



Master's thesis

Environment and Natural Resources

Governing Common Pool Resources for Sustainability

An Institutional Analysis of the Evolving Sheep Grazing
Regime in Iceland

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October 2021**



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SCHOOL OF SOCIAL SCIENCES

FACULTY OF SOCIOLOGY, ANTHROPOLOGY
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Final thesis submitted in partial fulfilment of a MA degree in Environment and Natural
Resources

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60 ECTS

Faculty of Sociology, Anthropology and Folkloristics

School of Social Sciences, University of Iceland

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Printing: xxx
Reykjavik, Iceland, 2021

Abstract

Sheep grazing has been an important agricultural practice in Iceland since the earliest days of settlement, dating back to the 9th century. As early settlers brought sheep, horses, chicken, and other types of livestock with them, grazing systems have developed throughout common mountain pastures. The Icelandic sheep grazing system, an institutional framework for governance of common-pool resources on mountain pastures, has been manifested and documented in various legal books since the 9th century and continues to be an important institution for this purpose within the country to this day. This study explores how the Icelandic sheep grazing institution has evolved and changed throughout history. By utilizing Elinor Ostrom's framework for institutional analysis, this study examines main actors as well as how power, rules, and boundaries function within the Icelandic sheep grazing institution. To gather this information, multiple semi-structured in-depth interviews were conducted with key informants that collectively held extensive, long standing personal experience with the sheep grazing system. Conversations that resulted from structured in-depth interviews revealed that while much of the core of the sheep grazing system detailed in both the old books of law, Grágás and Jónsbók still exist today; however, various changes in the institutions have been made in response to both industrialization and pressures of modern economic systems. The study claims that the Icelandic sheep grazing regime was historically robust when sheep farming in Iceland was a subsistence practice but lacked the ability to respond efficiently when Iceland started to industrialize in the past two centuries. As the historic structure of the Icelandic sheep grazing regime continues to be influential in the current form of the regime, it is imperative to critically think about how the regime can handle future calls to acknowledge problems such as rural decline, land degradation, and lacking conflict-resolution processes.

Preface

Writing a master's thesis during a pandemic was not necessarily what I envisioned during my time in Iceland, but regardless this thesis somehow gotten written during this weird time. First off, I cannot overstate how thankful I am to my advisor Jón Geir. You have been so patient with me for the past year and consistently pointing me in the right direction to go. This would not be written without you. I would also like to say thank you to Björn for helping this thesis take shape in the last months of writing, your comments have been invaluable. I have learned so much from the both of you and walking away from this thesis with a deep appreciation of institutional analysis.

I would like to say thank you to my friends and family back home. Being abroad during a pandemic was so isolating, and you kept me sane through this process with endless video chats and phone calls. Not being able to see you in person for almost three years hurts and I cannot wait to be reunited. Also big thanks to the friends I have made in Iceland, I am so blessed to get to know so many wonderful people.

Last, but definitely not least, thank you to all of my interviewees. This thesis would not have been possible without you, and I am so grateful.

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1 INTRODUCTION

Sheep grazing has existed in Iceland since the first settlers moved to the island. Arriving during the second half of the ninth century, settlers of Iceland brought sheep, cattle, and horses with them from their homelands of the Nordic countries (Austrheim et al., 2008). Before the settlers arrived in Iceland, there were no grazing animals on the island. In addition, Iceland had, and continues to have, a lack of significant predators other than the Arctic fox. This lack of predators and competing grazing animals combined with a natural vegetation suitable for grazing on the island allowed for settlers to easily begin grazing sheep when they arrived in Iceland. Further, the Viking settlers that initially came to the island likely had some knowledge needed for designing an institution that would be needed to manage a common resource such as mountain pastures in relation to sheep grazing (Stefánsson, 2018). Sheep grazing in Iceland has been well documented in historical legal books such as *Jónsbók* and *Grágás* that set out multiple legal provisions for management rules of sheep grazing on common lands and has been implemented since the early days of settlement. *Grágás*, one of the first compilations of legal frameworks in Iceland, contains two large manuscripts that cover Iceland's constitutional and judicial systems. Originally known orally, the laws were written down in the twelfth century in Iceland (Byock, 1988). The laws written in *Grágás* were later replaced in the 13th century by *Jónsbók* when Iceland became a part of the Kingdom of Norway (Schulman, 2010). Both *Grágás* and *Jónsbók* detail the Icelandic landscape through legal issues including personal rights, farming, and land-use. Incredibly influential in the countryside, sheep grazing exists not only as an agricultural practice, but has evolved into a well-established social institution.

This thesis understands an institution as informed by Elinor Ostrom's research. Ostrom defines an institution as "the rules that humans use when interacting within a wide variety of repetitive and structured situations at multiple levels of analysis" (Ostrom, 2005). Similarly, in this work a regime is defined as "sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area" (Young, 1986). Elinor Ostrom's academic work on institutional frameworks guide current understandings of institutional analysis. Ostrom's work on institutional frameworks, initially theorized to challenge to Garret Hardin's "Tragedy of the Commons", argues that individuals and communities are able to manage their own

collective resources and have done so in various ways throughout history (CGIAR, n.d.) Her work further developed a framework to study community management of collective resources, which is now called the Institutional Analysis and Development Framework (IDS). This framework assists researchers in identifying both components and relationships between components within an institutional analysis. Identifying components and their relationships allows analysts to develop models that can predict potential outcomes when discussing a problem within an institution (McGinnis & Ostrom, 1992).

The Icelandic sheep grazing system was thoroughly assessed by an institutional analysis framework in a paper written by Práinn Eggertsson in 1991. Published only one year after the release of Ostrom's fundamental work *Governing the Commons: The Evolution of Institutions for Collective Action*, Eggertsson's article discusses both the failures and successes of the Icelandic sheep grazing institution through the past 1,000 years. As this thesis takes inspiration from Ostrom's work, it further carefully considers and analyzes questions that Eggertsson asked in his 1991 institutional analysis of Icelandic sheep farming, but with a critical gaze influenced by the wide body of work published in the past thirty years on institutional analysis. One of the main influences that this thesis will incorporate is an understanding of the institutional-historical perspective and path dependence, both theories that have been developed since Eggertsson's article was published. This thesis understands history as not only a phenomenon of "something in the past", but as something that critically informs people's daily lives in a contemporary setting (Cleaver, 2002; Gagliardi, 2008; Mahoney, 2000; Petursson & Paul Vedeld, 2015). The Icelandic sheep grazing regime, hence an institutional framework to govern natural resources, continues to stand out as an excellent example of a regime governing a common-pool resource. Past work of studies on the regime will be expanded on as this thesis utilizes the Ostrom framework in order to analyze the robustness of the regime (Eggertsson, 1991; Mager, 2019; Stefánsson, 2018; Þorláksdóttir, 2015). The thesis will utilize a combination of both historical analysis and in-depth interviews of farmers and critical stakeholders.

1.1 Research objectives and questions

This thesis has the overall objective to investigate the design, robustness and endurance of the Icelandic sheep grazing regime, a ten-century old institutional arrangement still presiding. It does so with a utilization of the Ostrom design principles for long-enduring community-based environment and natural resource institutions and as informed by an understanding of path dependence of institutions. Various individual actors, all with ties to the sheep grazing institution as farmers or employees of sectors that are involved with the sheep farming industry, were interviewed on key points within the Ostrom framework. The aim is to discuss the Icelandic sheep grazing regime's evolution through the past centuries and its ability and challenges to operate in modern contexts. Departing from this thesis' objective, the following research questions were crafted.

- How has the Icelandic sheep grazing regime evolved throughout the past centuries?
- What is the design of the regime?
- By utilizing the Ostrom framework and key stakeholder interviews, what are perceptions about the structure of the sheep grazing regime and how it operates today?
- How is the Icelandic sheep grazing regime currently coping with change within its institutional structures and how are these changes informed by contemporary history?
- What are the implications of these findings for policy and practice in contemporary Icelandic national policy regarding the sheep farming regime?

This analysis of the robustness of the Icelandic sheep grazing regime will be analyzed in six main sections. First, a brief introduction to the thesis topic is given, including the study's objectives, research questions, and what the thesis's main contributions are intended. The second section includes a discussion of the theoretical basis to the study is, as well as an analysis of analytical frameworks were applied. Third, the Icelandic sheep grazing regime is historically analyzed and how it has both evolved and stayed the same through the past centuries. The fourth chapter outlines the methodology and explains the study design for data collected for the thesis. The fifth section contains both results and discussion of findings which are presented in relation to each other, categorically. The categories presented are key themes in the Ostrom framework as well as other

influential themes identified in stakeholder interviews. Finally, the conclusion will include final thoughts on the relationship of stakeholder interviews in relation to literature written about institutional analysis, in addition to notes on potential policy recommendations.

2 GOVERNING COMMON POOL RESOURCES – THEORETICAL FOUNDATIONS

Institutions are fundamental in shaping the ways in which humans interact with the societies and environment they engage with. This chapter will discuss the foundations of institutional theory and contemporary frameworks that will be used in this thesis. Key themes discussed in this chapter include institutional analysis, Eleanor Ostrom's contribution to the study of institutional analysis, common pool resources, and finally, understandings of path dependent institutional arrangements.

2.1 Institutional analysis of a regime

Institutional analysis targets on one specific part of a socio-ecological system (SES). Anderies et al. (2004), defines a socio-ecological system as “social systems in which some of the interdependent relationships among humans are mediated through interactions with biophysical and nonhuman biological units” (D. Cox, 2012). A socio-ecological systems approach to a study focuses on the relationship between ecosystems and the societies that maintain them through three distinct channels. The first being through accounting for the services provided by an ecosystem. Second, how social dynamics modify and influence the health of ecosystems. Finally, socio-ecological system approaches address how social and ecological systems both respond to endogenous and exogenous drivers of change (Berrouet et al., 2018). Similarly, regimes are defined as “sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area” (Young, 1986). A socio-ecological system is the link between humans and non-humans, while the regime refers to the set of parameters within a society that instruct individuals how to act.

In a socio-ecological system, social dynamics and environmental factors are equally crucial factors beginning to understand how humans are critically in environmental management. Berrouet et al. (2018) emphasizes that understanding the links between environmental changes and the ways that it impacts social systems is crucial as a misunderstanding could lead to misestimating impacts to both social and ecological systems through poorly designed public policy. However, studying the links between environmental changes and social systems is incredibly difficult. Araral (2013) reiterates the difficulty in studying these links by invoking complexity theory which suggests that

human societies are inherently “problem solving organizations”. In his understanding, energy is required for the maintenance of socio-political systems. As a socio-political system becomes increasingly complex, there are inherently more costs per capita and more energy required for the maintenance (Araral, 2013). In relation to the robustness of a specific socio-ecological system, Araral (2013) emphasizes that it is important to understand the ‘thresholds’ of specific systems, particularly in relation to a system’s adaptive capacity. He writes, “An SES is robust if it prevents the ecological systems upon which it relies from moving into a new domain of attraction that cannot support a human population, or that will induce a transition that causes long-term suffering” (Araral, 2013). In understanding the management of social-economic systems, institutions become an important concept.

Other important concepts that factor into institutional analysis includes understandings of norms and rules, as well as their differences. Ostrom (2014) defines norms as, “preferences related to prescriptions about actions or outcomes that are not focused primarily on short-term material payoffs to self-levels”. While norms typically are acquired in the community context, they often internally involve within individuals. Norms are often powerful because individuals fear the social consequences of a norm-breaking action, which amplifies the internal value that individuals assign to a specific norm. Further, there are various types of norms that can exist within an action area with different types of consequences derived from breaking the norm. For example, personal norms relate to internal satisfaction and regret while community norms often lead to shame or pride (Ostrom, 2014). In the same vein, Ostrom (2014) defines rules as, “linguistic statements similar to norms but rules carry an additional, assigned sanction if forbidden actions are taken and observed by a monitor level”. In order for a rule to exist, the situation that arises must be in relation to a rule-making situation and system for monitoring and sanctioning must exist. Further, rules can be made in many arenas including local, regional, national, and international contexts (Ostrom, 2014). So while norms and rules are very similar, it is important to remember that rules carry potential ramifications if broken, carrying the form of official sanctions while norms carry social ramifications in form of feels such as guilt or shame. Both norms and rules exist within all action areas; however, rules carry a form of monitoring and sanctions that are influential in creating the structure of the institution. Any institutional analysis needs to be informed

by norms and rules in order to start to lay out who is potentially involved in maintaining, monitoring, issuing sanctions, and essentially allowing the institution to develop its own culture. Norms and rules develop within an institution in order to inform users and appropriators what is okay and what is not okay do.

Institutions, a word that is genuinely misunderstood, are defined in this thesis in relation to Elinor Ostrom's Institutional Analysis Development Framework. Here institutions are systems of rules and norms that are socially constructed in order to provide structure to everyday life for human. As institutions limit choice, they are able to make certain behavioral routines repetitive and reduce uncertainty in human's lives. Due to the ways in which institutions shape every human's experience they are instrumental in cultivating personal identities (Ostrom, 2018; Pandey et al., n.d.). As institutions can vary greatly from differently locations and groups of people, there is an importance to acknowledging the central role that cultural knowledge plays in shaping institutions. As a certain group of humans lives in an area, they learn about the dynamics of a landscape and how that landscape responds to that group's activities. The culmination of knowledge by the group in regard to how a landscape responds to their activities is understood as cultural knowledge (Simpson et al., 2001). As institutions and cultural knowledge are highly variable, the ability to great simple mathematical models representing a 'correct' way to govern a certain institution becomes close to impossible. Ostrom (2018) writes,

"A key finding from decades of in-depth studies of institutions and the environment is that the same rules that work well in one setting are part of failed systems elsewhere! There are no 'optimal' rules that can be applied to all fisheries, all forests, or all water systems. We simply must stop relying on stick-figure models along and proposing 'one-size-fits-all' solutions, given that these solutions have themselves generated tragedies when widely applied rather than solved them" (Ostrom, 2018).

The high variability of institutions and the way that they shape human interaction with the natural world around them can be frustrating, but also gives way to a world of possibilities. Similarly, as representations of a 'correct' mathematical model of institution governance is potentially impossible, there is a false dichotomy made between ideas of 'traditional' in relation to 'modern' institutions. Often, 'traditional' institutions are understood as being informal, culturally, and socially embedded institutions while 'modern' institutions are understood in terms of formal and hyper-rational structures (Cleaver, 2002). Cleaver (2002) argues that this false dichotomy often allows researchers

to overlook the complex realities of how natural resource management often blends together formal and informal qualities into institutions. The combination of there being no 'correct' way to manage resources as well as the highlighting of the false dichotomy between 'traditional' and 'modern' resource management, really emphasizes that institutions are dynamic arrangements (Cleaver, 2002; Ostrom, 2018).

