, bananas, and palm oil, but the production of soy represents perhaps an even more spectacular example. Soy is an adaptable crop and can be cultivated in a variety of climates (Robbins et al., 2010, p. 175). In South America, the land cover given over to production in the last two decades is overwhelming. In 2010, more than 20 million hectares of land were dedicated to the production of soy, which is an astounding number considering that no soy was grown in the country in 1960 (Robbins et al., 2010). Rajão et al. (2020) argue that all of Brazil's economic partners "… should share the blame for indirectly promoting deforestation and GHG emissions by not barring imports and consuming products contaminated with deforestation, illegal or not" (p. 248).

Brazil is home to some of the most important ecosystems on the planet, and the conservation of such valuable nature is of great importance to the planet. Most of the Amazon rainforest is in Brazil, and this rainforest is of great regional and global importance and is instrumental in controlling climate change. The Amazon plays a key role in biodiversity, and half the world's rainforest and one-quarter of all faunas are found here (de Area Leão Pereira et al., 2019, p. 8). Tropical deforestation is a significant sustainability challenge, and globally, Brazil has been a leader in such practices. Between 1996 and 2005, an average of 19,500 km^2/year of tropical forest were cleared (de Area Leão Pereira et al., 2019).

The Amazon rainforest is not the only Brazilian ecosystem of importance. Consisting of grasslands, savannas, woodlands, and forests, the Cerrado is a tropical ecosystem (De Castro & Kauffman, 1998, p. 264). The Brazilian Cerrado is one of the world's most biodiverse savannas.

Savannas are of global importance, and they play a key role in supporting ecosystems and biodiversity (Rodrigues et al., 2022). Scientific consensus exists regarding the crucial role that savannas play, yet they remain undervalued and poorly protected. In international and domestic efforts, rainforests tend to be prioritised and given the most attention (Rodrigues et al., 2022, p. 6808). The Cerrado is often portrayed as being 'idle' land. However, 25 million people inhabit the area, many of whom belong to Indigenous groups and traditional communities that rely on the ecosystems and landscape (Schilling-Vacaflor et al., 2021).

It has been noted by various studies that in the deforestation of the Amazon rainforest, the direct role of soy plantations is minor. However, the current agreement in place to protect the Amazon contains no plan for how to address the indirect consequences soy production has on deforestation. The areas for soy plantations tend to be agricultural areas that are already consolidated, and the costs for logistics and soil correction are lower in these areas. For economic viability, this is an important aspect. Land used for other types of farming, particularly cattle, is bought by producers of soy. The result of this is that other types of farming are 'pushed' into new agricultural frontiers (Future in Our Hands & Rainforest Foundation Norway, 2018, p. 19). Furthermore, the agreements in place to protect the Amazon does not extend to the Cerrado. Biomes, such as the Cerrado, plays a crucial role in supporting ecosystems and biodiversity and should to a greater extent be included in discussions about deforestation.

Deforestation has been a key focus in the debate about the environmental and social impacts of soy production. However, this is not the only consequence. The expansion of soy production has exerted several significant environmental and social impacts. Soil erosion and water pollution due to agrochemicals and machinery, biodiversity loss, child and forced labour, foreign control over land, and an increase in land concentration are all connected to the cultivation of soy (Frey et al., 2022).

The environmental and social impacts of soy production in Brazil are complex and influenced by a range of variables. Illustrative of this is the use of fertilisers. In discussions about soy production, soy's nitrogen fixation properties are often highlighted by its proponents. In modern agriculture, crops need fertilisers to secure yields. These can either be of organic or chemical origin. The use of fertilisers, especially chemical fertilisers, poses several environmental challenges. Firstly, the production of fertilisers requires a significant amount of energy.

Secondly, the use of rare natural resources, such as phosphorus, exerts considerable effects (Oosterveer & Sonnenfeld, 2012, p. 47). Most Brazilian soy production occurs in the western part of the country, an area where the soil has a low natural fertility, despite being the region of the country with the highest potential for agriculture. The high production of soy in Brazil is possible through the techniques and inventions of modern agriculture. In well-managed fields, 70–85% of the nitrogen required for soy production can be supplied from this biological fixation (Alves et al., 2003).

However, agricultural production is dependent on more than nitrogen. Soy production and growth in Brazil are constrained by the low availability of phosphorus and potassium in the soil. Fertilisation with these nutrients is therefore crucial for production (Raucci et al., 2015, p. 421). While the need for nitrogen fertilisers is low, the overall use of fertilisers in soy production in Brazil is high. Soy cultivation is amongst the main users of fertiliser in the country, and around 35% of the national fertiliser use stems from soy production. The use of phosphorus fertilisers in Brazilian soy production is large, and it can potentially impact eutrophication and freshwater species (Eliasson et al., 2023). A considerable amount of soy production occurs in areas that are converted from pastures, as previously discussed in the thesis. Overgrazing, manure removal, and soil erosion lead to nutrient deficiency in the soil of pastures, and such areas therefore require large inputs of fertiliser (Eliasson et al., 2023).

Examining fertiliser use alone is not expedient, as it is not the sole factor in the carbon footprint of agricultural production. Soy production and global consumption systems are complex, and they should be evaluated in ways that encompass this complexity. A good example of this is the Matopiba region in the north-eastern part of the Cerrado (Eliasson et al., 2023). In their review of the risk imposed by fertilisation use in Brazil, Eliasson et al. (2023) found that this region is assessed to have a relatively low risk of nutrient loss, species richness, and use of phosphorus (p.8). From the perspective of fertiliser use, Matopiba seems to be ideal for soy cultivation. However, in the same region, other studies have revealed that deforestation is a major problem (zu Ermgassen et al., 2020), that the carbon footprint of Matopiba is between two and six times larger than the Brazilian average (Escobar et al., 2020), and that biodiversity is threatened by LUC (Green et al., 2019). This is just one example of the complexity of production and why the question of sustainability is rarely straightforward.

Agribusiness is one of the most important economic activities in Brazil. Simultaneously, it is also a sector that contributes significantly to the country's GHG emissions (Toloi et al., 2021). Scientific consensus exists that environmental change is one of the most pressing issues of the 21st century (Sarwar, 2008). Following this, consumers are increasingly concerned with how the food they consume is produced. The origin, quality, and environmental impacts are progressively being questioned (Toloi et al., 2021, p. 4). A focus amongst large soybean producers to reduce environmental impacts has emerged as a response to these concerns (Toloi et al., 2021). In recent years, several efforts have been promoted to negate the negative impacts of production, such as reducing deforestation, using no-tillage systems that reduce soil erosion and the use of fertilisers and pesticides, and the creation of the Soy Mortarium (Prudêncio da Silva et al., 2010).

The environmental challenges soy production in Brazil poses are the focus of this thesis; however, it is important to note other important concerns as well. Informal work is the reality for most rural workers in Brazil, and there are numerous examples of violations of labour rights on soy plantations. Furthermore, federal inspectors have found evidence of and brought charges of contemporary slavery against soy plantations (Future in Our Hands & Rainforest Foundation Norway, 2018). The use of pesticides has not only been critiqued from a natural environmental perspective but also from a human health perspective. The use of these pesticides has often been conducted without safety and health regulations in place or following existing ones.

Certification schemes are an integral part of companies' efforts to address deforestation and conversion driven by commodities. Indeed, 65–75% of the commitments made by companies to be deforestation and conversion-free are made through certification systems (WWF & BCG, 2021, p. 23). Certification schemes have the potential to hold businesses accountable if they are implemented effectively and are part of a multifaceted approach. However, a critical examination of certification schemes is needed, as significant discrepancies exist in the credibility and robustness of these arrangements (WWF & BCG, 2021). In recent years, there has been a proliferation of green certification schemes, and with this growth, their reliability and consistency have become more questionable. Certification schemes have multiple origins; some are created by companies themselves rather than third parties, and many countries adopt their own standards. The result is that global trade in eco-friendly certified goods is a confusing hodgepodge (Robbins et al., 2010, p. 41).

Most of the soy imported by fish feed producers in Norway is certified according to the ProTerra standard. The aim of this standard is to ensure that the soy is non-GM and that it has been grown following practices that are sustainably viable (Future in Our Hands & Rainforest Foundation Norway, 2018). The ProTerra standard was created in 2006 and is concerned with promoting sustainability in food and feed SC and the use of non-GM materials. The Basel Criteria on Responsible Soy from 2004 serves as the basis for the standard. The core aims of the standard are as follows:

> Foster good agricultural practices; secure the supply of sustainably produced, fully tracible, non-GMO ingredients for feed and food; protect the environment; and promote that workers and communities be treated with dignity and respect. (ProTerra Foundation, 2019a, p. 4)

Multiple challenges have emerged from the massive growth in certifications, standards, and labels that have emerged in the aquaculture industry (Nilsen et al., 2018). In this thesis, certifications regarding soy have been explicitly discussed, but there are many more. Nilsen et al. (2018) find that "… the different certification schemes are in competition with each other, as certification, standards, and labels have become big business" (p. 3155). Certification schemes have been criticised for being costly and for their lack of transparency, making them difficult to evaluate. Furthermore, they only encompass specific farms, leading to only a small fraction of the sector being embraced by the schemes (Rajão et al., 2020, p. 248).

4.3 The interconnected world economy

Our economic system is built on capitalism, and such a system is prone to developments that create unevenness across time and space. Following periods of economic growth come stagnation, decline, and even crisis (MacKinnon & Cumbers, 2011, p. 213). An acceleration of crises in space and time can be observed in the financial system, and globalisation appears to exacerbate these tendencies. The instability in the world economy has grown with increasing financial mobility and the deregulation of economies (MacKinnon & Cumbers, 2011). In an interconnected world economy where people have grown dependent on each other, a key player cannot retract without consequences (Yeung, 2021). In recent years, several key players in the global economy have moved towards protectionism, and trade wars have emerged as a result. The weakening of trade is a contrast to the market acceleration that has been observed in the previous two decades (Prelipcean & Bucătar, 2019).

The agricultural commodity market is complex and influenced by myriad factors. The soy market is thus affected by a range of factors beyond the control of the local producers, ranging from the impact of weather events on harvest to changes in demand and political developments. In recent years, examples of these factors have been observed. The outbreak of the swine flu in Africa and the COVID-19 pandemic caused changes in demands, and the trade war between the US and China resulted in hiccups in the supply chain (Kuepper & Stravens, 2022).

Most recently, the war in Ukraine has significantly impacted the global market (Aas et al., 2022b). Ukraine was invaded by Russia in February 2022, and while consequences for the Ukrainian people have been grave, but they have also had global repercussions. Russia and Ukraine are critical in the international agricultural trade. Russia is the largest exporter globally of both fertiliser and wheat. Ukraine is the top global exporter of sunflower oil and the fourth largest exporter of corn in the world (Glauben et al., 2022, p. 157). The levels of economic and business uncertainty have markedly increased because of the war, and in a British study, nearly half of the firms identified the Ukrainian war as the greatest cause of uncertainty for their work (Prohorovs, 2022). The most immediate consequences have been severe shortages in the global food supply, and food prices have consequently increased (Aas et al., 2022b).

5 Analysing fish farming companies views on soy, the global market and sustainability

In the following chapter, I present the primary themes that emerged through the coding and processing of the data. The themes are illustrated with excerpts from the interviews and elucidated by the background and larger context. The chapter has four main parts. The first part of the chapter presents the perception of soy, how the industry regards this representation of soy, and how they have faced the critique. In the second part, the industry's view on their place in the global market and their ability to influence it are introduced. The industry's work on and views on the development of alternative raw materials is presented in the third part. In the fourth part, the costs of implementing sustainability measures are introduced. Lastly, the empirical analysis is summarised and discussed in relation to the research questions.

5.1 The perception of soy

The Norwegian fish farming industry's use of soy gained much attention from both the environmental movement and mainstream media in 2018. The German newspaper *Die Zeit* published an article declaring Norwegian farmed salmon the most dangerous fish in the world, partly due to the widespread use of Brazilian soy (Fischermann et al., 2018). A few months later, the environmental organisations the Rainforest Foundation and Future in Our Hands published reports detailing the environmental and social impacts of soy production in Brazil and criticising the fish farming companies' use of it. Politicians have also been active in the debate around soy, with some arguing for a search for new raw materials and others suggesting an extra tax on soy. Some disagreement existed amongst the informants on the impact of this negative attention on the industry. Some argued that the events of 2018 were a wake-up call, while others said that there had been much more awareness in the industry than what has been conveyed in the media and by the environmental movement: "If I am being honest, I think the industry was ahead of Future in Our Hands. We have been buying deforestation-free and non-GM soy for a very long time" (FF4).

It is important to emphasise that the Norwegian fish farming industry was purchasing certified deforestation-free soy prior to 2018. The environmental challenges associated with the production of soy were not news to the industry, and the criticism from the environmental movement was not directed at the industry's direct consumption. Rather, the main critique was that the Brazilian suppliers were not deforestation free in all their operations: "(…) It's not

enough that you buy certified soy. You also have to buy from suppliers that are deforestation free in all their operations and don't sell uncertified deforestation soy to other customers" (Rainforest Foundation). In other words, the fish farming industry was indirectly supporting deforestation through its suppliers. Critics further argue that while the industry has taken steps to ensure more sustainable raw materials, it is still part of global demand. Through its purchases, it contributes to driving the need for soy on the global market, leading to an increase in production of all soy. The informants expressed their awareness of their role in the global demand for soy.

