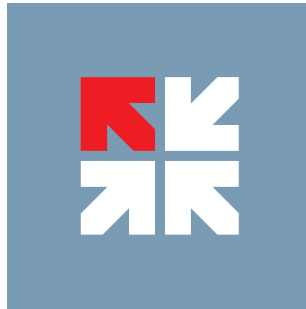


Master's thesis



**Sustaining the rural:
Assessing socio-ecological resilience through
farming in Iceland**

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Sustaining the rural: Assessing socio-ecological resilience through farming in Iceland

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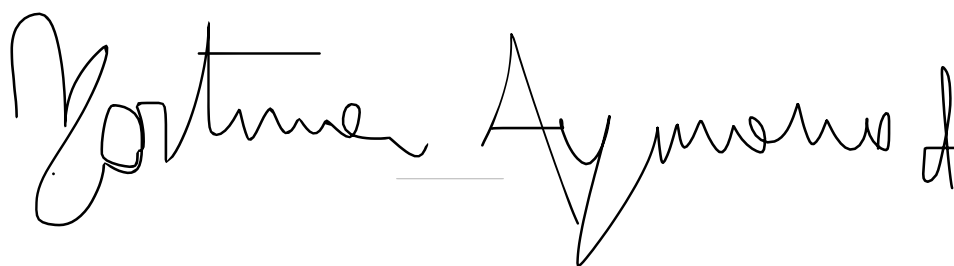
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Declaration

I hereby confirm that I am the sole author of this thesis, and it is a product of my own academic research.

A handwritten signature in black ink, reading "Martina Aymonod". The signature is written in a cursive style with a horizontal line under the name.

Martina Aymonod

Abstract

The farming sector in Iceland is facing social, economic, and environmental challenges that impact its long-term sustainability and development.

This study explores the main challenges faced by farmers across Iceland and how they cope with them, adapting through behavioural change, contributing to an understanding of rural resilience in the Icelandic farming system. The research analyses key factors and adaptive strategies currently used or potentially required within the agricultural sector.

A mixed-method approach was adopted. Semi-structured interviews were conducted; meanwhile, on-site observations were made around Iceland. An online survey was carried out, and the word elicitation method was applied to identify keywords related to rural and farming resilience.

The findings indicate a high number of challenges and concerns within the social and financial aspects, such as the difficulties in finding workers and the need for an extra job, in the farming sector. They also reveal that there is some hope for future generations to work within this sector despite its unprofitability.

However, research is subject to limitations considering the remoteness of the fieldwork locations as well as the participants' availability, language barriers, and time constraints.

Nevertheless, the research concludes that the farming sector requires hard-working conditions, and it is not profitable, posing threats to future generations who want to start an agricultural business, raising significant doubts about the sector's evolution. Moreover, it shows the cooperation between small farmers regarding the use of technologies and machinery, the values shared in family business, and the attention to the land. The study proposes recommendations to assess resilience within the farming system in Iceland.

The results contribute to a better understanding of current farming socio-ecological conditions in Iceland and can serve as a foundation for further social science research.

Keywords: farming, resilience, sustainability, rural development, Iceland

Útdráttur

Landbúnaðargeirinn á Íslandi stendur frammi fyrir félagslegum, efnahagslegum og umhverfislegum áskorunum sem hafa áhrif á sjálfbærni hans og þróun til lengri tíma litið. Þessi rannsókn kannar helstu áskoranir sem bændur um allt land standa frammi fyrir og hvernig þeir takast á við þær með því að laga sig að þeim í gegnum breytta hegðun, og stuðlar hún þannig að auknum skilningi á seiglu í dreifbýli innan íslenska landbúnaðarkerfisins. Rannsóknin greinir lykilþætti og aðlögunaraðferðir sem nú eru notaðar eða gætu reynst nauðsynlegar innan landbúnaðageirans.

Notast var við blandaðar rannsóknaraðferðir. Tekin voru hálfstöðluð viðtöl og jafnframt fóru fram vettvangsathuganir víðs vegar um Ísland. Vefkönnun var framkvæmd og orðakveikjuaðferð (e. *word elicitation*) var beitt til að finna lykilorð tengd seiglu í dreifbýli og landbúnaði.

Niðurstöðurnar sýna fram á mikinn fjölda áskorana og áhyggjuefna í landbúnaði hvað varðar félagslega og fjárhagslega þætti, svo sem erfiðleika við að finna starfsfólk og þörfina á aukastarfi. Þær leiða einnig í ljós að það er nokkur von til þess að komandi kynslóðir muni starfa í þessum geira þrátt fyrir litla arðsemi.

Rannsóknin er þó háð takmörkunum vegna þess hversu afskekktir rannsóknarstaðirnir voru, auk þess sem aðgengi að þátttakendum, tungumálaörðugleikar og tímamörk höfðu áhrif. Engu að síður er það niðurstaða rannsóknarinnar að landbúnaðurinn útheimti erfið vinnuskilyrði og sé óarðbær, sem skapar ógn fyrir komandi kynslóðir sem vilja hefja búskap og vekur það verulegar efasemdir um framtíðarþróun geirans. Enn fremur sýnir hún fram á samvinnu smábænda varðandi nýtingu á tækni og vélbúnaði, sameiginleg gildi í fjölskyldubúskap og umhyggju fyrir landinu. Rannsóknin setur fram tillögur til að meta seiglu í íslenska landbúnaðarkerfinu.

Niðurstöðurnar stuðla að betri skilningi á núverandi félags- og vistfræðilegum aðstæðum landbúnaðar á Íslandi og geta þjónað sem grunnur fyrir frekari rannsóknir í félagsvísindum.

To all the people who left their homes to follow their dreams and unexpectedly found
another place to call *home*.

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Acronyms

AD: Ante Deum

AI: Artificial Intelligence

EU: European Union

FAO: Food and Agriculture Organization

NCSC: National Center for State Courts

OECD: Organisation for Economic Co-operation and Development

SDG: Sustainable Development Goals

SES: Socio-Ecological Systems

SF: Smart Farming

SLS: Sea Level Rise

WTO: World Trade Organization

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Takk fyrir

1. Introduction

1.1 Contextualizing Farming Resilience

1.1.1 Agricultural Systems and Global Pressures

In an increasingly globalized agri-food market¹, where the final product matters more than its origin, cultivation, and processing, the agricultural production is exposed to complex social, economic, and environmental pressures that impact its long-term sustainability (Bertolozzi-Caredio et al., 2021; Meuwissen et al., 2019; Ólafsdóttir et al., 2000). To date, this sector attracts scientific interest, since in an ever-changing global market, it is important to know and study how these increasingly frequent and less predictable sources of pressure influence the agricultural sector and question the resilience² of rural areas and the results achieved with respect to the Sustainable Development Goals (Bertolozzi-Caredio et al., 2021; Darnhofer et al., 2016; Toader et al., 2015).

From an external perspective, institutions at multiple levels, including local and international associations, have taken note of the situation and are no longer indifferent to changes. In fact, in 2020, the OECD (*Organisation for Economic Co-operation and Development*) published the report *Strengthening Agricultural Resilience in the Face of Multiple Risks*, which proposes a reference framework to strengthen the resilience of farming activities, where it first analyses risk management in the agricultural sector in rural areas, proposing example cases, and then proposes an approach to strengthen resilience.

¹ According to the European Monitor of Industrial Ecosystem, the agri-food market is part of a sector that encompasses all activities related to food, from the farmers to the final consumers. European Commission. (n.d.). *Agri-food | European Monitor of Industrial Ecosystems*. Monitor-Industrial-Ecosystems.ec.europa.eu. <https://monitor-industrial-ecosystems.ec.europa.eu/industrial-ecosystems/agri-food>

² For the definition of the term, see paragraph titled *Concept of resilience*, page XXV.

From an internal perspective, however, it must be acknowledged that farmers play a key role in rural development and in socio-ecological systems (SES)³, despite the various challenges they may encounter, such as emigration, depopulation, climate change, economic instability, and others (Darnhofer, 2010; Malinauskaite et al., 2019). To address these challenges, farmers continuously adapt their practices to cope with climate uncertainty, economic pressures, and institutional changes. These structural transformations concerning the sector, therefore, call into question the perception of problems and growing uncertainty regarding one's ability to cope with new and/or persistent pressures (Fanzo, 2018; Ólafsdóttir et al., 2000; Perrin et al., 2020).

1.1.2 Diversity of Land-based Farming Systems

Farming is not only the activity of raising animals for final production or cultivating fields, but it is also something more complex than that. The farming activity is the result of complex socio-ecological interactions where the farmers play an important role in interfacing the environment and the society (Darnhofer, 2010; Perrin et al., 2020).

Farming plays a key role in rural development, the food market, and maintaining biodiversity (Toader et Roman, 2015). According to the FAO (*Food and Agriculture Organization of the United Nations*), there were an estimated 570 million farms worldwide in 2010, and after further research, they reported around 608 million farms worldwide in 2017, and a large percentage of them are considered smallholders or family farms. The distribution of farms is unequal at the global level: most of the farms are situated in rural regions of middle-income countries (Lowder et al., 2014; Lowder et al., 2025). Most of them are family farms; even if there is no clear definition of the term, it is commonly used to describe small-scale farms.

2 criteria that are used to define a *family farm* (Fanzo, 2018; FAO, 2018):

- The activity must be owned by a member of the family; it is internally managed.
- The activity requires a minimum number of workers; it normally relies on family labour.

³ Socio-ecological systems (SES) describe the interdependence between humans and nature relations (Malinauskaite et al., 2019).

There is a difference in what to consider an average and median farm size, and it is not only about the size of the farm, but it also includes the number of livestock held, the operated land used for cultivation or grazing, gross sales, and revenue (Fanzo, 2018).

Different types of farming include (FAO, 2018; Huber et al., 2024):

Pastoral farming	Crop grown used for the grazing of the animals. The livestock can freely move or is held in a large field delimited by fences.
Arable farming	Growing crops and harvesting.
Mixed farming	Mixing practices of rear animals and grow crops.
Organic farming	This type of farm is sustainable and environmentally friendly. There is no use of pesticides nor chemicals. There are no intensive practices.
Subsistence farming	The production is enough to. There is usually only a little surplus that can be sold. Family farms are usually considered types of subsistence farming.
Commercial farming	The final production is sold to make profit.
Hobby farming	A little number of animals is kept for the pleasure of it.
Intensive farming	A lot of effort is put there is a high input on technologies, money, and labour.
Extensive farming	It is the opposite of intensive farming: low inputs and low outputs.
Sedentary farming	The farming settlement remain the same through the years. It is permanent.
Nomadic farming	It is the contrary of the sedentary farming: nomadic farmers move around.

Table 1. Types of farming activities, Source: The Author

Modern farming methods can include, for example, hydroponics techniques, in which the crops are not directly planted into the soil, but they grow with a nutrient water solution. Vertical farming is often used indoors, for instance, in greenhouses, and the crops are growing in vertical layers instead of horizontally (Verma et al., 2023; Verma et al., 2024). There is also a growing trend in agroforestry, where farmers try to integrate the plantation of trees into animal and crop farming systems (Brnkalakova et al., 2021).

Farming in rural areas is somehow a way of life that provides a livelihood and contributes to the revitalization and development of the rural areas (Toader et Roman, 2015). Today, it is possible to talk about two types of farming in rural regions, for instance, smallholder and traditional farmers primarily aiming at subsistence, and large-scale modern agriculture farms for commercial production (Ellis et al., 2001; Fanzo, 2018). Farming in rural regions usually includes horticulture, pastoralism, and the grazing of livestock such as cows, sheep, and horses.

When talking about land-based farming, or more generally, about agricultural policies and regulations, need to be considered. Worldwide, 2 organizations play an important role in global food security: FAO⁴ and WTO⁵. The first one is the FAO, which aims to guarantee food security and improve agricultural productivity on a global level. The second one is the WTO (*World Trade Organization*), which deals with trade and rules globally, including food market management. Those organizations collaborate and share visions, trying to give a positive outcome in the agrifood systems (De Matteis et al., 2025). Moreover, FAO promotes sustainable agriculture according to the SDG (*Sustainable Development Goals*) and frequently shares academic publications that are available on its website. On a smaller scale, it is possible to identify national and local institutions and organisations that deal with the agricultural sector.

1.1.3 Thesis Structure

This thesis was written based exclusively on the information found in the research context and academic data available, and it was carried out to reach its maximum potential. Although it tries to offer an in-depth analysis, it may be limited as it does not take into consideration all possible parameters for an exhaustive answer due to the complicated accessibility of information. It is aimed at exploring the role of farms in rural Iceland and how they perceive and respond to social, environmental, and economic challenges, focusing on the adaptive strategies employed by farmers to enhance resilience and sustain their activities, and finally examining how different-scale institutions support resilience.

⁴ FAO: <https://www.fao.org/home/en/> (official website)

⁵ WTO: <https://www.wto.org> (official website)

The study explores framework concepts about farming history and conditions and conceptualizes farming resilience throughout the literature. It addressed the study area, the actual conditions, and the challenges it is facing. Opinions from farmers and solutions from the government are also considered. From a broader perspective, the study aims to promote rural development in Iceland by exploring the benefits of good socio-ecological interactions in farming areas. A concurrent mixed-methods approach is used to gather data, such as focus group interviews, an online survey, a word-elicitation, and on-site non-participant observations. The results of the research provide some insight into the current farming situation in Iceland and how farmers perceive challenges and cope with disturbances, and how they can assist them with some recommendations, both for them and for regional policies.

1.2 Research Questions and Aims

This research aimed to explore the role of farms in Iceland and how they perceive and respond to social, environmental, and economic challenges, according to point 44. of the OECD work in the Ministerial Declaration:

“Identifying innovation policies and accompanying institutions, investments and knowledge transfers to catalyse efficient progress towards agricultural productivity, sustainability, and resilience contributing to rural development.”

(OECD, 2023)

The scope of the thesis was to answer the research questions below, accompanied by their related aims:

1.2.1 Research Questions

- What function do farms serve in Iceland, and how do their owners view challenges related to socio-ecological resilience in rural areas?
- What adaptive strategies are farmers using to cope with social, environmental, and economic changes in Iceland?