Similarly, academic works studying socio-ecological systems have brought criticism of ideas suggesting that there is a 'correct' way to manage resources. Since institutions are key components of socio-ecological systems, they are critical for engagement in the management and governance of ecological systems in their vicinities. Socio-ecological systems (SESs), and the various institutions affiliated with them, may succeed at governing the SES or they may do a bad job at governance, resulting in degradation of the resources within the socio-ecological system. This idea is understood as the concept of 'institutional fit', which proposes the idea that institutional arrangements should match "the defining features of the problems they address" (D. Cox, 2012). This is the idea that different environmental problems should be addressed differently and that similar problems should be addressed similarly. However, ideas of 'institutional fit' are often limited by being conceptually vague (D. Cox, 2012). Drawing off of Folke et al. (1998)'s paper in which the idea of 'institutional fit' is originally introduced, Braissoulis (2015) quotes Young and Undertal (1997)'s expansion on the "problem with fit" as it "asserts that the effectiveness and the robustness of social institutions are functions of the fit between institutions themselves and the biophysical and social domains in which they operate" (Braissoulis, 2015). This idea posits that 'institutional fit' proposes a binary and dichotomous notion that there is either an institutional fit or institutional misfit. Thus, the greater the fit, the more resilient a socio-ecological system is to shock (Braissoulis, 2015). While understandings of institutional fit may be problematic due to its vagueness and tendency to lean on binary thinking, it can be helpful through encouragement of handling institutional arrangements as being place and case specific.

A main influence in early common-pool resource literature is the University of California's professor Garrett Hardin article, titled "The Tragedy of the Commons". A main thread in Hardin's writings insinuates that humans are inherently selfish actors that have no ability to regulate the usage of common-pool resources independently (Hardin, 1968). His article, initially pushed in the magazine *Science*, relied on politics of human population

growth and use of the welfare state (Mildenberger, 2019). Writing for *Scientific American*, Matto Mildenberg reflects on Hardin's legacy and his promotion of an idea called 'lifeboat ethics' which argue that as global resources are finite, rich people can and should dominate poor people throwing them "overboard to keep their boat above water". This sort of mentality is scattered all of Hardin's "Tragedy of the Commons" as he advocated for privatization of resources. This sort of thinking can hold large impacts when legacies of colonization and current trends in globalization are considered. Mildenberger (2019) further noted a time that Hardin lobbied the United States congress against sending food aid to poor nations as he believed their populations were threatening the Earth's 'carrying capacity' (Mildenberger, 2019). Garrett Hardin's writings and actions through the years were noteworthy enough to earn the label him of both 'eugenicist' and 'white nationalist' from the Southern Poverty Law Center (SPLC, n.d.). While the overt politics of Hardin is beyond the scope of this thesis, students of environmental resources studies must think critically about the political effects of the writings of Garrett Hardin and his contemporaries and consider the geopolitical ramifications of such ideologies. Elinor Ostrom became one of the first influential thinkers that challenged Garrett Hardin's writings in her work on natural resource management and common pool resources. Her work emphasizes looking for solutions through collective action while focusing on food security and local livelihoods (CGIAR, n.d.). Further, Ostrom was instrumental in challenging binary thinking through her field research in places such as Main, Indonesia, Nepal, and Kenya where she studied 'bottom up' approaches to common-pool resource management. In opposition to Hardin's argument in support of privatization of common-pool resource management, Ostrom argued that government management was often not effective if the policies were not supported by the individuals and communities affected by it (CGIAR, n.d.).

2.2 Common-pool Resources

Institutions all sorts of governance systems, but for this thesis governance of common-pool resources is interest. Common-pool resources are defined by Ostrom (2018) as "resources that are sufficiently large that excluding beneficiaries from using them for consumptive or non-consumptive purposes is non-trivial." Common property is generally owned by a defined group of people, such as a community or nation. The group

that owns the common property has the right to exclude non-members (Wendel, 2004). Individuals within the group that owns the resource are able to set norms and rules in order to manage the way in which the resource is utilized. As common-pool resources are generally large, there is a necessity for effective institutions that govern harvesting so that the resources are not overharvested or destroyed (Ostrom, 2018). Solutions have the potential of breaking down due to lack of social control, which often becomes a problem due to population growth. Skurray (2015) argues that there is a fundamental tension within common-pool resources between private rights in the flow and common interests that shape the viability and well-being of the stock (Skurray, 2015). Common-pool resources can be understood for an institutional analysis as an 'action arena' as its structure is shaped by variables that are exogenous to the resources. These variables include biophysical and material conditions, community, and sets of rules that govern actions. Identifying and understanding these variables is important in order to understand how the common-pool resource is governed (Pandey et al., n.d.). Action arenas are composed of both action situations and the actors that are involved. The situation is the social space where actors interact, work to solve problems, and exchange various goods and services. The actors, on the other hand, are those who are involved in the situation (Nigussie et al., 2018). Further, common-pool resources are not isolated and are enmeshed in various forms of polycentric governance. Pandey et al. (n.d.) explains that polycentric governance structures are those that "directly influence exogenous variables such as the rules of resource use and the attributes of the community; indirectly even the biophysical attributes of the SES" (Pandey et al., n.d.). Common-pool resources thus interact with varying types of governance structures with various potentials for the ways in which private and public interests can be shaped (Ostrom et al., 1994; Pandey et al., n.d.).

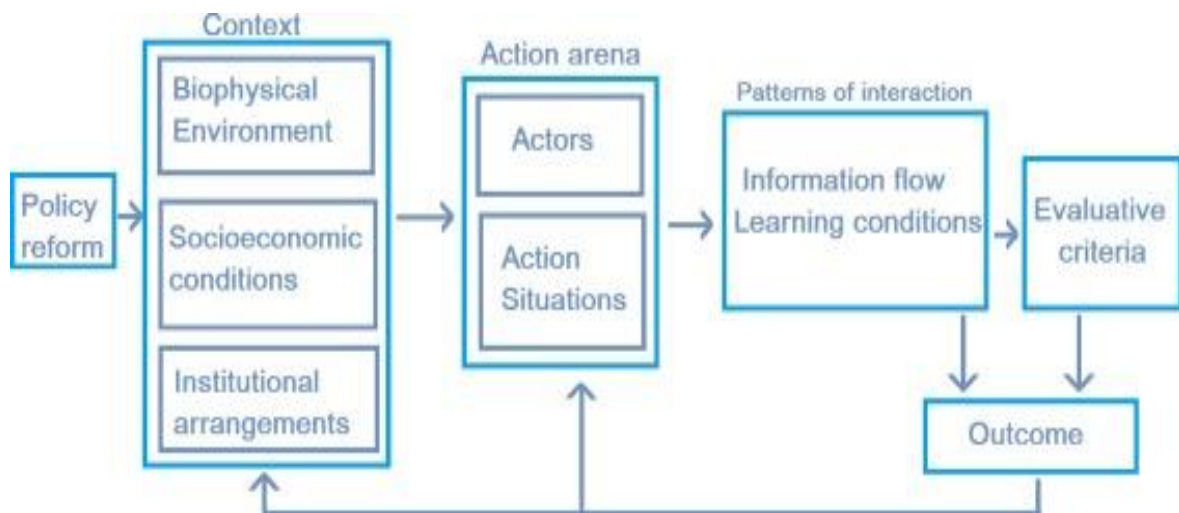


Figure 1. The Institutional and Development Framework. Ostrom et al. (1994)

Understandings of common-pool resources, however, have been contested. Ostrom's definition has been challenged by Choe & Yun (2017) as they argue that excludability and subtractability as attributes are social construction as they are not physical or technical. As they are a social construction, public opinion has the ability to change the nature of understandings of some resources (Choe & Yun, 2017). Further, Choe & Yun (2017) argue that there is a legitimization effect that works to prevent access to most resources that are already privatized, including club and private goods. This is due to the influence of technical development that reduces the price of potential exclusion, allowing most resources to be able to hold the attribute of excludability. They write, "excludability is not a physical or technical attribute of resources, but a socio-ethical attribute shaped by common sense like the 'Golden Rules'" (Choe & Yun, 2017). Finding a source of solutions for common-pool resource management problems is often a point of contention in academic literature. In 1968, Garrett Hardin argued that all common-pool resources, no matter how they are owned, lead to exploitation due to inherent incentives to 'free-riding' (Hardin, 1968). Inversely, many argue that local communities are the best at understanding their own environment and thus are able to manage the natural resources in a sustainable way (Wendel, 2004). Elinor Ostrom argued this in her seminal book *Governing the Commons: The Evolution of Institutions for Collective Action*, where she takes seven diverse examples of common-pool resource management throughout the world and links it with sustainable management. Throughout her book, Ostrom argues that the key to sustainable management of

common-pool resource is in the development of institutions that manage the resource in an appropriate way (Ostrom, 2018; Wendel, 2004).

2.3 Ostrom's 8 Principles for the Analysis of Icelandic Sheep Grazing

The most useful and relevant unit of analysis for understanding an institution or system is the action area. All common-pool resources can be understood as an 'action area' (Pandey et al., n.d.). Action areas include various 'action elements' that are not isolated but are heavily affected by a specific set of rules. These rules are generalized into seven types. Boundary rules specify how actors are able to enter or leave a position. Position rules establish what different sets of position there are and how many actors hold each one. Choice rules indicate which actions are assigned to each actor. Information rules stipulate different channels of communication between actors and the limits to what information may or may not be shared. Scope rules indicate the outcomes that could be affected from decisions. Aggregation rules specify how decisions of actors at one position influence intermediate or final outcomes. Finally, payoff rules establish how benefits and costs are distributed to different actors in their various positions (Hijdra et al., 2015). Ostrom (2014) explains that these eight types of rules can be present at three various levels. The first level is operational, where individuals directly affect variables such as how goods are exchanged, a good is allocated, or fish are captured. The second level includes policy situations where actors decide on rules that are in effect at operation levels. Examples of the second level include legislatures that pass laws regarding market exchange, Water User Committees, or a proctor of a school making policies on how new positions are listed and hired. The third level includes constitutional rules that create the rules used by the legislatures in level two (Ostrom, 2014). Ostrom further writes on eight defining principles regarding common-pool resources, some warranting longer discussion than others. These principles are:

Table 1: List of 8 Ostrom Principles of Institutional Analysis with associated meanings and their connections to common grazing regimes

Principle	Meaning	Connection to Common Grazing Regimes
1. Well-defined boundaries	An understanding of boundary rules for designated resources designates who is given rights to withdraw unites from the resource.	This can either mean that individuals or households who have the right to withdraw resource unites from the CPR

	Details residency or membership. Lack of boundary rules result in potential free-riding and rent-seeking (Wendel, 2004).	must be defined or that the boundaries of the CPR itself must be well defined (Cox, 2012).
2. Congruence between appropriation and provision rules and local conditions	Necessary to have agreement in how provision rules and local conditions are allocated in order to ensure that member contributions and benefits are in balance (Wendel, 2004).	This allows for equity among users in regard to time, place, technological, and/or quantity of resources that are being used in relation to the condition, labor, material, and/or financial unites (Wendel, 2004). Negative consequences result when externally imposed rules are not a match with local customs and livelihood strategies (Cox, 2012).
3. Collective-choice agreements	Most individuals affected by the operational rules can participate in modifying the operational rules (Wendel, 2004).	Local users have first-hand and low-cost access to information about their situation. Emphasis on the importance of local knowledge (Cox, 2012).
4. Monitoring	Monitors are either present and actively audit CPR conditions and appropriator behavior OR monitors are either accountable to or are the appropriators (Cox, 2012; Wendel, 2004).	Research shows that CPRs that are actively monitored tend to be kept in better condition. Monitors may perform better if they directly benefit from improved resource conditions. Environmental monitoring also plays a role into this (Cox, 2012).
5. Graduated Sanctions	Appropriators who violate operational rules are likely to be assess graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, officials accountable to these appropriators, or both (Cox, 2012).	Violating a rule in a CPR is inevitable from appropriators. Sanctioning deters appropriators from excessive violations. Allowing sanctions to be graduated helps maintain community cohesion while allowing for harsher punishment of severe cases (Cox, 2012; Wendel, 2004).
6. Conflict resolution mechanisms	Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between	Without available or easily accessible conflict resolution mechanisms, CPR management becomes significantly more difficult. Preparing for the potential of conflict allows for

	appropriators and officials (Wendel, 2004).	cost of conflict resolution to be lowered (Wendel, 2004).
7. Minimum recognition of rights	The rights of appropriators to devise their own institutions are not challenged by external government authorities (Wendel, 2004).	Posits that external government agencies do not challenge the right of local users to create their own institutions as there could potentially be a government failure if externally imposed rules do not correspond to local conditions (Cox, 2012).
8. Nested enterprises	Governance activities (appropriation, provision, monitoring, enforcement, conflict resolution) are organized in multiple layers of nested enterprises (Wendel, 2004).	A match between the boundaries of smaller common-property systems in larger ones may be important. Intercommunity linkages can also be important as horizontal linkages while connections of multiple jurisdictional levels are vertical linkages (Cox, 2012).

1. Clearly Defined Boundaries

Institutional analysis of common-pool resources requires an understanding of boundary rules for the designated resources in order to analyze who has the ability to enter and harvest the noted resource. Clear boundaries and rules that designate who is given rights to withdraw units from the common-pool resource are very important. This includes rules that limit withdrawal where has been deemed to fit (Wendel, 2004). Ostrom (2018) notes that there are three classes of boundary rules. First include residency or membership rules that detail requirements for residency or membership. Second, personal characteristic rules, include rules relating to personal attributes such as, but are not limited to, age, gender, education. Lastly, rules relating to relationship to the resource, detail the specific conditions of use. Examples include length and continuity of use, ownership of land, and/or acquisition of license (Ostrom, 2018). Boundary rules are incredibly important, as poor performance is associated with the absence of such rules or monitoring efforts. Similarly, lack of boundary rules could potentially lead to free-riding and rent-seeking (Ostrom, 2018; Wendel, 2004).

2. Congruence between appropriation and provision rules and local conditions

There needs to be agreement in how provision rules and local conditions are allocated in order to ensure that member contributions and benefits are in balance. This is necessary in order to guarantee equity among users in regard to time, place, technological, and/or quantity of resources that are being used in relation to the condition, labor, material, and/or financial units (Wendel, 2004). Further, the member that uses most of the resource must have the highest proportion of the fees in order to use the resource.

3. Collective-choice arrangements

In a common-pool resource, collective choice agreements should have the potential to be modified due to collective decision among members (Wendel, 2004).

4. Monitoring

Monitoring of conditions and of actions taking place within the designed boundary should be done by either users or by people accountable to members (Wendel, 2004).

5. Graduated Sanctions

Violators of rules of the common-pool resource need to receive some sort of punishment; however, these penalties need to be graduated. This means that initial sanctions should be very low but then should gradually increase. Graduated sanctions should be designed in such a way that users are willing to obey the punishment. In institutions that are considered robust, monitoring and sanctions are not undertaken by external authorities but by the participants themselves (Wendel, 2004). Penalties should be decided on by either users or by people accountable to users.