> We know that deforestation takes place in the Amazon. One could say that this is not due to the Norwegian fish farming industry, but then the environmental movement will say that we still buy soy, so we are a part of the global demand, and that is why we must continue the work. (FF1)

> We acknowledge that while we buy the greenest soy available and we are doing everything right, and we do get praise from the Rainforest Foundation for this, we cannot avoid the fact that we still buy soy. We buy a part of the total pot, and when we buy our green soy, the other soy must come from somewhere – the customers that don't care about the environment, only profit. But if you follow that train of thought, it will apply to everything in our value chain. Making it impossible for us to mitigate. (FF2)

While the industry acknowledges its part in the global demand for soy, it also emphasises that if it were to follow this trail of thought, production would be impossible. The global demand argument could be applied to every raw material, and if it were to 'cut out' raw materials based on this logic, it would have none left. There is certainly truth to this argument; all raw materials and food production exert some form of impact. However, one could also argue that they do not all have the same impacts and that some are more serious than others. The environmental impact of agricultural production varies depending on the product and method of production. An increase in global demand for a product with high environmental impacts is more problematic than an increase for a product with a relatively lower impact.

Regardless of how impactful the companies regard the 2018 critique as being, there have undeniably been important changes in the industry since then. Several informants argued that there has been a renewed focus on sustainability since 2018, and they have begun to work more actively on sustainability related to soy.

5.1.1. Actions taken

When soy started getting a 'bad reputation' and negative coverage in the media, fear arose in the industry that soy would become the new palm oil. The use of palm oil in Norway has drastically decreased in recent years. The raw material gained much negative attention due to both environmental and health concerns. Multiple actors became involved in the effort to reduce or ban palm oil from the Norwegian market. Today, products are marketed as 'not containing palm oil' in Norwegian stores; "(…) It became a pariah product" (F1, 2022). Informant F1 further elaborated on how the company had expressed concerns that soy could receive a similar treatment as palm oil in meetings with suppliers. The Norwegian importers of soy for the fish farming industry realised that changes needed to occur. If they continued with the current policies on soy, they risked losing the Norwegian market. Significant changes have been made in the industry relating to soy since 2018.

In 2021, it was announced that the SC of the Brazilian soy suppliers to the salmon industry would become completely deforestation and conversion free, with 2020 as the cut-off date. This deal is historic, as no Brazilian soy suppliers had previously made such commitments (ProTerra, 2021). A driving force behind this agreement was the Aquaculture Dialogue on Sustainable Soy Sourcing from Brazil (ADSSSB), a dialogue group consisting of feed companies (i.e., Skretting, BioMar, Cargill Aqua Nutrition and Mowi), the certification standard ProTerra, and Brazilian SPC producers (i.e., CJ Selecta, Caramuru, and Imcopa). In addition to the dialogue group, companies in the salmon supply chain, including farmers and processors (i.e., Grieg Seafood, Lerøy Seafood Group, Cermaq, Norway Royal Salmon, SinkabergHansen, Aquascot, Hilton Food Group, Labeyrie Fine Foods) and retailers (i.e., Tesco, Ahold Delhaize, Coop UK, Marks and Spencer, METRO, Waitrose) have been in dialogue with Brazilian suppliers (ProTerra, 2021).

> This means we only have three Brazilian suppliers, which is unfortunate for our pricing. We, the Norwegian fish farming industry, pay millions for it. But it is the right thing to do. We are certain that the soy we buy is a) deforestation free, and b) it creates attention and a market for doing the job right. That taking all these considerations into account and being an ethical company pays off in the long run. (FF2)

There is immense pride in the industry over what it has been able to achieve with this agreement. Every informant mentioned it at length, and it was a recurring theme throughout the interviews. They all emphasised that leaving the Brazilian market is not the right way to tackle the environmental challenges soy production represents, as some organisations and politicians have suggested.

> (…) then we get very scared that if we were to stop buying Brazilian soy today, Brazilian farmers would say, 'Oh, look at those farmers that accepted not cutting down forests; they are losing their contracts anyway; it's just nonsense to do things the way the Europeans ask us to do them'. (F1)

They emphasise how they are leading by example, and if they were to move their operations out of Brazil, their hard work and practices would be 'eaten up' by other businesses with a lesser focus on sustainability. Working with suppliers is the industry's answer to how one should address the challenges soy production presents.

While emphasising the importance of having a presence in Brazil and maintaining the agreements that are in place, everyone agrees that the problematic aspects of Brazilian soy production need multiple approaches. Reducing the reliance on Brazilian soy in the feed was highlighted by several informants as an important sustainability measure. Donau Soja (DS) is a transnational organisation that emerged as a response to the environmental consequences soy production has in South America and the European reliance on the large South American suppliers of soy (Bentia, 2021).

> We have removed soy from South America from some of the feed. So, there are slightly different recipes. A feed is not just a feed; there are many different types of feed – size, quality, and where you are in production. But for two out of three fish producers, a feed type without South American soy has been chosen. (FF5)

An inclusion of European soy was shared by all informants, but the views on how much more sustainable European soy is differed. “When you look at the CO_2 footprint, European soy is much more favourable compared to Brazilian soy” (F2). Some informants highlighted that this is because forests in Europe were cut down hundreds of years ago. LUC is, consequently, not a concern regarding European soy, and it therefore have a lower carbon footprint.

> The certified soy we buy is guaranteed to be deforestation free after 2008. That doesn’t help because the Land Use Change (LUC) requirement is 20 years. So that means that you would have had to be deforestation free since 2002, and we haven’t. Meaning that the soy that has been deforestation free since 2008 also gets the LUC addendum, as if it had been grown on deforested land in the Amazon. (F1)

The informant further argued that due to the increased overview and traceability of their value chain, they were able to operate with primary data and that when these numbers and footprints were applied, Brazilian soy was amongst the raw materials with the lowest CO_2 emissions (F1). The soy purchased by Norwegian feed producers might have a relatively low carbon footprint, but once again, the global demand argument comes into play. An increase in demand for European soy would have far fewer global consequences than an increased demand for Brazilian soy. It is important to remember that the environmental issues the world is currently facing transcend climate change. Biodiversity loss and contamination of water are just two examples of the environmental challenges soy production poses. Furthermore, soy production does not only have environmental impacts. Social issues also arise because of soy production in Brazil. This is an element I have yet to find in literature on the production of European soy.

The impacts of the war in Ukraine have been strongly felt by the industry. The long-term effects of the war remain unknown, as it is still ongoing at the time this thesis is being written. However, at the time of data collection, the immediate effects were quite clear and strongly felt by the industry. Russian and Ukrainian raw materials became unavailable. The sourcing of European soy was greatly affected, as these countries play an important part in this production. Some informants were still able to source some European soy, but for the vast majority, the war meant a return to South America.

> We were sourcing as much as possible from Ukraine and Russia, and we were probably up to 20–30% European raw materials, but then the war came and that whole market disappeared. That was a blow below the belt, simply put. But then it became even more important that we had done the work with our Brazilian suppliers. We live well with having transitioned back to them. (FF2)

> We have taken the position of not trading with Russia, which means that we must look for alternative raw materials. Some may have a higher CO_2 footprint compared to certain Russian raw materials. Another effect is that it accelerates the implementation of new sustainable raw materials since we need alternatives. (F2).

Several informants expressed that they were hopeful that when the war ends, they would be able to continue their work with European soy. They also emphasise that, due to the work they have done with their Brazilian suppliers, their sustainability efforts are not compromised by the increase of Brazilian soy in their products.

5.1.2 Frustration in the industry

There is much pride in the industry, but also frustration, as well as a sense of always being portrayed as 'the bad guy', in a way they do not agree with. This particularly holds true for their use of soy. Soy is often perceived as negative, and all the informants experienced the debate around soy as unnuanced and lacking in information. There seemed to be exhaustion from having to continuously defend their use of soy and being misunderstood.

> When I talk to people about soy, there is an underlying basic principle that soy is bad and that we should stop using it. I think that is due to a lack of knowledge about it, but soy is problematic because it is produced in a country that is important for biodiversity and GHG emissions. (F1)

> I think soy has gotten an undeservingly bad reputation. I really wish we could have a more balanced discussion. I think it is a bit scary to demonise one feed ingredient; rather, there should be a bigger focus on the positives and negatives of an ingredient. (FF4)

> I want to preface this by saying that the bad guy is not always soy. There could be other raw materials that do worse in terms of greenhouse gas emissions or other sustainability parameters. (FF6)

Furthermore, there appeared to be frustration with the lack of acknowledgement of the sustainability measures the industry have taken. The public debate and image portrayed of them seem to overlook all their hard work, especially their deal with their Brazilian suppliers. "We work much more intensely with [sustainability] than what outsiders looking in get an impression of" (FF2). Another informant noted that "we have not been, we are not very good at talking about what we have done" (FF3). In discussions about the sustainability of soy and how they evaluated their use of soy, it became quite clear that they were expecting me to be negative, that no one wanted to write about soy unless they were opposed to it.

In 2021, the Norwegian government launched its aquaculture strategy, *Et hav av muligheter*. An important part of this strategy is to ensure sustainability in the industry, and feed is an integral part of this. In discussions about the food of the future, soy is featured prominently. "Soy cannot be produced in Norway, and if it is to remain an important part in the feed of the future, it is important to ensure that this production is sustainable" (Nærings – og fiskeridepartementet, 2021, p. 48, my translation). The need for sustainable feed was further emphasised in Norway's 2023 *Eighth National Communication: Under the Framework Convention on Climate Change,* underscoring how changes to the feed composition and an optimalisation of feed use are integral to reducing the climate impact of the fish farming industry (Ministry of Climate and Environment, 2023).

> I completely agree [how soy is described in the strategy]. And then I also scratch my head over why only soy is emphasised; it should highlight everything that is produced… At the same time, such a description implies that soy is not sustainably produced today, which I would contradict. (F1)

> Yes, it is a large part of the recipe, so it is an incredibly important raw material. And when we produce as much feed as we do in Norway, meaning large quantities, it is important to act carefully. That you are sure of who you are buying from and that you do the necessary investigations to uncover risks. Most of the criticism directed at soy from Brazil is about deforestation; all soy in the Norwegian farming industry is deforestation free. (F2)

The informants agreed with each other and the government that ensuring sustainable production of soy is integral if it is to remain an important part of the feed. However, as expressed by F1, some questioned the sole focus on soy and disagreed with the implication that today's production of soy is not sustainable. There appears to be a clear desire within the industry for a more nuanced discussion of feed and sustainability. Several informants questioned the explicit focus on soy and hoped for a broader focus.

5.1.3 The consumers

A business is nothing without its consumers. While environmental movements and the media hold influence, consumer opinion is clearly the most important. "Yes, to a certain degree, it [the environmental movements reports] has influenced us. However, the main pull, comes from the actual customers" (FF2). Sustainability has increasingly become an important topic for consumers, and multiple informants have experienced an increased interest in the sustainability of their company. Consumers request information to back up the sustainability claims to a much greater degree; some informants argue that it has become a requirement.

> It has become a demand from consumers and financial institutions. I have worked in this company for 6 years, and the first 3 years there were hardly any questions from sales, consumers, or buyers about documentation on soy, for example. Today, we get multiple requests every month. (FF1)

Many of the companies operate business to business, meaning their consumers often are professional buyers.

> (…) So, in that market, we notice that our customers are more concerned with information, such as information about where the fish is from and other conditions such as climate emissions. It can be used with soy, right? Information around the kind of soy that is used is information that is requested. It can be how much fish is used to produce our fish; that's an area of interest. It's a need for information that our customers have, who to a large degree are professional buyers in larger malls and other large consumers and processing facilities in Europe and other places. (FF6)

Knowing where raw materials originate from and how they are produced is necessary as sustainability becomes increasingly important in society and more and more consumers – both professionals and otherwise – become aware of the challenges soy presents. Not knowing is simply not good enough in today's political climate in Europe.

Consumers must trust the product. This trust is not built on knowledge about how products are produced; rather, it emerges from vested trust in retailers, brand names, certifications, or the limited information given by retailers and media (Franz & Rolfsmeier, 2016, p. 272). Several of my informants noted that the Norwegian market was less critical and asked fewer questions about the production of salmon than the other markets they exported to. This does not necessarily mean that Norwegians are less concerned about the environment. It might be due to the high degree of trust in Norwegian society. The Norwegian Citizen Survey from 2021 revealed that Norway is characterised by a high degree of social and institutional trust (Direktoratet for forvaltning og økonomistyring [DFØ], 2021).

5. 2 The global market

The Norwegian fish farming industry is part of a continuously growing global market. "The whole food production industry has become global. The raw materials that are acquired are from all over the world in all feed production, independently of whether it's feed for salmon, beef, or pork production" (FF5). The Norwegian fish farming industry imports and exports to countries all over the world. The fish farming industry as it exists today would not exist without the global market. As the industry grows, so does the demand for raw materials.

> We are in very exciting but demanding times when it comes to the sourcing of raw materials. It is important to keep in mind the global perspective on the demand for raw materials. It is easy to become self-centred and only focus on what takes place in Norway. But that would be wrong. (FF2)

Aquaculture is the fastest-growing food production sector in the world, and in the years to come, sourcing raw materials will present a challenge. It is important to keep the global demand for raw materials in mind, as it shapes the Norwegian industry. However, the focus of this thesis is on the Norwegian perspective.

5.2.1 The dependence on import

The Norwegian fish farming industry is dependent on imports. In the feed produced in 2020, 91.7% of ingredients were imported (Aas et al., 2022b). The majority of ingredients with Norwegian origin were marine raw materials, such as fish meal and fish oil (Aas et al., 2022a). While several informants expressed an aspiration for more locally sourced raw materials, they were also in agreement that being a part of the global food market is essential for the industry. They emphasised how important exports are to their business. "I think the Norwegian market consumes about three to four percent of what is produced. The rest is exported" (FF2). The industry has customers all over the world, but the most important market is Western Europe. This does not mean that the Norwegian market is unimportant or holds no influence, but the EU market is far more important. The importance of the European market also means that it greatly influences the industry. European consumers and EU legislation shape the industry. "The European Directorate-General for Health and Food Safety, especially their taxonomies, will be very defining for how we operate. That is what matters to us because we sell large quantities of fish to those markets" (FF2).