1.2.2 Aims

1. To determine how socio-ecological processes influence farming resilience in rural Iceland.
2. To discover what function farmers serve in Iceland, and how they perceive social, environmental, and economic changes and challenges in the rural lands.
3. To analyse adaptive strategies used by farmers to cope with socio-ecological challenges.
4. To contribute recommendations for enhancing the farms' future resilience.

In other words, the research focused on the adaptive strategies employed by farmers to enhance resilience and sustain their activities, and it suggested recommendations applicable to the sector.

2. Background

2.1 Understanding Rurality

2.1.1 Beyond the City: Defining the Rural Land

When the open land exceeds the settlement presence and built areas, they are considered *rural areas* (Dasgupta et al., 2014). This term is often left somewhat misunderstood or undefined due to the varying perceptions of it, and this lack of a clear and shared definition leads to interpreting it as just the opposite of an urban area. However, it is not that simple, and different places in the world may have different interpretations of the term conceptually or empirically (Wiggins et Proctor, 2001). *Rural areas* usually refer to the countryside where natural habitats, for instance, mountains, water sources, are abundant compared to human structures and activities, which are limited (Wiggins et Proctor, 2001).

According to OECD, *rural areas* are defined by population density, while according to the *EU Rural Vision*, *rural areas* are thinly populated areas where more than 50% of the population lives in rural grid cells that normally count less than 300 inhabitants per km². What is meant by grid cells is that they can be classified into categories of clusters sharing similarities in population size and density. Hence, rural grids define rural areas that are not identified as urban clusters (OECD, 2021). It is possible to assess spatial definitions based on patterns, categorizing *predominantly rural*, large regions with over 50% rural population, *intermediate* regions with between 15% and 50% of rural population, and *predominantly urban*, having less than 15% rural population in the area (OECD, 2021).

2.1.2 Rural Population Patterns and Community Dynamics

3.3 billion people around the world live in rural areas where they heavily depend on agricultural resources. In the EU, in 2018, rural areas covered 83% of the total land (Bertolozzi-Caredio et al., 2021). Those areas are often forgotten by the government and difficult to reach, because far away from urban centres, lacking market abundance, creating stress and challenges to which people must adapt (Dasgupta et al., 2014; Fanzo, 2018). The lack of infrastructure and reliable transportation makes it difficult for people to move, creating a disconnection between the rural and the urban (Fanzo, 2018).

It is debated that for having rural development, there must be a shift in activities and diversification of sectors; however, some areas do not offer the right conditions to have these changes happen (Douwe van der Ploeg, 2000). For this reason, people migrate from rural areas to urban centres, and it is estimated that more than 60% of the world's population will be living in developed cities within the next 25 years (Fanzo, 2018). This demographic shift will lead to rural isolation and to the abandonment of the land and land-related activities. By migrating, there is a lack of successors and a shrinkage in the number and size of rural communities (McManus et al., 2012; Meuwissen et al., 2019). Another reason for young adults to move to cities is the access to higher education, such as universities, making their lives more modern and cosmopolitan. Thus, these reasons lead them to a position where they do not want to go back to rural areas, except those who have a strong attachment to their communities (Bjarnason et Edvardsson, 2017). Consequently, if young people move from rural to urban areas to seek a better lifestyle, they are unconsciously causing a faster population aging in rural areas. Other reasons rural inhabitants want or must move within their country or to other countries are easier access to infrastructure, better job opportunities, and centralized services (Fanzo, 2018).

Rural communities consist of 3 elements that impact their dynamics (Wilkinson, 1991):

- *Locality*: which is the geographical area of a community, set by boundaries.
- *Local society*: the community made by people, and how it is organized.
- *Community field*: the process of interactions of all social fields.

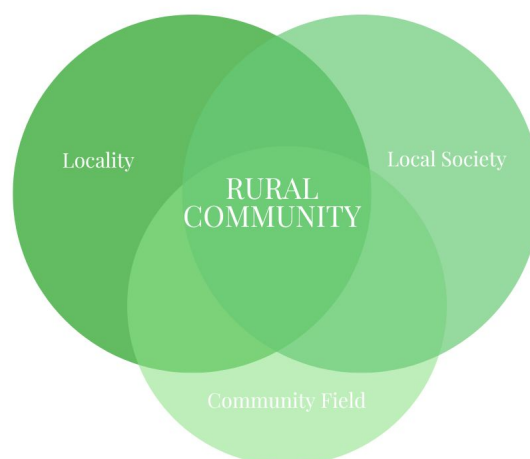


Figure 1. The 3 elements of a rural community, Source: The Author

2.1.3 From Experience to Expertise: Knowledge in Rural Areas

Traditional rural knowledge plays a crucial role in achieving faster productivity (Li et al., 2015). In the past, self-consciousness and the bottom-up model (endogenous development) of knowledge transfer represented the oldest tradition of know-how expertise (Lowe et al. 2019). Endogenous rural development refers to the ability of a rural system to develop with internal resources (Bertlozzi-Caredio et al., 2021). Despite their skills, the expertise was considered non-scientific, and whenever a research process was involved, scientific advice was provided and viewed as professional (Lowe et al., 2019). This imposed top-down model, or exogenous development, where the main forces of progress were coming outside the rural areas, and limited the share of local knowledge, causing negative socio-ecological consequences.

Rural knowledge nowadays is usually place-based and is identified as a network model in which both knowledge is shared and flows in both directions. An increasing number of researchers and policymakers recognize the significance of incorporating indigenous expertise in addressing sustainable development (Ólafsdóttir et al., 2000). This new approach is referred to as network development (neo-endogenous) and tries to interconnect both the local and the external forces, creating a mosaic of knowledge, strengthening the expertise and skills. Those models of rural development led to a *vernacular expertise*, which is place-based but, at the same time, promotes the exchange with external factors (Lowe et al., 2019).

2.1.4 Geographical and Historical Context of the Icelandic Rural

Iceland is a volcanic island of about 103,000 km² in the North Atlantic Ocean, under the Arctic Circle between the 63° and 66.6° northerly latitudes, and 13–24° westerly longitudes (Arnalds, 2005; Arnalds, 2015; Jóhannesdóttir et al., 2017). Climate-wise, Iceland is characterized by humidity, and depending on the lowlands or highlands, it can vary in cold and sub-arctic temperatures, which can affect the presence of vegetation. There is a significant reduction in woodlands from 27% to 1% of the total land (Dugmore et al., 2007). The morphology of the country consists of highland areas, which are commonly grazing areas, and the inlands, while lowland areas along river plains and coastlines, with some mountain exceptions along some shorelines (Arnalds et al., 2003). There are several rural areas in Iceland in the inland and along the coast, and most of the highlands are uninhabitable

due to the presence of glaciers and volcanoes (Karlsson, 2021). The Icelandic rural landscape is vast and sparsely populated, and it is defined by natural amenities like waterfalls, glaciers, and fjords.



Figure 2. Physical map of Iceland, Source: Náttúrufræðistofnun, 2026

Iceland was settled by Norsemen around 874 AD, and since then, the population rapidly increased until the Middle Age where it collapsed and then remained stable (Arnalds, 2005). Before the First World War, most of the inhabitants lived in rural areas, and their way of life was characterized by land-based farming or fish farming. Nowadays, according to the *Statistical Icelandic Database*, in January 2025, Iceland is home to about 389.444 people, and about two-thirds of them live in the capital area of Reykjavík (Statistics Iceland, 2026).

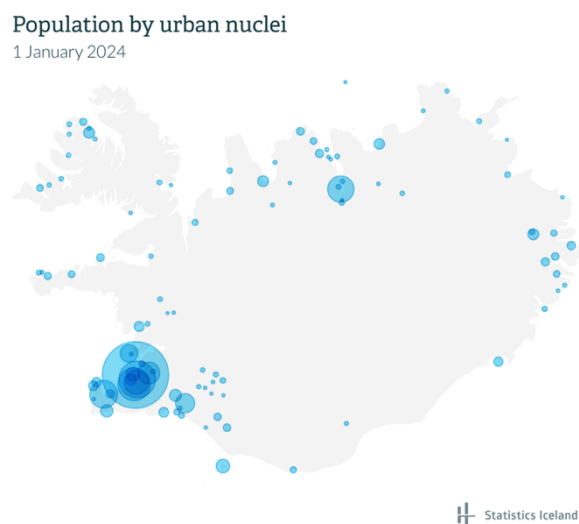


Figure 3. Density of population by urban area in Iceland in 2024, Source: Statistics Iceland

The proportion of elderly people is higher than the proportion of children, and the number of foreign citizens is increasing (Statistics Iceland, 2025). The population dispersion around the country can be reflected in agricultural implications, such as the small size of the market and the high supply chain costs (Jóhannesson, 2010). On an economic scale, the agricultural sector now plays a small role in the country's economy, leaving a larger space for the fishery, tourism, and industry sectors.

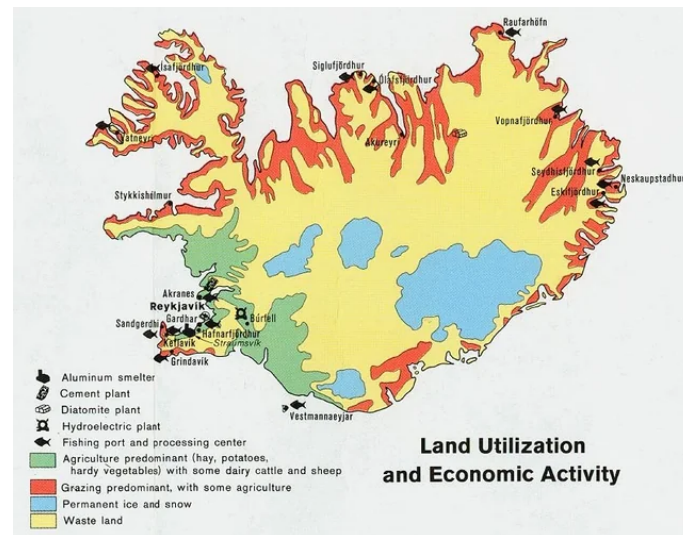


Figure 4. Land utilization and economic activity in Iceland, Central Intelligence Agency. Library of Congress Geography and Map Division Washington, D.C. 20540-4650 USA, <http://hdl.loc.gov/loc.gmd/g6930.ct001394> (1973)

2.2 Rural Systems in Iceland

2.2.1 Farming Practices in Iceland

Agriculture in Iceland is an ancient form of subsistence, and it acquires particular significance due to the geological features of the island and its geographical and meteorological conditions, such as the presence of volcanoes and glaciers, and the harsh climate (Jóhannesdóttir, 2017; McCooey, 2017). While Iceland is rich in fish farming along most of its coastal perimeter, it incentivizes this sector and earns profit from it; on the other hand, activities related to land and farm animals still take place inland (Popescu et Poulsen, 2012). The main agricultural activities that take place on Icelandic territory are almost all animal-based and mainly involve the pastoralism of ovine species, such as sheep and goats,

as well as activities involving cattle, like cows, and other animal genera, for example, horses and poultry (Jóhannesdóttir, 2017). Despite the limited Icelandic production in the agri-food sector, it is also due to the small quantity of livestock present in the area, production is highly subsidized and oriented towards satisfying the domestic demand (Arnalds, 2003). The development of agriculture in Iceland, since the first settlements, has gone through several phases: from self-sufficiency, support of family needs, in response to the growing demand of the urban market for agri-food products, such as different types of meat and dairy products (FAO, 2015). At the end of the 20th century, a quota system was introduced to regulate production and establish prices, and only in the early 2000s, the first digital and technological advances in the sector regarding machinery and databases were recorded (Jóhannesson, 2010).

Nowadays, farmers face increasingly unpredictable pressures that affect their state of resilience, such as the abandonment of rural areas to move to urban areas, like migrations of small villages to large cities, aging of the population, and decline in birth rates, land-related challenges like soil erosion and unfavourable climatic conditions, and reforms in territorial policies and norms. The combination of these dynamics underscores the importance of understanding, not only from an external perspective but also internally, how farmers perceive their vulnerability and how they carry out and adapt while maintaining the structural functions essential to agricultural activities. *How, then, can the resilience of agriculture in Iceland be assessed, and what makes it possible?*

2.2.2 Evolution of Icelandic Farming Systems

Historical Overview

Agriculture is the foundation of many rural communities in Iceland, even if it can be limited by both geological and geographical factors (Jóhannesdóttir, 2017). The story about land-based farming⁶ in Iceland started centuries ago, when livestock was brought to Iceland, and remained isolated on the island, without mixing with any other breeds (Arnalds, 2015). Farmers had access to the highland to graze their livestock, which was mainly sheep. The

⁶ In this context, land-based farming intends to describe all traditional agricultural activities that are done in the land for instance livestock, crop or mixed production, excluding land-based aquaculture and fish farming.

cultivated land included mostly haymaking, which was then used to feed the animals during the wintertime. In the past, farming was a very popular and dense activity across Iceland, but after volcanic eruptions, it declined due to the loss of cultivable land (Ólafsdóttir et al., 1999). Highlands also faced terrible soil erosion through the centuries (Arnalds, 2005).