6. Conflict-Resolution Mechanisms

There needs to be a pre-defined arrangement for settling conflicts both between users and between users and officials. These arrangements should be designed to be done quickly and at low cost. By preparing for the potential of conflict there is an acknowledgement that conflicts and violations of resolutions, specifically involuntarily, will happen (Wendel, 2004).

7. Minimal Recognition of Rights to Organize

In order for users to be able to enforce the rules of the common-pool resource themselves, governmental authorities must recognize the users' right in order to devise their own rules and organizational structures. This allows for the institution not needing formal governmental jurisdiction in order to govern the resource (Wendel, 2004).

8. Nested Enterprises

The final principle that Ostrom includes in her Institutional and Development Framework is the importance of having enterprises that are nested together. This means that the various governance activities that have already been expanded on (appropriation, provision, monitoring, sanctioning, and avenues for conflict resolution) are organized in layers that are nested together. This further emphasizes that inter-community linkages are important both horizontally and vertically. A strong, robust system will encourage that all of these link's work and communicate well between each other (D. Cox, 2012; Wendel, 2004).

2.4 Historical Perspective & Path Dependent Institutional Arrangements

This thesis will utilize an institutional analysis with an approach that emphasizes historical perspectives. As societies develop and change, their futures are conditioned by their past. Institutions are a significant part in the development of societies, which means that understanding the history of an institution is instrumental in understanding the present (Gagliardi, 2008). Understanding an institution's history is important in critically analyzing the ways in which humans make decisions in the development of various institutions. In order to understand why people have made previous decisions in an institution's past, taking history into account is crucial. In her work, Elinor Ostrom utilizes a concept called "rational choice theory", which builds off of game theory and other mathematical models. There are two main assumptions with rational choice theory: methodological individualism and intentional action. Gagliardi (2008) reminds readers that rational choice theory is often inadequate in relation to institutions as individual choices are often surrounded in self-imposed constraints or other ideas of altruism that are imposed by the relevant institutional framework. Since institutions are "the rules of

the game in a society”, individuals are often highly affected by both the formal and informal rules set by whichever institution are in force in a society at a certain point in time (Gagliardi, 2008).

An institutional analysis that favors the historical perspective understands institutions as being ‘path-dependent’. Path dependence is the idea that at the establishment of an institution, the basics of the institution are negotiated and realized by some group in power. As the details of the institutions are renegotiated and restructured, the details are always shaped by already existing arrangements and decision-making processes within the institution. This process makes it so that other alternative possibilities become less likely as there is a constraint on future choice (Gagliardi, 2008; Petursson & Paul Vedeld, 2015). In this regards, path dependence is more than stating that “history matters” or that “the past influences the future” (Mahoney, 2000). Path dependence emphasizes that changes within an institution are not random or discrete, often specifically designed to meet the interests of the most powerful actors within the institution. Petersson & Vedeld (2015) explain that successive historical evolution “therefore becomes an outcome of the interplay between those in power and the path dependency, where actors involved exercise their power according to the path.” Mahoney (2000) argues that path dependence has three defining features. The first feature is that decisions made in the early stages of an institution are crucial as they often are very important for defining the framework for the institution. However, the second feature states that early historical events are contingent currents that cannot simply be explained by ‘initial conditions’ or prior events. In this regards, the idea that final outcomes cannot be predicted by initial conditions is ruled out. Lastly, the third feature is once processes in relation to the institution are started and begin to track a particular outcome, the processes tend to continue and track the same types of outcomes (Mahoney, 2000).

Path dependence is often written about in relation to a concept called ‘institutional bricolage’. This idea, most influentially written about by Frances Cleaver, conceptualizes how mechanisms for resource management and collective action are often borrowed or built upon from existing institutions, styles of thinking, and other sanctioned social relationships (Cleaver, 2002). This begs the question of how much of a role does human agency play in shaping and reshaping institutions? Similar to other ideas

of path-dependence, institutional bricolage rejects the usage of rational choice theory as individuals are often not completely rational or even simply 'economic resource appropriators' as they are simultaneously conscious and unconscious social agents. Individuals are enshrined in their own cultural realities while also able to analyze and act upon the situations that they are confronted with. This characterizes actors with both agency and constraint (Cleaver, 2002). Institutional bricolage relates to path dependence because, as institutions are constantly being layered and reworked, there is an ever-present dependence on historical processes that shaped whichever institution is being modified. Potential reforms need to be understood in relation to historical sequences of events and broader historical-institutional backgrounds of power struggles and the negotiations that shaped current institutional structures (Petursson & Paul Vedeld, 2015). Institutional bricolage is understood as an authoritative process as some 'bricoleurs' possess more authoritative resources than others, affecting their ability to push for certain decisions over others. Authority, time, and effort are involved in institutional bricolage, meaning that the poorest people are often excluded (Cleaver, 2002).

Institutional analysis and development (IAD) frameworks and theories have been utilized in order to study various common-pool resources throughout the world. The introduction of this sort of theory has allowed for studies of community-based governance of resources that have been historically glossed over. While detailing the plethora of practical analysis utilizing IAD frameworks throughout the world is beyond the scope of this thesis, there are multiple works written that were influential towards the theoretical end of this thesis. For example, Eduardo Araral (2013) wrote an article detailing his thoughts on what is important for socio-ecological systems to be considered 'robust'. Focusing on Ifugao, a landlocked province in the Philippines, Araral (2013) studied the region's 2,000 year governance systems protecting 14 different mountain ranges and associated rice terraces in order to ask the question, "When does the collapse of one part of a socio-ecological system imply that the entire system loses its robustness?" Elements influencing the recent developments within Ifugao province's governance regime include integration into a post-colonial social order, migration, agricultural development, urbanization, and tourism. This case study showed that ideas of 'adaptive efficiency' and 'resilience theory' are key in understanding potentials for a regime to be 'robust' (Araral, 2013). Another study that heavily influenced the writing the

theoretical framing of this thesis included Teshome H. Mulesa and Ola T. Westengen's 2020 study on access to plant genetic resources for food and agriculture (PGRFA), particularly in Ethiopia. Internationally Ethiopia is recognized for the prevalence of wild and cultivated plant genetic diversity and is a lead actor in international biodiversity governance in this regard. Ethiopia is also noted for restricting access to information on plant diversity within the country. The authors of this study ask questions such as "why do some countries implement a restrictive access governance regime" by examining how Ethiopia's restrictive governance regime over wild and cultivated plant diversity has evolved over the past century (Mulesa & Westengen, 2020). A final example of a practical application of Ostrom's IAD framework includes Kristoffer Wendel's 2004 master's thesis on grazing land in the Matsheng Area, Kgalega District, Botswana. By interviewing cattle owners in multiple villages in Matsheng Area in relation to IAD framework Wendel concluded that the present resource management regime is not sustainable due to skewed income variance, lack of indicators, and ongoing degradation of water and land. He also pointed towards dual grazing rights only benefiting wealthy cattle owners (Wendel, 2004). Wendel (2004)'s thoughtful analysis of cattle grazing in Botswana was very valuable while designing this thesis by showing how various interviews can bring out important information that cannot be found in secondary data. While this only includes a list of three studies that were helpful in the development of this thesis, there are many studies done on various governance regimes from all over the world. From animal grazing to marine governance, institutional analysis has continuously proven to be an invaluable tool for understanding local governance.

3 THE CASE OF THE SHEEP GRAZING REGIME IN ICELAND

Settlement began on the rugged and uninhabited island of Iceland in the 9th century A.D. Early settlers brought cattle, sheep, horses, goats, pig, geese, chickens, and dogs with them as they pursued a new life on a volcanic island in the North Atlantic (Eggertsson, 1991). Throughout the generations, livestock numbers were generally low and highly limited by the climate and the frequency of volcanic eruptions on the island (Austrheim et al., 2008). Grazing was favored as throughout Iceland, other than the fox, there were no wild mammals. This allowed herds to graze throughout mountain pastures, known as *afréttir*, in summer months without being overseen by farmers (Eggertsson, 1991). Geographically very young, Iceland is famous for being one of the most volcanic countries with about 200 post-glacial volcanos. About 30 volcanos have erupted since the settlement of the country in the 9th century. Iceland is generally divided into lowlands and highlands. The lowland generally are grasslands, wetlands, and heath-lands with a variety of dominant vegetation that is generally suitable for livestock grazing. The highland areas tend to be barren, dessert, with some wetlands (Austrheim et al., 2008). Sheep grazing has been important throughout Iceland as they are animals that are most likely to survive the often cold and windy Icelandic winters. Lowland areas are also well-suited for sheep grazing, often providing more than enough vegetation for sheep to eat throughout the summer months (Austrheim et al., 2008; Eggertsson, 1991).

Much of Iceland's agricultural history is primarily understood through the lens of legal code, especially from the writings of *Grágás*, the ancient law code of the Commonwealth, and *Jónsbók*, the reformed law code used after Iceland's union with Norway in 1262 (Eggertsson, 1991; Simpson et al., 2001). *Grágás* and subsequently *Jónsbók* were effective in Iceland until 1965 as they were thought to provide both adequate and practical solutions for effective resource management on the island (Mager, 2019). Translating to "gray goose", *Grágás* was compiled separate from concerns from royal justices or prerogatives as Iceland was self-determined until 1262 when the country pledged fealty to the Norwegian king (Byock, 1988). While the date of origin of *Grágás* is unknown, there is evidence that the legal code existed by 1096. Contained in two large manuscripts, *Konungsbók* and *Staðarhólsbók*, *Grágás* illustrates the limits and abilities of a legal system that operated separate from an executive authority. At the time, Icelandic law was maintained through negotiation and compromise. Jesse L. Byock (1990)

writes that Grágás was not necessarily a set code; however, was a group of rules that individuals could potentially utilize in order to disadvantage others as well as guide communities in how to organize their local governmental systems (Byock, 1988). Grágás details sheep grazing and farming in detail, which lets historians and archaeologists understand the nature of how this ancient system used to operate (Eggertsson, 1991). Eggertsson (1991) explains that Grágás is important in detailing regulations that help modern academics, in their own terminology, understand how exclusion, internal governance, and spillover effects operated in the first few centuries of Icelandic sheep farming communities.

Grágás included strict laws about how farmers could graze their sheep and had legal designations of different types of rangeland property types. In Grágás rangelands were divided into *afréttir* and *heimalönd*. *Afréttir*, defined as mountain commons, were jointly owned by two or more (generally many) people or the municipality and located in highland areas. Generally *afréttir* were used to graze sheep during the summer months and sheep were rounded up and brought back to farms in the fall (Stefánsson, 2018). *Heimalönd*, on the other hand, are rangelands that are privately owned and tend to be either close to a farm or surrounding the farm. *Heimalönd* can also be mutually owned by multiple farmers but are generally never owned by the local municipality. Further, *heimalönd* is used most often for grazing during the winter. *Afréttir* did not have any purposes other than use as meadows from grazing and all farmers involved in the governance of *afréttir* were involved in similar professions. Those who used an *afréttir* were automatically compulsory members of a local governance institution known as a *hreppur* (Eggertsson, 1991). A *hreppur*, a sort of commune, was a local association that organized many farmsteads, often twenty or more, that governed local grazing resources and organized the yearly round-up of sheep from both the highlands and *afréttir* (Simpson et al., 2001). While the origins of the use of a *hreppur* in Iceland are unknown, there is evidence of their existence as early as 1096. Further, the Grágás required that every community had a *hreppur* that included at least 20 farmsteads. Other than governing farming activities in a community, the local *hreppur* was in charge of collecting the tithe and maintaining the poor (Simpson et al., 2001). Both the *afréttir* and *hreppur* were institutions that had critical importance for farming communities and remained staples of rural Icelandic culture until technological advances in the 19th century

(Eggertsson, 1991). The internal governance of the *afréttir* centered around two important uses. The first being the preservation of grazing potential of the *afréttir* from overuse by users and the second being the protection of individual property rights of sheep which flocks from different owners were left unattended in the mountain pastures (Eggertsson, 1991). Some other laws that are prescribed in *Grágás* include designating length of summer sheep grazing period and instructing farmers to drive their sheep into the middle of common rangelands in order to mitigate sheep encroachment on the lands of farmers whose *heimalönd* was near *afréttir* (Stefánsson, 2018). Further, *Grágás* detailed the use of *ítala* which was a sort of quota that indicated the number of sheep farmers could bring to *afréttir*. Used as a measure to prevent overgrazing, farmers could use *ítala* in order to transfer grazing rights temporarily to another farmer (Eggertsson, 1991; Stefánsson, 2018).

Similarly, the laws of Iceland were compiled by Jón Einarsson in 1281 into the book that would come to be known as *Jónsbók*. This legal framework was very similar to *Grágás*, however was a more formal as Iceland was under the dominion of the Kingdom of Norway (Byock, 1988). *Jónsbók* made some clarification on rules regarding the land use of rangelands. For example, local governmental bodies were given the power to decide when sheep would be driven to and collected from *afréttir*. In *Grágás*, these dates were the same in each *hreppur*. This change was made as certain data from one district may not have been suitable for others located in different parts of the country. Similar to *Grágás*, however, those who did not follow the laws prescribed in *Jónsbók* would be fined (Stefánsson, 2018). *Jónsbók* would continue to be the primary legal framework used until the 20th century in Iceland even though Iceland would become a part of the Danish Crown in the late 1300s, losing the majority of its legislative powers and functions. In 1874, Iceland was allowed to let *Alþingi* to have legislative and financial power over their domestic matters. Around this time there were some reforms to the sheep grazing system. Some changes included the introduction of a democratically elected body, *hreppsnefnd*, or Rural district committee that was in charge of sheep grazing matters. Each rural committee was in charge of constructing regulations regarding *afréttir* and other sheep grazing concerns in their region (Stefánsson, 2018). In 1918, Iceland became a sovereign state with the Act on Unions and was declared fully independent by *Alþingi*

in 1944, the same year the state adopted a constitution and became The Republic of Iceland (Stefánsson, 2018).

Sheep farming in Iceland has gone through many different phase through the centuries and the sheep grazing regime has evolved along with it. During the first centuries, wool was the most important product from the sheep and wool cloth became the main currency for Iceland in foreign trade (Mager, 2019). Because of this, sheep husbandry focused on maximizing wool quality and quantity, manifesting in sheep grazing practices that attempted to keep sheep out of forests in order to prevent wool damage. By the 14th century the importance of wool as an export product significantly declined. In turn, sheep numbers decreased, and grazing pressures also lessened. Further, the period of time between the 14th and 17th centuries were particularly harsh for those living in Iceland. This period saw severe economic decline as there was significant climate cooling and spread of disease. As many of the people in Iceland were focused solely on survival, cattle were often replaced with sheep as the primary milk supplier since sheep had lower maintenance costs. Lactating ewes were also prioritized between the end of June until October and were under daily supervision. During this period only a small portion of sheep and weaned lambs were allowed to roam freely on common grazing lands (Mager, 2019). The 18th century continued to be harsh for the population living and grazing sheep in Iceland as there were large collapses of some flocks due to winter grazing. In 1770 English sheep were introduced to the country for breeding purposes; however, the imported sheep carried sheep scab which prompted both death and systematic culling by farmers to prevent disease from spreading throughout the entire sheep population. This dropped sheep numbers throughout the island to 140,000 (Mager, 2019). Further, the 1783 Laki eruption in South Iceland, a historically significant eruption that is known for resulting in the death of potentially 25% of the Icelandic population, further dropped sheep numbers to below 50,000 (Mager, 2019).