The Norwegian fish farming industry produces extremely high volumes of fish yearly, and the subsequent need for feed reflects production volumes. The quantities needed for production are higher than what the Norwegian market can deliver. In reflections on the dependency on imports, the need for imports to sustain the current production volumes was a frequent theme amongst the informants.

> We produce so much food in Norwegian fish farming that there is not a chance that Norway could stand for a large share of the raw material production. We simply do not have enough agricultural land for that. We are totally dependent on world trade. (F1)

Furthermore, the importance of producing raw materials effectively was highlighted.

> And then it's a bit about sourcing the raw materials from where they are most efficient to produce – so we can't make soy in the mountains; it's about having raw materials that are produced in a way that gives the lowest possible environmental footprint. (F2)

Informants also argued that Brazil is ideal for soy production. Therefore, it is both effective and economically smart to keep production in suitable areas, such as Brazil.

5.2.2 Differentiation and diversification

The dependency on imports has been felt strongly as the world economy has experienced several shocks in recent years. The COVID-19 pandemic and Russia's invasion of Ukraine are examples of events that have shaped the availability of resources. These events have highlighted how intertwined the world economy is, and questions are being asked about vulnerabilities in the economy.

> So, we saw that now during corona that there were problems, it created enormous challenges for us when it came to sourcing raw materials, but we managed it. (F1)

> (…) The more raw materials we have, the less vulnerable we become. If we lock ourselves up in only soy, fish meal, or fish oil, a few big raw materials, we become very vulnerable if something were to happen. We can see that now with raw materials originating from Russia and Ukraine, which are important suppliers. After the invasion, feed prices have doubled. (FF1)

> The challenge right now is accessibility and uncertainty about delivery time, and this is a reason why we would like more local raw materials. We should have more differentiation, perhaps. An increase in national and Scandinavian. Closer. I think that more local raw materials can be a positive development in the future. If we can make that happen, supply security will improve. (FF6)

Informants express that supply security is a threat and a challenge to Norwegian fish farming, as they might not be able to access key ingredients or the quantities needed. Diversification or differentiation is proposed as an important step in ensuring supply stability and making the industry less vulnerable.

> With that being said, feed producers are very good at differentiating raw materials. We would be in a much more precarious situation if they didn't have a forward-leaning attitude and a good focus on differentiation. So, what I am talking about is getting raw materials from different parts of the world in the basket so that you get a better risk distribution. (FF6)

An important aspect of diversification efforts in the fish farming industry is the search for alternative or novel raw materials. How the industry views alternative raw materials and what has been done in this realm is discussed in depth later in the thesis.

5.2.3 Traceability and transparency

Key steps in ensuring sustainability in food production are traceability and transparency. The importance of traceability became particularly clear to the Norwegian fish farming companies when they were facing criticism from the environmental movement in 2018.

> When this report highlighted the areas that these farmers had carried out the criminal acts, we were not able to tell if they had delivered [soy] to us or not because we didn't have information about it. (F1)

A consequence of the critique in 2018 was a greater focus on having a complete overview of the entire food supply chain. F1 further elaborates,

> But then we woke up, because certifications alone are not enough. We need to have much more control. We already had our code of conduct that said all suppliers must agree to respect human rights, workers' rights, and things like that. The new thing was that we now had our suppliers apply our code of conduct throughout their value chain. (F1)

The necessity and importance of traceability are recognised by all informants, and they agree that they now have a good overview of their operations. However, on a detailed level, some interesting differences amongst the informants exist. When asked if they had a complete overview of the food supply chain of their feed, some informants expressed that they had a full overview; "I want to say yes, because we have an overview and can trace a batch of feed delivered to our facilities" (FF1). Another informant argued similarly, while emphasising the importance of the feed producers; "We can trace everything back, and so I can relatively quickly trace, in a couple of hours, everything that is in a specific feed. But then I have to go through the feed suppliers" (FF4). Others argued that while they have a good overview of the food supply chain, it is not perfect; "Yes, we have an overview of [the food supply chain]. But we are not able to document everything well enough" (FF3). In a similar vein, others noted that 100% certainty is not possible; "I can't say 100%, that I can't do it. But as much as is possible with the documentation from our suppliers" (FF5).

Certification schemes are a key part of the traceability and transparency claims of the industry. All informants continuously underscored that only certified soy is imported and used in the feed. "We make demands on the soy we buy, which is certified through ProTerra or RTRS, which are very strict certifications when it comes to traceability, deforestation, social aspects, and Indigenous people. The whole package" (FF2). The informants further argued that such certifications entail the involvement of third parties. "When it comes to soy we buy only certified raw materials, which means that an independent certification body have checked that it is produced in accordance with the stipulations in the certification" (F2).

Several certification schemes are in place for the global trade of soy. The certification scheme most frequently mentioned in the interviews was the ProTerra standard. The ProTerra Foundation was a key facilitator in the development of the dialogue group and the following agreement with the Brazilian suppliers. Certification schemes are not guarantees for ethical and environmentally conscientious behaviour, and they have been critiqued on several grounds. In the eyes of the Rainforest Foundation, the ProTerra standard has some weaknesses. "The criteria's in the ProTerra standard are strong and decent enough, but there is something about the ProTerra organisation itself which is not very trust inducing" (Rainforest Foundation).

Several members of the board of directors at ProTerra hold dual roles, as they also represent ProTerra member companies. An example of this is Brad Riemenapp, who is CEO of the FoodChain ID Group, which is a certification and auditing company that is an associated member of ProTerra. Jochen Koester is the managing director of AgroTrace, a commodity brokerage firm, and a full member of ProTerra. Augusto Freire is now CEO of value chain consulting but was previously CEO of Cert-id, a company that provides third-party certification programmes, including ProTerra certification. Other members, such as Trygve Berg Lea, have close ties to the fish farming industry. Lea worked for the Norwegian feed producer Skretting between 1992–2021, and ProTerra does not disclose when he joined the board (ProTerra Foundation, n.d.). As the board of directors supervises the secretary and has legal responsibility and financial decision-making authority in the organisation, this could be viewed as a conflict of interest (ProTerra Foundation, 2019b).

"There are some red flags in the system. I am not saying that it is not credible, but it is a bit fishy when there are so many from the customer group that are a part of the ProTerra Foundation itself. This alone is not sufficient to say it is not good enough, but it gives grounds for questioning it" (Rainforest Foundation). As noted by the Rainforest Foundation, this alone is not enough to draw conclusions about ProTerra, but it does raise some questions. For an organisation working to ensure traceability and transparency in the supply chain, little transparency exists into how the organisation is run.

5.4.4 The influence of the Norwegian fish farming industry

The informants all showed a great deal of pride in the work they have done in Brazil and the agreement with the soy producers that has come into place, as well as how this agreement has the potential to influence more than the trade relations between the Norwegian fish farming industry and Brazilian soy producers; "(…) I do think it has the potential for a trickle-down effect on other parts of the livestock industry, especially in Europe" (FF4). In the argumentation on why they have stayed in Brazil, their influential power is highlighted.

While agreeing that they have a certain amount of power in the industry, most of the informants emphasised what a minor role they, and the Norwegian fish farming industry in general, have in the global soy market. They argued that contrary to what is often perceived in Norway, the companies do not hold the kind of power and influence in the global market that many believe. It was noted that a kind of arrogance exists in Norway, through which we overestimate our

place on the world stage. “We are a small country that loves to be noticed, and thinks that the noise we make does have global repercussions. However, when it comes to soy, we overplay our role” (FF2). This sentiment is also apparent in the outlook on alternative raw materials where there is put emphasis on the global demand for raw materials.

Some argued that the Norwegian fish farming industry has very little influence. Using the proposed resource rent tax as an example of their inability to influence Norwegian politics, “I don’t think our power to influence is that great. The political guidelines and all that are way over our heads” (FF3). One informant emphasised that it is important to not minimise the Norwegian fish farming industry’s influential power. “I strongly disagree with those who say our voice don’t matter and that there is no reason to make demands – that is like not voting because your vote won’t make a difference – such an attitude should one be very careful with” (FF6). This statement aligns with the environmental movement’s view on the Norwegian industry’s potential impact; “(….) and through this deal with the Brazilian producers they have showed that they can be game changers and play an important role” (Rainforest Foundation).

5.3 Alternative raw materials

Feed is the most important contributor to GHG emissions from the production of farmed salmon. Furthermore, it is the largest expense. Finding raw materials that are both environmentally sustainable and economically viable was expressed by informants as a key focus in the industry. Salmon is a carnivore, and as previously discussed, the change to a mostly vegetal diet has been challenging. Feed production is complicated, and simply adding or subtracting ingredients is not always possible. The development of alternative raw materials is therefore not a straightforward process.

Innovation is described as at the core of company operations by most informants. In the interviews, the large body of work on alternative protein sources was emphasised, and the informants highlighted that this work is a priority. In recent years, multiple alternative protein sources have been explored. Lennartsson et al. (2011) find that the fungal biomass from spruce and birch can be used as a replacement for fish meal in feed (p. 1404). Sharma et al. (2018) similarly found that yeast cultivated from brown seaweed and spruce wood has the potential to replace some traditional fishmeal. Sánchez-Muros et al. (2014) conclude that the use of insect meal as a protein source in fish feed is technically feasible (p. 16), and the Sintef project CalaFeed is currently working on enhancing the potential for the zooplankton Calanus as an

aquafeed ingredient (Sintef, 2021). These are a few examples of the efforts currently being made to develop new raw materials.

The development of algae oil is amongst the most influential developments. Algae oil has emerged as an alternative to fish oil, and almost every informant emphasised this as a key development when discussing alternative raw materials for feed. Algae is one of the most established alternative raw materials; some informants even questioned its status as an 'alternative' raw material given its widespread use. However, when examining the ingredients used in Norwegian salmon feed in 2020, algae remain a very small component (Aas et al., 2022b).

The informants perceive the focus on developing alternative raw materials as shared with the government. The need for innovation is a prominent theme in government strategies. In the 2021 governmental strategy *Matnasjonen Norge*, the societal need for 'green solutions' is emphasised, and innovation is presented as key to responding to current societal challenges (Landbruks- og matdepartement et al., 2021).

> Because the Norwegian government has an ambition to produce, to a much greater extent than today, raw materials for salmon feed nationally. They acknowledge that increasing Norwegian production would mean increased security for Norwegian food production and the Norwegian economy. It is the kind of industrial fairy tale that we might actually be a part of. We are not an agricultural nation, right? Both due to the climate and because of the soil, the limited areas with good soil are where our cities are, and they grow and grow and eat up more and more topsoil. So how do you make food? You must make feed raw materials out of things that can't be used for human consumption. They have a great focus on that, and that is understandable. (FF2)

Informants argued that the development of alternative raw materials presents opportunities for the Norwegian economy. A Norwegian production of alternative raw materials would therefore be beneficial for both the Norwegian fish farming industry and the national economy.

In reflections about the dependency on imports, several informants emphasised that they would like more Norwegian raw materials. Norway is not suited for large-scale agricultural production. However, developmental potential in the Norwegian production of alternative raw materials exists. While the informants acknowledge this Norwegian potential, they highlight that the most important thing is that development happens, not necessarily where it occurs. "If it happens in Norway that's great, but for us as a company the most important is that it happens, so if it happens in Europe that is great as well" (F1).

The informants collectively emphasised novel raw materials, meaning raw materials cultivated in new ways. The commonality amongst these new ways of production is that they do not depend on agricultural land.

> We have a strong belief in insect meal. We are currently using that. We also believe in cultivating unicelled organisms. Simply put, cultivation involves bacteria or fungi. Or have other fermentation techniques so that you can take these bacteria or fungi, which often contain a lot of protein, and grind them up. We really believe in that, and then you produce protein in tanks without having to use large agricultural areas. (F1)

> And we imagine that more new raw materials will be implemented in the future. Especially single-cell protein, which is very exciting. We have, among other things, made protein from fir wood, meaning waste from wood. So new raw materials are something we prioritise. (F2)

While the informants were happy to discuss the need for raw materials and what they had achieved so far, there was a reluctance to discuss what they were currently working on and where they would go in the future. They would remark that they had several projects in the works but were not willing to share what those were or which they believed in the most. Informants further remarked on how aquaculture is a competitive industry and how the different companies are wary of each other.

> Globally, salmon is already a luxury product, and it is hard to differentiate a luxury product with a little extra luxury because it is already expensive for the ordinary middle class out in the world. So, you don't necessarily earn anything by being first with something, but if a lot of players take the leap and you are left behind, you will get harshly punished. (FF2)

It is worth noting that while there is a great focus on the development of alternative raw materials, according to the informants, the actual use of them seems low. Between 2016 and 2020, few changes to feed composition occurred. Ingredients such as insect meal, single-cell proteins, fermented products, and microalgae comprised only 0.4% of the feed ingredients in 2020 (Aas et al., 2022b). The vast majority of alternative feed ingredients are in the beginning stages of development, and it remains to be seen whether they are possible to upscale.