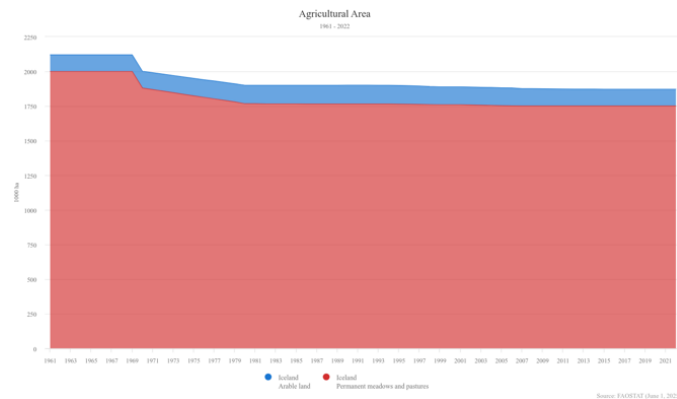


Figure 5. Line chart showing the agricultural area of Iceland 1961-2022. Source: FAOSTAT

Contemporary Farming

Nowadays, most cultivated areas are implied in livestock grazing, as it is possible to notice in *Figure 4*, where areas for pastures and meadows are predominant over horticulture (Jóhannesdóttir et al., 2017). More than half of the farms in Iceland are traditional and involve both cattle and sheep, as it is possible to see in *Figure 6*, where the bar chart shows the numbers of active farms, divided by sector, from 2008 to 2022 in Iceland (McCooley, 2017; Jóhannesdóttir et al., 2017). Most of the Icelandic agriculture is dairy production and the production of sheep meat. A minor proportion counts on goats, poultry, and pigs. Horses are present on the Icelandic territory in high density, but they are mainly used for recreational purposes and not for meat production (Arnalds, 2015).

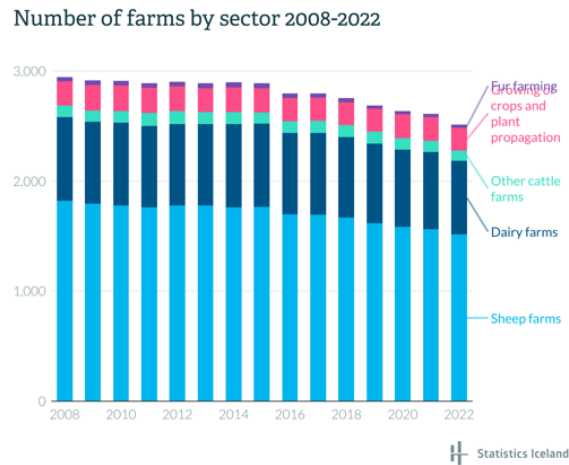


Figure 6. Bar chart showing the number of farms divided by sector in Iceland 2008-2022,
Source: Statistics Iceland

Animals are usually kept outdoors during summertime, with a distinction between sheep that can graze freely, and dairy cows, which stay near the land farm, enclosed by fences. The outdoor period usually starts in June and ends in September, but it can vary from year to year depending on the weather conditions. During the wintertime, animals are kept indoors, except for the horses.

At present, it is difficult to find reliable data that focuses only on the agriculture sector in Iceland, because the only dataset available online combines different sectors in one category, in this case: agriculture, fisheries, and forestry, with most of the attention relying on fisheries. In fact, as reported by the World Bank database, the combined contribution of all 3 categories accounted for 4.05% of Iceland's GDP in 2024, significantly lower than 8.79% in 1995, indicating a gradual decline in Iceland's GDP contribution (Globalen LLC, 2023).

Regional Distribution

According to the *Statistical Database of Iceland*, the number of farms by regions in 2010 showed that less than 2% of the total Icelandic territory is cultivated, and a considerable concentration in the South and Northwest area, followed by the Northeast and West area, leaving the East, Westfjords, and Capital and Southwest area with a low concentration. However, despite the high number of agricultural lands which continues to remain stable over the decades (around 18700m²), the number of active farmers declined by 4% from 2019 to 2020, reaching roughly 2000-2400 farming activities in Iceland (Ministry for Foreign Affairs of Iceland, n.d.). The type of cultivation is dictated by the soil quality and access to

geothermal sources, but it has diversified over the years, maintaining hay and grass fields, and growing also tomatoes, cucumbers, carrots, and strawberries inside greenhouses for the local market. And in some cases, privates take care of agroforestry and the processing of forest products by planting trees. Greenhouses are a suitable solution for horticulture, especially for vegetables and fruits that are not originally from Icelandic territories, and they need warmer temperatures, water, and natural light. Greenhouse farming, in some areas of Iceland, can satisfy those needs thanks to access to the geothermal water and energy.

Family Farming

In the past, agricultural activities were run within families that were self-reliant. Today, Icelandic farms are mostly small family businesses where just a small workforce is involved compared to the number of livestock, making the work harder and less profitable; moreover, most of the time, the members involved in the activity have an extra job. (Calus et Lauwers, 2009; Wuepper et al., 2019). By being a family business, it is usually inherited from older generations to newer generations that take over the land, the animals, and the machinery. It is difficult for young people to start farming activities without having any of these facilities already available and accessible; it is expensive and not profitable. However, there are possibilities to rent a farm or share the machinery. There is a growing trend in horticulture activities becoming bigger and opening to tourism possibilities, and other mixed husbandry animal farms interested in export activities. For these reasons, there is a need for an extra workforce, and some farms hire seasonal workers to satisfy this need during the busiest periods.

Government Support

Land-based farming in Iceland is ruled by the government, which provides a high level of financial support (Arnalds, 2005). The Icelandic government contributes to the wealth of the agricultural sector, offering subsidies and policy measures (Arnalds, 2015). To get this financial support, farmers need to apply and register as farm operators, and they must submit reports to the tax authorities. There are different types of support depending on the type of farming, for example, for horticulture, farmers can get subsidies as land payments or payment for the units of cultivated land, which are used for the cultivation and harvesting.

For sheep farming, farmers can get financial help for quality control and incentives for rural development, and they are controlled by a quota system. In fact, to prevent the sheep meat

sector from overproduction or lower market prices, the government set a *greiðslumark*, which is a production quota indicating a maximum number of livestock for which a farmer is or is not eligible to get the financial support. According to the Ministry of Industries and Innovation and the Farmers Association of Iceland (2016), in order to be eligible to get subsidies, farmers must participate in recording their breeds in the programme and meet certain requirements. To give an insight into how much farmers can get depending on the number of sheep they own, here are some examples of payments per farm according to category (Ministry of Industries and Innovation & Farmers Association of Iceland, 2016):

- From 101 to 120 sheep: 20000ISK.
- From 210 to 220 sheep: 120000ISK.
- From 301 to 350: 220000ISK.
- Over 801 sheep: 320000ISK.

Other types of payments are introduced by the government, as mentioned in Article 4. *Quality Assurance*, Article 5. *Headage Payments*, Article 6. *Farm Support*, Article 7. *Utilisation of Wool*, Article 8. *Regional Support*, Article 9. *Investment Aid*. Article 10. *Higher-value sheep products* (Ministry of Industries and Innovation & Farmers Association of Iceland, 2016).

In addition to the government support, some institutions and associations are supporting the farmers, offering funds and loans to which farmers can apply. Below, it is possible to find a list of 3 supportive organizations located in Iceland:

- The Icelandic Farmers Association (*Bændasamtök Íslands*): farmers can be members of it, they can take part in meetings, and make use of their rights.
- The Icelandic Regional Development Institute (*Byggðastofnun*): it provides grants and loans for rural development.
- The Agricultural Productivity Fund (*Framleiðnisjóður landbúnaðarins*): it offers funds for agricultural development.

2.2.3 Constraints in Icelandic Farming Practices

As previously noted, small-scale farmers play a significant role in assuring global food security; they face some challenges that sometimes they are unable to manage because they depend on external variables (Abiddin et al., 2023). Those challenges make small-scale

farmers exceptionally vulnerable to risks and make farming activities more difficult and less profitable (Ellis et al., 2001; Strandt, 2025).

Environmental pressures

Farmers in Iceland are vulnerable to environmental challenges that can affect their productivity. Those challenges include soil degradation, climate change, water scarcity, and atmospheric pollution, and they can damage the farming system (Dhillon et Moncur, 2023). Soil degradation encompasses land degradation and soil erosion. It escalates rapidly over the course of time, changing from a fertile landscape to an infertile space, and human presence and activity accelerate the process of land erosion (Arnalds, 2005; Barrio et al., 2018). The big impact of climate change can be split into small, diverse problems like the rising temperatures that can cause easier and faster spread of diseases between plantations and livestock, as well as the climate variability with more climate-driven extremes, like river floods, volcanic eruptions, storms and heat waves, sea level rise (SLS) that can steal fertile land, and desertification of other water lands and lakes (Dhillon et Moncur, 2023; Habib-ur-Rahman, 2012; Iglesias et al., 2012).

Social challenges

Social challenges incorporate all difficulties and trials that see the human resources as the protagonist. In fact, an aging farming population, labour shortage, and rural depopulation are the main social challenges in Icelandic farming systems (Asai et Antón, 2024). A cause of those challenges is the reluctance of the young generation to work in the agricultural sector, because seen as hard work and unprofitable. Academic data gaps exist while trying to find the average farmer's age in Iceland; however, it is possible to agree with the European trend that saw, in 2020, only 1.1 million (11.9%) farmers were younger than 40 compared to the 3million older than 65 years old (Eurostat, 2025). Old farmers tend to own and manage small-scale activities, and the presence of young farmers remain scares. In point of fact, young people out-migrate, meaning they move from rural lands to urban areas like Reykjavík, where they can find better and more opportunities in educational or occupational sectors (Abiddin et al., 2023). Young generations are not attracted to this sector, and this trend leads to long-term issues. By moving out of rural areas, young people unconsciously create a population shrinkage, lacking on human labour force, and a higher percentage of the aged population who have decided to stay in that area. Labour shortage is

caused by the difficulty of finding workers who are willing to work seasonally, especially during harvesting season, and in hard working conditions, like being able to be available at night to satisfy the livestock needs (Win et al., 2025)

Economic vulnerability

One of the main challenges for farmers to have a successful business is to start, maintain, and implement their activity (Dhillon et Moncur, 2023; Pannel, 1999). As a matter of fact, people need enough capital to start a business in this sector. Buying or renting land, getting the machinery and the equipment, maintaining costs for the livestock, and other expenses are an expensive part of being a farmer (Abiddin et al, 2023). Despite the inaccessibility of the national dataset in English, the *Statistics Iceland* website provides some insight into production, and the economic and financial accounts of agriculture, and shows that the farm-level incomes are fragmented. In Iceland, the insufficiency of capital and the high production costs cause a deficit and a possible failure of the activity if not prevented in advance, leading to the sector's unprofitability. The cost of the land itself and the cost of the soil management have not been set, and it is not predictable due to the land type, the remoteness, access to natural resources, or the opportunity to develop a business, and it is hard to establish the land's value (*Statistics Iceland*). Loans and governmental subsidies are available, but sometimes people are not aware of that, and they have limited capital, which means high costs of investment (Vasavi et al., 2025). The price volatility is also one of the main economic challenges, and it can cause unstable income for the small-scale farmers and compromise the access to the market (Davidova et Thomson, 2014; Abiddin et al, 2023).

Other types of disturbances

In addition to the previous constraints, farming activities in Iceland are also facing challenges linked to technological innovation. More modern challenges can be connected to technological devices and innovative methods. Examples of these SF (*Smart Farming*) technologies utilization can be the use of a drone to overview the fields and the livestock movements, as well as automation of machinery that substitutes the manual work of farmers, for instance, during the milking process (Nettle et Ingram, 2025). Hence, these examples of modern changes can impact the farmers' awareness of workloads and knowledge, but at the same time, they require time investment to learn how to use the tools and financial investment to cover the expenses of the tools.

2.3 Concept of Resilience

2.3.1 Resilience through Literature Insights

The concept of resilience has evolved over recent decades, and trying to conceptualize the terms *resilience*, *farming resilience*, *resilience thinking*, or *rural resilience* is difficult because of the different nuances they might have. Different definitions might confuse, but they can also give a wider meaning to the same concept. In response to the challenges farmers face, the emphasis on resilience as a valuable framework highlights how they cope within agricultural and rural systems while maintaining functionality (Folke, 2006).

One of the first academic articles to mention the term *resilience* was published in 1973 by C. S. Holling. The Canadian ecologist and scientist defined *ecological resilience* as the capacity of a system to withstand shocks without transitioning to an alternative state (Holling, 1973). Hence, the concept of resilience evolved: in fact, Walker et al. (2004) referred to resilience as:

“The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedback.”

6 years later, Folke et al. (2010) defined resilience as the capacity of a system to absorb perturbations, and at the same time keep the same structure and functions, and be able to develop. Meuwissen et al. (2019) said that resilience in a farming context relies on the capacity to maintain structural functions despite involuntary and/or unexpected shocks (Darnhofer, 2021; Perrin et al., 2021). In more recent years, according to Bertolozzi-Caredio et al. (2021), the resilience concept analyses the socio-ecological systems as interconnections between humans and ecosystems, which can function just with the presence of the other. According to the OECD (2020), resilience is:

“The ability to prepare and plan for, absorb, recover from, and more successfully adapt and transform in response to adverse events.”

In other words, resilience is trying to maintain the stability of a system's functions despite any disturbances, depending on the availability of resources and how they are used to cope with them.

Core Attributes of Resilience

Besides, contemporary literature identified common capacities in the different definitions of the concept of resilience, sharing 3 attributes (Bertolozzi-Caredio et al., 2021; Darnhofer, 2010; Milestad et al., 2008; Walker et al., 2004):

- *Persistence*: This is the farming ability to endure and ensure the core functions of the activities despite external disturbances. An example can be bad weather conditions, such as long, dark, and cold Icelandic winters;
- *Adaptability*: This is the farm's capacity to adjust its practices and strategies to cope with challenges;
- *Transformability*: This is the capacity of a farm to change its structure and/or function when the challenges become untenable.

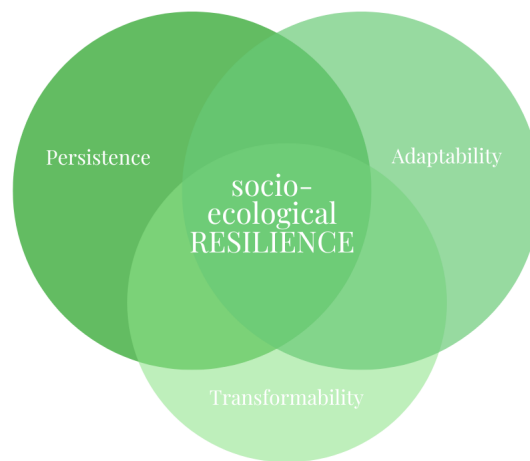


Figure 7. Key dimensions of resilience, Source: The Author

The 3 aspects of resilience mentioned above can be used as criteria to examine how farming systems in Iceland respond to socio-ecological challenges.