Industrialization brought some of the largest changes that the Icelandic sheep grazing system had seen in centuries. Sheep numbers throughout Iceland began to rise during the 19th century through a combination of industrialization as well as an increasing demand for food in growing cities throughout England (Austrheim et al., 2008; Mager, 2019). This also led to an increase in the export of live sheep to Europe. As lamb meat production rose, farmers started allowing lambs to roam freely with their mothers during

the summertime months. The 19th century was not all good for Icelandic farmers though, as there were harsh climatic conditions and another sheep scab epidemic in 1855 along with the import of English breeding rams (Mager, 2019). General increases in livestock numbers continued the degradation of Iceland's green areas. Since the beginning of the 20th century, green areas throughout Iceland were estimated, conservatively, to be half the size they were at the time of settlement in the 9th century. On top of this, annual production of vegetation is believed to be only a third of what it used to be in the 9th century as well (Eggertsson, 1991). Trends from the 19th century continued into the 20th century. By 1920, farms seldom kept any sheep for milking and drove the majority of their herds to highland pastures. Another round of diseases was introduced to Icelandic sheep as well when German sheep were imported in 1933. This started a widespread need for building fences throughout the country in order to keep diseases under control (Mager, 2019). In 1934, the Act on Slaughtered Livestock was passed, setting the foundation for the current subsidy system. In 1959, a committee was formed by the Minister of Agriculture in order to formulate a body of laws focusing on rangelands and herding affairs. The goal of this body was to bring together the old formal and informal institutional frameworks into the national framework. A decade later the Act on Highland Rangeland matters, mountain herding, etc. No. 42/1969 was passed in Alþingi. This act acknowledged the local government authority of sheep grazing as well as made some local power more explicit. In all, local governance was granted more rights and saw an increase in power. The act also emphasized vegetation protection and the use of *ítala*, the quota system, in order to protect the rangelands (Stefánsson, 2018).

The number of sheep in Iceland peaked in 1977 at 900,000 and have since then been decreased by half (Austrheim et al., 2008). In a response to overproduction, a livestock quota was introduced in 1985 (Mager, 2019). After the introduction of the quota, the number of sheep throughout the country dropped significantly; however, began to rise again through the turn of the century due to the utilization of perverse subsidies within Iceland. Mager (2019) explains, perverse subsidies are, "governmental payments that do not take into account impacts on the environment and therefore imply long-term hidden costs to society in the form of environmental degradation". Increased fertility and carcass quality was aided by breeding programs; however, domestically sales of sheep products have decreased in domestic markets while prices in foreign markets have also dropped

(Mager, 2019). Increased scientific knowledge has also changed the way in which researchers understand the Icelandic sheep grazing regime and its relationship between both people and the ecosystems it affects. Marteinsdóttir et al. (2017) examines the effects of extensive sheep grazing throughout various Icelandic ecosystems. Ecosystem degradation has been notably severe in Iceland due to the negative consequences that come from grazing sheep in volcanic ecosystems with short growing seasons. As Icelandic vegetation originally developed without the influence of large herbivores, the introduction of sheep allowed bare ground throughout the island to become exposed. Exposed ground is then more prone to water and wind erosion. Finally, high impact of sheep grazing in the lowlands of Iceland resulted in a rapid ecosystem transition to open grasslands and heathlands, both which are less resilient to natural catastrophes (Marteinsdóttir et al., 2017). Currently there is still limited knowledge about the ecological consequences of grazing resulting in degraded or collapsed ecosystems continually being grazed today. Marteinsdóttir et al., (2017) suggest that effective management is hindered when there is a lack of knowledge. They argue that in order to create a management system that is effective it is imperative to establish a scientifically sound monitoring program throughout the country (Marteinsdóttir et al., 2017). While land degradation is not a key focus of this thesis, understanding that the Icelandic sheep grazing institution continues to effect ecosystems throughout the country is imperative to understanding what changes need to be made to the regime to make it sustainable in the future.

4 METHODOLOGY AND DATA

This qualitative study utilized a series of in-depth interviews of key stakeholders. Initially two key informants were chosen for interviews and due to the degree of thoroughness from these interviews, it was decided that the rest of the data would come from guided in-depth interviews. Interviews were loosely structured with various key questions interspersed in order to guarantee that necessary information was collected. Sticking to a loosely structured assured that important data would be collected while allowing the interviewee to explain key points that the pre-determined questions may not have potentially allowed for. For interlocutors that may not have had time or confidence in English skills a translated copy of interview questions was created into a questionnaire that was sent to interviewees in both English and Icelandic. Responses to these were naturally much more succinct and to the point as guided in-depth interviews allow for interviewees to protract more developed answers as they become more comfortable in the interview process. In-depth interviews also allow for points that may have not been discussed before to be probed for more information.

This study utilized “snowball sampling”, which is a relatively widespread technique in order to reach a wider range of individuals with expansive knowledge on the Icelandic sheep grazing system. While snowball sampling can take various parameters, this study understands it as creating an initial sample of individuals to interview (or extrapolate some sort of data from), and then asking individuals in the initial sample to suggest individuals to include on subsequent sample groups (Audemard, 2020). Snowball sampling is often used potential participants are members of hard-to-reach populations as they may be ignored in more traditional forms of sampling and are more easily identified by members of a specific community. Another reason that snowball sampling is used is to sample an individual’s personal network (Audemard, 2020). Snowball sampling was utilized for this study due to the latter reason, as the initial individuals interviewed for the study are highly knowledgeable individuals and have been involved in the sheep grazing regime for decades. In a country such as Iceland, which has a relatively small total population, utilizing an individual’s personal connections is enough for identifying other key informants. Semi-structured interviews are also a common way for social scientist to gather data as they facilitate the ability for interviews to both have pointed questions as well as space for interviewees to expand on information they find

important. Not all interviewees have the same background on a similar subject and semi-structured interviews allow for each interviewee to discuss in depth fields they find particularly interesting or are knowledgeable about, a more long-ended process that often allows interviewees to open up much more about a subject that a questionnaire would allow for (Baur & Ernst, 2011). One main purpose of a social researcher doing semi-structured interviews is to act as a mediator between interviews and the final product that is informed by the interviews. Social researchers have the intention of keep as much information given in the words of the interviewee while presenting it in a way that is readable (Bryman, 2008).

This thesis also utilized an in-depth questionnaire following the Ostrom principles. The questionnaire outline questions that were deemed important for the thesis and allowing for semi-structured interviews allowed space during the interviews for all for all of the questions to be answered while simultaneously granting an avenue for conversation that fleshed out responses from respondents. Allowing the in-depth interviews to be semi-structured and less rigid acknowledges the depth of local knowledge and create a space for respondents to elaborate more freely on points that they deemed important as well. On the other hand, as there were two respondents that did not have the time to partake in an in-depth interview, having a questionnaire provided the ability for respondents to participate in the study by responding to questions in the questionnaire by email.

In total, nine people were interviewed about their knowledge and experience with the sheep grazing regime. The interviewees were contacted through an e-mail which explained the purpose of the research and whether they would like to participate in the research. Seven of the nine interviews were done online through video chatting in order to keep everyone safe from COVID-19. The two other interviews were filled out through a questionnaire. It is possible that holding all of the interviews online may have affected the way that interviewees interacted with the semi-structured interview, but it was the best way to stay safe. The interviews were held in English, and each lasted between 30 minutes to 2 hours. Each interview was transcribed in word by word and reviewed multiple times for clarity after the interview was completed. The majority of people interviewed work either as sheep farmers or hold a job that deals with some aspect of the sheep grazing regime, many working as both (Table 2).

Table 2: Brief description of each respondent and their relevance to the study:

Respondent	Description of respondent and relevance to study
A	Respondent is a farmer and works with a sheep related association as a consultant on sheep breeding and the national sheep registry.
B	Respondent is a farmer, agricultural consultant, and works with a sheep related association
C	Respondent is a farmer and professor emeritus who has studied various sheep related topics
D	Respondent is the head of a municipal government that deals with environmental and development projects
E	Respondent works in a branch of an Icelandic association that gives formal opinions on proposals. They often work with proposals in municipalities where sheep grazing is an important economic activity.
F	Respondent is a farmer and also works as a historian at an agricultural university.
G	Respondent is a farmer, former consultant, former staff member of a sheep related association, and is a former professor at an agricultural university.
H	Respondent is a former staff member of a sheep related association, currently works with at an agriculturally focused government ministry
I	Respondent is a sheep farmer and works at a sheep related association

As seen from the table, six of the nine respondents are currently sheep farmers, and all respondents work at varying capacities in sheep-related fields. Further, the majority of the respondents currently hold jobs that are directly related to sheep farming.

The semi-structured interview made use of the Ostrom principles (Appendix A). These principles included: well-defined boundaries, congruence between appropriation and provision rules and local conditions, collective-choice agreements, monitoring, graduated sanctions, conflict resolution mechanisms, minimum recognition of rights, and nested enterprises. In addition two additional variables were identified and expanded on: the prevalence and effects of abandoned farms and long-term institutional sustainability (Table 3).

Table 3: Expanded themes influencing the Icelandic sheep grazing regimes

Theme	Main focus	Additional Notes
Abandoned Farms	Discusses the influence of old farms where sheep are no longer farmed or grazed	Additional discussion on land use issues, ability to buy and sell farms, other ownership issues, threats to

	and that impact on the regime	sheep gathering in the Autumn, community size,
Institutional sustainability	To discuss potential changes to the institution raised by interviewees in order to ensure long term institutional sustainability.	Discussion of potential for farmers to each more in relation to the amount that they work, infrastructure improvements in rural areas, and projects such as Project GRÓLIND.

This thesis also utilized a variety of secondary sources in order to write about the theoretical side of common pool resource governance as well as the historic case of the Icelandic sheep grazing regime. Secondary resources utilized in this thesis include theoretical writings from authors such as Elinor Ostrom and her peers who study institutional analysis, various master's, and bachelor's thesis from former students at the University of Iceland, and supplemental peer-reviewed articles concerning sheep grazing.

5 RESULTS AND DISCUSSION

Initially, the in-depth interviews conducted to collect data for this thesis focused on the following variables which are central to an institutional analysis: boundaries, equity, collective choice agreements, monitoring, graduated sanctions, conflict-resolution mechanism, recognition of rights to organize, and nested enterprises; however, it became clear through the interviews that there were two other important variables and discussion points that are central to any discussion on sheep grazing in Iceland. These additional variables included the significance of abandoned farms and farmer's perceptions on changes that need to be made in order to keep sheep grazing a sustainable institution. There have also been additional talking points that may not fit into any specific category but shed further light onto the workings of sheep grazing. These will be discussed towards the latter half of this chapter. All of these factors were integral in analyzing the robustness of the Icelandic sheep grazing regime as well as pin-pointing where future modifications would be the most optimal for increasing the institutional sustainability of the regime.

5.1 Assessing the Robustness of the Icelandic Sheep Grazing Regime

5.1.1 Boundaries

In any well-designed, robust institution, comprehension of boundary rules is integral to designating rights to withdraw units from any given reasons. Boundary rules are also important for detailing residency and/or membership of any given institution. These rules must be clear in order to deter from free-riding and/or rent-seeking behavior. In the Icelandic sheep grazing context, the entire island is considered part of the common-pool resource, as farmers release their sheep into mountain pastures and let the sheep wander wherever they like. The interviews conducted for this study highlighted two different forms of boundaries being formed for the sheep grazing institution in Iceland. The first type of boundary is concerned with the formation of municipalities and their governance of mountain pastures (afréttir). The second type of boundary is concerned with natural borders between municipalities throughout the island as well as areas fenced with the intention of keeping sheep out of a given place. This second type of boundary is more concerned with physical abilities to keep sheep in any given area.

Both historical documents and interviews taken for this study show that the boundaries within the institution of Icelandic sheep grazing were initially set in place with some of the first settlers and have not changed very much during the past centuries. Multiple respondents discussed how the original generations of settlers divided the land throughout Iceland into various farms. Many of the original farms from this time period have the same boundaries today (Respondent I and C). Each of these farms historically belonged to a hreppur, a local administrative unit or sort of municipality, of which there were about 200 hreppur throughout the country. Historically, there were commonly about 20 farms within each hreppur unit which could mean that each municipality had about 200 or so people. While official statistics on the population count in Iceland began in 1703, the population of the Iceland has likely wavered between 30,000 to 80,000 since settlement times. In 1703, the population of Iceland was 50,348 (Hagstofa Íslands, n.d.). Hreppur was a main organizational unit throughout Iceland for both sheep grazing and community governance (Respondent C). To this day, rural municipalities are in charge of local administration of necessities such as schools, roads, and land use planning (Respondent A).

The old law books, Grágás and Jónsbók, guaranteed the rights for sheep farmers within a hreppur access to afréttir for the grazing of their sheep during the summertime. The hreppur system and their respective afréttir are important components in the governance of sheep grazing in Iceland. Historically, each hreppur had elected boards that would democratically govern and manage their hreppur and its respective afréttir. For many parts of the country, the hreppur unit is more a part of history and less important for the administration of the country as many have been merged into larger municipalities. Various interviewees discussed this in relation to the lessening importance of farming and rural life in Iceland as many younger people move to the city. The impact of this results in fewer people throughout farming communities, which often forces multiple hreppur to consolidate together. One interviewee detailed this relationship thoroughly, stating,

So the use of the rangeland is rather conservative, we keep the original hreppur, they control their own areas, but of course when it comes to organizing the gathering of the sheep, then there may be a central committee to cover even several hreppur together. There's also a difference in the hreppur. In the old days you had, they

elected their own boards, it's a political kind of system that in each hreppur you have a council, and you govern your own affairs. It was very democratic, and even hreppur with less than 100 people, they would elect their own council and manage their own affairs. But nowadays when you combine them into bigger authorities for economic reasons, then they lose, there is just one board elected for the combined units. But hreppur is, as far as rangeland management is concerned, very important. We use it in, we have in our identification of sheep, especially out of sheep, we keep the old names of hreppur in each earmark record. We keep the names of the old hreppur because they still have their identification numbers. So we keep the old system and it's very efficient, no problem at all. But when it comes to the government, the political government, it will be easy to amalgamate, so there may be many hreppur combined into one authority and I could give you many examples of that in different parts of the country. And the trend of that has been to reduce the number of local authorities and this means combining hreppur together, two or more, but we still have a few small ones, and they want to stay independent. But then it's a mechanism for the impact, in our ministry of social affairs, they have some clauses in the law to enforce them to combine into bigger units, but this is not always popular. (Respondent G)

Another interviewee noted that the hreppur consolidation for his home consisted of 12 smaller hreppur that had been merged into one larger municipality which today has about 3,700 inhabitants (Respondent D). As the quoted interviewee noted, hreppur consolidation is not always a popular option. Other interviewees voiced concerns about hreppur consolidation taking away abilities for communities to govern themselves adequately .