5.3.1 Feed factor

In discussions of alternative raw materials for feed, the feed factor is important to keep in mind. The importance of understanding the feed factor was mentioned by the informants. Feed supplies the fish with nutrients, and a central part of the sustainability of fish farming is how effectively the feed is converted into finished fish. How much energy and nutrients are required to produce the feed and how well the fish convert them is not only a question of environmental resource efficiency but also of economic sustainability. However, to only consider the number of kilos of feed needed to produce one kilo of fish is much too simplistic. A better measurement of resource efficiency in fish farming is therefore to compare the energy and nutrients in the finished fish and in the feed (Barentswatch, n.d). Informants expressed that outsiders' critiques of the current feed lacked an understanding of the complexity of feed production and the role of the feed factor. "If you use another raw material that allows you to half the consumption of soy, but the feed factor doubles, then you are just as far. In that scenario, you haven't really had a reduction in the consumption of soy" (FF1).

5.3.2 The problem of upscaling

The Norwegian fish farming industry requires large volumes and stable supplies, and upscaling is identified by the informants as a major challenge in the development of alternative raw materials. At this point in time, most alternative raw materials are in the starting phase of production, and producers are still not able to deliver the quantities needed by the fish farming

industry. Furthermore, development takes time. Some of the alternative protein sources being discussed are still hypothetical or in early development. “What is unfortunate with these things is that it takes time. It’s not like we can sit and discuss and then have the solution ready in two years. It will most likely take 5, 10 or 15 years before the volumes are large enough” (FF1). This is further exemplified in thoughts about the use of algae. “We started the journey with algae in 2012, and it took us 10 years to reach industrial volumes” (FF2). Several of the informants expressed the need for the industrialisation of alternative raw material production.

The fish farming companies and feed producers seem to agree that this is an area where they want the authorities to be more present. Most informants noted that they experience the current legislation as an obstacle to the development of new feed ingredients. “I think there is a lot of talk about financial support and boast and cutting cords at the openings of new small factories, but the foundation for scalable production might not be there” (FF1). Several informants noted that much of the government support is aimed at helping companies start up, not scale up. Scaling up can be costly, and several of the informants feel that the initiatives currently in place are not sufficient. “You could say okay, it is the fish farming companies’ role to pay a little extra for these raw materials, and to some degree we do, but I think there should also be an effort from the government and the industry” (FF4). In 2021, the Labour Party (Arbeiderpartiet) and the Centre Party (Senterpartiet) won the parliamentary election. The Centre Party is an agrarian political party, and some of the informants expressed disappointment in the lack of governmental support and an experience of more words than action. “It [the development of alternative feed ingredients in Norway] should fit well in today’s political climate, where the districts/rural areas are in focus. Yet I can’t see this focus” (FF4).

5.3.3 Not a substitute

Consensus exists amongst the fish farming industry, government, and environmental movement that alternative raw materials are necessary. The fish farming industry is, however, clear on the fact that alternative raw materials will be an addition to the current feed ingredients. Alternative raw materials are not viewed as a way to substitute soy. “It is important to us that we don’t remove items from the toolbox we have today to produce feed, but that we add to it” (FF2). The industry further argues that it cannot afford to leave raw materials behind, as the expected growth in aquaculture will lead to an equivalent increase in demand for feed.

> We will do it [search for new raw materials] because we need more raw materials in the future. (F1)

> New raw materials and all that are great, but we look at them as extras, not as substitutes. Because we are going to need so much extra if we cut out our established raw materials that we have today. (FF2)

The time it takes to develop alternative raw materials is used as an argument as to why they cannot be substituted. There is expected to be growth in the industry while simultaneously striving to reach climate agreements, such as the Paris Agreement. In this scenario, there is no time to wait for alternative raw materials that might be upscaled. Rather, the industry argues that continued work on current raw materials is as important as the development of new raw materials.

5.3.4 Working towards a circular economy

Many of the informants highlighted how they want the industry to become more circular through better use of land animal by-products (LAP). Important reasons why there is not widespread use of LAP are public opinion, as well as strict regulation. Norwegian and EU legislation have strict regulations on what kind of animal by-products can be used to feed which animals and how these by-products must be processed in a particular way before they can be used as feed (Mattilsynet, 2022). In 2001, legal relaxation regarding LAP occurred; despite this, there is still a market reluctance by SC to incorporate such products. The rationale behind reluctance to use LAP is negative consumer reactions (Shepherd et al., 2017). "Blood meal, for example, is a great source of protein, but today it is prohibited, or I guess technically it is legal, but it is not used, and that is at least partly due to the history with Mad Cow Disease. So, that is a raw material that has not been discussed" (FF1).

Bovine Spongiform Encephalopathy (BSE), or Mad Cow Disease, as it has become most commonly known, is a serious neurodegenerative disease most often found in cattle, and in rare instances it can affect humans. The disease was first detected in the UK in 1986, and 10 years later, beef exports from the UK were banned by the European Commission (Anyshchenko & Yarnold, 2021, p. 394). By 1988, the knowledge of the disease had grown, and it was hypothesised that the disease had evolved due to scrapie, an encephalopathy found in sheep, that had been transmitted through cattle being fed contaminated meat and bonemeal

concentrates (Anyshchenko & Yarnold, 2021; Fisher, 1998). This hypothesis has since been challenged, and the view on the mode of transition has changed. Yet, cattle being fed the remains of other cattle is the source of most BSE spread, and control over animal feed is the most effective measure in the effort to eradicate the disease (Fisher, 1998, p. 218). The history of BSE is an important factor in the strict EU and Norwegian legislation.

Choosing not to use LAP due to negative consumer reactions is not unique to the Norwegian context; Shepherd et al. (2017) similarly finds that retailers in the Scottish fish farming industry did not view LAP as a food safety issue but as an issue of public opinion. The industry accepted that the customers do not want this policy to change (p. 57). However, this does not mean that it is impossible to use animal by-products in feed production. There are examples today of fish farming companies collaborating with the poultry industry. Furthermore, some informants expressed that it might be time to incorporate LAP despite public opinion due to the environmental benefits. The legislation makes the process more time consuming and presents some hurdles, but where there's a will, there's a way.

By-products from animals are not the only ones of interest. Agricultural by-products have also been discussed. This is once again an area where algae oil was mentioned by the informants. "Algae production is a process that is based on residual products from sugar production. Then you also get a lower carbon footprint. That [algae oil] is a product that has increasingly been used in recent years" (FF1). Likewise, yeast cultivated from spruce wood can be produced from waste from timber, and insects can be grown from waste from humans.

5.4 The cost of sustainability

An important topic that arose in considerations about sustainability was the cost of taking sustainability measures. The informants emphasised that choosing the more sustainable alternative is often also the most expensive alternative. "Usually, investments are needed to bring about new sustainable solutions, so you are dependent on customers that are willing to pay for it or incentives that make it more beneficial to make sustainable choices" (F2). One informant further argued that if the cost of salmon increased due to high feed costs, it might lead customers to less sustainable alternatives.

> We can get hold of raw materials that are of higher quality in terms of sustainability, but they come at a much higher cost. The price of salmon would significantly increase, and consumers might not be able to afford it anymore. Salmon might then become unavailable to a large group of consumers that will then buy other protein sources such as pork, beef, and chicken, which have a higher carbon footprint. (FF4)

This echoes the statement that salmon is already a luxury product and therefore hard to diversify through making it a little more luxurious, namely through sustainability measures. At the same time, the industry recognises that it can afford to take costly actions. "We have taken the largest and most cost-bearing measures. Because we can take measures that the Norwegian livestock industry simply cannot afford" (FF2).

Cost is also a key component in discussions about alternative raw materials. Novel ingredients are often more costly than established raw materials. Feed is the largest expenditure in the production of farmed salmon. Informants expressed a willingness to pay for sustainability and, as emphasised by FF2, their ability to take measures that other actors in Norwegian food production cannot afford. At the same time, economic sustainability is at the core of decision-making. Several informants expressed a high level of motivation for innovation and the development of alternative raw materials as a way to reduce feed costs. In other words, the focus on the development of alternative raw materials is driven by multiple drivers.

The environmental movement argued that while sustainability might be costly from a short-term perspective, the cost of not taking sustainability seriously will be much higher. Taking measures to ensure sustainability today is an investment in the future, as agricultural practices are completely dependent on natural resources. Representatives from the environmental movement further argued that the environment is the natural resource base for our economy. Neglecting to take measures today will have long-term effects on both the environment and the economy. Stressing the need to look beyond the short-term perspective, the informants recognise the need to protect the environment, as they are all keenly aware that they are dependent on it. Nevertheless, to some degree, they use the fact that they are the 'most sustainable' meat option to continue their current operations.

5.5 Summary: empirical analyses

In this chapter, I have presented and analysed the themes that emerged from interview data and governmental documents. The analysis has aimed to illuminate the research questions: 1) *How does the Norwegian fish farming industry evaluate its use of soy?* 2) *What type of image does the Norwegian fish farming industry want to convey?* and 3) *How does the Norwegian fish farming industry work to find alternatives to soy*?

The evaluation of the use of soy centres around the actions the industry has taken, the demands they make, and the agreements in place. The informants are clear in their statement that the current use of soy in the Norwegian fish farming industry is sustainable. The problematic aspects of soy production in Brazil are acknowledged, but the informants argue that the measures taken ensure that the soy is up to par. The explicit attention given to soy is critiqued by some of the informants, who argue that focusing solely on one component of the feed is misguided. Rather, they argue that a more holistic approach to the sustainability of feed is needed.

The informants express a great deal of interest in how the industry has worked with their Brazilian suppliers and the outcome of these efforts. They perceive themselves as a sustainability-focused industry. Following this, a sense of disappointment in the way they are being portrayed can be observed. Informants argue that their sustainability efforts go under the radar and that the industry must become better at communicating how intensively they work with sustainability. The informants describe the products that they produce as the most sustainable meat alternative on the market. Furthermore, they present the industry as a trailblazer that makes demands on soy that no one else does.

Innovation is described by the informants as being at the core of their operations. All informants underscored the importance of developing alternative raw materials but agreed that these should not be a substitute for the existing components of the feed. While the informants emphasised that they were working on or championing development, they were reluctant to disclose specifics. The work on alternative raw materials was highlighted by the informants as an area of great importance. However, the alternative raw materials have yet to make it into the feed, as the changes in feed composition between 2016 and 2020 were minimal.

6 A theoretical perspective on the views of the Norwegian fish farming industry

In this chapter, insights from the theoretical framework and empirical analysis are combined to further illuminate the research questions. Additionally, excerpts from Norwegian fish farming companies and feed producers' sustainability reports and websites have been included to give further insights into the views of the industry. Moreover, the inclusion serves as an indicator of how indicative my findings are beyond my case study. The theoretical discussion has five main parts. Firstly, the Norwegian fish farming industry is placed within the larger context it is a part of. How relations of power and trust within the food supply chain influence the industry and shape its decisions is discussed. In the second part, the CSR of the industry and how that impacts their evaluations is presented. How informants relate to the concept of sustainability and why definitions matter is discussed in the third part. Fourthly, informants' views on the future of soy in Norwegian fish farming are introduced. The last part introduces how the industry places itself in the future of food production.

6.1 The food supply chain of Norwegian farmed salmon

In its beginning, the Norwegian fish farming industry was primarily based in Norway, with feed consisting mostly of marine raw materials. In the 1990s, growth in the industry created new demands, and as a response, changes were made to both the feed and how it was produced. These changes created a food supply chain that is geographically more extensive, relying on raw materials from multiple regions. Amongst the most important of these is Brazilian soy. Brazil has become one of the world's largest producers of soy, and the political climate in the country has facilitated such production.

Food production is deeply complex and, at times, hard to track (Pullman & Wu, 2012). Soy is often produced in bulk. Defining traceable units is complicated by bulk production, as it involves the splitting and blending of individual batches, making it hard to tie information to specific units (Thakur & Donnelly, 2010, p. 99). However, in the Norwegian context, this differs due to the agreements they have in place with their suppliers.

The food supply chain of which the Norwegian fish farming industry is a part is complex. It is a global food system that sources raw materials and distributes products globally. The food supply chain consists of a multitude of suppliers and processors. The aim of this thesis is not to

examine the entire food supply chain of Norwegian farmed salmon but to examine soy and its role. The following description therefore describes soy's place in the supply chain.

The starting point of production is the farmer. Farmers purchase seeds from seed companies, and the crops are sold to an elevator after harvest. The elevator is the link between the farmer and the processor. Elevators keep the soy in storage, blend it, and sell it to processors. The transportation of the crops from the elevator to the processor is usually done by railcar. At the processors, the beans are stored in silos until they are ready to be processed. The result of the processing is soy oil, soy meal, and SPC (Thakur & Donnelly, 2010). The role of soy in the food supply chain of Norwegian farmed salmon is detailed in Figure 3. In fish feed, SPC is used, and this is what is imported by the feed producers. The fish farming companies negotiate feed agreements with the producers, and feed is delivered accordingly. Fish is then grown, slaughtered, processed, and exported (Valumics, 2021).