2.3.2 Resilience Thinking in Farming Systems

Resilience thinking emphasises the fact that if there is a will to persevere an activity for a long time, there is a need for change (Darnhofer et al., 2016). Learning from the experiences and developing knowledge is also part of resilience thinking because it helps to face similar situations that might happen in the future (Milestad et al., 2008).

Resilience thinking in farming includes the characterization of a farming system and the actors involved, identifying the challenges that this system shows, at the economic, environmental, and social levels, and the desired functions of the farming system. After that, assessing the capacities previously mentioned, and lastly enhancing resilience (Meuwissen et al., 2019).

Key Perspectives of Farming Resilience

The resilience of rural and farming systems is a growing concern, and it is complex to assess because it involves external drivers, and the reaction farmers and rural communities have to them (Perrin et al., 2020). Farming resilience distinguishes 3 perspectives: the structure of the farm itself, the social actors involved, and the relations of the farming activities (Darnhofer et al., 2016):

- *Structure – the farm*: this refers to physical and ecological components of the farming system, like tangible buildings, machines, ecosystem (i.e., soil, etc.), and on which farmers depend.
- *Social actors – the farmers*: this includes all people involved in farming activities and who influence the structure, and can be family members, stakeholders, extra workers, etc.
- *Relations – farming*: this concerns the interconnections between the structure and social actors, for example, traditional practices and decision-making processes. These dynamics connect farming systems with the markets, institutions, and knowledge systems.

Socio-Ecological Resilience in Farming Systems

Overall, resilience thinking focuses on enhancing the long-term socio-ecological systems' adaptability (Darnhofer, 2010). In the rural and farming systems, resilience thinking shifts from the term *farm* seen as a stable structure, to the term *farming*, which includes all the socio-ecological interactions and becomes a process of becoming with constantly changing.

The scheme in the next page (*Figure 8*) visualises, in a simplified way, farming resilience, how external factors affect the farming system throughout disturbances, and how the system adapts and transforms while maintaining positive outcomes.

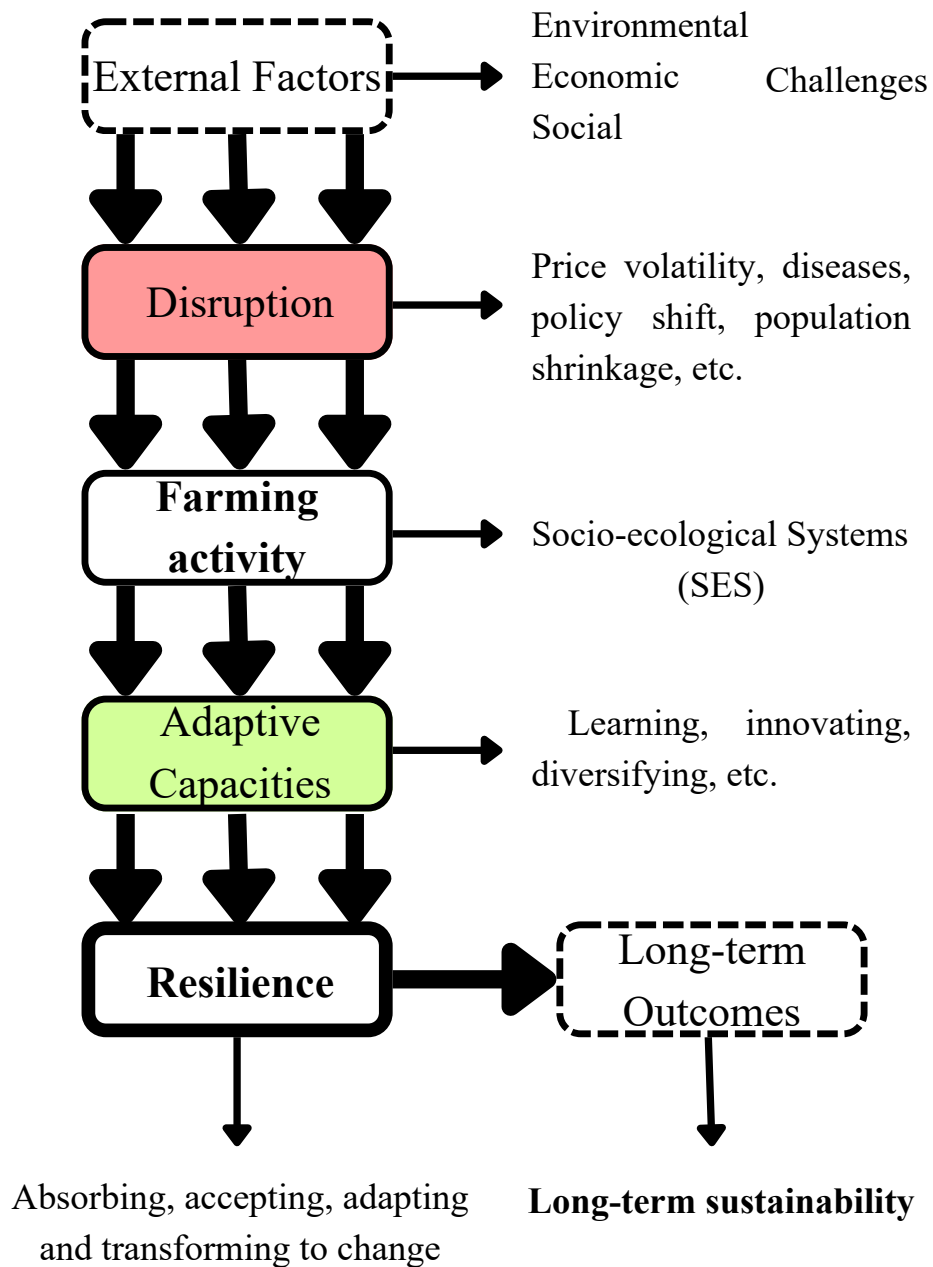


Figure 8. Visual conceptual framework of farming resilience, Source: The Author

3. Methodology

To answer the research questions and fulfil the goals of the research, a mixed-methods approach with an exploratory design was used, focusing on qualitative data as a primary source of information (Almeida, 2018). The diversification of the methods has been essential to obtain a comprehensive and global picture of the Icelandic farming situation. Firstly, a survey was published online, then interviews were conducted around the country, while multi-locality in-site observations were made, and a section comprising the word elicitation method was used both in the survey and the interviews (Bethlehem, 2009; Kahlke et al., 2024).

The criteria for the target were that all participants in the study needed to be willing to take part in interviews and the survey, and they needed to be currently involved in farming activities (livestock, crop, or mixed) or be in rural areas of Iceland. The criteria for the sizes and methods followed a purposive sampling, which, according to the NCSC (*National Center for State Courts*), refers to:

“Intentionally selecting participants based on their characteristics, knowledge, experiences, or some other criteria”.

Before the fieldwork started, the criteria aimed to ensure diversity in the geographical locations, according to land utilization and economic activities (*Figure 4*), as well as the size of the farms and the type of agriculture they offer (livestock, crop, or mixed). The qualitative size tried to count a minimum of 1 or 2 interviews per designed area (*Figure 9*), whereas the quantitative research through the survey tried to reach at least 20 responses.

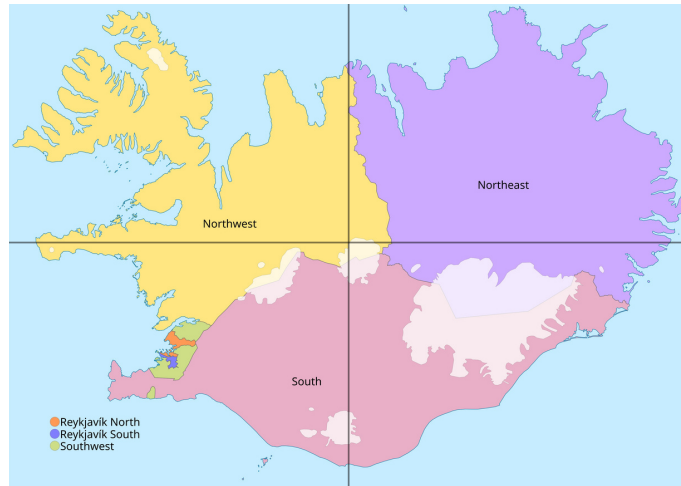


Figure 9. Electoral districts of Iceland in a map divided into 4 equal parts; Source: Bjarki S. 2021, with final edit of The Author

3.1 Research Methods

3.1.1 Survey

Administering surveys can be considered one of the most common methods for collecting data in conducting research (Morse, 2009). Creating a survey from scratch requires the use of a clear structure and the use of terminology appropriate to the type of audience to which you want to reach. This method can give an overview of what the target audience responds to (Dillman et al., 2014).

For this study, the online survey (*Appendix B*) was created with the *Microsoft Forms* platform and published on different social media platforms, such as Instagram stories and Facebook feed, as well as sent via email and message to friends and coworkers who forwarded it to their close acquaintances. The choice to survey 2 languages, Icelandic and English, was made because it made the questions more accessible and comprehensible to foreigners, or more generally, to people who do not speak or understand Icelandic. The survey was first created in English and then translated into Icelandic with the help of *Artificial Intelligence* (AI) and *Skrambi*, an Icelandic website, to correct the grammar. After doing it, some Icelandic native speakers read the text to check the language level and whether the vocabulary was relevant and comprehensible to everyone.

The importance of having it in Icelandic was that most of the respondents were expected to be Icelandic-speaking individuals, and to live in Iceland. The other criterion was to be at least 18 years old or older to fill out the survey. Inclusion played a big role; in fact, the survey was open to farmers and non-farmers with or without agricultural knowledge. The sections were built in a way that if you were not a farmer and you did not have any experience in the sector, nor any knowledge, you were not forced to answer any further questions in the survey sections. Whereas if you were a farmer or a non-farmer with previous experience or knowledge in the sector, you were able to complete the survey. The inclusion criterion was important to show the different background knowledge (Section 2.) and various perceptions of farming in Iceland according to people directly involved, people involved indirectly, and people not involved.

It took 5 to 10 minutes to be completed, and it guaranteed the anonymity of the participants, without asking any personal information such as names, surnames, or other peculiarities that could be connected to a particular person.

Survey's sections

The survey was structured into 5 different sections:

- Section 1: *General Information*
 - This first section was created to gather information related to the genre and age range of the respondents to find out the demographic features of the people involved in the survey.
- Section 2: *Background Knowledge*
 - This section explored the basic knowledge of the respondents about the overall topic of farming in Iceland, whether they are currently involved in some agricultural activities, or if they know someone involved in them. It also tried to find out whether those people have been living in a rural environment and had some experience in farming.
- Section 3: *Farming Activities*
 - This section was made to deeply analyse the kind of agricultural activities the respondents are involved in, if they are, what the focus of the farming is, the kind of production, and the number of human resources involved.

- Section 4: *Economic and Social Aspects*
 - This section sought to better understand what people think about the agricultural sector economically and financially, placing it in the national and international markets and considering changes over time based on factors such as changes in working methods, the use of new technologies, media and political attention, climate, and environmental changes.
- Section 5: *Personal Perception*
 - This last section was set with open-ended questions to investigate the respondents' opinions about a specific branch of Icelandic farming, for instance, the challenges of the sector nowadays, and what its future could be. The 4 questions of the survey were open-ended, giving more freedom to answer for the participants. They included mentioning:
 - *Themes*: 3 words related to farming activities in Iceland.
 - *Challenges*: The biggest challenge(s) the Icelandic farming sector is facing.
 - *Visions*: Future scenarios of the farming sector in Iceland.
 - *Optional comments*: Additional comments.

In the *Themes* part, the word elicitation method was used for one question (see paragraph 3.1.3). This part was setting the context of farming, asking the respondents to write the first 3 words that came to their mind while thinking about farming in Iceland. This method aimed to set a relevant and real-life context by using authentic language.

The table below shows in a schematic way how the survey was structured:

Section	Title	Content
Section 1	General Information	Demographic features and general information of participants
Section 2	Background Knowledge	Basic knowledge of farming and rural activities
Section 3	Farming Activities	Types of activities

Section 4	Economic and Social Aspects	Economic, financially and social changes and considerations
Section 5	Personal Perception	Open-ended question related in accordance to participants' opinions

Table 2. *Survey structure, Source: The Author*

Once the survey was filled out, the respondents submitted it anonymously, and the answers arrived directly on *Microsoft Forms*. The panorama of the answers showed that 60 people took part in the survey. The analysis process aimed to thematically analyse the responses of the survey and to highlight common insights mentioned by different farmers and non-farmers participants.

3.1.2 Interviews and Multi-locality In-site Observations

To gain a deep understanding of the social aspects and perspectives of a particular topic, conducting interviews is an effective method. Semi-structured interviews were conducted with the willing participants in the farms, focusing on their personal experiences, knowledge, visions, and advice (Adeoye-Olatunde et al., 2021). The way the interviews were constructed was to let them be flexible to encourage the participants to have an open discussion on the topics mentioned and enhance a free dialogue (Toumi et al., 2018).

Interviews Construction

The interview method started by finding some suitable questions based on specific topics, such as the participants' backgrounds, their personal opinions, environment, politics, economics, etc (Adeoye-Olatunde et al., 2021). Although targeted questions were created initially, it was decided to keep the generic questions about specific topics, without putting the participant in too much awe. Before starting with the actual interviews, a test interview was conducted in such a way as to be able to time its duration and understand the most appropriate sequence to follow in asking the questions.

The primary language used for all interviews was English, except for specific terms that could not be translated from Icelandic to English or that would have changed the meaning even slightly. Therefore, these words were mentioned by the participant in Icelandic and, in

some cases, explained in English or hand-transcribed in Icelandic, so that they were later translated during the transcription process.

Those who participated in the interviews, before being registered and beginning to answer questions, read and signed a confidentiality agreement, written both in English and Icelandic, which described the purpose and methods of the research and protected confidentiality by using the collected data only for university research purposes and not mentioning their real names or characteristics to not making possible to identify the farming activities.