The amalgamation of hreppur into larger municipalities is not a new phenomenon. Essentially all population centers throughout Iceland were included in some hreppur until the 19th century; however, the majority of larger city centers are now considered cities or townships, abandoning the hreppur system. One interviewee detailed this transition, pointing out that Akureyri, Seltjarnarnes, and Kópavogur were all once smaller municipalities called Akureyrihreppur, Seltjarnarneshreppur, and Kópavogshreppur, but are now considered larger towns, almost transcending the hreppur designation. Today Akureyri, Seltjarnarnes, and Kópavogur are officially known as Akureyribær, Seltjarnarnesbær, and Kópavogurbær (respectively, the town of Akureyri, the Town of Seltjarnarnes, and the town of Kópavogur) (Respondent G). The few larger towns through Iceland have shifted their focus from farming in the past centuries to other economic endeavors, which has shifted conceptions on how municipal governance should be pursued. This is especially true for Reykjavík, which has a dwindling number of farms within it's purview. As one respondent explained, while the hreppur is

still a basic unit that is responsible for rangeland management, when there are several that are amalgamated, there is a council that is responsible for rangeland management. The council then delegates which tasks are to be done in various parts of the area of which the council governs (Respondent G). However, when smaller municipalities are amalgamated, their commons often become part of the part of this bigger municipality with a small or mid-sized town. The larger towns often are not very interested in the governance of the commons, as the daily roles of governance for larger towns is often much more complex due to more people. For example, the City of Reykjavík is in charge of controlling the communal crazing areas, but the city council allows a sheep society that is manned by farmers within the capital area take care of the implementation of the law. One interviewee explained, “the city council has nothing to do with us, we do it on their behalf and it doesn’t cost them anything because we look after our own sheep and you go into the mountain in the fall to gather the sheep and sort them, and we keep our own authority, so to speak, without being interfered with by the council of Reykjavík and this works very well (Respondent G).

Hreppur consolidation can be a touchy subject for many throughout Iceland. One interviewee noted that in Alþingi, the Icelandic parliament, there is discussion of changing the laws so that each municipality has to be at least 1,000 people in order to have a functioning local government (Respondent A). Multiple interviewees noted that in the light of this law proposal, local communities few threatened due to losing their ability to govern their own communities and rangelands (Respondents A, G, and B). One interviewee noted that while there are cons for hreppur consolidation, it is important to acknowledge that Icelandic society has change dramatically in the past two centuries, explaining,

“There’s very heated discussion about this. Whether the results of that would change any of that for the subject we’re discussing, sheep farming, well it probably shouldn’t be that important. Because sheep farming goes on in municipalities that have merged, and it’s not affected. It shouldn’t really be a big issue in our discussion. The administration, including local governments, it’s changing. It needs to reform. If you consider that hreppur, the small unit of local government, they’ve existed for 900 years or so. And of course the modes of transport have changed dramatically. You have bridges over rivers now. And, you have at least half decent roads. So it’s not really a problem anymore. In most of these municipalities you have much fewer people than used to live there. A municipality that has 100 inhabitants now you maybe used to have 1,000 150 years ago. The community has changed. You have

bigger farms, you have smaller families, and in many of them you hardly have any children anymore. You have demographic changes” (Respondent E).

Another interviewee notes that while hreppur have been amalgamating for the past decades, there have been agreements to not change the organization of local committees that are in charge of matters surrounding sheep grazing and governance of the commons. They explained that it is important for local people to arrange matters in regard to sheep grazing in their localities. Another interviewee noted that while farmers are still able to be involved in the governance of their afréttir, they lose out in representation on local councils that govern larger municipalities. A main reason to be wary about this is due to urban rural divides as urban viewpoints may be over-represented in these councils and rural voices become less important. The interviewee noted, “So, it’s a question of public participation and so, the bigger the unit, the bigger the system is, the less likely it is that individuals feel that they are a part of it. And this is a problem of course in modern society that many people feel that they are not sort of being listened to and they are on their own somewhere and they do not seem to be able to control their own affairs” (Olafur). This potential inability for rural people, many of whom are farmers, to feel as if they can control their own affairs is a large problem when it comes to the governance of common grazing lands.

Boundaries of sheep grazing land throughout Iceland are also divided by natural borders. One interviewee explained, that while sheep are released to wander and find food wherever they are able, they often cannot go too far as there are natural limits and borders throughout the country (Respondent A). These natural borders include mountain ranges, rivers, and glaciers. Another interviewee, citing laws 38/2013 gr. 8, Lög um búfjárhald, noted that a landowner is allowed to ban grazing on his land if he is able to fulfill some demands, primarily keeping fences in good shape so that the sheep are not able to enter the property (Respondent D). Sheep can also be banned on certain roads where there are fences and enclosures, this is based on legislations of the road administration, Vegalög. Sometimes a farm’s access to potential grazing in an afréttir is completely cut off due to the existence of fences from other farms and geographical features (Vegalög, 2007; Lög um búfjárhald, 2013). One interviewee explained this stating,

In my area I graze my sheep pretty freely but there are areas surrounding my grazing areas that are fenced because they are used for roads, forestry or as hayfields or acres for other farms. These fences and large rivers mean that my grazing pastures aren't very big. The biggest part of it is land my father owns and land I lease from the government. In some areas in Iceland grazing is not permitted because of problems with soil conservation or other reasons but not in my closest area (Respondent B).

So, while every municipality has its own *afréttir* and every sheep farmer who is allowed historic rights from the old laws of the *hreppur* has a right to use the *afréttir* to graze their sheep, it may not always be practical for a farm to utilize the *afréttir* within their municipality. People who are excluded from being allowed to use the *afréttir* include those in new municipalities.

The boundaries within the Icelandic sheep grazing regime in regard to municipalities is heavily informed by history and currently in a time of evolution. Those who live and farm within a municipality are allowed to graze their sheep on the municipality's common grazing lands. Farmers have the option to be involved with their local committees that make decisions on numbers of sheep allowed in common grazing lands, dates when sheep allowed to enter the grazing lands, as well as planning surrounding the annual sheep round up in the autumn. These rural areas are currently changing quickly due to rural de-populations and *hreppur* consolidation. Yes, individuals are able to still be involved in local committees making decisions for their *afréttir*, however, if there are less and less people farming in each region, how long is it until in some regions there are simply not enough people to be involved in the governance of the commons? Without populations in rural areas and strong communities with two dozen farms or more, will the boundaries and rules continue to be important, or will they need a drastic overhaul in order to accommodate for the scarcity of people that are involved in the system? It is impossible to bring concrete answers, but it is possible that with so few people farming in some areas that the boundary rules become less important as potential problems with free-riding and rent-seeking are almost a complete non-issue. Potentially, the lack of discussion from interviewees around free-riding and rent-seeking may hint that the boundaries for the Icelandic sheep grazing regime are adequate; however, with a lack of people in order to note potential problems, there may be problems that are generally not noticed in the regime.

5.1.2 Congruence between appropriation and provision rules and local conditions

Focused on equity between users of a common-pool resource, it is necessary for there to be agreements of how provision rules and local rules are allocated. This is to ensure that member contributions and benefits are in balance. For the Icelandic sheep grazing institution, this is somewhat easy to delineate as all farmers from the old hreppur that is connected to afréttir are allowed access to common pasturelands for their sheep. There are no fees; however, farmers may have to follow specific laws within a municipality. Some of these costs are attached to the management of commons. This includes of upkeep of fences and housing as well as the gathering of sheep in the autumn. So, ultimately farmers do pay a fee through either labor or taxes. The Icelandic government is, however, not able to charge farmers money in order to utilize this rangeland.

The Icelandic government attempts to ensure that farmer's contributions and benefits are balanced through a subsidy system, providing both direct and indirect support to farmers. Without subsidies in the current system, sheep farmers would be contributing far more than they would gain from benefits. Income for farmers throughout Iceland has been greatly subsidize by the state in the past century or so. Multiple interviewees discussed this history and their opinions on the prevalence of subsidies with Icelandic sheep grazing. Currently, about 50% or less of a sheep farmer's income comes from the market (Respondent C). One interviewee explained that pre-World War 1, sheep production on farms was generally to meet the needs of families and maybe communities. However, during the war the populations within city centers started to increase and people started moving to towns next to the sea for the fishing industry. One interviewee noted that between the years of 1930 until 1985, European states got involved and started subsidizing and sending money to the Icelandic government for sheep production. The sheep production export to Europe, particularly Norway, was a good market for Icelandic sheep farmers. This also led to an increase in sheep production in Iceland. Further, the United States provided support to Iceland that allowed for the increase in sheep meat production during and after World War 2 (Respondent C). Another interviewee recalled reading a thesis on Icelandic public administration about developmental support to agriculture in the country during the 1930s. They recalled reading a law that parliament approved in 1935 on Needs Sale, which attempted to

guarantee a minimal price of meat sold in order to “ensure that sheep farmers get a similar sort of income as other professions in Iceland”. The interviewee noted, however, that this goal had never been reached (Respondent H).

In order to make a living out of farming sheep in Iceland without high costs attached, farmers almost have to be a part of government subsidy schemes. In fact, it is impossible for sheep farmers to have decent livelihoods from sheep farming without claiming government subsidies as well as benefiting from indirect support from the government in terms of market restrictions on imports of sheep products. This comes with many caveats as in order to receive full government funding, the operating farm must be register with the government and take part of general reporting. Animals need to be registered, numbered, and participate in the general registry. The registered farm also has to take part in sector-specific reporting (Respondent H). Another interviewee noted that parts of the support often also involve soil protection. The Soil Conservation Service (I: Landgræðslan) has agreements with numerous sheep farmers in order to restore the land. Receiving government support and working with groups such as the Soil Conservation Service and the Icelandic Forestry Service often create some conflict for farmers. For example, one interviewee noted that individuals often work with the Forestry Service in order to support reforestation efforts throughout the country. Those who raise forests are expected to also raise fences around the forest in order to ensure that sheep do not graze in the forest and damage it. Some argue that those who are engaged with forestry should not have to pay to keep the fences in working order and that it is a farmer’s duty to keep the sheep out of forests (Respondent E). Government subsidies in different sectors may have the potential to work against each other and create strife between landowners.

In the past two centuries Icelandic sheep farming has transitioned from being largely subsistence based system. This changed through the 20th century, particularly with the introduction of the subsidy system following the economical transformations after WW2 in the 1950s. As was noted in Chapter 3, subsidies for Icelandic sheep farming were introduced in order to guarantee that farmers would earn competitive wages when compared to other professions (Mager, 2019). As it will be noted in the last section of this chapter, multiple interviewees noted that one of the failures of the system today is that farmers have and are expected to put in large amounts of work but are not able to earn

enough money to live. This means that there is a large disconnect in the relationship between membership contributions and benefits. Sheep farmers are expected to take care of the land, work with various government administrations such as the Soil Conservation Agency, ensure that there is no degradation to the lands, and provide a product at the end of the day; however, the majority of farmers cannot make enough money solely through farming that they are often forced to work a second job, another point that will be discussed more in detail later on as well. If farmers are supposed to protect and restore these common lands, be land stewards, how can the regime change in order to support farmers in or to emphasize that the lands are governed sustainably? If widespread subsidy systems are put in place to maintain sheep farming practices, rural communities, and promote the ecological health and biodiversity of rangelands, farmers need to be guaranteed some minimum livelihoods. Having farmers continuously busy with other jobs can potentially lead to a situation where the commons are ignored and become degraded due to inattention.

5.1.3 Collective-choice agreements

As equity is a main emphasis in an institutional analysis, individuals within a common-pool resource should be able to participate in groups that have the ability to modify the operational rules. Further, this principle emphasizes that users should have access to information about their situation. Sheep farmers in Iceland have two main avenues to participate in modifications of operational rules. The first is avenue that a sheep farmer can take is by participating or lobbying in local and national politics. Each municipality has a committee or board that makes decisions for the municipality. Being a part of this board may mean simply volunteering, but many members of the boards are elected. Farmers also have the ability to impact operational rules through lobbying of their local committees without becoming elected to them. One interviewee noted that every four years Iceland holds elections throughout the country. This election is for national positions as well as local elections (Respondent F). The interviewee further noted that these municipal boards are open to all people, but it's very common that farmers participate. The municipal boards make decisions relating to all types of municipal governance including schools, taxes, roads, and also, local rules for sheep farming such as timing of grazing and when to gather the sheep. The other avenue that sheep farmers

can take to potentially modify operational rules is by participating in the Sheep Farmer's Association (Landssamtök sauðfjárbænda) and its regional groups. The Sheep Farmer's Association will be discussed more thoroughly in section 5.1.7. The association is important for representing farmers and acting as advocates for them in relation to government matters as well as advocating for policy that supports farmers. Farmers have the ability to join committees and regional associations that influence potential rule modifications.

5.1.4 Monitoring

Ensuring that common-pool resources stay adequately governed and maintained is a main concern to institutional elements. This introduces a need for a source of monitoring of the resource. Key elements to monitors of a common-pool resource is that they have to either be present or actively audit the conditions and appropriator behavior of the resource or they have to be accountable to the appropriator or be an appropriator themselves. This element is important for a robust CPR as research shows that CPRs which are actively monitored tend to be kept in better condition. Robustness of an institution is also increased when environmental monitoring is taken into account (D. Cox, 2012). Interview responses brought up three main ways in which the Icelandic sheep grazing institution is monitored, which include municipalities, the Soil Conservation Service, and from a distance, the Icelandic Food and Veterinary Authority (MAST).

Historically, municipalities played a large role in the monitoring of sheep and rangelands. Before 2014, municipalities were in charge of livestock and animal welfare inspections (MAST, n.d.). Still today, farmers play a large role in inspecting rangelands in order to gauge the health of the vegetation. One interviewee noted in any given area, there may be an association between some farmers that do vegetation inspect and make decisions on when it is possible to put sheep to pasture. They do their best to ensure that individual farmers within their municipality follow the rules they have set for themselves and enforce some sort of self-regulation (Respondent H). They also explained that in some municipalities there is a committee on agriculture on land use who are in charge of monitoring the land and must issue permission for farmers to transport their sheep to the afréttir (Respondent H). Another interviewee noted that these committees are important when there is either a hard winter or a cold spring in order to make sure

farmers don't take their sheep out to the rangelands too early. They also noted that vegetation concerns have decreased recently due to decreases in sheep numbers (Respondent D). The formation of old committees within a hreppur, made up of farmers who live and farm the same afréttir, in order to monitor the rangelands have been in place for centuries and have not changed much in the last century.