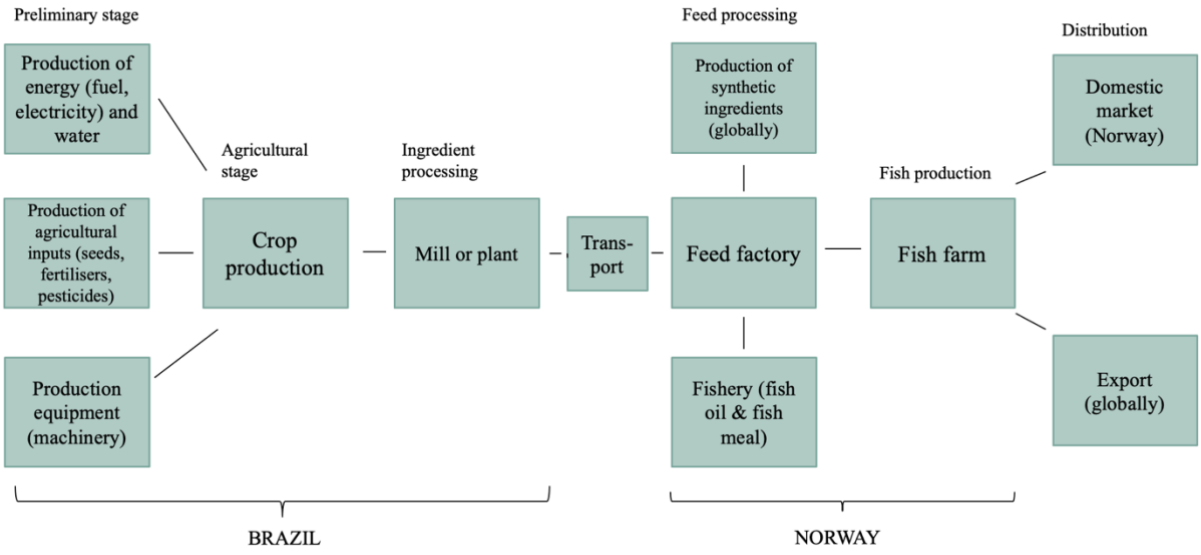

Figure 3 Soy in the Norwegian farmed salmon food supply chain

The focal point of the supply chain is the fish farming companies, who provide contact with the customers and deliver the finished product. Through certification schemes and standards, the fish farming companies govern the supply chain in many ways. The finished product is overwhelmingly associated with fish farming companies; few consumers think of the soy farmers in Brazil when examining a fish fillet in the grocery store or when eating it for dinner. Hence, the food supply chain is not apparent from seeing the finished product. As the focal

company in the supply chain, the fish farming companies have had to take on the environmental responsibility and social performance of their suppliers. In the critique from both the environmental movement and the media in 2018, it was clear that the fish farming companies were perceived as the responsible party.

6.1.1 Power

Power relations are a fundamental part of all business-to-business relationships. The informants expressed a contradictory view of power in the supply chain. On the one hand, they continuously referenced the work they have done with their Brazilian suppliers. The ADSSSB showcases the fish farming industry's instrumental power. "From 2020 we have forced our suppliers to be third-party certified deforestation free in their entire supply chain" (FF2). In discussing the agreement, they emphasised that this commitment is something the suppliers would not make of their own accord. Rather, it was the specific demands from the Norwegian fish farming industry that made them change their behaviour, indicating that in the relationship between Norwegian feed producers and fish farming companies, and Brazilian soy suppliers, the power lies with the former. On the other hand, the industry downplays its instrumental power by stressing how small a player it is and claiming that while it holds some influence, it cannot exert much of an impact on the soy industry.

The Norwegian fish farming industry has been involved in and essential for the development of several private certification schemes and standards. This is the manifestation of the industry's structural power. In Brazil, the fish farming industry is in a position where it supplements Brazilian authorities. The informants emphasise the key role they play in maintaining these certifications.

> I think it would be unfortunate if the Norwegian fish farming industry were to pull out of Brazil. It would leave a gaping hole, and it is not certain that the ones that take over would follow up on the certification schemes that are in place today. (FF4)

Economic activities are grounded in social, cultural, and political processes. Brazilian politics are shifting, especially regarding the environment. Brazilian politics have facilitated the expansion of agricultural production, such as soy, meaning that much of the logging taking place in both the Amazon and the Cerrado has been legal. However, being legal is not equivalent to being environmentally conscientious. Brazilian authorities have been criticised for

facilitating industrialisation and agricultural expansion at the expense of the environment, vulnerable nature, and Indigenous people. Changes in the Brazilian leadership drastically alter the measures taken to protect the environment and combat deforestation. Some of the informants acknowledged that the political situation in Brazil is an obstacle to ensuring sustainable production of soy.

> It is always a consideration, and if it turns out that it cannot be guaranteed that it [soy] is deforestation free due to the political situation in Brazil, then that is something we have to take seriously. (F2)

The Brazilian government's varying focus on conservation and, at times, lenient legislation towards expansion into vulnerable biomes have opened up for corporate actors to govern sustainability efforts in Brazil. Private certification schemes and standards are an integral part of this, and companies make stricter demands on production than local legislation dictates. However, it is important to note that there are important differences between private governance and the actual government. These 'soft laws' are not mandatory and do not carry the force of the law (Nilsen et al., 2018, p. 3150).

However, as Dicken (2015) argues, states have not been stripped of all their power. The Norwegian government's GM policies greatly shape the industry's operation. The non-GM requirement determines the options for the industry regarding where they should source raw materials from. The US and Canada are amongst the largest producers of soy. All this soy is GM, and this market is therefore not available to the Norwegian fish farming industry. These restrictions take away some of the industry's bargaining power, as they must adhere to standards most players in the global soy market need not consider. Furthermore, while the Norwegian fish farming industry might not be the most powerful player in the global soy market and must adhere to some specific standards, their actions have had global effects. Comparably, Backhouse et al. (2022) find that the social movements campaigning against the intensive use of soy in South America are not able to move beyond the local scale. At best, they have been able to limit the use of pesticides locally.

Although consumers have been a theme explored in this thesis, they have been examined from the fish farming industry's perspective. The consumers are important because they greatly impact decision-making in the industry. No data has been collected on the public's view of the

industry in this project, making it hard to evaluate the trust the public has in its expertise, capacities, and intentions. Internationally, the Norwegian fish farming industry has a good reputation. The heated debates about salmon farms have been largely national (Hynes et al., 2018). As noted by the informants, the most important consumers are not Norwegians but Europeans. To understand the political legitimacy of the Norwegian fish farming industry would therefore require an investigation of public opinion in multiple countries, making it a large project.

Value is generated through the supply chain, but its distribution is unequal. Agricultural production has experienced significant changes in recent decades. The introduction of monocultures signalled a move towards focusing on making food retail products cheaper to produce. A result of this shift is a change in value distribution along the food supply chain, with processors and retailers now capturing most of the value as opposed to farm inputs (Lang & Heasman, 2004). As most fish farming companies are producers, processors, and retailers, they can benefit from this. Farmed salmon is a luxury product, and fish farming is a billion-dollar industry. In Norway, the term 'salmon billionaire' has emerged to describe those who have built their wealth on the production of farmed salmon. As highlighted by the informants, feed prices have increased in recent years; measured in Norwegian kroner (2020-NOK), the price increased by 50% between 2005–2020. To understand the increased cost of feed, it is important to keep in mind that the industry is part of a global market. The input factors in fish feed are listed in US dollars. The depreciation of the krone therefore greatly influences the cost. Furthermore, prices on input factors have increased recently, partly due to the war in Ukraine. resulting in the production costs ahead being further pressured (Misund, 2022). However, despite increases in feed prices, the revenues from food produced in aquatic environments predominantly end up in the industrial-scale firms that control the global SC (Crona et al., 2023).

6.1.2 Trust

6.1.2.1 Trust within the supply chain

A well-functioning food supply chain is dependent on collaboration. Through the ADSSSB, the industry showcases its ability to collaborate horizontally and vertically. Feed producers 'competing' in the same market came together in the dialogue group, displaying horizontal collaboration. In addition to the dialogue group, both upstream and downstream actors participated in discussions with the Brazilian suppliers, collaborating vertically. The agreement

is monumental not only due to its content but also because of the collaborative effort behind it. Collaboration is crucial as trust is relational, and dialogues such as this can thus lead to a greater sense of trust within the supply chain.

Certification schemes are an important part of ensuring traceability and transparency in the supply chain. Pullman & Wu (2012) emphasise that trust in SC is the expectation that buyers and suppliers deliver on their promises and behave in accordance with agreements. In complex globalised food chains, knowledge becomes centralised in the different parts of the chain, and actors in the focal company might not have the knowledge to evaluate the work of their suppliers. Clear distinctions exist amongst the informants regarding their views on the availability of knowledge about the soy they import. Some are fully confident that they have a complete overview and understanding of the situation, with no need to 'simply trust' their suppliers because they know; others state that they do not have all the details themselves, but they have complete trust in their suppliers and in the work these do.

> Because I think that what we landed on is that as long as our suppliers can vouch for and argue as to why their purchases are sustainable, then that has to be good enough for us. We don't have the competence to fact-check those decisions. And really, they [feed producers] are more dependent on a good name and reputation when it comes to this than we are. After all, it is the demands they make of their suppliers that are important. (FF3)

While some disagreement exists around the fish farming companies' ability to fact-check information themselves, the informants are in full agreement that their Brazilian suppliers and the certification schemes can be trusted.

> We run supplier audits. Either we do it or we have a third party do it. Who goes in and examines the entire value chain backwards. So, we run on that type of model. And correspondingly, we get quite a lot of information from the feed suppliers. So, they report from a lot further down the value chain to us in relation to volumes and what kind of species are used. But then there is a lot; the feed suppliers are certified according to various voluntary standards, and, in addition, they are also certified or controlled by the Norwegian authorities. So, I have pretty good confidence that the information provided by the feed supplier is valid. (FF4)

The intention behind labelling products as certified is to allow consumers to make informed purchases (Alfnes, 2017). Certifications are therefore a form of trust. However, trust can move from one actor or organisation to another without the issue of trust itself ever being addressed. The certification schemes move the question of trust from the producers to the certifiers or accreditation agencies. The question of whether one can trust the actor remains (Olsen et al., 2021, p. 4). The informants express complete confidence in the validity of the certification schemes and third-party evaluations of them. The close relationship between the industry and the certification schemes was not mentioned by the informants, nor was the relationship between certification schemes and third-party auditing companies. Several members of the board of directors at ProTerra hold dual roles, as they also represent ProTerra member companies. It could be argued that this is a potential weakness with such certification schemes; however, this is not a concern that was raised.

6.1.2.2 Trust between industry and the government

The resource rent tax on aquaculture exemplifies how trust can be dynamic and change over time, as noted by Fleming et al. (2020). The news of the tax has been met with strong reactions, and there appears to be a weakening of trust between industry and government. Gustav Witzø, the chairman of Salmar, declared to the Norwegian newspaper *E24* that the tax was a betrayal against them and the whole industry (Tangen et al., 2022). The break in communication between industry and government became even clearer when the Minister of Finance and Minister of Fisheries and Ocean Policy invited some of the largest companies to talk, but they refused to attend. Rather, they sent the industry organisations Norwegian Seafood Federation and Sjømatbedriftene to speak on their behalf (Tangen et al. 2022).

The news of the tax came in the middle of my data collection and was therefore only a topic discussed in the final interviews. I did not mention the tax in interviews; rather, thoughts on it emerged in response to questions I asked all informants. The tax has been continuously debated since its announcement, and changes have been proposed. The following discussion is based on the situation at the time of data collection, as outlined in the background chapter.

In reflections about sustainability and the green transition, it became clear that the tax proposal had led to a feeling amongst the informants that the government no longer worked with them but rather against them. One informant explained how the company has had to change their

priorities due to the tax. Examples include postponing investments in sustainability projects and the implementation of sustainability measures. This is not unique to the company this informant represented. Multiple companies announced that they were halting investments and projects in the wake of the tax (Kristiansen, 2022). As another informant stated, "Sustainable solutions are possible, but sustainability [in the industry] has taken 10 steps back in one week" (FF3). This informant further argued that most people do not realise that with such a tax, the investments needed to get a fully integrated value chain will stop.

When asked about their view on the division of roles between the government and industry in the green transition, the Norwegian Seafood Federation responded, "That is an interesting question in these times where the investment funds are taken by the state. Then it becomes obvious that the state must take responsibility for the green transition". The Norwegian Seafood Federation further argued that the state must reduce the economic risk of the green transition. These statements align with what the industry has expressed in the media and in televised debates. There seems to be an experience of being punished and, once again, frustration at being undervalued. Witzø, representing Salmar, further argued in a televised debate that he is not against taxes, but he said that they already contribute to society through their wealth, a contribution they intended to continue, but the development of the industry and coastal communities' hinges on predictability from policymakers. He further argued that Salmar has invested millions of Norwegian kroner in making the industry more sustainable and has paid millions in wealth tax (Tangen et al., 2022).

6.1.3 Supply chain risk

In the past few years, the uncertainty of the supply chain has increased due to events such as the pandemic and the war in Ukraine. Vulnerability has consequently increased in line with the uncertainty. The informants stressed that they can still source the raw materials they need but that the effects of the events mentioned above have certainly been felt in the industry. As discussed in the previous chapter, supply security is perceived as underrated. In other words, supply risk is perceived as the most pressing issue.

The measures taken by the fish farming industry to combat this uncertainty align with the literature on supply chain risks. Diversification is a common strategy to reduce risk. Diversification strategies include relocating purchasing volumes between existing suppliers and seeking out alternative suppliers in another geographical region (Mizgier et al., 2015, p. 115).

Both strategies can be observed in my data. In response to the disruption caused by the war in Ukraine, the companies relocated purchasing volumes from eastern Europe back to Brazil. However, it is the second strategy that features most prominently in my data. In response to the general experience of increased supply risks, several informants expressed a wish for a more national or Scandinavian supply chain and a desire for more local raw materials. This can also be tied to what Diabat et al. (2012) term a 'centralised sourcing strategy'. The informants further emphasised the importance of multiple suppliers and highlight how they would have been in a much more precarious situation if they did not have a variety of suppliers.

Supply risk is not only a current issue regarding existing raw materials. The need for stable and reliable suppliers is a key point in the informants' views on alternative raw materials. The hesitancy to invest in or incorporate small-scale alternative raw materials is viewed as a strategy to mitigate supply risks, as the outcome of these new endeavours remains unknown, and the volumes are not there to support the needs of the industry. This uncertainty can also be seen in the informants' thoughts about product diversification. Salmon is already a luxury product, and it is therefore difficult to differentiate with a little more luxury. There is little to gain from being first with something; it is simply not worth the risk.