The interviews followed a question guideline made by micro topic 17 questions, as it is possible to see in *Appendix A*. During the interviews, the questions asked were more general and explored the past, the present, and the future of the farming activities, giving a context to socio-ecological resilience.

The interviews were conducted primarily on-site, except for one interview that was conducted online. The interview locations were multiple and scattered across the Icelandic territory (*Figure 9*). In fact, this research project was conducted in the rural lands of Iceland, where agriculture is still low-intense. (Jóhannesdóttir et al., 2017). The fieldwork took place around the 103,000 km² Icelandic territory according to 2 variables:

- The first variable was to focus on the areas where there is a predominance of agriculture and grazing, as can be seen in *Figure 4*. Those areas were the ones with the highest presence of human-related farming activities.
- The second variable was to consider Iceland divided into 4 zones in accordance with the 4 districts: Northwest, Northeast, South, Southwest, and the Reykjavík area, as it is highlighted in the second map (*Figure 9*).

Variables	Description	Accomplishment
First variable	Find farming activities in agriculture and grazing zones	Fully accomplished
Second variable	Finding farming activities based on the division of the Icelandic territory in 4 symmetrical zones	Not fully accomplished

Table 3. Site description variables, Source: The Author

While the first variable was accomplished, the second one struggled to be followed, as it will be explained later in subchapter 5.3.

The meetings were condensed as much as possible into a week-long period for destinations far from the Westfjords, where the research is based, while the closest meetings were organized on a same-day basis.

Interview participants were contacted via email or social media such as Facebook. After checking Google Maps for possible farms or farm-related activities, they were skimmed based on email accessibility to easily contact potential respondents and on geographic accessibility, whether the locations were easily accessible by car. After contacting people, not all responded, or some responded late, while others responded promptly. After a presentation of the research and the importance that these people's contributions can bring to the analysis of the results and to future academic research, a time and place for conducting the interviews was established. The number of interviewees was 9, but more people were involved in some of the meetings, for example, for translation or to give some extra help and opinions. The interviews were conducted inside the interviewees' homes or on farm structures where agricultural activities are carried out. For this reason, some of the interviews were not recorded due to the interference with clients or family members, or the environment was too noisy to have a smooth and uninterrupted recording. During the interviews, notes were taken by hand rather than on a cell phone or computer in such a way as to make the person being interviewed comfortable, and, if there was a need to draw objects or recreate maps, it would have been easier and quicker with a pen and paper for both the interviewer and the interviewee. At the end of the day, the notes were paraphrased and analysed, and if there was a recording, it was listened to after the fact and transcribed into the computer.

Multi-locality in-site observations

In parallel with the interviews is the multi-locality in-site observations method, since during the fieldwork trip to reach the various locations of the interviews, photographs were taken, and observations were made on fields, livestock, recurring or original buildings, or machinery (excluding images of people to protect their privacy), considered useful for the study and analysis of the data (Bardon et al., 2020; McKechnie et al., 2008). In the social sciences, this is one of the most used phenomena that might be important for the research, and it is usually related to other data collection methods, which in this case are mentioned above.

3.1.3 Face-to-Face Word Elicitation

Elicitation techniques are methods used in sociological research to obtain information (Kahlke et al., 2024). Especially, the word elicitation method can be used to provide information about what the participant knows or does not know about a certain topic, and to grade the importance of words they picked (Halim et Halim, 2019; Zimmer, 2021). For this research, a face-to-face exercise was held after some interviews. At the end of the interviews, the participants got a paper (*Figure 10*), and an explanation of what they were expected to do, then they had some time to write at least 1 word up to 3 for each topic. The words could be written in English or Icelandic. Some people decided to write some short sentences instead of words, but it has been accepted anyway. This practice was used during 9 exercises, after which the participants were asked to explain the word choice and to discuss it if they wanted. The aim was to discover what the participants think about their farming activities according to 3 different categories: economic, environmental, and social.

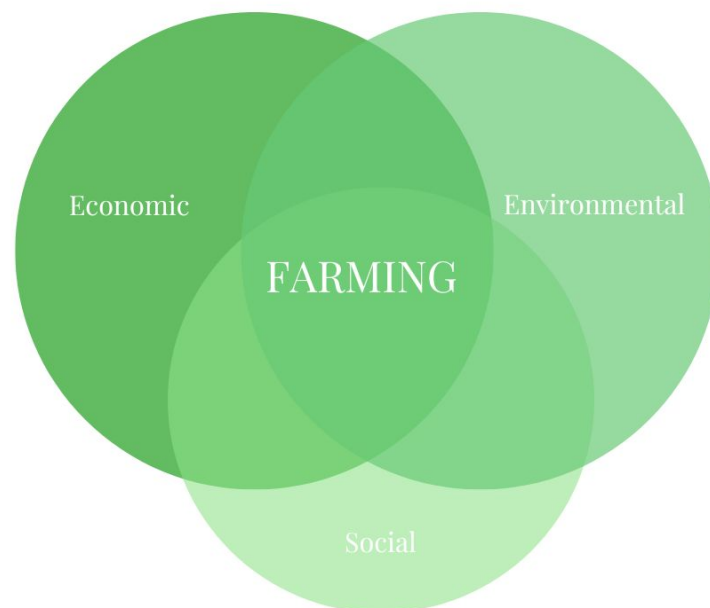


Figure 10. Facsimile of the paper sheet, Source: The Author

3.2 Ethical Considerations

The thesis advisor board, in accordance with the guidelines given by the University Centre of the Westfjords, granted ethical approval for this research (*Appendix C*). By filling out the survey, the participants voluntarily agree to participate in the research, while keeping their anonymity. Before participating in the interviews, all participants filled out a consent form, which confirmed their consent toward the nature of the study (*Appendix D*).

Despite the attention to the carbon footprint, a certain amount of CO₂ emissions has been inevitable due to the fieldwork around all of Iceland over a week by car and alone, without sharing the expenses.

4. Results

This section shares the results of the study after having gathered them using different types of methods, showing the different Icelandic features in the farming sector, how challenges are perceived by farmers and non-farmers, and how the people involved are adapting and transforming to overcome disturbances and have a better outcome.

4.1 Survey results

4.1.1 Demographic Features

60 people located around Iceland answered the survey, and most of them were women. The age range was extensive, and many participants were between 18 and 28, followed by people between 40 and 50, while the lowest number of respondents was aged between 30 and 60 years old. Regarding the question of being a current farmer in Iceland, only 18% of the participants answered positively; however, more than half of them have at least one family member or know a close acquaintance who is involved in farming activities. Although not a lot of the respondents are current farmers, a lot of them used to work and had some experience in farm-related activities, but they did not get paid because they were just helping, or they were members of the family.

4.1.2 Farm Type

The survey results show that the most common farming activities are related to livestock, especially sheep, but also cows and goats. Followed by dairy production and crop farming, and only in the last place, greenhouses are used for the agriculture of vegetables and fruits like tomatoes. The workforce involved in the farming activities mentioned by the respondents is surprisingly low, with an average of 5 workers, apart from some picks of 10 workers, but no more than that. Some other activities involve only 2 to 4 task forces. The low number of workers can be attributed to the fact that most of the respondents said that the farming activity they own or know about is family-run or is just a hobby farm, usually on a smaller scale than a business or tourism-related farm, where there may be the need for a higher number of workers. From the answers, an interesting point is that farming is not considered the primary source of income, even though it was a profitable sector in the past;

it has been highlighted that the need for another job, most of the time not connected to agriculture, to have a stable income.

4.1.3 Sector Changes

Regarding alterations in the sector over recent years, people have noticed:

Many changes in:

- The evolution of technologies and machinery use, such as cultivation systems like hydroponic plantations, and the cooperation of ownership of machines.
- The fluctuation of prices and financial-related conditions, like the quota system, the setting of prices by slaughterhouses, and changes in market prices.
- The climate and environment, the duration of the winter, and the difference in the soil assessment.
- The food market, regarding the food quality, food security, and production in the country, based on the consumers' demand.

Some changes in:

- The working methods involve replacing manual work with machinery or changing the traditional way of farming.
- The media attention, from newspapers, radio, as well as online and live news on social media or TV.

Nevertheless, respondents still do not have a clear view of changes in political attention, the introduction of new policies or governmental subsidies, mentioning the dependence on the political party in power now.

The last 4 questions of the survey were open-ended, giving the participants more freedom to answer. The answers included:

Themes Frequency

Challenges

Visions

4.1.4 Themes Frequency

With the first question, respondents were asked to write 3 keywords related to farming. It is possible to identify the most frequent words that are very dominant and repetitive in the answers given, then other common and redundant words, and some less frequent but still meaningful words.

Most frequent	Frequent	Least frequent
1. <u>Work</u> related words (work, hard work, etc.): giving a sense of high intensity activity demanding effort and physical activity. 2. <u>Food</u> related words (food, production, etc.): emphasising the consumer demand in the food market. 3. <u>Animals</u> related words (animals, livestock, sheep, etc.): reflecting the centrality of animal-based farming in Iceland.	1. <u>Nature</u> related words (nature, rural, land, etc.): linking to the environment and landscape. 2. <u>Milk</u> related words (milk, dairy, production, etc.): highlighting the importance of the sector, as previously mentioned in the type of farming activities. 3. <u>Money</u> related words (money, income, finance, etc.): pressuring the financial reliance and governmental support.	1. Family 2. Tradition 3. Culture 4. Joy 5. Weather 6. Satisfaction

Table 4. Frequency of themes related to farming activities according to the survey respondents, Source: The Author

After having analysed all words, written in a raw table, not considering blank answers (this small lack of words is not impacting the findings of the question because the other

answers gave diverse keywords), and divided them by frequency of appearance, it has been possible to interpret them by core ideas and themes.

Themes	Descriptions	Examples of words
Work intensity	Farming as physically demanding and time-consuming	Work, hard work, long working hours, sweat, struggle, toughness, low wages
Livestock production	Agriculture associated with animal-based farming systems	Sheep, cows, livestock, animals, lambing, herding, milk, dairy farm
Food production	Farming viewed as essential for ensuring national self-sufficiency	Food, food production, food security, necessity, essential, meat, vegetables
Nature, land, and rural identity	Farming linked to the environment, and landscape	Nature, land, countryside, rural, soil, environment, water, connection to nature
Economic pressure	Financial challenges and policy support mechanisms.	Finances, money, capital, low income, subsidies, government, tariff protection
Technology and machinery	Use of machinery, tools, in farming	Tractor, hay machinery, tools, excavators, fertilizer, green/clean energy
Family and tradition	Farming understood as a lifestyle and cultural heritage	Family, traditions, culture, lifestyle, heritage, countryside life
Values, and motivation	Emotional attachment associated with farming despite the work intensity	Love, joy, satisfaction, perseverance, initiative

Table 5. Themes related to farming activities according to the survey respondents, Source: The Author

As it is possible to see in the table above (*Table 5*), there are 8 main themes highlighted in the survey, which can be divided into the macro sector of farming: social, environmental, and economic, depending on their relevance to the topic.

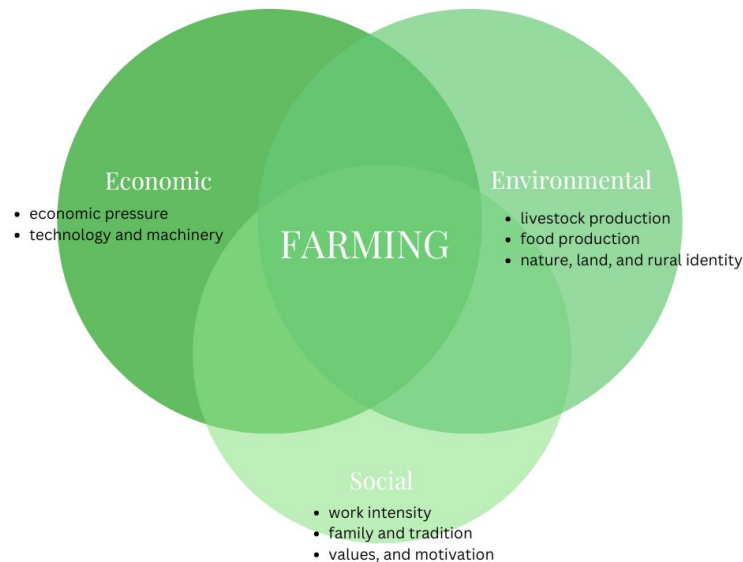


Figure 11. Frequent themes for each macro sector, Source: The Author

4.1.5 Challenges

In the second open-ended question, the respondents mentioned what they thought the biggest challenge or challenges the farming sector is facing in Iceland. Some of those answers overlap, creating distinct and dominant thematic challenges:

Topics	Descriptions	Examples
Demographic	These types of challenges include the social part of farming which shows the low engagement of young people in the sector, the lack of workforce and financial difficulties of people to start a business.	Lack of new young workers, labor force, recruitment is difficult because it is so expensive to buy a farm; aging farming population, urban migration, too few people involved in agriculture, enabling young people to enter agriculture, declining number of people taking over farming, workforce shortages.

Economic	These types of challenges show the low profitability of the sector. It is expensive to start a business and to maintain it. It also affects the consumers' willingness to pay the final product.	Increase in expenses and not getting the money back, operating costs, pricing, low prices for products, product pricing, impossible to buy a farm unless you are wealthy, prices farmers sell their products for, finances, practicing profitable agriculture, expensive electricity, expensive machinery purchases, access to consumers willing to pay, low prices paid to farmers, high machinery costs.
Governmental	Fluctuations in taxes and prices influence negatively the farming sector.	Tax increases, and having government support, constant changes in regulations regarding animal farming, finances, taxes, lack of sufficient funding, supportive government, high land prices and interest rates.
Sustainability	Not all farmers define their activities as sustainable, sometimes if the methods are sustainable, maybe they finances are not, or vice versa.	Being environmentally friendly, being sustainable, farming not financially sustainable.
Market	Many challenges might occur in the agri-food market. Import-export, local-external, dependence-independence.	Preference for imported ingredients, being independent from other countries, being able to make a living in the sector, import of cheap products, meat and milk industries take most profits; distribution challenges, dependence on imported vegetables and fruit, overemphasis on exports, high costs and low selling prices due to competition.