Similarly, the Soil Conservation Service (I: Landgræðslan) are often involved in the monitoring the land on which sheep are grazed within afréttir and on private land. The Soil Conservation Service most often gets involved when farmers are involved in a government scheme called Sheep Quality Control (I: Gæðastýring í sauðfjárrækt) which is a part of the government subsidy system for sheep farming. One interviewee notes that most farmers actually take part in this scheme. Farmers have to bring a plan to the authorities at the Soil Conservation Service which includes where they intend to graze their sheep, how many, and during what period of time. The Soil Conservation Service then oversees if farmers are following this rules (Respondent H). Another interviewee noted that they felt that the Soil Conservation Service was not taking as active of a role as they should be in the monitoring of activities in the rangeland in order to ensure that they are not degraded. The interviewee also noted that they don't believe that the Soil Conservation Service has the resources to adequately monitor the rangelands (Respondent G).

Finally, the Icelandic Food and Veterinary Authority, Matvælastofnun (MAST), are concerned with enforcing legislation for various fields in which animals are involved in Iceland, mainly animal welfare. Three different interviewees listed MAST as being important in the monitoring of Icelandic sheep and their respective farms (Respondents I, H, and B). One interviewee noted that MAST is in control of inspections of farms in order to ensure that sheep are being treated well and according to regulations. This includes guaranteeing that sheep have enough housing, food for winter, and are kept in good health (Respondent H).

While this thesis is not concerned primarily with the current status of land degradation within the sheep grazing commons of Iceland, there is some disconnect between the duties of the municipalities to ensure that lands are not degraded and the Soil Conservation Service. If the municipalities are primarily self-regulating their own rules

in order to ensure that their common pasturelands are not being degraded and the Soil Conservation Service are not taking an active role in advising rural committees, it brings the potential problem of farmers viewing the Soil Conservation Service as being illegitimate as they may not have the knowledge to understand what is happening in the rangeland as local farmers do. However, it seems that the Soil Conservation Service is not accountable to the appropriator as it is a state agency initially started in order to halt soil erosion and reverse ecosystem degradation, potentially setting up for an institutional misfit in regard to monitoring. This is not to say that the Soil Conservation Service is not doing important work, more that the work that the government agency is stated to do is not focused on sheep farming and governance of common rangelands (Landgræðslan, n.d.).

5.1.5 Graduated Sanctions

The next principle that Ostrom stresses is the need for sanctions in case someone violates the operational rules of a given institution. Her analysis stresses that for robust institutions, graduated sanctions are the most valuable way in which to handle inevitable rule violations (D. Cox, 2012; Wendel, 2004). This ensures that sanctions are not too harsh, particularly if it is an individual's first rule violation. Both Cox (2012) and Wendel (2004) argue that graduated sanctions help maintain community cohesion while making space for harsher punishment of more severe cases. Interviews revealed three different parties that have the potential for issuing sanctions for those who break rules related to sheep grazing. These parties include MAST, individual hreppur and municipalities, and lastly, the police.

The first level that may issue some sort of sanctions is the individual hreppur or after their merger, the municipalities. In each hreppur/municipality there is a committee that is designated to solve potential problems within the sheep grazing regime that may arise within the municipality. One interviewee explained that it is up to the farmers to decide if they want to use this local committee or not. Often this is for smaller, very local issues, such as the maintenance of fences. (Respondent A). Another interviewee explains that this committee is in charge of contacting farmers or community members in order to solve the problem. This committee also has the right to issue fines if it is in line with laws and legislation. They gave the example that if a farmer is supposed to have 10 people

working on the sheep gathering but only has 8, that farmer needs to pay a fine (Respondent D). Another interviewee told a story of being asked to have a meeting with farmers in order to act as a mediator and work through some more difficult problems. There are certain individuals throughout the country that are considered experts on local issues within the sheep grazing regime and are able to act as consultants (Respondent G). This level is important for solving the majority of personal issues within a given municipality. There is the potential to issue sanctions, but generally issues are solved between community members applying soft powers.

Another group that handles the issuing of sanctions to those who violate rules is MAST. As explained as a major party that handles the monitoring of sheep farming, MAST is also important for the handling of sanctions for Icelandic sheep farmers. As one interviewee explains,

“Today this is, we call it MAST, the Icelandic Food and Veterinarian Authority. They are suppose to look after farmers and make sure they are following all the rules. And it is like that today that if they get some complaint about, that some farmer is not doing a good job or something is wrong, then they go visit them. They have in their rules that they have to visit all farms every three or five years. If everything is fine on that farm, they don’t have to visit it next 3-5 years. If there are some complaints or they have some reason to visit the farm after, then they do. That is sometimes the cases that the feeding is not okay, or that there are no houses for the sheep or something. They are something like the police for farmers.” (Respondent A)

The interviewee continued to explain that if a problem is serious enough MAST has the authority to stop production on a farm or tell a farmer that they need to slaughter some animals if they are sick. If the problem is severe enough, MAST may call the police and start handling the case within the Icelandic legal system (Respondent A). MAST acts as the main authority issuing sanctions and have the ability to also halt government payments to farms. An interviewee described the process of more serious cases for farms and the response from MAST on these payments,

The most extreme cases are not very common, and handful of cases every year. By a handful, I mean maybe 5 where the sheep is taken from you. But, there are some complaints about the land-use can be more common. Sometimes it’s just the payment are put on hold, you may have to use fewer sheep or find a different pasture, until you fix things the payments are frozen. If you correct the situation you can get back-payments (Respondent H).

Serious violations are rare, and the sanctioning system is set up in a way to encourage farmers to correct their mistakes applying soft powers. Strict sanctions are only issued if farmers don't fix the mistakes on their farms. The lack of serious violations and encouragement for farmers to correct their mistakes shows that the implementation of graduated sanctions is working well within the Icelandic sheep grazing regime. There are incentives to following the rules and farmers are genuinely discouraged from breaking the rules.

5.1.6 Conflict-Resolution Mechanisms

When analyzing an institution for the governance of common natural resources and how robust it is, there is an assumption that conflict is inevitable. Conflict within a system is not inherently bad nor a sign that an institution is not working well. In order to analyze an institution, it is important to look if there are mechanisms set in place to allow for amicable conflict-resolution between affected parties. There are a few conditions that are found in robust systems, such as appropriators and officials having quick access to affordable and local avenues to resolving conflicts (Wendel, 2004). Further, scholars have shown that if conflict-resolution mechanisms are not available or easily accessible, common-pool resource management becomes more difficult. Additionally, if there has been preparation for the potential of conflict, the cost of conflict resolution is generally lowered (Wendel, 2004). Interviewees tended not to say much on the matters of conflict-resolution as to them the matters seemed almost obvious. Potential avenues for conflict general fell into two lane: conflict between farmers and conflict between farmers and land-owners who may not be sheep farmers.

Conflict between farmers tend to take more local avenues of conflict-resolution. Multiple interviewees noted that if two farmers have a conflict, they can approach their hreppar's local committee (l: fjallskilaneftnd). This is the same committee discussed in Section 5.1.6 Graduated Sanctions (Respondents A, B, and D). One interviewee noted that utilizing this committee for various conflicts is part of old legislation that has persisted into the modern understanding of the Icelandic sheep grazing institution and still works well. Another interviewee noted that it is possible for these committees to also hire outside consultants to advise on particular matters if the committee does not feel as if

their knowledge is sufficient (Respondent G). If conflicts between farmers are bad enough and the committee cannot help the individuals, it is possible to have lawyers involved.

Another potential for conflict is between farmers and other non-sheep farming landowners that they may interact with. Multiple interviewees noted this as a source of conflict, generally due to differing opinions on the role that fences should play (Respondents D and A). In Iceland, if a landowner does not want to have sheep grazing on their property, it is up to the landowner to implement and maintain fences in order to keep sheep out. Otherwise, sheep have the freedom to roam where they would like. Two sources of conflict that were noted for this were the maintenance of fence length as well as general expenses of fences, as landowners generally do not want to pay for fence maintenance. Interviewees noted two different ways to handle this sort of conflict if discussion between individuals does not solve the problem. The first avenue would be to take the case to the courts, as is similar to other sources of conflict within Iceland. Another avenue would be for the municipality to ban free roaming sheep (I: banna lausagöngu) granted through the old laws. It was noted that this is generally difficult for municipalities as the municipality would have to ensure that every sheep is on its own farm, which could be a large matter in a larger municipality (Respondent D). However, generally throughout Iceland it is up to the landowner to keep sheep and other livestock out of their land, if they wish. This is due to more recent amendments in legislation as both Grágás and Jónsbók initially required farmers to keep track of their animals. Today, there is no conflict resolution system in place in order to regulate this throughout lands which ends up causing conflict. The lack of a conflict resolution system being in place for conflict between farmers and private landowners is perhaps a main weakness in the governance of the commons. Potentially the local committees run by the municipalities could take on a larger role in facilitating conversations between farmers and landowners, or farmers and landowners can meet together and develop a new system for solving these sorts of conflicts together and set a new standard.

5.1.7 Minimal Recognition of Rights to Organize

As the previous section argued that institutions must have access to affordable mechanisms for conflict-resolutions for users, a similar necessity includes the ability for appropriators to devise their own institutions which are not challenged by external

government authorities. This principle becomes important in the face of a potential government failure as externally imposed rules may not correspond to local conditions (M. Cox et al., n.d.; Wendel, 2004). The Icelandic sheep grazing system has two main institutions that allow for organizing outside of the governmental system: committees formed at the hreppur level for local management and conflict-resolution as noted in sections 5.1.5 Sanctions and 5.1.6 Conflict-Resolution Mechanisms as well as the Sheep Farmer's Association (Landssamtök sauðfjárbænda), which is a part of the larger Farmer's Association (Bændasamtakanna). This section will focus on the Sheep Farmer's Association predominantly, since the main uses of committees at the hreppur level have been discussed in previous sections.

The Sheep Farmer's Association is one of sixteen total associations that organize under the larger Farmer's Association. According to the Sheep Farmer's Association's website the main goal of the association is, "to be an advocate for farmers and work for progress and prosperity in agriculture" (Bændasamtaka Íslands, n.d.). Broadly speaking, the Sheep Farmer's Association is key in the formulation of policy and legislation in regard to sheep farming, acting as a representative for sheep farmers in negotiations between them and the government and similar organizations (Respondents I and H). One interviewee who worked in relation to the Farmer's Association stated,

"I mean the biggest part of what we do is we follow up on the policies that we make. One of the biggest parts is making contracts with the government and following that through. The subsidies for the sheep farmers. We also work towards the market, with both the domestic and the export market. We have an export office. We are involved in everything that needs to be done for the sheep farmers. From the dealing with the new laws up to regulations about ear tagging or wool quality or things like that. We cover everything that needs to be done." (Respondent I)

When asked why farmer's get involved in the Sheep Farmer's Association, the same interviewee stated that farmers are able to go to meetings and have their opinions on future policy be known. They also mentioned that it is often difficult for members to see tangible reasons to be a member of the association, but most members see that the association is working towards a collective goal in order to make farmer's livelihoods better (Respondent I). There was slight disagreement between interviewees on how many farmers are members of the Sheep Farming Association with main numbers being between 60% and 80% (Respondents I and H). The Sheep Farmer's Association also runs

different branches throughout the country and farmers are able to join local units (Respondents I and A). Currently sheep farmers are able to join both the Sheep Farmer's Association and the Farmer's Association.

In the past years, however, Farmer's Association and its related branches have gone through some changes as in 2017 the membership structure changed from obligatory membership to voluntary membership. One interviewee explained this transition rather succinctly, stating,

“...until the beginning of 2017, every farmer had to pay a specific tax which was called Agricultural Tax, so 1.2% of your production was paid to the government and the revenue from that tax was divided between organizations in agriculture, the sheep farmers association, the agricultural advisory service, and there are also some district organizations. If you live in the south, there a special district organization located there. In the north they have a part of it too. In the beginning of 2017 this tax was abolished, so now since then it's all by choice that you will have to decide for yourself if you're going to be a member of each organization and you will not be a full member unless you pay the designated dues to each one.” (Respondent H).

Now, instead of the Farmer's and Sheep Farmer's Association being paid through government taxes, farmers pay 20,000 Icelandic krona per year to be a part of each association. In relation to the 1.2% tax on production that farmers used to pay to the government annually, 20,000 ISK is much more affordable (Respondent I). Multiple interviewees noted that even though membership fees are not incredibly expensive and the majority of sheep farmers have joined the newer iteration of the Sheep Farmer's Union, there are always going to be some hold outs, for whatever reason. Some will refuse to join because they think that the association is a waste of time, and some are farms that do not have many sheep (Respondent I).

There are currently differing opinions on whether the change to membership rules of the Sheep Farmer's Association is a net positive or negative. One interviewee noted that they felt that the older system worked better because everyone took part. As the Sheep Farmer's Association is working to better the livelihoods of all sheep farmers, the non-paying members still benefit from the role the association plays in policymaking and acting as a middle-man with the government. The interviewee described a symptom of the free-ride effect, stating that they felt that those who didn't want to pay were allowed to benefit from the association's work without paying their own dues. They additionally noted, however, that the old system was often viewed as unfair as larger

farms were expected to pay a lot into the system in comparison to smaller farms (Respondent F). Before the system change, every sheep farmer had to pay into the system that funded the Sheep Farmer's Association; however, farmers were not obliged to be registered members if they didn't want to. Previously, the majority of farmers believed that if they were paying through taxes, they might as well become a member and get membership services (Respondent H). Another interviewee noted that one of the effects of the change in payment system is that the Sheep Farmer's Association needs to figure out effective ways in order to differentiate between members and non-members. Current membership benefits include getting access to services such as association for grant applications, access to the association's lawyers, and assistance with issues related to the government. Further, the Farmer's Association runs multiple programs for farmers and members pay 30% less for these programs, so there are some monetary gains. The interviewee reiterated that there is a learning curve in the Farmer's Association and all related associations include the Sheep Farmer's Association in figuring out how they should organize themselves (Respondent H).