Sustainability has emerged as an increasingly important issue in SC and therefore an issue for buying companies. Hofmann et al. (2013) emphasise the need to focus on sustainably related supply chain risks. Sustainability is increasingly being integrated into the literature on supply chain risk. However, this literature is underdeveloped, and a contextualisation of sustainability risks is needed. Stakeholders, such as the media and NGOs, repeatedly push sustainability issues forward as an area companies must relate to. A key part of business and sustainability is public perception. Hofmann et al. (2013) emphasise that supply chain risk management should not only focus on disruptive events such as wars, natural disasters, or economic crises. Possible stakeholder reactions should also be considered. Hofmann et al. (2013) argue that by doing so, companies will reduce their vulnerability. Stakeholder reactions are crucial to the fish farming industry. The fear that soy would become the 'new' palm oil is one example of this. The focus and importance of consumers in decision-making and the focus on public perception further emphasise the priority given to stakeholder reactions. The informants were very aware of the importance the media and NGOs play in how they are perceived. The role the environment plays in agricultural production and the risk environmental degradation poses is discussed later.

6.2 A corporate socially responsible fish farming industry

An important aspect of the CSR concept is that it goes beyond legal obligations. Rather, CSR entails taking actions that transcend the company's interests and what the law requires (McWilliams & Siegel, 2001, p. 117). The picture painted by the informants is that of an industry that goes above and beyond the bare minimum. The informants emphasised that they have taken cost-bearing action because it is the right thing to do and further argue that they do this much more than any other actor in the global soy market. They highlighted the voluntary aspect of the actions they have taken.

A possible consequence of not taking CSR seriously is blowback from consumers. The threat of a consumer boycott or gaining a bad reputation affects all businesses, but it is particularly impactful on companies with well-established brand names (Wickert & Risi, 2019). In reflections about the negative portrayal of soy and the use of soy, this was highlighted by some informants; "It particularly affects companies like [company name] that is really out there with our brand, and who don't like to be made out to be the bad guy" (FF2). Consumer boycotts are one of the clearest examples of how consumer behaviour can be shaped by perceived CSR negligence by a company (Smith, 2003). The consequences of a consumer boycott can be seen when examining palm oil in the Norwegian market. After gaining significant negative attention and actions by stakeholders, products are today marketed as not containing palm oil.

Whether a company is successful in their CSR strategies is highly dependent on their perceived trustworthiness. The stakeholders must be sure that the companies have actually implemented ethical issues into their management strategies and that it is more than just empty words.

The actions taken by the industry in recent years are central to the characterisation of the current use of soy. The certification schemes and agreements in place make the informants confident that today's use of soy can be described as sustainable. "So, I believe that the purchase of soy as we do it today is sustainable" (FF4). The industry's pride in its sustainability measures can be found in informants' thoughts about the current use of soy. "I am really proud of the way the Norwegian fish farming industry use soy" (FF2). The properties of the soy plant and its accessibility are noted as major reasons why soy is such an important part of feed.

> We use soy, and we are dependent on soy today to produce our salmon. And that's the way it is. It is used to a relatively large extent. Today, both European and Brazilian soy are used. It is a raw material that is stable, predictable, and good. And not least, there are large quantities accessible. All of this makes it a natural part of every recipe in fish farming today. (FF6)

Informants highlighted the potential flexibility of the industry. "No raw material is irreplaceable – there are alternatives. But right now, soy is a good raw material with the current agreements in place, such as certifications" (F2). Showcasing the industry's ability to produce feed without soy, as well as the perceived redundance of this as today's production, is viewed as sustainable. The discussion of the current use of soy further demonstrates the trust in the certification schemes and the agreements in place. Due to these standards, the informants feel confident, saying that the current use of soy can be described as sustainable.

It is important to note that informants are not naïve in their evaluation of the current use of soy. The Brazilian authorities and their policies were brought forth as an area of concern that could affect the sustainability of Brazilian-produced soy. Jair Bolsonaro, nicknamed the 'Tropical Trump', was the president in Brazil at the time of the data collection. Under his presidency, the government took actions that reduced the control of deforestation and introduced measures to facilitate the expansion of farming (de Area Leão Pereira et al., 2020). As shown in the discussion of power, informants expressed that they continually evaluate the political climate in Brazil and were willing to move their businesses out of Brazil if the situation called for it. However, none of the informants elaborated on what would constitute a situation that would result in such a withdrawal. The political situation in Brazil exemplifies that sustainability is not static, is contingent on multiple factors, and therefore must be continuously worked on.

The informants highlighted the importance of certifications in ensuring the sustainability of soy. Similarly, Olsen et al. (2021) find that aquaculture companies argued that an important part of their work towards a sustainable industry was certification. However, the same study found that sustainability was not the only motivator for obtaining certifications. Financial benefits and improving reputation and social legitimacy were key factors (Olsen et al., 2021).

Purchasing certified materials is a good first step to ensure sustainability and deliver on commitments; however, it is not enough to demonstrate that "the materials in the supply chain is deforestation free, conversion-free, or produced with respect to human rights" (WWF & BCG, 2021, p. 23). Certification schemes for agricultural production should not be used in isolation; they are just one of many tools needed to address the multitude of environmental and social issues agricultural commodity production represents (WWF & BCG, 2021, p. 23).

In their contemplations about soy production in Brazil, informants emphasised their efforts to reduce deforestation, while other problematic aspects of soy production were rarely mentioned in interviews. Toloi et al. (2021) argue that actions such as efforts to reduce deforestation, no-tillage systems, and agreements such as the Soy Moratorium are not enough. Soy production is dependent on a multitude of inputs. Fertilisers, pesticides, fuels, and machinery are integral to production (Toloi et al., 2021, p. 4). A focus on deforestation is important, as this is a substantial issue, but that alone is not sufficient to ensure the sustainability of production.

6. 3 Defining sustainability

Sustainability can be understood in a multitude of ways. How a concept is defined is important because it has implications for the solutions proposed. Grasping how the informants define sustainability is key to understanding their evaluations of the sustainability of soy.

6.3.1 Definitions matter

How a problem is framed affects the solutions proposed. As such, how sustainability is defined and understood shapes the measures taken to achieve it. Dryzek (2013) argues that the multitude of definitions and understandings of sustainability is not necessarily a weakness, as most influential concepts have more than one definition. The lack of consensus can, however, serve as an obstacle to achieving 'sustainability'. Without an agreed-upon definition, companies are given the freedom to define the term themselves. This may lead to biased definitions made to make the company look good. In their review of the conceptualisation of the circular economy, Kirchherr et al. (2017) note that the concept can become blurred when it is employed by a variety of stakeholders. This blurriness is due to the fact that these stakeholders operate in worlds of thought that are substantially different, leading to significantly different interpretations. I argue that the same can be said about sustainability.

Several of the informants expressed that the multitude of definitions made the field of sustainability hard to navigate.

> What is sustainability? That is the type of question where if you ask a hundred people, you will get a hundred different responses (…) And then it has ended up where sustainability covers every bloody activity anyone could think to have. God only knows what sustainability is. (The Norwegian Seafood Federation)

> It [sustainability] is a jungle to navigate. It is a very demanding field of study. The desire to simplify it is unfortunately very present. (FF2)

> Then again, what is sustainability? In the discussion of what is sustainable soy, the answers depend on the eye of the beholder. (FF4)

Fleming et al. (2020) similarly finds in their study of stakeholders' perspectives on Australian fisheries and their perception of and trust in sustainability. They find that sustainability had lost some of its meaning to some informants; and had become a buzzword comprising 'everything' (Fleming et al., 2020).

The informants in my project displayed a variety of definitions and understandings of sustainability. The informants' understandings of sustainability partly expressed what Oosterveer and Sonnenfeld (2012) describe as a neoliberal view on sustainability, with an emphasis on the importance of companies in addressing agricultural sustainability.

> There are so many governmental, semi-governmental, and private actors that try to make their own schemes, programmes, definitions, and observations that are supposed to help large and medium-sized companies find sustainability paths, especially for seafood. I am sorry, but that is completely meaningless. (FF2)

The neoliberal view on sustainability can also be found in the informants' view on the agreement with their Brazilian suppliers and certification schemes, with an emphasis on how these private sector initiatives succeed in addressing the environmental challenges of soy production. However, when considering alternative raw materials as a way to ensure

sustainability, their views differed from the neoliberal understanding, as this is an area where the informants expressed a desire for more government involvement.

Sustainability in the food system is largely framed as a production challenge by the informants. Technological innovations, such as the development of alternative feed ingredients or closed containment systems, are central to answering the question of how to ensure sustainability in the industry. Managerial changes, such as a transition from Brazilian to European soy, are an integral part of the industry's sustainability efforts. The environmental movement, on the other hand, exhibits an understanding of how to address sustainability in food production that is more in line with consumption and socio-economic perspectives. While the environmental movement champions the work to develop alternative raw materials, it also emphasises the need to decrease the consumption of soy.

In recent years, the environmental, social, and governance (ESG) framework has gained popularity amongst corporate actors. The ESG concept on sustainability, which was dominant amongst the informants, was developed in 2004 by 20 financial institutions after a request from the UN. It refers to how environmental, social, and governmental concerns are integrated into the strategies and business models of companies and investors (Gillian et al., 2021). It is closely related to CSR, and the concepts are often discussed in conjunction with each other. The main difference is that ESG addresses governance explicitly, while CSR does so indirectly (Gillian et al, 2021). ESG factors are "… environmental, social or governance matters that may have a positive or negative impact on the financial performance or solvency of an entity, sovereign or individual" (European Banking Authority, 2021, p. 6).

In the corporate world, sustainability is often understood as a business's capacity to be both successful and persistent over time (Boyd et al., 2020). Profitability and predictability are therefore central to this understanding of sustainability. The primary concern of businesses is rarely the health of the environment, but at the same time, leaders recognise the need for a healthy environment for operations (Boyd et al., 2020). While the informants highlighted the importance of environmental sustainability, they also emphasised the importance of economic sustainability. "For us, sustainability is both climate and the environment, but it also has to be sustainable economically" (FF4). The focus on economic sustainability is of course not exclusive to the fish farming industry. "Economic sustainability has become a focus for

producers of everything. Not just food, everything" (Norwegian Seafood Federation). Economic factors appeared to be the most decisive in decision-making.

In the literature on sustainable agriculture, environmental issues are usually examined regarding how the environment is utilised. Most studies find that economic viability and natural resource conservation are contradictory (Janker et al., 2019). Yet, the informants did not comment on the potential 'conflict' between economic and environmental factors in their sustainability considerations. While the environment has gained increased importance, economic factors remain essential to the company's strategies and decision-making. Informants stressed that the industry took more cost-bearing actions because it could afford them, but simultaneously, it became evident that there are limits to the prioritisation of the environment over economics.

6.3.2 The carbon footprint

In reflections about what sustainability is, it became clear that the carbon footprint was at the core of the informants understanding of sustainability. The carbon footprint is often used as a metric of climate change impacts (Jamaludin et al., 2019). This was also visible in my interviews, where the carbon footprint appeared to be the most decisive factor in determining whether soy was considered sustainable. LUC was largely framed as problematic in Brazilian production due to the high carbon footprint it results in. Similarly, European soy was argued for with reference to its relatively lower carbon footprint compared to Brazilian soy. The focus on carbon footprint amongst the informants is not unique to the fish farming industry, as carbon footprint is a widely used metric for climate change impact amongst both governmental and corporate actors (Jamaludin et al., 2019). Hence, much of the literature on sustainability in the fish farming industry focuses on its carbon footprint.

Carbon footprint accounting is helpful in giving companies an overview of their GHG emissions and can serve as a starting point in developing measures to mitigate emissions (Jamaludin, et al., 2019). However, environmental sustainability is more than climate change, and the sole focus on carbon footprints is therefore not comprehensive enough to address global environmental change (Laurent et al., 2012). Climate change has received most of the attention in recent years, and while addressing climate change is of high importance, it is not the only challenge the world is currently facing. Global environmental change includes "… biodiversity loss, air and water pollution, oceans acidification, degradation and salinisation of soils, deforestation, and threats to ecosystem services" (O'Brien et al., 2013, p. 1).

Few informants reflected on the priority given to carbon footprints and climate change over other facets of global environmental change. Only one informant explicitly discussed and noted that sustainability is a concept encompassing a wide variety of issues and that prioritising is necessary to tackle the issues that are most pressing.

> You have to choose your fights. In my eyes as biologist, at least, the most important and pressing issue is the fight against global warming. We focus on this without losing sight of biodiversity, child labour, money laundering, or the whole package. (FF2)

Most informants recognised that global environmental change entails more than a carbon footprint; however, in their outlook on soy production, it seemed to take precedence. While other problematic aspects of soy production in Brazil were mentioned, they were not addressed in depth.

6.3.3 Why should we work towards sustainability?

All agricultural practices are, in a way, territorially embedded, as they are dependent on physical locations with certain attributes. The Norwegian coastline, with its many fjords, is ideal for aquaculture. However, soy cannot be produced in Norway, making the industry dependent on imports. Furthermore, Norwegian legislation around GMs limits the possible locations to source from. The Norwegian fish farming industry has therefore become 'anchored' in specific places, such as Brazil, because they are amongst the few providers of soy that can deliver what the industry requires.

Climate change and environmental degradation are threats to the very places the industry is dependent on. One could thus argue that environmental sustainability is necessary for economic sustainability. As many of the consequences of climate and environmental change are not immediate or felt most strongly by those with the most responsibility, a tendency for short-term thinking exists. Slawinski & Bansal (2015) found in their inductive study of five companies in Alberta working with oil sand that while some companies choose to forfeit some immediate profit to mitigate climate change, many prioritised short-term profit and put investments in greenhouse gas reductions on the backburner (Slawinski & Bansal, 2015, p. 531).