Environmental	Environmental challenges include all the natural phenomena that might have an impact on the farming activities like soil erosions.	Climate change, weather, harsh weather conditions, climate conditions, extreme weather, climate impacts.
Public perception	The public plays a key role in the farming perception because it can compromise the societal view of the activities. It can have a positive impact, but it can also change very quickly and becoming negative.	Lack of understanding, consumer choice of local products, public perception, changing societal view of farming.

Table 6. Challenges related to farming activities divided by topics according to the survey respondents, Source: The Author

4.1.6 Visions

In the third open-ended question, the respondents shared their opinion about the future scenarios of the farming sector in Iceland.

The raw data show that there are mixed opinions about the future of the farming sector in Iceland. Some people are more optimistic, focusing on sustainability, while others are more pessimistic, perceiving an abandonment and decline.

On one side, there is the hope for the sector to bloom, having a generational change and becoming more tourism-oriented, whereas on the other side, small farms are becoming fewer and getting abandoned, with just big farming companies' survival. These visions are summarized in the table below:

Visions	Descriptions	Examples
Negative vision	Are considered negative visions those visions that might influence badly an process or activities,	Slowly dying, fewer farms, fewer farms and larger farm sizes, struggling; many farms abandoned, new challenges, will disappear within 30 years, fewer animals,

	preventing the total or partial success. Those visions might bring to the decline of the sector.	pessimistic, even harder than now, farming dying out as a sole livelihood, small farms disappearing without generational continuity, rather bleak future, overall decline, not particularly good, bad, farming moving into heavy industry, difficult, not optimistic and high entry barriers.
Positive vision	Are considered positive visions those visions that show improvement on the short and the long term and reach desirable progresses.	Self-sufficient production, ore technology, good, farmers having more direct contact with consumers, more efficient farms, domestic production playing a large role, still good, Iceland as a farming country, food security and domestic production, better infrastructure and working conditions, public closer to food production, growing, blooming with support, optimistic, vegetable production growing, bright future.
Conditional future	This vision is not 100% certain, but it implies conditions to make it happen “If this will...”. This vision relies on hope and positive faith.	Hopefully growing, holding onto hope for viability, possibly fully state-controlled, not bright unless government support farmers, stable short-term and significant decline later, hopeful for development, bright future if handled correctly, hopefully improving, bright if properly nurtured.
Focus on sustainability	This vision emphasizes the long-term sustainability, farming resilience and balanced development (social-economic and environmental).	Greenhouses, greater emphasis on sustainability and organic farming, more greenhouses, vertical farms, more local sales, organic farming, lower carbon footprint, more public awareness of food origins and environmental impact, greater

		focus on sustainability and vegetable production.
Tourism-orientation	Possible fusion of the farming activities with some touristic activities. It would not only involve the farmers, and the livestock, but also tourists. The two activities are combined.	Niche and high-end farming combined with tourism, mix of farming and tourism for stable income, farms turning to tourism and cultural heritage.
Uncertainty	Uncertain visions for the future of the farming sector in Iceland. It does not show any negative or positive sides, it remains vague.	Don't know.

Table 7. Future scenarios of farming activities according to the survey respondents, Source: The Author

4.2 Interviews and On-Site Observations Results

4.2.1 Interviews Results

A total of 9 interviews were conducted with people involved in different kinds of farming activities. Some of them have been recorded while other not, with respect to the participants' privacy. To better understand the dynamics of the farming operations and their barriers' perceptions, a clearer description of the participants is provided:

Farm Type	Farm size	Location	Age of farmer(s)	Number of workers
Sheep farm	Small size	Westfjords	>60	1 + family help
Sheep farm and hobby goats	Medium size	Westfjords	40-50	2 + family help

Goats farm and tourism activities	Small size	West	40-50	1 + 1 family member
Goats farm and tourism activities	Medium size	West Inland	30-60 and >18	4 + 2 seasonal workers
Greenhouses	Small size	West Inland	>70	1
Greenhouses and tourism activities	Big size	Southwest	30-60 and >18	4 + 20+ seasonal workers
Sheep farm and tourism activities	Medium size	Southeast	>70	1 + 1 family member
Sheep and bulls farm	Big size	East Coast	19-50	3 + 2 seasonal workers
Sheep farm	Big size	East Inland	45-80	3 + 5 seasonal workers

Table 8. Description of interview participants, Source. The Author

After that, they have been transcribed and manually analysed, trying to find recurring words, by categorizing 11 different themes.

Family Farming

The totality of interviewees answered that their business is family-based, and the number of people involved is usually small. This means that at the head of the management of the farm, there is a family unit or more, and they cooperate in the same activity. Most of these family farms have been handed down from generation to generation, started decades ago, and evolved until nowadays. A small number, conversely, are more recent, but still managed by a family and the relatives. In fact, many of these farms, with some exceptions for those that hire workers, only involve the members of a family who are freely helping without getting any salary or getting just a small amount of money for the spontaneous help. Despite the size of the farm, it could be big enough for commercial or small enough for a hobby; the activity usually runs across generations.

Tourism Integration

Many of the interviewees expressed their willingness to open the farming activity to tourism. In fact, they seem positive regarding a mix of farming and tourism activities to gain maximum profits out of the combination. Some of these farms with deals with the

commercial market already have integrated tourism into their business. It started as a game but evolved and became bigger and consumers' oriented. They sell, indeed, the products directly in a small shop near the farming activity, letting people try and taste the products which could be edible like meat or dairy products, or other souvenir markets. Bigger business-oriented more to the gastronomy sector of tourism, offering the clients traditional Icelandic cuisine with the vegetables and fruits cultivated, and with the dairy products and meat of the bred livestock. Smaller businesses offer an immersive experience with the animals, offering private visits to the farms and interactive activities. Tourists can book these experiences online and get in touch with the farmers. Finally, the term *tourism* has been mentioned by most of the interviewees, and they showed interest in devoting a part of their farms to it, because more profitable than their farming activities, as it has been mentioned, "*less sheep, more tourism*".

Barriers for Young Farmers

At the question "*What would you recommend to a young adult who would like to start running a farm?*" most of the respondents were hesitant, because aware of the difficulties the sector might have. A great deal of negativity emerged from the answers; for instance, some participants mentioned:

- "*Do not do it!*"
- "*It is difficult to buy the land; it is costly if you start from scratch.*"
- "*It is not as profitable as you think; you need to escalate.*"
- "*Look at the market and see what is lacking*".

The citations above highlight the fact that there are some barriers for young people to start or be involved in farming activities. Some exceptions are made by young farmers who are already involved in a family business, and who are most likely to take over it, or for those who are renting the activity and the land from old farmers. However, starting from zero, buying the land, the livestock, the machinery, and the structure is expensive and not profitable in the short term; in fact, there is a need to follow the market closely and understand what product is lacking and be able to escalate the competition. Starting this type of business, running it, and maintaining it is expensive, especially for young farmers. Only a small number of respondents were positive and had big faith in the young generations to continue the farming activities in Iceland, as a respondent said, "*If you believe it, you can do*

it. Go for it!” Another participant also recommended having a background before starting farming, to be ready for all possible cases and have some knowledge of how to deal with them, because “*you need to know what you are doing*”.

Diversification

What emerged from the interviews was the need to diversify the production of goods. As an interviewee said, “*try to diversify*”, not only focus on the production of one good, because in the case of cultivation or livestock disease, there is a big chance to lose everything. In fact, many farms produce and cultivate not only one type of livestock or plant but also try to offer different options to the market.

Decline in Farmers

As mentioned in the literature in the previous chapters, interviewees noticed a decline in the number of farmers and farming activities, which is related to population shrinkage. Respondents proved this point, stating that in Iceland, rural areas are losing farmers. One of the participants mentioned the fact that in the area where the farm is, there used to be 20 farms in the past, while now there are 2 in total. This decline shows, once again, the difficulties that people have in running this business in rural areas, causing abandonment of the activity because “*small farming is not for industry*”.

Farmers Cooperation

When it has been asked if farmers feel the competition between them, they all assured that they do not feel being competitors between each other, instead they feel a great sense of cooperation regarding methodology and machinery sharing. It was common to hear during the interviews that farmers share labour and equipment. Some said that a group of farmers buys innovative and expensive machinery together to share the expenses and to reduce individual prices, while others borrow the machinery for a small fee from another farmer. “*We bought the equipment with our neighbour*”, mentioned one interviewee, and it shows the reciprocal help between them, as well as for the *Réttur* where all farmers gather and help each other sort out their livestock. Other farms do not cooperate, but still, they do not feel any tension or competition between them, because breeding and cultivate different things.

Economic Fragility

All interviews highlighted the low profitability of the farming sector, noting that the only practice of farming is rarely economically viable. In fact, most of the small-scale farmers rely on another job to be able to take care of the family, whereas if you want to rely only on farming, *“you need a big farm to make money”* because just the farming activity *“has never been enough to care about the family”*. There has been an important shift from the past, when farmers were self-sufficient and *“used to be rich”*, whereas now, prices are settled from the market and by the slaughterhouses, so that *“farmers get so little, and do not live on it, that is bad”*. Farmers face challenges to start, run, and maintain the farming activity alive, and *“need a lot of money to buy the land and the animals”*.

Environmental Change

During the interviews, some of the participants reported significant changes in the environment and the climate. These conditions affect some of the farming practices, while others have not been affected yet. However, there were some common patterns mentioned by the respondents, for example, the grass quality. In the past, the quality of grass was better; in fact, it was greener and lusher, and it was found in large quantities. On the contrary, now, the fields are more arid, thus decreasing the presence of good grass for grazing. Another change mentioned was the snow levels; it is snowing less than in the past, and the duration of seasons varies, and as a participant described the weather as *“more unpredictable than in the past”*. In the past, winters were getting shorter and summers longer; now, it affects the period of grazing outdoors, which is slowly becoming longer. So, from the different answers gotten, there is awareness among farmers about environmental change, but it is not uniformly experienced.

Social Reconnection

Most of the interviewees showed an indirect connection to the social and cultural shade of the sector. They believe that, nowadays, people have lost their connection with the land, as mentioned in the interviews, *“people do not understand the value of the food”*, they do not know where it comes from, how much work is behind the production, and the cost of it; in fact, this shows how *“people have little knowledge of farming processes”*. For farmers, it is important that people can rebuild a connection with nature, and this can be done by farm-based experiences, for example, *“farm tourism can help reconnect people with nature*

and agriculture". The interviewees saw farming as the key to reconnecting modern society with the food origins and the rural land.

Government Support

A large number of respondents perceived insufficient government support despite their essential need to get governmental subsidies to economically survive. They brought out the fact that the government support exists, but it is not enough to implement the sector. They mentioned the quota system, land subsidies, quality-control payments, the payments they get based on the animal conditions and numbers, and the production, as well as possible public and private grants. However, the participants feel that they need more political and media attention; otherwise, as a farmer described, the government sees them "*almost like a hobby*" instead of considering it a real profession. The government support is seen as insufficient, as interviewees said:

- "*The government does not help*".
- "*The government needs to think about it*".
- "*The government has to give more attention to farmers*".

Uncertainty about the future

The totality of the interviewees expressed uncertainty regarding the future of their farming activity. On one side, some of them were negative and said that there is "*not really hope for the future*" because the children will not take over the business. So, some farmers are trying to diminish the number of livestock by not replacing them with new animals when they die, so that the production slowly declines. On the other side, some others have a positive vision, thinking about implementing their businesses, making the production bigger, offering new products to the market, and connecting the farming activities to the tourism sector. Some farmers could not clearly predict the future of their activities; they were uncertain about the long-term future of farming in Iceland.

Taken together, the interviews revealed that farming in Iceland is mostly family-based, and it is rooted in cooperation, leading nowadays to tourism strategies and diversified activities. However, farming businesses suffer from economic fragility, social barriers, and a lack of governmental support, leading to an uncertain future for the sector.



Figure 12. Themes perceived by interview participants regarding farming in Iceland,
Source: The Author

4.2.2 On-Site Observation Results

During the fieldwork, several relevant elements have been pictured with a digital camera. The on-site observations have been made to give an idea of how the farming sector looks in Iceland, showing the livestock, the methods used for the farming activities, and space utilisation. The observations took place over 7 days at the end of September 2025, while travelling around Iceland to arrange interviews with the farmers. Some pictures have been taken in the farming activities, involving the livestock of the interviewed farmers, while others have been made by stopping in relevant places on the way to show some rural features. From all the pictures taken, 8 of them represent the best image of farming in Iceland. The photos are grouped by resemblance: the first 3 represent the livestock, 1 the product, 1 the mix of farming and touristic activities, 2 methods used in greenhouses, and finally, a potential resource. They are listed below:

In the first picture (*Figure 13*), it is possible to recognize a herd of cattle in an outdoor enclosure. The animals are free to graze inside the delimited area, as it is possible to notice by the fences in front of the picture. However, from some observations, it has been noticed

that the conditions of the fences are not always good. In fact, most of the time, the ropes are broken, or the wooden poles show signs of damage, such as collapse, breakage, or rot, mainly caused by long exposure to harsh weather conditions and only limited maintenance. If there are gaps in the fences, it is possible for the animals to escape, causing a livestock loss for the activity.



Figure 13. *A herd of cattle in an outdoor corral. Source: The Author*

Figure 14 captured a pair of free-grazing sheep. While driving around Iceland during the summertime, before the *Réttur*⁷ starts, it is possible to see many sheep and lambs grazing outdoors freely, without any enclosure or a shepherd tending the flock, because predators are generally absent, with some exceptions of occasional sightings of the Arctic Foxes. One enemy could be cars, because sheep usually cross or walk by the side of the roads.

⁷ *Réttur*: is an Icelandic term which defines the traditional livestock gathering. Farmers of the area, go up to the mountains to let the pastures (mostly sheep) going down to an enclosure where then they got sorted according to the ownership. (Source: Interviewed participant).