The Sheep Farmers' Association being in a time of transition is a main point of a weakness in sheep farmer's rights to organize in order to advocate and take part in the governance of the grazing commons. There is hope that with the passage of a few years the Sheep Farmers' Association transition to a new membership model will take a positive shape. This thesis is, however, acknowledges the importance of major changes in institutions with an eye towards path dependent institutional arrangements. Literature on institutional analysis and path dependence states that changes within an institution are often designed to meet the interests of the most powerful actors within the institution (Petursson & Paul Vedeld, 2015). These early years of the Sheep Farmers' Association are critical as it is important to ensure that the association reformulates their membership advantages and goals in order to advocate for all sheep farmers throughout the country and not just the ones who hold the most power within the institution. Mahoney (2000) further argues that the early stages in institutions are critical as they are important for defining the framework for the institution. The Icelandic sheep grazing institution is an old institution; however, major changes to the structure, such as the Sheep Farmers' Association, need to be made cautiously and intentionally in order to make sure that the institution works for all members. Now is the most important time for

the Sheep Farmers' Association to work closely with sheep farmers and take all of their comments into consideration in order to ensure that farmers are adequately represented and have avenues to participate in organization throughout the country.

5.1.8 Nested enterprises

The final principle to analyze for an institutional analysis for robustness is whether the institution features nested enterprises. When the various enterprises within an institution are nested the various governance activities (i.e., the previous sections discussed such as monitoring groups, sanction enforcements, conflict resolution systems) are organized in multiple layers. Literature has stressed that both inter-community linkages and horizontal linkages are important and should be included with vertical linkages. The nesting of enterprises has been discussed in various other studies such as Anja Mager's 2019 bachelor's thesis for the Agricultural University of Iceland on the socio-economic aspects of sheep grazing. *Figure 2* is her adaptation of an attempt to map out the various enterprises within the sheep grazing regime, with a focus on legislative processes.

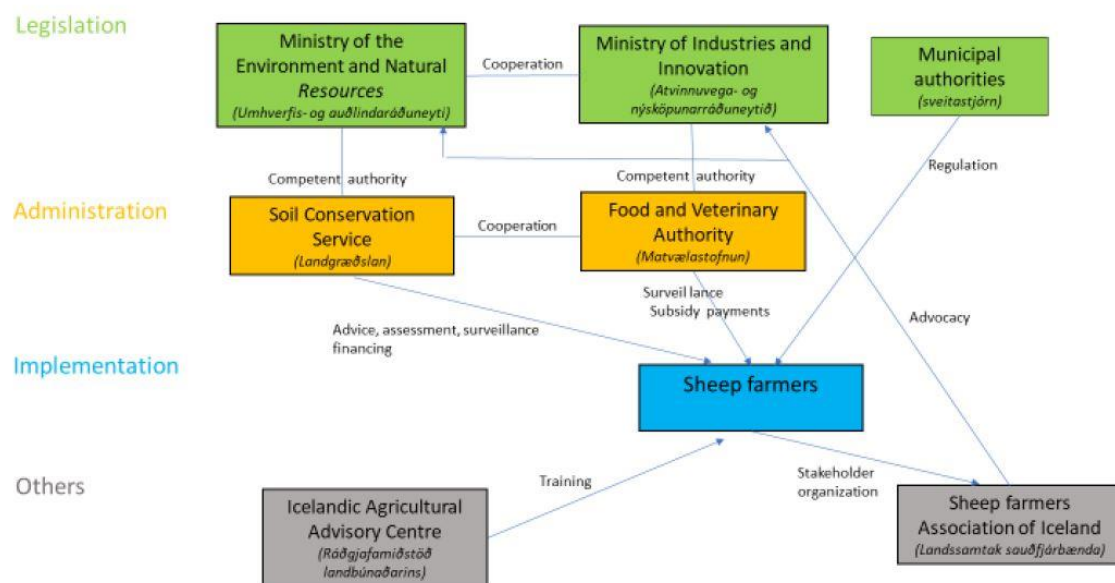


Figure 2: Map of actors involved in the Icelandic sheep grazing regime, Mager (2019)

This map of the main actors involved in the sheep grazing regime in Iceland is relatively thorough; however, leaves out the importance of municipal authorities and their respective committees. Understandably, as Mager (2019) used this map to focus on legislative processes, the processes behind monitoring, graduated sanctions, and conflict-

resolution mechanisms fall to the side in terms of importance. From a macro-level as well, since each municipality operates somewhat independently, their governance mechanisms vary from each municipality, which furthers the difficulty of mapping out the nesting of enterprises. From this initial map, it is clear that there lack horizontal linkages within the Icelandic sheep grazing regime. Potentially, municipal committees made up of farmers could be viewed as a horizontal linkage, but often they are involved in implementation of laws and development of new policy. Being apart of local government, they do exist as a vertical linkage. This may be a downfall of modern governmental organization in Iceland being less centered around rural communities and mainly taking place in population centers such as Reykjavík and Akureyri. When local communities lose their autonomy in governing their common grazing lands, there is a lose of horizontal linkages as vertical linkages become more common.

5.2 Expanded themes influencing the Icelandic sheep grazing regime

Through in-depth interviews there were two major issues that were discussed at length by interviewees. These points included the prevalence of farms that have abandoned their past of sheep farming and ways in which the institution of sheep grazing, and their respective commons can continue on in a sustainable fashion into future centuries. The presence of abandoned farms throughout the country also plays a role in institutional sustainability; however, the section on institutional sustainability will focus on farmer profitability, infrastructure improvements, and programs such as Project GRÓLIND.

5.2.1 Abandoned Farms

Iceland is a very rural country, with large swaths of generally uninhabitable land or land that is not suitable for farm life. There are, however, very many of farms that have had their historic farming practices completely abandoned. Today these farms are left in various sorts of ways, some may be completely abandoned, some are bought for the land and salmon fishing rights, and some are used as vacation homes for people that live in larger towns or cities. The prevalence of these unused farms was described succinctly by an interviewee so I will quote them in full:

“Even a whole hreppar, in 2 or 3 cases, a whole hreppar was nearly derelict, with perhaps maybe one farm left, in the whole hreppar. And this is worse, if you go to the Northern part of Westfjords, the situation is much worse. So if you go up to the

area in the North, sort of northwestern part, there are no farms left. Just simple as that. And they have been giving up farming over long periods of time. This is something that's been going on for a long time, and you can find the same also for example, in the Eastern Iceland, in the more remote Iceland. You can find it everywhere; however, in some areas there are very few abandoned farms. There are only a few, and young people seem to be taking over farms, they may be farming, say, the land of two farms together, just living on one farm and the other one is derelict, and they use the land then. They keep it going, the cultivation, when they make hay for the silos for animals, they may even have a sheep house there. You can say it's divided, in certain areas you have a lot of these derelict and in others, not so much. And then you can ask, what has happened to the farms?" (Respondent G)

In this section, general problems that interviewees discussed about abandoned farms will be covered. This includes land use issues, problems related to ability to buy and sell farms, property ownership by those who do not live on the property, threats to fall sheep round-up, and lastly, threats to lively communities.

Multiple interviewees noted problems relating to the upkeep of fencing for farms that have abandoned farming. One interviewee noted that historically, a farm may have had the grazing ability of 2 to 3 hundred sheep but today have 3 to 5 hundred sheep because so many of the farms around them have been abandoned (Respondent C). Having larger amounts of sheep maybe a rational decision for farmers in terms of revenue created from sheep, however, there are problems generally related to upkeep of fences and having the ability to monitor that large of a number of sheep (Respondents D, F). Two interviewees noted that upkeep of fencing, particularly in mountainous areas, is rather expensive, so many people who may own a farm in Iceland but do not farm on it often allow their fencing to often whither away. Degrading fencing causes problems if sheep are able to enter onto lands that are private. One interviewee explained that while a farm may be abandoned, the owner is still expected to gather the sheep they may find on their land. The problem arises when a landowner may gather the sheep once, but then will not check for sheep on their property after that. This means that sheep farmers are expected to look for their animals over incredibly large areas and for long periods of time. This interviewee also explained that abandoned farms may be bought by companies that may have no interest or respect for the rules and regulations of sheep farming history. The owners of these often refuse to collect sheep on their lands and also push back on paying the costs of fencing. Basically, there may be push-back on taking part in the duties that come with owning a farm (Respondent D). The combined lack of interested from

landowners of abandoned farms and potential for sheep to be grazing on these lands with no help from landowners in rounding sheep up, make it so that farmers are left with far more work than they are supposed to have.

The issue of buying and selling farms throughout rural Iceland becomes relevant to abandoned farms. One may ask, why don't farmers buy up the abandoned farms surrounding their farms? There are many answers to this question. One is that the land may be expensive, and the farmer may not have the resources to upkeep all the fencing etc. on the farm (Respondent C). It is also not unheard of for a landowner to sell the land to a local farmer but keep the old housing. Another common situation is that a buyer may buy the farm and not intend to farm the land and may plant trees there. One interviewee noted that the most likely scenario in rural areas is that there isn't a buyer, and the farm might become completely deserted. They explained that this is common for all types of farming, to the point that in the West Fjords, dairy farming is hardly existent anymore (Respondent F). Once a farm is abandoned, however, the likelihood of that farm being bought and used for a farm in the future is very low. One interviewee recalled a story of someone buying an abandoned farm in the West Fjords and turning it into an operational farm. This story is so rare that it made the news (Respondent H). Turning an abandoned farm into an operational farm is very expensive, and generally, it takes a long time to pay back all of the money needed to start a farm from scratch. Generally, if someone wants to buy a farm, they look to buy a farm it's previous farmer so they can continue on whatever operation is currently running, typically being handed down within families (Respondents H and C). Costs associated with running farms is a main reason in which farming may be abandoned on a certain piece of land as for the owners it makes more financial sense to hold the property as a place that can be for a summer house as often finding a buyer is much more difficult than general upkeep of the property.

Part of the issue with abandoned farms is that the owners often do not live in the community that the farm is located in. One interviewee noted that most of the land that used to be used for sheep farming is private property and the owners live in Reykjavík, Akureyri, or somewhere else. There are also some 1,000 farmlands that belong to either the state or the church (Respondent C). The question of whether there should be rules to ensure that these abandoned farms are being used for farming or something similar was

asked to a couple interviewees. One interviewee felt conflicted, as strong rules make it difficult for farmers to sell their land if they want to leave as not many people want to buy farms. However, they felt it is important that someone is living on the farms and doing something positive with the land, whether they are farming the land or not (Respondent A). Another interviewee expressed that they were in favor of this sort of legislation, as it is a problem that farms are being kept within absent families. A group of kids may be raised on a farm and when their parents die, none of the kids want to take over the farm. The interviewee stated they didn't know how the legislation should look, but it is not good if perfectly good farms are left to become derelict because the owners do not want animals but are also unwilling to give it to others (Respondent F). Another interviewee recalled that some countries have regulations that if one owns a farm, they have to live there. The interviewee believed that Iceland does not need such strict regulation and that with policies the people can decide how things will develop, or that they can let it evolve naturally (Respondent I). This becomes a tricky discussion, as interviewees seem torn between creating a system in which farms in their region continue being farms for future generations but also acknowledging that when individuals buy property, they should be allowed to do what they please on that property.

Multiple interviewees also noted discomfort of wealthy individuals, both foreign and Icelandic, buying and collecting abandoned farms throughout the country. Interviewees noted that they would not argue that foreigners shouldn't be allowed to own farms in Iceland, as Icelandic people are reciprocally allowed to own houses in other countries. But multiple interviewees noted that they think there should be some rules so that things don't get out of hand. For example, some wealthy people may collect farms and then no one is living on them. When farms are owned by an absentee landlord, or someone who exclusively uses the land for sport fishing, there are less people living in these rural communities. As one interviewee noted, "People need other people around them" (Respondent F). It is hard to keep society going in these rural areas when wealthy people are collecting the farms. Schools and health services start to shut down, shops start losing income and customers, and roads stop being improved (Respondents B, F). Historically, there have been wealthy individuals who have bought farms, and allowed farmers to stay on the land, farming and keeping the community alive. One interviewee recalled this history, explaining,

“So, I feel it is very serious if the derelict farms end up in the hands of greedy capitalists. That is a very bad future. And we have examples of that, in fact, since many years ago. There was a very rich man in Iceland, who became very rich around 1930, and he bought basically, nearly a whole valley, in the west of Iceland. There was a river. He had a similar motive as Radcliff who owns 40 farms. So he bought 10 or 12 farms out of less than 20 farms in the hreppur. And he was okay, he allowed farmers to stay on the farm, and he bought the river, and he started making money off the river. But his descendants, they were not so kind to the farmers, they just wanted the income from the rivers and if you go into that valley today there are only 2 or 3 functional farms left. And this is what happens in these cases, so what would we do then? I would much rather prefer that if a farmer wants to sell his farm, and he's not able to sell it in the open market, that he simply sells it to the state.”
(Respondent G)

This history has started to be repeated which was a controversial issue to many of the interviewees as there is a wealthy British businessman who has been buying various farms throughout Northeastern Iceland (Respondents G, A). Currently owning over 40 farms in the region, the businessman is interested in the region's productive salmon fishing which is similarly an expensive sport (Respondent G). This businessman is currently allowing farmers to stay on the land and farm; however, there was concern expressed from interviewees that farmers may potentially become dependent on absentee landlords and are not able to benefit from the region's rivers and lakes themselves. The land-grabbing of all lands that are potentially valuable for purposes that do not necessarily strengthen local communities is a cause for worry. The Icelandic government did, however, pass a law in the past years attempting to restrict the amount of land a wealthy individual may be able to buy in the country. One interviewee noted that while they think this is an important step, there needs to be some sort of mechanism to transfer farms to young people who want to live there with their families (Respondent G).

Multiple interviewees expressed concern that the prevalence of abandoned farms has a large effect on being able to implement the rounding up of sheep in the autumn (Respondents F, I, H, G). For centuries all of the sheep in the hreppur have been taken to common pastures in the early summer and then have to be herded in the fall. This is a rather intensive activity, rounding up the sheep, and historically, all of the farms in the hreppur would take some part in the round up. Due to de-population throughout rural Iceland, less people are able to take part of sheep round-ups around the country. One interviewee noted that the farmers in Iceland today are an older population, which adds

another strain to the physical element of rounding sheep up in the autumn (Respondent I). When communities get too small, many of the remaining farmers are forced to quite if they cannot handle the communal work in the fall of rounding up the sheep that is needed. This is a problem that is exacerbated by abandoned farms. Another interviewee noted that gathering sheep in the autumn is a skillful operation as some areas are only accessible by horseback. It can also take certain areas up to a week to gather some of the sheep in some areas due to how massive they are (Respondent G). When there are fewer operating farms, it's not only the manpower that is being lost for helping out in the autumn sheep round-up, but also the extensive knowledge needed to ensure that the round-up is being handled efficiently. Currently sheep owners are able to graze any available land that isn't fenced off, but abandoned land brings tricky property ownership questions if the owner is not adequately upkeeping fencing. Owners of private property are expected to keep track of the sheep that are coming and leaving their property; however, who is supposed to keep track of that when the owner of a certain property is not present to do this sort of monitoring? How should sheep farmers handle this during the autumn round-up? These are the beginnings of major questions that have to be discussed both at the local governmental level as well as nationally.