The normal functioning of ecosystems is integral to agricultural production. Production is dependent on stable climatic conditions, meaning that the level of rainfall, temperature, and humidity are within the normal range of variation (Filho, 2022, p. 485). Current climatic change, especially rising temperatures, greatly influences agricultural practices. To face these new climatic conditions, many farmers have had to alter their planting and harvesting periods to secure good yields (Filho, 2022, p. 485). Climate change has significant effects, and these are expected to continue to grow in the decades to come. The environmental conditions of the soil, plants, and livestock are altered by the impacts of climate change. As a consequence, if measures are not taken to face the challenges of global environmental change, the yields and quality of agricultural products will be significantly impacted. Food SC will in all likelihood be influenced in unparalleled ways (Filho, 2022, p. 487).

In reflections about growth in the industry, some informants expressed somewhat similar views, arguing that growth is not possible unless it is done sustainably. In these discussions, fish health, space, and technological solutions for the net cages were the most prominent themes when the informants described dealbreakers for growth. In 2019, the director of the Norwegian Seafood Federation announced that their vision was a fivefold growth in Norwegian aquaculture by 2030 (Trana et al., 2019). When asked if such growth was possible and, if so, if it was possible to agree that growth and sustainability were compatible, most of the informants agreed that some changes were necessary to achieve sustainable growth.

> I don't think in terms of the classical fish farming we have today. I think we must find new solutions for the future regarding facilities, including a combination of open net cages and closed containment systems in the ocean and facilities on land. I think we have a long way to go before we get there. (FF5)

> You can't achieve that kind of growth if it isn't done sustainably. And that is why we believe in a combination of the existing open net cages we have today and more land-based production, as well as letting the fish grow bigger before they are set out in the ocean so that they don't get exposed to lice and other things. And the fact that you can use closed containment systems allows you to operate in new areas that are more vulnerable too. (F1)

Informants did not see sustainability concerns as a hindrance to growth, instead arguing that sustainability is a necessity for growth. The dependence on a stable environment was explicitly expressed by some informants. Overall, most informants argued that fivefold growth was not possible at the moment. However, the reasoning for this went beyond environmental concerns. Technological solutions and problems with lice were highlighted as greater obstacles to growth.

6.4 The Future of soy

The informants frame soy as an integral vegetal protein in the feed, and there is certainty in describing today's use as sustainable. Following this, the negative perception of soy is a source of dissatisfaction amongst the informants. A sense of pride is displayed regarding the current use of soy. The questions that then emerge are, 'What about the future? What role should soy play in the future of fish farming?' The great majority of informants argued for the continued use of soy in the future. However, all agreed that future use should not exceed current use.

> We're not going to buy more soy than we did in 2018, but it's still going to be important. Because it is such a great raw material, both in terms of sustainability and nutrition, it should not become more important. (F1)

> Soy is a very good raw material, so I think it should stay. But it should be one of many raw materials. So, yes, it has a good amino acid profile, but it can't be the sole source of protein in the feed. (FF4)

Others emphasised how differentiation and the development of alternative raw materials will make soy less important, while at the same time stating that the global soy market will remain the same.

> I think soy will be with us for some time, but I do think that the amount in the receipt will decrease as we will have a bigger share of new raw materials. But what one can speculate on is whether the total consumption of tonnes of soy will decrease if production increases. And that I don't know. I can imagine the numbers decreasing for salmon production, but for the global soy industry, I don't think production will decrease any time soon. (FF1)

> I think it is good for us to get an increased differentiation, because it is not good for us to only have a few 'go to' raw materials in the fish feed today. It might be healthier with increased differentiation, and thus soy might become less important in the future. As least that's what you can hope for. (FF6)

Only the Norwegian Seafood Federation argued that soy had no place in the future.

> No, within the framework of reducing our footprint, the environmental impact of food production, and increasing food production – and we can produce a lot more fish in this country than what we do today – soy has no place. It would have to be an extra 'spice' regarding nutritional needs, but as the main protein source, it is completely wrong and has no place. (Norwegian Seafood Federation)

Economic sustainability and the profitability of the company are undoubtedly at the heart of decision-making, but to say that this is the only value the fish farming industry considers would be a simplification. As noted by Smith (2003), a company's reasoning for engaging in CSR might be due to both a genuine dedication to an ethical practice and to self-interest (e.g., a business move). Safeguarding the environment is often an economically motivated decision in today's market. Consumers demand sustainability from companies, and transparency in the supply chain has become a requirement. Furthermore, taking environmental measures could be viewed as an investment in the future, as agricultural production is dependent on stable climatic conditions. In the views about the future of soy, economics emerges as an important factor. At the same time, I believe that the informants were sincere when they expressed sustainability concerns. However, the solutions they proposed to achieve a sustainable industry were highly technical. The development of new and innovative ingredients is a stipulation for a reduction of soy in the feed.

In comparison, the environmental movement emphasises that a decrease in dependence on soy hinges on more than the introduction of alternative raw materials. They also highlight the need for consumer awareness and changes in diets. A decrease in the consumption of products that are dependent on feed produced on valuable land that could be used to produce food for human consumption is needed. However, the environmental movement stresses that it is not the consumer's responsibility to reduce the challenges of soy production; what is needed is that we, as a society, move towards more plant-based diets that will be beneficial for the environment.

It is, however, important to remember that the amount of soy produced for human consumption differs greatly from the amount produced for livestock production. The enormous quantities needed to feed cows or salmon cannot be compared to what is needed to produce tofu or soy milk.

6.4.2 Genetically modified agriculture

Agriculture has evolved over millennia, and almost all food crops differ from their earlier natural ancestors. Farmers have manipulated and modified crops through the gathering and replanting of seeds they have selected because the plants had the highest yields and resistance (Zilberman et al., 2018). This traditional way of breeding was revolutionised with the discovery of DNA in the 1950s. The discovery opened the door to an entirely new way of modifying crops (Zilberman et al., 2018). Crops can be genetically modified (GM) by "… inserting, removing or altering the activities of one or more genes, or part of a gene, so that an organism gains, loses, or changes specific traits" (Redden, 2021, p. 1). GM has proved to be one of the most controversial food supply issues of the 21st century and in discussions of the future (Lang & Heasman, 2004). The use of GM has been strictly regulated in Norway, and as previously discussed, no GM products have been approved to date. However, some argue that the restrictive regulations might have to be lifted to face the current challenges in the food system. More stressful crop environments emerge due to global warming, and the world's population is predicted to exceed 9 billion by 2050. GM is proposed as a possible solution to these issues (Redden, 2021).

The Norwegian market might therefore have to embrace GM products in the future. A lifting of the GM restriction would also entail access to new markets for raw materials for the fish farming industry in the future, such as the US and Canada. The Midwest produces massive amounts of soy, but all of this is GM, as the US has had much more liberal GM policies than Europe. Some informants expressed an openness to possibly including GM-produced raw materials in the future.

> One cannot rule out that GM might be a part of the future, but this implementation would have to be done very carefully to ensure no harm is done. (F2)

> With that being said, I think GM is a bit like the raw material market; it is complex and not only negative. Again, it would be wrong to be too generic. We pay attention. Try to learn what it means. Today, large parts of the world's production on land are genetically modified. And there are milieus that argue that genetic modification is going to 'save' the world in terms of increasing production, getting specific production for specific needs like omega 3. So, we are very curious and want to learn more about this development. And I think there will be changes in this area going forward in Europe. (FF6)

Shepherd et al. (2017) found that most of the UK retailers in their study expressed that if the market circumstances changed, they would be open to a more flexible approach to GM feed (p. 58). The informants expressed curiosity and interest in the potential use of GM soy, and several said that they were closely following the developments. However, all were clear on the fact that it would have to be approached with caution. None of the informants actively campaigned for a lift of the Norwegian regulations, and most appeared content with being GM free. Expressing that if a lift were to occur, they would have to evaluate their stance. Given the current Norwegian regulations on GM, some of the informants expressed that few assessments had been made regarding GM.

The Norwegian Food Safety Authority is currently considering an application concerning Aquaterra, an oil from genetically modified rapeseed for use in fish feed (Mattilsynet, 2023). The Norwegian Scientific Committee for Food and Environment carries out risk assessments for the Norwegian Food Safety Authority and the Norwegian Environment Agency. In their assessment, they conclude that there is no greater need for health or environmental monitoring of feed containing Aquaterra than conventional feed (Thorstensen et al., 2023). As of April 2023, a decision has not yet been made (Mattilsynet, 2023). While the verdict on the Aquaterra application is pending, the war in Ukraine has brought a sense of urgency to the question of GM in Norway. The Norwegian production of feed is, as previously discussed, dependent on imports. The Ukrainian war has decreased the availability of GM-free raw materials, and some have therefore raised concerns about Norway's ability to produce feed. However, there is not yet a 'feed crisis' (Stranden, 2022).

6.4.3 What would replace soy?

Soy is amongst the most important commodities in the world (Backhouse et al., 2022). Soy has a privileged role as an ingredient in compound feed formulations, and feedstuffs are the largest market for soybean meal. SPC and soybean meal are key components of the feed used in aquaculture (Kuepper & Stravens, 2022). In the feed used in Norwegian fish farming, soy is the largest component. A question that then naturally emerges is, 'What would replace it?' This aspect is highlighted by the informants; "But then you have to put it into perspective: what would you replace it with?" (FF1).

"If you remove soy from the equation, what comes in as its replacement? It is not necessarily something that is better for the environment. That is something that must be considered in these total evaluations" (FF3). The development of alternative raw materials is ongoing, but there are many unknowns. The vast majority of alternative raw materials are still in the beginning stages of development, and they make up a very small percentage of the feed. Whether they will be able to be upgraded to meet the demands of the Norwegian fish farming industry remains to be seen. Likewise, how sustainable the production of these alternatives will be is unknown. It is important not to assume that new is synonymous with better.

The move towards vegetal feed has had negative impacts that were not immediately apparent. Soy and other vegetal feeds came about as a solution to overfishing for feed. However, over time, it became clear that soy production had unintended environmental and social consequences. Hansen (2019) finds that development towards soy-based salmon feed exhibits weak sustainability where economic sustainability is the main focus. She further argues that there is no guarantee that this will not be the case as new innovative feed substitutions continue to evolve (p. 1). The current search for and development of new ingredients may result in new challenges for salmon farming. Environmental, animal welfare, or societal problems might emerge as a consequence of the production of these new ingredients (Hansen, 2019, p. 13). It is therefore important not to naively assume that new raw materials will be sustainable and unproblematic. The potential impacts of new solutions are not always easy to assess, often not becoming apparent until later. However, this does not mean that the search for new raw materials is futile. Rather, I argue that it encourages balance in our approach to innovation. Hence, there is a need for continuous work on the development of alternative raw materials while also addressing the underlying structural problems of the food system. It is important to

find a balance between believing in the future and the work currently being done while simultaneously not relying on future innovation to solve all of today's challenges.

The development of alternative raw materials is presented both as a sustainability measure and as a means to mitigate supply chain risks. Events in recent years, such as the COVID-19 pandemic and the war in Ukraine, have revealed weaknesses in the interconnected world economy and reiterated the importance of having a diverse set of suppliers. Differentiation is a key strategy for lowering such risks. The development of alternative raw materials is framed as a prerequisite to lowering the dependence on soy. New components in the feed will undoubtedly be important in the future. However, the development of alternative raw materials is not without its challenges. It is important not to assume that new ingredients will automatically be more sustainable.

6.5 The future is blue

Oceans are increasingly being viewed as having unexplored potential for economic growth. Companies and governments are currently racing to capitalise on marine resources (Bennett et al., 2021, p. 1). The ocean is framed by corporate actors as an underdeveloped arena for business and economic growth. It is described as a place of opportunity 'ripe for development' (Bennet et al., 2021, p.1). Concepts such as the blue economy, blue growth, and blue food have emerged to describe the economic opportunities and environmental benefits of production in the ocean (Bennett et al., 2021; Eikeset et al., 2018; Crona et al., 2023).

6.5.1 The needs of the future

The need of the future is an important part of the perception of the fish farming industry's role in the future global food market. To ensure a sustainable food system, production growth in aquaculture is desirable. Informants highlighted how blue foods are preferable to terrestrial food production.

> We need to question how we are going to produce food in the future, and the best solution is to produce it in the sea. That is more favourable than production on land. (FF5)

> It's not possible to grow much more on land; there is not enough freshwater or soil to feed all these people. Then we have to get more of our food from the sea, but we can't fish more than the fisheries do today. It has reached its peak; we can't fish more without destroying it. So, how on earth are we going to do this, then? We believe in aquaculture. (F1)

The lack of land needed for fish farming was an argument frequently used by the informants on why the future of food production should be in the sea. While it is true that fish farming requires less land than other meat production methods, it is important to remember that the production of farmed fish is not landless. Key ingredients in the feed are all dependent on land. Production of soy is land-demanding, and a growth in fish farming will lead to an increased need for land for agricultural production of ingredients for the feed.

The view of aquaculture or blue foods as a necessity for the future is not only expressed by informants in the interviews but can also be found in the companies' sustainability reports. Three out of the four feed producers that operate in Norway emphasise the need for aquaculture both for the environment and for human nutrition.