Figure 14. *Free-grazing sheep. Source: The Author*

In the photo below (*Figure 15*), it is possible to observe two goats that are grazing in a fenced field near a river. During the field work, there were many sites where livestock like cows or sheep were grazing, but it was rare to see goats. In fact, goats have been introduced in the past from Norway, and they adapted to the Icelandic territory very easily. However, over time, the dairy production declined, and nowadays those animals are mostly involved in hobby farms and owned by private. This type of breed, due to its low number, can be considered vulnerable.



Figure 15. *Two goats grazing in a fenced field. Source: The Author*

Figure 16 illustrates a crate filled with lemon-cucumbers, which the production is made in greenhouses. This type of production would not have been able to survive outside, subjected to the unpredictable Icelandic weather, because it needs higher temperatures of the soil, of the air, and of the water, and light exposure. The production is indeed possible inside the greenhouses, because its needs are met. Lemon-cucumbers are not originally from Iceland, and they are not commercialized in big quantity as they are for cucumbers.



Figure 16. *A crate filled with lemon-cucumbers. Source: The Author*

As it has been observed during the fieldwork, many farming activities are mixed with tourist activities. The buildings are employed for both purposes. Notably, in the figure below (*Figure 17*), one structure, like the greenhouse, is used for the cultivation of tomatoes (visible in the background) as well as for hosting tourists with a social gathering section made with tables and benches (visible at the front). Other farming activities around Iceland showed the same purpose of combining with tourism. They are characterized by small souvenir shops, cafés, and restaurants selling the products from the farm, from food to items like yogurt or soap.



Figure 17. *A greenhouse used for both cultivation and hosting tourists. Source: The Author*

Some farms around Iceland are using innovative methods for their activities. *Figure 18* and *Figure 19* show two of them. The first picture (*Figure 18*) represents the vertical cultivation system used for lettuce. Big poles covered by holes, where the plantation grows, is a technique that maximizes space efficiency by expanding the growth vertically rather than horizontally (Verma et al., 2023).



Figure 18. *Vertical lettuce cultivation system. Source: The Author*

The second picture (*Figure 19*) shows a hydroponic cultivation system inside a greenhouse. This method allows better control of the cultivation growth and faster growth if all the

conditions are met. Tomato plants are not rooted in the natural soil but inside rockwool, and they receive the nutrients they need through water-based solutions (Verma et al., 2024). Consequently, it is a suitable method to meet the commercial requirements in Iceland.



Figure 19. *Hydroponic tomato cultivation system. Source: The Author*

In the last photo (*Figure 20*) it is possible to see a source of geothermal waters that was near a greenhouse. This type of natural resource is often used in some parts of Iceland for agricultural purposes, depending on the area's availability, and the costs are lower than heating up streaming water.



Figure 20. *Geothermal waters used for cultivation purposes. Source: The Author*

4.3 Word Elicitation Results

9 participants took part in this face-to-face exercise, and they were asked to write on paper (see *Figure 10*) keywords or sentences related to their farming activity, either in English or Icelandic. The words were meant to be connected to economic, social, or environmental themes of the participants' farming activities (and repetitive words were not considered). Thereafter, participants were asked to explain their choice of words, justifying their answers, explaining the connection they gave to the words in the farming context. After having summed up all the answers in one table, divided by themes, they have been clustered in subthemes inside the macro-groups, to find secondary themes relevant to farming activities. The coding procedure, following the similarity of the words, and having attention to their meanings or identity to a certain domain, resulted in 15 micro-themes:

4.3.1 Social Dimension

Community cohesion

This term evidences the positive impact that farming has on social relationships, creating a sense of membership in a group sharing the same knowledge, passions, and activities.

Examples: positive effects on the community, part of the community by being a farmer

Rural identity and social contribution

These concepts identify the lifestyle values the participants give to farming. They feel an emotional connection to the land and feel a sense of belonging. The role that farming plays in a community is that it can also contribute to creating job opportunities.

Examples: grounding, stability, close to the nearest town, job creation

Educational role of farming

Participants shared the need for people to gain knowledge and experience before undertaking a farming business. Thus, Iceland has one agricultural university: The Agricultural University of Iceland (*Lbhl*), where students can study and have theoretical and practical insights into the farming sector.

Examples: teaching, schools

4.3.2 Environmental Dimension

Economic vulnerability

Some participants wrote words that can be related to economic viability. Lack of income and high prices in the market create instability and vulnerability for farmers to be part of the local and national market without suffering from external competition. The financial vulnerability is reflected in prices set by slaughterhouses and not by the farmers themselves, and by the volatile costs of production.

Examples: lack of income, volatile costs

Agricultural entrepreneurship and diversification

Other participants wrote that by being a farmer, there is a business potential and easy market integration if at the right moment and in the right way. In fact, it has been said that it would be good to insert in the market a product that is lacking at a certain moment, to make the business profitable and consumer-oriented.

Examples: business, win-win, diversity, lack of goat products on the market

Institutional support

It has been mentioned that the structural support the farmers are receiving from institutions such as the government and the Icelandic Farmers Association (*Bóndi*). The support can be monetary, for example, receiving grants or non-monetary, like the organisation of meetings where farmers can discuss relevant last news

Examples: support from the government

Non-monetary values

Behind the economic value that a farming activity can have, it hides the non-monetary values. In fact, people were referring to values beyond money. Emotions, feelings, a sense of belonging, and the pride of seeing an animal growing up or a plant making its fruits cannot be paid with money, just gratitude.

Examples: there are more things that have value than money

4.3.3 Economic Dimension

Landscape value

Terms related to the environment gave importance to the natural landscape. The quality of the environment is something farmers take care of. Hence, they protect and respect nature, as a character that gives them the resources they need for farming. The keywords referred to harmony across nature and environmental stewardship.

Examples: big areas, natural resources

Sustainability practices

Some participants wrote down words referring to sustainability and local production. In fact, they mentioned their locally made products coming directly from their farms. Moreover, some participants highlighted the fact that they are not using any pesticides in their activities, and they are using natural pollinators like bumblebees. The word *sustainability* itself has not been cited often; however, other keywords pointed out the long-term environmental responsibility farmers have.

Examples: sustainability, local made

Climate conditions

Farmers noticed environmental change, and they gave some keywords related to the Icelandic environmental features. Climate conditions might have a positive or negative impact on farming activities, or do not interfere with them at all.

Examples: global warming, cause of the environment we have less bacteria

5. Discussion

This chapter will discuss the core findings of the study, trying to correlate the literature with the research questions and aims. By analysing and interpreting the answers of the interviews, the data from the survey, the photos from the on-site observations, and the key concepts from the word-elicitation method, the socio-ecological processes will be explored and how they influence the resilience of Icelandic farming activities. Overall results will be presented for the Icelandic context. The discussion will first focus on dimensions of socio-ecological systems, highlighting how farmers face challenges and build adaptive strategies to cope with them. Moreover, governmental and institutional policies will be discussed in terms of the importance of an effective and adequate management of the farming sector. Furthermore, sustainable strategies will be recommended for enhancing future farming resilience in Iceland. Finally, methodological limitations of the study will be mentioned, and recommendations for future studies will be proposed.

5.1 Building Socio-Ecological Resilience

Research results showed that the farming sector in Iceland is facing social, economic, and environmental challenges that impact its long-term sustainability and development. The findings from the survey and interviewees' answers, the on-site observations, and the word-elicitation method provided the basis to assess socio-ecological resilience through farming in Iceland.

5.1.1. Coping with Disturbance

The findings of this study indicate that Icelandic farmers are feeling the sector's changes, whether they regard social, environmental, or economic dimensions (*Chapters 1. and 2.*). The results analysis based on the literature shows that the farming sector in Iceland has been going through several changes over the years, in particular:

- *Shifting in the system's primarily scope:* from subsistence activities to consumers' satisfaction, farming activities were based on satisfying the family's needs; the production was limited, but it was enough to satisfy the household; whereas now, farming activities are seen more as commercial activities to satisfy the consumers'

demands: the production is not only for the household, instead is following the market demands and it is made to be sold.

- *Shifting in meteorological conditions:* farmers noticed a difference in weather conditions, from harsh winters in the past to a higher number of unexpected climate events. These changes are timely, but they have slow consequences; however, they have an impact on the long-term of farming activities.
- *Shifting on sector's focus:* changes are inevitable, and some farmers are taking advantages from it. Tourism is becoming bigger in Iceland, and some farmers recognized it as an opportunity for investments. A cooperation method used by small-sized farms is to combine their activities with tourism activities: for instance, opening the farm for visiting and offering to sell local products.
- *Shifting in density and in quantity:* more and more farms in rural areas are abandoned, the old generations are slowly dying, and not always are young generations taking over the activities. This dynamic causes a decrease in the number of active farming activities in the country.
- *Shifting in sustainable practices:* a higher number of farmers are adopting new farming practices that are more environmentally friendly and long-term sustainable. Using geothermal water for cultivation, and not chemicals nor pesticides, but instead pollinators like insects, and new cultivation techniques, like vertical cultivation, are signs of a mindset changing toward sustainable ecological systems.
- *Shifting in consumers' awareness and behaviour:* people are getting more excited about buying a local good, to know where it comes from, and to know how it has been produced. This increasing awareness and consciousness reveal a subtle shifting toward sustainable practices and thinking. More generally, people feel the need to be connected to the land again, to have direct contact with farmers and nature.
- *Shifting in public attention:* with the advent of social media, more publications and data are accessible online. The media shares the image of farming, showing the public how the sector is structured and how it works.
- *Shifting in the sector prominence:* if before farming was historically a dominant sector that people could rely on, nowadays it does not get enough political and governmental attention as the fishery industry and tourism.

Those changes mentioned above are the results of the capacity to adapt to disruptions, as is possible to visualise in *Figure 8*. Farmers are suffering from challenges that can impact their activities in the long and short term. They need to be able to overcome challenges such as:

Social challenges

- *Family farming*: most of the farms are family-owned and managed, and do not benefit from external help like paid workers, because most of the time, the profits are not enough to be able to pay extra salaries. So, the activities stick with the household members. If future generations do not want to take over the family activity, there might be an abandonment of farms or the need to sell them.
- *Labour shortage*: there are obstacles in finding people who are willing to work in the agricultural sector because of the harsh environmental conditions, such as being outside in the cold to check on the livestock, and physically demanding work, like accomplishing manual tasks.
- *Barriers for young generations*: young people are attracted to urban areas and move from rural areas to have more life opportunities, causing an indirect rural population shrinkage. However, young generations, who want to develop a farming business, can struggle financially, for example, with buying the land, equipment and livestock, to maintain their activity and to scale the agri-food market.

Environmental challenges

- *Climate change*: farmers need to cope with the consequences of climate change that directly affect their activities. It affects the long-term farming activities.
- *Unpredictable weather conditions*: they affect the short term, affecting the daily tasks of farming activities, and consist, for example of snowstorms and heavy rains.
- *Soil erosion and land degradation*: wind and water are influencing the soil erosion as well as intensifying grazing, especially in areas where there is not enough dense vegetation, making the soil arid and not ready to be cultivated

Economic challenges

- *High prices*: the market is characterized by the volatility of prices, and the high cost of production and maintenance of the structures, field fences, and machinery. Slaughterhouses are setting the prices, and farmers are not involved in the price-

making process. Another economic challenge, especially for small-scale farms, is that the farming activity itself is insufficient to sustain an entire household, making the family members need to seek an extra source of income.

- *Government support*: despite farmers receiving institutional help, whether financially or not, they feel they are not listened to and considered, and that they do not receive the support they wish, especially economically. The feeling through the government is mixed: some farmers feel a strong presence, others feel neglected compared to other sectors.

The concept of coping with disturbances strengthens the resilience of SES in the farming sector. However, socio-ecological resilience thinking does not cover all the distribution and quantity of farms in rural areas; in fact, it is not considered a *one-size-fits-all* adaptation strategy approach, where one strategy can be applied to several cases and bring positive effects (Walker et al., 2004). The concept follows more of a *place-based* approach, where there is a focus on finding one or more strategies that are applied differently to find a window of opportunities during a moment of disruption of the system. For instance, farmers in Iceland see the lack of a good or a service in the national market as an opportunity to expand and improve their business.

5.1.2. Adaptation and Transformability

Following the adaptation strategy approach mentioned above, farmers see the challenges as window opportunities; there is a need to integrate innovation, evolving, and transforming the resilience model (Folke et al., 2010). Thus, the resilience thinking system becomes more of a theoretical framework than a practice to follow, as it is possible to visualise in *Figure 8*. (Darnhofer, 2010).

Different factors are involved throughout the innovative process, making adaptive (as the human capacity of managing resilience) and transformative (as the creation of new stability with new adjustments) strategies built differently depending on the nature of the process, and on the farming activities (Walker et al., 2004).

To enhance socio-ecological resilience and have positive outcomes in the long-term, farmers play a key role in the farming process. In fact, they function as the main social actors to integrate those insights into farming systems (Darnhofer et al., 2016; Perrit et al., 2020). Insights are neo-endogenous, meaning based on local expertise, with the influence of

external inputs, and create a third dimension called *vernacular* expertise (Lowe et al., 2019). A clear example of vernacular expertise applied to Icelandic territory are greenhouses, and vertical and hydroponic cultivation systems (*Figures 17, 18, 19*), designed as a mix of traditional knowledge and new technologies and methods. However, the social dimension not only includes the way farmers manage their resources, but it also encompasses the norms and policies that can impact their adaptability to cope with disturbances, as will be further mentioned (*Paragraph 5.2*).