5.2.2 Institutional Sustainability

At the end of each interview, each interviewee was asked the question, "What sorts of changes to the sheep farming system could be made to improve the sheep grazing institution?". Answers to this question generally related to some way in which interviewees thought the institution could be made more sustainable in the modern era. Three key themes came out in the answers: improve the potential for farmers to profit from their work, improve infrastructure in rural areas, and, finally, engage in programs from the Agricultural University such as Project GROLIND.

Profit from lamb sales of both the domestic market and export market were noted by multiple interviewees as a key problem in the sustainability of the sheep grazing system (Respondent E, F, A, H, and I). Governance of the sheep and their respective lands may be sound and a robust system, but if farmers are not able to make a living from of selling their products, the number of people operating farms within the country will continue to dwindle. One interviewee voiced that they felt that farmers get too small of

a percentage of the profit made from meat sold to consumers. Currently, a large portion of profits go to the middlemen like slaughterhouses, packers, and store owners. They mentioned that of course all of these other people have to be paid fairly too, but farmers are often expected to take what is left, if there is anything. This system keeps farmers stuck with the subsidy system and with not much income (Respondent F). The same interviewee noted that there needs to be a policy that resists the urge to import cheaper meat from countries such as New Zealand, a move that would also weaken farms throughout Iceland. Another interviewee noted that the price of lamb throughout the country should reflect the true production cost, stating,

“If you are going to make it a sustainable business you either have to increase government support substantially, or you need to sell it to the consumer that you should, you should have to pay much more for these products than people already do” (Respondent H).

Finally, another interviewee noted that they would like to see that there is more consideration taken about the effect of tourism on farmers. They explained that farmers had been greatly affected by the COVID-19 pandemic as international travel had been halted and Iceland experienced a major drop in tourists numbers. As tourism creates larger domestic markets and values local goods such as lamb, having a year or two with a lack of tourists created many financial hardships for various farms. The interviewee noted that this affect could mean that there are fewer farmers and that some may give up farming entirely. They stated, “we’re blessed here. Hardly any people died here, but it’s still affecting us economically” (Respondent E).

Another factor that interviewees noted as being intrinsic for keeping the Icelandic sheep grazing institution alive is the importance of ensuring that rural communities are supported. One interviewee explained that while the Icelandic population is about 360,000, there are about 3-4,000 sheep farmers; however, a large portion of the total population is interested in sheep and sheep farming, which is reflected in the amount of people interested in helping with the sheep round-up in the autumn (Respondent C). Even though there are still people interested in sheep and sheep farming, there has still been a large rural de-population. Certain areas had lively and productive farms until about 20 or 40 years ago, but today they have large amounts of abandoned farms (Respondent G). Another interviewee mentions that it’s not just sheep farms that keep communities alive,

but a combination of people living on farms, others participating in fishing, and others working in schools and other services (Respondent I). They also explained that the government could help rural areas out a lot by improving infrastructure like internet connections and roads in rural areas of the country. Another interviewee explained that with better internet connections, and schools that aren't too far away, and better roads, it's possible for people to live on farms and work from home, all while raising children (Respondent H). Another explained, "We have many farms in North Iceland, and many hectares of nice grazing land, but if the schools are closed and you can't get to the post, or the computer isn't usable, then it's problematic to render a life up there." Generally, interviewees believed that with improved infrastructure throughout the country and an emphasis on schools, roads, and other amenities throughout the countryside more people will be interested in living either on farms or in farming communities.

Lastly, multiple interviewees emphasized that it is important for farmers to take part of development projects such as Project GRÓLIND (Respondents G and B). Project GRÓLIND is a joint project between farmers, the Soil Conservation Service, and The Agricultural University focused on soil and vegetative mapping to advance understanding of the sustainability of sheep grazing. Past scientific mapping projects have taken lots of samples, but scientists have not returned to the same spot after years in order to take subsequent samples. Project GRÓLIND, however, has established between 100 and 200 permanent spots to monitor and sample with intervals of 3-5 years on the exact same spot, a process that is easier now with remote sensing. This project has also explicitly been in collaboration with farmers to encourage trust between them and larger government agencies such as the Agricultural University and the Soil Conservation Service. With farmers included in monitoring of the rangelands, it is much more possible to maintain *afréttir* and the lands that sheep graze on healthy for future generations. One interviewee also noted that getting farmers involved helps individuals trust that process and trust that scientists aren't collecting data in order to prove that farming is inherently "unsustainable".

CONCLUSIONS

The objective of this thesis was to analyze the robustness of the Icelandic sheep grazing regime and its effectiveness in governing rangelands. Through the use of in-depth interviews from key respondents in conjunction with historical analysis and utilization of literature building off of Elinor Ostrom's seminal work on institutional analysis of the governance of common-pool resources, interviewee's responses were analyzed in order to assess various principles which inform institutional robustness. In order to achieve this objective, the Icelandic sheep grazing regime was analyzed from a historical institutional point of view that acknowledges the importance of path dependence while being informed by institutional analysis and socio-ecological systems frameworks.

The introduction of the Icelandic sheep grazing regime can be traced back to some of the earliest generations of farmers, which is seen through the texts of Grágás and Jónsbók, which exist as some of the earliest legal texts in Icelandic history. These texts detail the rights and duties as farmers. While it is not possible for legal texts to tell completely accurate histories of what has happened in past centuries throughout Iceland, they are adequate at allowing for glimpses into the past. Grágás and Jónsbók both show that sheep farmers throughout Iceland have been engaging in governance of their commons grazing lands for over ten centuries, since the beginning of settlement in Iceland (Eggertsson, 1991; Simpson et al., 2001). The governance structures that sheep farmers in Iceland developed throughout the island centered practical, bottom-up rural governance. The combination of dividing up the country into hreppur units that each govern their own common pasturelands with local committees made up of sheep farmers in order to make decisions in order to protect common rangelands from over-grazing. The Icelandic sheep grazing institution developed as subsistence based agriculture. Settlers tended to rely on sheep farming as main ways to subsist through the years as the Icelandic landscape is generally not suitable for the agrarian farming that is more common throughout mainland Europe. The Icelandic sheep grazing institution developed throughout the centuries in order to bring power to rural municipalities. The formation of rules in relation to rangeland management were likely formed in the early days of Icelandic society, long before they were written down in the 12th century (Stefánsson, 2018). Cleaver (2002) expands on "institutional bricolage" as a way of understanding how

mechanisms for governance of institutions are built upon from existing institutions, styles of thinking, and other social relationships. Institutions are constantly being layered and reworked, something that is seen throughout the history of the Icelandic sheep grazing regime. Historical path dependence and institutional bricolage has allowed the Icelandic sheep grazing regime to be long-lasting, existing for over 1,000 years.

The Icelandic population and economy, however, has changed significantly throughout the past two centuries. Shifting from a subsistence practice, the necessity of Icelandic sheep farming has lessened and what is needed from governance structures have also changed. Generally, the Icelandic population has started a general depopulation of rural areas throughout the country. Further, those living in Iceland are able to diversify their diets due to the widespread availability of import food products throughout the island. Governance of Icelandic rangelands by sheep farmers is still important as sheep products continue to be a major industry throughout rural Iceland; however, the question becomes, how is the Icelandic sheep grazing institution coping and evolving with the changes that have been brought in the past two centuries Iceland? Initial changes included the introduction of subsidy programs through the island, initially intended to ensure that sheep farmers are able to enjoy the same quality of life that other professions throughout the country have. Subsidy programs brought new potentials for problems to sheep farmers, such as over-grazing as a response to dedications of larger subsidies. The introduction of monitoring groups such as The Soil Conservation Service (Landgræðslan) and groups such as the Sheep Farmers Association (Landssamtök sauðfjárbænda) also influence the governance structures for sheep farming in Iceland. The governance of rangeland commons is no longer solely governed by respective communities but are now more advanced with national structures that are aided by modern communication structures and up-to-date science. While the introduction of associations and modern monitoring groups is important, it is also important to address the implications of large changes to a governance structure potentially can have on rural communities that have benefited from strong local governance structures for the past 1,000 years.

With the shift to a market economy away from subsistence farming, the Icelandic sheep grazing regime has entered a new era in which the regime may no longer exemplify

an “institutional fit” with current Icelandic biophysical and social domains (Braissoulis, 2015; D. Cox, 2012; Young, 1986). A main problem discussed in Chapter 2 about “institutional fit” is that its understanding can lean into binary thinking detrimentally. The main issue with the Icelandic sheep grazing system is not that the system is unequivocally a bad fit; however, there are two main problems in that there are simply not enough people living in rural Iceland to carry on traditional governance systems and that sheep farmers are not benefiting from the system enough to wholeheartedly be supporting traditional governance structures. The institutional misfit of the Icelandic sheep grazing regime has been studied in relation to legal bodies of sheep farmers land use and the need to reform the legal framework of sheep grazing and land use (Stefánsson, 2018). This findings of this thesis agree with Stefánsson (2018) and adds that the institutional misfit of the Icelandic sheep grazing regime is not only misfit with legal and formal institutions, but a misfit with urban-rural arrangements throughout the island post 19th century. Local government plays a large role in the governance of sustainable common-pool resources, so as rural Icelandic governments lose populations and community strength, their governance of common-pool resources will also continue to whither (Wendel, 2004).

There are multiple points when discussing the robustness of the Icelandic sheep grazing regime and its governance of associated rangelands have potential divergences. The first point for development of future policy is in regard to encouraging rural populations in order to ensure that communities outside larger towns are able to survive. Multiple interviewees expressed deep concern over the number of abandoned farms throughout the country. When there are less people living in rural areas, the historic governance structures set in place to manage common rangelands start to fail as there are not enough people living throughout municipalities. Another point is that there needs to be an overhaul to acknowledge the relationship between sheep farmers contributions to managing common rangelands and their respected returns. While many Icelanders take deep pride at their history of sheep farming both within families and through Icelandic history, if farmers can not make enough money or do not get enough support for their farming and management of the common rangelands, more and more farmers are likely to give up farming for good. Further, the current institutional structure for the Icelandic sheep grazing regime does not facilitate the regime adequately responding to

land degradation and other pressures to Icelandic ecosystems. Future evolutions of the regime need to holistically consider the pressures that Iceland's unique ecosystems deal with when sheep are allowed to graze on often overgrazed lands (Marteinsdóttir et al., 2017). This could include facilitating strong relationships between farmers, scientists, and policymakers in order to devise policy that strengthens rural livelihoods while being as sustainable as possible. Another point of potential strife within the Icelandic sheep grazing institution is the lack of a conflict-resolution system in place between farmers and private landowners. Conflict between these two groups often go to lawyers, a process that is expensive and does not support communities in creating systems for more locally based justice. Lastly, the re-organization of the Sheep Farmers' Association is a point of potential divergence as they work to ensure that their organization is truly working towards advocacy for farmers. Mahoney (2000) argues that once processes in relation to an institution are started, the processes tend to continue and track the same sort of outcomes. With this argument, its important that the next years are crucial in order to set in place systems within the new re-working of the Sheep Farmers' Association that truly work in the favor of sheep farmers and governance of common rangelands. There are many ways in which the potential for building a more robust institutional framework for the Icelandic sheep grazing regime can be studied and the current system will continue to be tested in the upcoming years. Governance of common rangelands will continue to be important in coming years as many nations start asking important questions in regard to climate change and food security. More in-depth studies using both the IAD and SES frameworks will be helpful for answering these questions, as well as studies looking at potentials for rehauling the regime in order to prepare for a future that brings possibilities that the regime is not well-equipped to respond to.

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Appendix A – Questionnaire

1) Personal questions about the respondent:

- a. What is your name?
- b. Are you a sheep farmer?
 - i. If yes:
 - 1. How long have you been a sheep farmer?
 - 2. Did you take over farming from your father/parent?
 - ii. If no:
 - 1. What is your job and how does it relate to sheep farming?

2) Boundaries

- a. In what areas are sheep farmers allowed to graze their sheep? Are there areas where it is not permitted?
- b. What is a hreppur and how does it work?
- c. What are the pros and cons to consolidation of smaller hreppur into bigger hreppur?

3) Monitoring:

- a. Who monitors to make sure that the rules are being followed by sheep farmers?
- b. Has it always worked this way?

4) Graduated sanctions:

- a. If someone breaks some rule while farming, what organizing body is responsible for giving out sanctions?
- b. What happens if someone breaks the rules while farming?

5) Conflict-resolution mechanisms:

- a. How are conflicts worked out when they come up?

6) Minimal recognition of rights to organization:

- a. What sorts of organizations exists for farmers and others involved in sheep farming to join?
 - b. Are all farmers able to join these organizations?
- 7) Abandoned farms:
- a. Do you consider abandoned farms to be a threat to the sheep farming system?
 - b. What other challenges come with the number of abandoned farms?
 - c. Do you worry about the buying of abandoned farms for salmon fishing?
- 8) What sorts of changes to the sheep farming system could be made to improve the sheep grazing institution?

Questionnaire in Icelandic

1) Personal questions about the respondent:

- a. Hvað heitir þú?
- b. Ert þú sauðfjárbóndi?
 - i. Ef já
 - 1. Hvað hefur þú verið lengi sauðfjárbóndi?
 - 2. Tókst þú búinu af foreldrum?
 - ii. Ef nei:
 - 1. Hvað starfar þú við og hvernig tengist það sauðfjárrækt?

2) Boundaries

- a. Á hvaða svæði getur þú beitt fénu? Eru svæði þar sem beit er ekki leyfð?
- b. Hvaða sveitarfélagi tilheyrir þú og hvaða hlutverki gegnir það við skipulag sauðfjárbættisinnar?
- c. Hverjir eru kostir eða galla þess að sameina sveitarfélög í stærri einingar?

3) Monitoring:

- a. Hver hefur eftirlit með því hvernig sauðfjárbættinni er stjórnað
- b. Hefur það allaf gert með þeim hætti?

4) Graduated sanctions:

- a. Ef einhver fylgir ekki reglunum varðandi sauðfjárbæit og fjallskil, hvaða aðili ber ábyrgð á að reglum sé framfylgt?
- b. Hvað gerist tef einhver fylgir ekki reglum um afréttarmál og fjallskil?

5) Conflict-resolution mechanisms:

- a. Hvernig er leyst úr mögulegum ágreiningi um beitarmál?

6) Minimal recognition of rights to organization:

- a. Eru bændur á þínu svæði aðilar að félagi um fyrirkomulag sauðfjárbæitar?
- b. Geta allri bændur verið þáttakendur?

7) Abandoned farms:

- a. Telur þú að það að sveitabæir fari í eyði sé ógnun við fyrirkomulag sauðfjárræktarinnar?
- b. Hvaða aðrar áskoranir fylgja því að bæir í sveitinni farið í eyði?
- c. Hefur þú áhyggur af því að það sé verið að kaupa eyðijarðir vega hlunninda ss. Laxveiði?

8) Hvað breytingar telur þú mætti gera á fyrirkomulagi sauðfrárbæitar til að bæta?