> On a global scale, blue foods – the diversity of aquatic species and products sourced from oceans and fresh water – have a central part to play in ending human malnutrition and building a healthy, sustainable and resilient food system (Skretting, 2021, p. 6)

> Recent credible scientific initiatives have highlighted the critical importance of Blue Foods for global food security and health (BioMar, 2021, p. 40)

> With a growing global demand for seafood and the need for aquaculture to support it, there is an unprecedented demand on the sector to do more with less. Emerging research, such as the Blue Food Assessment of 2021, highlights how important aquaculture is for human nutrition—but aquaculture production must grow sustainably. (Cargill, 2022, p. 84)

The fish farming industry argues for its importance by highlighting the role it could play in ending malnutrition, ensuring healthy food for a growing population, and as an essential part of a sustainable future food supply chain. A continuous growth of farmed fish is therefore

perceived as important. In their reflections about the future, it becomes clear that the informants perceive the industry as forward-leaning and future-oriented. Moreover, this is the image they want to convey. An important part of the industry's marketing is its place in the 'blue future' and its role in ensuring food security in the future. This view was not only expressed in the interviews, but it is also a prominent theme in the companies' sustainability reports and websites.

6.5.2 The battle of mouths and minds

There are fundamental differences between food and non-food SC. Food is a part of everyday life and something we all consume. It plays an important part in culture and represents childhood memories, friendship, and family. Food is personal and intimate, and it can communicate identity and values (Pullman & Wu, 2012, p. 258). All the roles food plays make it unique in comparison to other SC. The uniqueness of the food supply chain presents both "… challenges and opportunities when considering economic, social and environmental issues in food production and food supply management" (Pullman & Wu, 2012, p. 258). Shaping food cultures and food policies has come to be an important focus of a 'conscious' food industry. Increasingly, food companies no longer just compete for the 'mouths' of consumers but also their minds. Getting consumers to form an emotional bond with products and companies has increasingly become a part of corporate marketing strategies (Lang & Heasman, 2004, p. 185).

In their contemplations about soy and sustainability, the informants expressed frustration with how the industry and its use of soy have been perceived. In their view, the industry works much more intensely on sustainability than what is presented in mainstream media. The informants express a view of an industry that places sustainability concerns at the forefront of decision-making. On their websites, they emphasise the importance of aquaculture for the future.

> Cermaq is a leading global salmon producer driving transition of our food system towards healthier and more climate-friendly food. (Cermaq, n.d.)

> Leading a Blue Revolution is not easy, but we believe our unique strengths – Mowi's global presence, being fully integrated, and being a front runner on innovation and research and development – will make a positive impact in the world. (Mowi, n.d.)

> Salmon farming is currently the most effective form of meat production available. The salmon utilise their feed better than both chickens and pigs. The raw ingredients in the feed are fishmeal, fish oil, soya oil, corn products and pulses. We collaborate closely with our feed suppliers to develop the feed so that we use the resources as best as possible. (Bremnes Seashore, n.d.)

It is important for the industry to market itself not only as a healthy food alternative but also to place itself in a larger context. Appealing to environmentally conscious consumers and presenting themselves as the most sustainable option. This view is reiterated throughout the data; the informants continuously emphasised how farmed fish is the superior choice compared to other meat products. Being a leading figure in the blue revolution appears to be both a way of marketing themselves and an identity marker, as they take great pride in having taken actions no one else has. This finding is corroborated by Olsen et al. (2021), who similarly find that the focus of the industry's narrative is on how they are a key part of solving the global challenge of the increased need for food in a growing population. Furthermore, the narrative is directed at fish as a healthy food option and their role as job creators in rural areas (p. 3).

6.5.3 Should growth always be the goal?

The world's population is growing, and there will undoubtedly be an increased need for food. However, one could question if growth really is the answer. Scholars have argued that our current food system is broken. It currently costs trillions of dollars in poor health and ecological damage (Nature, 2020, p. 296). The current food production system is ineffective; of the food produced globally, one-third is wasted. At the same time, 820 million people go hungry, and key players in the food system are unable to prevent it (p. 296).

The common policy approach to economic development has been 'grow now, clean up later' (Ekins & Zenghelis, 2021) – to ensure economic growth first and hope that one has the resources to 'fix' the environment later. It has been argued that economic development is not possible without such an approach. However, this view has been challenged in recent years. O'Connor (1996) finds no evidence of a slower economic growth in Asian countries, such as Hong Kong and Singapore, that have had a parallel focus on economic and environmental performance compared to those who do not. Similarly, Landrigan et al. (2018) find that the claim that pollution control curbs economic growth does not hold up. The literature suggests that it is possible to achieve economic growth while ensuring environmental performance.

In the reflections about the future of the fish farming industry, the focus is on increased production for a growing population. This increase in food production should come from aquaculture, as blue foods are more sustainable. How to feed a growing population is a question of food security. The dominant framing is that food security is a problem of inadequate agricultural production. However, food security is about more than availability (Tomlinson, 2013). Simply increasing production would not address the structural problems in today's food system. Rather, an increase in production would exacerbate many of the existing problems (Tomlinson, 2013). Aquatic produce has a more favourable sustainability profile compared to alternative protein sources such as beef, pork, and poultry. However, rather than seeing growth as the solution for the future, there should be a greater focus on how to reduce food waste. Ensuring that the food that is produced is consumed and utilised. An increase in food production will have environmental impacts and will not necessarily result in feeding the world's population. World hunger cannot be solved by technical fixes alone.

7 Conclusion

An examination of the Norwegian fish farming industry's usage of soy and the assessments conducted regarding this use has been the aim of this thesis. The industry has faced criticism for its use of Brazilian soy, and this thesis has aimed to explore the fish farming companies' evaluation of the situation and their continued use of it. Data was collected through interviews with feed producers, fish farming companies, an employer organisation, and environmental organisations, as well as through documents. The research questions of the project are 1) *How does the Norwegian fish farming industry evaluate its use of soy?* 2) *What type of image does the Norwegian fish farming industry want to convey?* and 3) *How does the Norwegian fish farming industry work to find alternatives to soy*?

The research questions have been explored from the theoretical vantage points of globalisation, food SC, CSR, and sustainability. The fish farming industry's use of soy has been placed within the wider context of the global food supply chain it is a part of. In this chapter, I first present the main findings of the thesis. Secondly, the transferability of the case discussed. Thirdly, I discuss the theoretical contributions of the case study. Lastly, implications for future research are addressed.

7.1 Main findings

The focus of the industry's evaluation of its soy use is on the extensive measures it has taken. Informants argue that due to the demand on their Brazilian suppliers, the current use of soy is sustainable. Frustration exists within the industry concerning how the sustainability of the industry and its use of soy are perceived and that the work it has done is, to some extent, not recognised. While informants characterise the current use as sustainable, they are clear on the fact that they do not want the use of soy to exceed its current use. In the context of growth, the development of alternative raw materials is therefore presented as an important factor to avoid increasing dependency on soy.

Work on developing alternative raw materials emerged as a key theme in the interviews. The informants highlighted the importance of this work and how it was a priority in their companies. While the development of alternative raw materials is emphasised as being central to the industry's work, few alternative raw materials end up in the finished feed. Upscaling is identified by informants as a major challenge: expanding the production of alternative raw

materials to a scale that is stable and able to sustain the needs of the industry. This is an area where the industry requests greater participation from governmental actors.

A major challenge with working with the concept of sustainability is its vagueness. No agreed-upon definition of the concept exists, and corporate actors have leeway to define it to suit their goals. The informants' definitions and understandings of sustainability varied to some degree, and they emphasised different aspects of sustainability. However, carbon footprints were central to views on the sustainability of the industry and soy production amongst most informants. Although the carbon footprint concept has been crucial in raising awareness amongst corporate actors and policymakers, it fails, however, to represent the whole 'environmental picture' (Laurent et al., 2012, p. 4106). The focus on carbon footprints may cause other environmental aspects to be neglected. A view that encompasses more environmental aspects may be more beneficial in the evaluation of the sustainability of soy.

The perception of the fish farming industry as unsustainable breaks with the image the industry has of itself and the one it wants to convey. Public perception is important, because "to be able to grow and maintain its position as a major player in global food production, the industry needs to foster a favourable public image" (Olsen & Osmundsen, 2017, p. 20). The informants place great emphasis on how the Norwegian fish farming industry has taken measures that no one else has. It appears that they want to be perceived as game changers or trailblazers. At the same time, they are reluctant to argue that they hold great influence over the global market; a dichotomy is present in how they present themselves as world leaders in the farming of salmon and the characterisation of their agreements with suppliers as ground-breaking, while simultaneously describing themselves as minor players on the global market.

The fish farming industry presents itself as a solution for the future. Informants emphasise the need for protein in the future and how marine food production is preferable to terrestrial production. The 'blue future' appears to be critical in how they want to present themselves, as well as their perceptions of themselves. Blue foods, the 'blue revolution', and similar concepts are reoccurring in fish farming companies' and feed producers' sustainability reports and websites.

Environmental sustainability is presented as being at the forefront of decision-making; however, economic factors appear to remain the most important factor. The need for economic sustainability in companies is emphasised by informants. As one informant noted, more sustainable options are available; however, the cost of these makes them economically unviable. These findings are corroborated by Hansen (2019), who concludes that while environmental sustainability has been given a greater focus in the Norwegian fish farming industry, economic sustainability continues to play a leading role (p. 13).

7.2 The transferability of the case study

This case study illustrates how actors in the fish farming industry view and relate to the use of soy. Furthermore, it concerns the complexity of sustainable food production and how environmental and economic aspects can sometimes be conflicting, leading to a prioritisation of economic sustainability. Through studying these cases, one gains insight into the phenomenon of how Norwegian seafood producers respond to the increased demand for sustainability in their production. The findings in the case study align with previous research on the use of vegetal feed in Norwegian fish farming, such as Hansen's (2019).

I argue that my case study has analytical generalisability due to the careful selection of cases. Although the case study is relatively small with eight cases, I still argue that it is generalisable to the industry in Norway. The Norwegian fish farming industry is highly consolidated, with the 10 largest companies producing 70% of the yearly output. The organisations chosen as cases are sufficiently large as to be influential in the market, and I therefore conclude that my findings are applicable beyond the actors that have participated. However, it is important to note that one cannot assume with certainty that other companies would have responded similarly. Nonetheless, I find that the websites, sustainability reports, and public statements from companies outside the case study support my conclusion and that the findings are indicative of the industry in Norway. Due to the specific Norwegian context with strict regulations and legislation, I do not consider the case to have transferability for the international fish farming industry. As a consequence, while the companies included in the study are typical cases of the Norwegian fish farming industry, the Norwegian industry itself is a unique case within the global industry.

Transferability is an important issue to discuss; however, the case study approach asserts that an in-depth investigation of the manifestation of a phenomenon is valuable in itself. Regardless of transferability, I argue that my findings are interesting, as they express the current views of some actors in one of the most important industries in Norway at present.

7.3 Theoretical contributions to the research literature

In the literature on the food supply chain, understanding relationships of trust and power within the chain is presented as key to gaining insight into the inner workings of the chain. Trust and collaboration are emphasised as essential for a well-functioning food supply chain (Assis et al., 2022). Trust also plays a central role in the literature on CSR, where it is viewed as a necessity for successful measures. The ethical considerations implemented by corporate actors must be trusted by their stakeholders (Hartmann, 2011). Power is an integral part of all economic relationships at all geographical levels and is therefore key to understanding food supply chain dynamics (MacKinnon & Cumbers, 2011; Reimann & Ketchen, 2017).

In debates about sustainability, trust is largely conceptualised in terms of the relationships between corporate actors and their consumers, and the importance of gaining the consumers trust in initiatives derived from a CSR focus is emphasised. In the literature on the food supply chain, trust between the various links in the chain is framed as important for good business. It is highlighted that trust leads to efficiency, good partnerships, and a well-operated food supply chain. Assis et al. (2022) find that most research on trust is concerned with the relationship between sellers and consumers and further conclude that "research in the area of management and sustainability of agrifood supply chains is smaller and can be increased, as trust remains a central theme" (p. 424). The need for a larger focus on trust between the links in the food supply chain regarding sustainability in the literature is emphasised by my case study. The findings of this thesis contribute to the conceptualisation of trust in food SC by showcasing the importance of trust in suppliers in the focal company's sustainability evaluations. A further exploration of vertical and horizontal trust and its implications for sustainability evaluations is therefore needed.

Power is a complex phenomenon that is difficult to measure, and this thesis cannot contribute a new take on how to measure it. However, the case study does further exemplify the complexity of the phenomenon. An actor can simultaneously perceive themselves to be both powerful and powerless. Literature on this might exist, but I have yet to find food supply chain literature that

emphasises how corporate actors can express an experience of power duality. Furthermore, the thesis contributes to the literature by raising the question, 'Is this perceived "powerlessness" a lack of actual power or a strategy to shift responsibility onto other actors in the global food system?' This case study does not have the empirical basis to answer this question, but in a market that increasingly demands sustainable products, this aspect of 'powerlessness' should be further explored theoretically.

7.4 Future research

This thesis has explored how the Norwegian fish farming industry relates to its use of soy and the considerations behind it. How 'sustainable' the soy is or how well the certification schemes work transcends the scope of this thesis. As private certification schemes have become an integral part of corporate efforts to address environmental change, this is an aspect of the fish farming industry worthy of further explanation. "Certification schemes associated with sustainability have the potential to conceal complex and uncertain knowledge of salmon production and its environmental impact by communicating through labels" (Olsen et al., 2021, p. 9). Examining the dynamics of such certifications and their close ties to industry and third-party auditing services might be an interesting topic for future research.

This thesis has focused on companies operating in Norway; however, the Norwegian fish farming industry is globally connected through more than just its supply chain. Several of the major fish farming companies and feed producers are owned by large multinational corporations. Whether these corporations follow the standards of the Norwegian fish farming companies in their other operations is beyond the scope of this thesis. It would, however, be of great interest to examine this, as it could be an indicator of whether sustainability measures are taken due to genuine concerns or economic factors.

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