5.2 Sustainable Strategies for the Future of Farming

5.2.1 Policies Implications in a Rural Context

Local, regional, national, and international institutions are seen as resilience enablers if they can lead farmers to be active and participative stakeholders of the rural policy-making process (*Page. 16*). In fact, farmers, or more generally, rural people, must be involved in shaping policies while sharing their contributions to the authorities (McManus et al., 2012). A system of adaptive governance, as an intermediate between the local realities and the rural policies, is needed to empower the vernacular development of farming activities in Iceland. Existing platforms, partnerships, and financial support are examples of institutional tools and methods and are part of the adaptive governance, as a self-organization's evolution and creation of networks (Allain-Dupré, 2025; Walker et al., 2004). Recently, Iceland improved its action plan regarding agricultural policies, which started in 2024. According to the *Agricultural Policy Monitoring and Evaluation 2025* report (OECD, 2025), the Icelandic agricultural policy is based on 3 points: the utilisation of the land, innovation and technology use, and environmental and climate protection. Each of these pillars is related to issues in different branches that have been discussed throughout this thesis, such as adaptation and mitigation, circular economy, land use, and others. So said, progress in Icelandic agricultural policy is part of a new food policy until 2040: everything is under implementation and revision and is going to be subject of possible changes over the next few years (OECD, 2025).

However, despite the help they receive, farmers complain about the limited decision-making power they have in the policy-making process. Simpler procedures in taxes and contributions payments for small-scale farms, in the fund application process, as well as

more institutional flexibility through farming activities in Iceland, could help farmers facing their economic and financial challenges. This shift in procedure would make farmers feel more supported by the government. For this reason, the policy implications in the Icelandic rural context should follow a more coordinated and coherent approach as suggested by OECD (2022). To find the right policies, there must be cooperation between the policy makers, like institutional and governmental authorities, and the direct stakeholders, the farmers. Furthermore, the Icelandic government could raise awareness of responsible consumption and production in the agri-food market by expanding access to knowledge about farming systems. Working on educational programs with schools would help young generations, especially young kids, understand how the agri-food market works and the role farming systems play in it. Creating community workshops where farmers and citizens get to know each other, and where they can share ideas with institutional authorities, would help them to have a better idea of the farms' socio-ecological value. The government should also promote local productions by supporting small-scale community markets where farmers can sell their goods directly to the final consumers, enhancing a feeling of connection to the land and to the producers. Or on a bigger scale, the government could organize a yearly national event where all farmers get together, and they can show and sell their production: in this way, consumers are closer to the producer, learning more about farming activities by seeing the producers and tasting the products, finally creating social cohesion.

5.2.2 Future Scenarios of Farming in Iceland

The scenario of farming in Iceland seems biased, expressing uncertain visions about the future of rural and farming systems. Results show mixed emotions about the future of farming in Iceland, and there is a defined line dividing positive and negative visions:

- **Positive vision:** Some farmers described the future of the farming sector as bright, with large improvements in methods and techniques, and with integration with tourism.
- **Negative vision:** other farmers think there is going to be a decline in the sector, caused by the high price, rural depopulation, and land degradation. They do not recommend to young generation start a business in farming.

Positive scenario

On one hand, the positive scenario can be described as full of hope and trust in the young generations to start their own farming business. In fact, this positivity encourages the qualitative production of more small-scale farms instead of bigger farms focused on export and quantity production. Better cooperation between farmers and between farmers and supportive institutions, with integration of new technologies and methods, would result in improvement and expansion of the farming systems in Iceland over the next few decades.

Negative scenario

On the other hand, the negative scenario is given by the difficulties that farmers are facing, which obstruct them from finding suitable solutions to overcome them. So, to avoid the young generations struggling, current farmers recommend not beginning to invest in the business. It would not only be economically expensive, but it would also require hard work without being able to have breaks, taking care of the land and the livestock. According to this negative view, there might be a quick decline in the quantity and density of small-scale farming activities over the next decade.

Uncertain scenario

Still, there are some uncertain visions about the scenario of farming in Iceland, resulting in questioning the independence and self-reliance of the sector. If a crisis were to happen in the country, it might shake the agricultural chain production, and the farming sector would pay the consequences, because it is not diversified and big enough to satisfy all the population's needs. This uncertainty has negative features, but it still relies on a positive mindset for the survival of the sector over the next few decades.

5.2.3 Socio-Ecological Thinking

To overcome the negative scenarios of farming in rural Iceland is essential to reorient the common knowledge, and the assistance for rural development by offering supportive learning on two levels: *learning by doing* and *doing after learning*.

The first level includes all those farmers who gained expertise through experience. By starting, maintaining, and managing the farming activities, farmers learnt how to cope with changes and how to apply adaptive strategies to their systems. The second level is working

the opposite way; farmers first get the knowledge and expertise thanks to learning paths, like university studies or informal community meetings, where people can share their expertise, or simply by informing themselves through literature and scientific research; and then apply what they have acknowledged in innovative and transformative practices and methods. The combination of the previously mentioned components and their relationships in rural contexts shifts the focus from describing resilience as an attribute to resilience as a complex process of interactions (Rogge et al., 2013).

To conclude, farming systems assume *a non-monetary value*: being a farmer is not considered a role strictly related to the agri-food market but becomes more of a lifestyle. There is something more behind the economic value of farming; farmers put their attention on the livestock wellness and on the landscape around their activities.

5.3 Limitations of the Study

One of the key limitations of this study was the limited availability of people for carrying out the interviews based on the 2 variables (*Table 3*). The plan was to reach at least 2-3 people to be interviewed per zone for a total of around 8-12 interviews spread around Iceland. Unfortunately, the Northeast area was not covered, because the only person who gave availability to meet stopped replying (*Figure 9*). This lack of participants' availability could have affected the reliability of the study, because it does not represent a specific part of the country.

Another key limitation of this study is the lack of well-documented past research regarding rural Iceland and Icelandic farming resilience online, as well as academic articles, statistical numbers, and maps. This absence might have had an impact on the reliability of previous data and of comparisons to the present.

Regarding social limitations during the fieldwork, language was demonstrated to be a barrier in some cases, where there were some misunderstandings with word definitions or concept explanations due to the language knowledge of the interviewer and interviewees. Sometimes the interviewees became anxious because they could not find the English translation of an Icelandic word in a particular field; therefore, explanations were difficult, or vice versa, the interviewer, transcribing by hand, misspelled or did not understand the Icelandic words used by the interviewees. Thus, doubts appeared during computer transcription about having

misspelled the desired concepts. The temporal constraint was another limitation of the study, because it was not possible to conduct extended observations during the fieldwork, and to go in-depth with the data analysis.

There is certainly much more to improve for this research, for example, during the data collection process for the survey and the interviews, to make the results of the study more reliable. People should have been reached in advance, across different platforms and through various groups and associations, creating a network of connections, so that people would be interested in the topic and be available to help.

5.4 Recommendations for Future Research

Future studies on the topic could explore in depth the agriculture activities that are practiced in Iceland, not only during the summer time when the animals are mostly kept outside, and they are free to graze in the fields (the field work has been done at the end of September), but also during the winter time when the animals are kept mostly inside the structure or outdoor, but inside the fences.

Moreover, further studies could have reached more farmers across all different regions to be able to cover the entire country's activities, as well as ask institutions (*Page 16*) to share the survey to reach more respondents.

Another point that could change for future research in the agricultural sector in Iceland, is to focus on just one type of breed and not doing a mixed-farming approach as done in this thesis, to be able to find similarities and differences, and to see if the farms located in different Icelandic territories are facing the same challenges by being part of the same micro-sector (examples: just focusing on ovine livestock), despite the geographical remoteness and terrain morphology.

Another option for further studies on the same topics could be to focus only on one or two regions of Iceland to find how farmers deal with challenges under different environmental conditions. For example, the study could focus on the Westfjords and Eastfjords, or the South and North Icelandic regions, including different types of farming systems.

Despite the research limitations (*Chapter 5.3*), this thesis could be used as a basis for further studies, as the methodological template could be applied to similar projects: not only in

Iceland, but also in other countries, because by being in English, it results more accessible and understandable compared to a national language like Icelandic; and because its scientific and social importance in academic studies.

6. Conclusion

At this point in the thesis, it is possible to answer the initial research questions and see if the aims have been reached. This study set out to investigate the function that farms serve in rural areas, how farmers perceive and react to socio-ecological challenges, and how they cope with social, environmental, and economic changes in Iceland (refer to *Chapter 5*). The overarching aims of this thesis have been largely achieved, determining how the socio-ecological processes influence farming resilience in Iceland.

Regarding the function played by farmers and how they perceive changes and challenges, the thesis revealed that they play an important role in socio-ecological dynamics and systems, as part of farming processes.

Concerning the analysis of adaptive strategies used by farmers to cope with socio-ecological challenges, it has been highlighted that to cope with disturbances, there is a need to quickly adapt, find innovative solutions, and make plans. Sometimes, to overcome shocks caused by external factors, farmers need to take a transformational approach, trying to find new opportunities where there are production and market gaps, to be resilient in the agri-food sector: for example, diversifying production or integrating with another sector. In other words, although socio-ecological processes may negatively influence farming resilience by causing shocks in the farming systems, the adaptive strategies adopted by farmers to cope with challenges often have positive outcomes that affect the long-term sustainability and enhance socio-ecological resilience of the sector.

Moreover, the study tried to contribute to enhancing farms' resilience, suggesting recommendations to be considered in the future to raise awareness among consumers about the Icelandic farming systems, to improve the support from governmental institutions towards small-scale farmers, and to consider the resilience thinking system as more than an evolving process rather than a fixed concept.

Overall, the research results mentioned by the method show common features, and they reveal that Icelandic farming resilience emerges through the interaction between the social, environmental, and economic factors that influence the daily life farming activities and their long-term outcomes and sustainability. In fact, participants associated Icelandic farming with family tradition, food production, hard physical work, labour shortage, rural

depopulation, and financial insecurity. To adapt to these disturbances, farmers often mentioned that they require production and market diversification, as well as knowledge cooperation, machinery and knowledge sharing, technological innovation, and integration of additional sources of financial income. Despite the perception of an unprofitable sector and being unattractive to young generations, participants still show hope for the future if there were more and better institutional support.

Altogether, the findings expressed that resilience in rural Iceland is rooted in socio-ecological relationships, including community support and community belonging, knowledge transfer and attachment to the rural land. Socio-ecological resilience in the Icelandic farming sector depends on the interaction between economic capacity, sharing of local knowledge, and social cohesion, in order to create the ability of being able to respond to changing conditions over time.

Taken together, the findings provide substantial insights into the Icelandic rural landscape and farming systems, highlighting how to strengthen their socio-ecological resilience, and they present a framework for future studies in the social sciences research on farming.

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Appendix A: Interview guideline

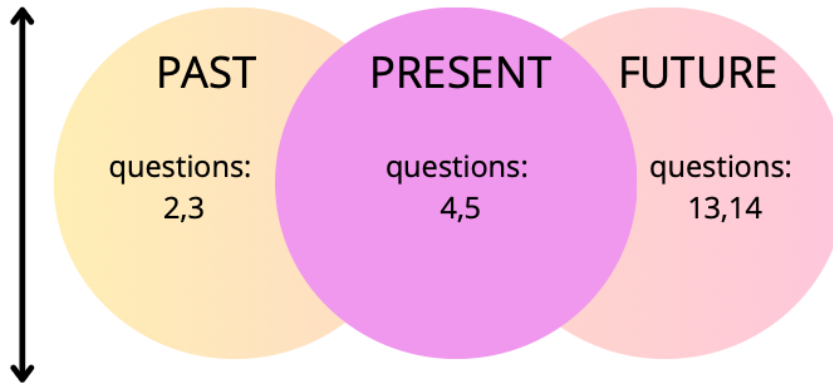
INTERVIEWS QUESTIONS



- Semi-conducted interviews
 - No longer than 1 hour
 - In English, but also Icelandic if needed
 - Consent form will be given before the interviews
-
1. Could you please tell me a bit about yourself and your farm?
 2. How long have you been farming for? Is it a family farm? For how long has it existed?
 3. Over time, how has the farm evolved?
 4. Are you currently using any technology or techniques that were not used in the past?
 5. How would you describe a typical day at your farm?
 6. How do you manage access to resources like water and soil use?
 7. How do you perceive the environmental impact of your activities, and vice versa, how environmental changes are affecting your farm?
 8. Is your farm playing an important role in the community?
 9. Are a lot of workers involved in the activities? Are they annual local people or seasonal foreign workers?
 10. How do you think people perceive farming activities?
 11. Are you currently getting some governmental/regional (i.e., financial, etc.) support?
 12. What are the biggest economic challenges that you can face in the market?
 13. How are you seeing your farm in the next 10 years?
 14. What are your main goals and hopes for the future?
 15. If you could change something in the farming sector, what would it be?
 16. Could you give some advice to people who would like to start a business in this sector?
 17. Is there anything else you would like to add?

QUESTIONS BY TOPIC

- Personal background
 - questions: 1, 2



- Personal opinions/suggestions
 - questions: 15,16,17



Appendix B: Survey Tool

Canva of survey tool:

<https://forms.cloud.microsoft/e/ecpqmrbUzV?origin=lprLink>

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of the Westfjords

Catharine Chambers

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Appendix D: Consent Form



September 2025

PARTICIPANT CONSENT FORM

- I voluntarily agree to participate in this research for university purposes.
- I understand that, even if I agree to participate, I can refuse to answer certain questions without any consequences.
- I understand that my answers and identity will be anonymized, and there will be no reference to personal information.
- I understand that, if distinguished and relevant extracts from interviews might be quoted in the final paper.
- I understand that I will not benefit in any way from participating in this research.
- I understand that by signing the consent form, I agree to be recorded during the interviews, and the original audio will be retained until the end of the data analysis and the publication of the final paper and then deleted.
- I understand that by signing the consent form, I agree that my interviews will be transcribed, and a copy will be retained until the end of the data analysis and the publication of the final paper and then deleted.
- I understand that I can access the information I have provided at any point in the research.

- I agree to hold the interview in the English language, with the help of a translator tool if needed.
- I understand I am free to contact the researcher to seek further clarification and information about the purpose of the study.

Information about the research purposes

The research aims to explore the role of farms in rural Iceland and how they perceive and respond to social, environmental, and economic challenges. The focus is on the adaptive strategies employed by farmers to enhance resilience and sustain their activities and examine how different-scale institutions support resilience. From a broader perspective, the study aims to promote rural development in Iceland by exploring the benefits of good socio-ecological interactions in farming areas.

Signature of the Participant

Date

Signature of the Author

Date

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