Quernstones and Craftsmanship

Diffusion of Innovation in Pre-Industrial Iceland

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Photograph on title page: Owner Ljósmyndasafn Reykjavíkur. The photo (TEA 64b) was taken by Tempest Anderson in 1893 in front of the farm Skútustaðir in Mývatnssveit, North-Iceland. Turf and stone house (*burstabær*), scythe, trout net, quernstones, young lady carrying water barrels.

*In memory of my loved ones who
passed away far too soon*

*Hans Ágúst Guðmundsson Beck
21. August 1986 – 26. March 2012
Halla Kjartansdóttir
30. January 1956 – 12. July 2017*

Ágrip

Nýjungar sem teknar voru upp í tengslum við *Innréttingarnar* um miðja 18. öld hafa lengi verið taldar að stórum hluta misheppnaðar. Ýtarlegar greiningar á ástæðum mismunandi velgengi einstakra nýjunga hefur hinsvegar skort. Eftir mistækar tilraunir með innlenda kornrækt var tekin sú ákvörðun á 7. áratug 18. aldar að hefja innflutning á ómöluðu korni og endurvekja innlenda kvarnarsteinaframleiðslu um allt Ísland. Sú endurvakning gekk framar vonum og var framleiðslunni haldið við fram á 20. öld.

Markmið þessa doktorsverkefnis var þríþætt: 1) að greina þá hugmyndafræði og atburðarás sem leiddi til endurvakningar á innlendri kvarnarsteinaframleiðslu, 2) að greina hvaða þættir skiptu sköpum fyrir framgang þessarar 18. aldar endurvakningar og 3) að greina hvort breytingar urðu í hönnun íslenska kvarnarsteinsins fyrir og eftir viðreisn innlendrar framleiðslu. Byggt var á tiltækum upplýsingum um framkvæmd kvarnarsteinaverkefnisins og þátttakendur þess, um almenna samfélagsgerð og hagkerfi tímabilsins, um framboð á nýtanlegum innlendum hráefnum, og gerðfræðilegri greiningu á íslenska kvarnarsteinasafninu frá landnámi til nútíma.

Sem dæmi um viðtöku nýjunga í fábreyttu samfélagi veitir endurvakning kvarnarsteinaframleiðslu á Íslandi fágætt tækifæri til að greina bæði ferlið sjálft og fornleifafræðilegar afleiðingar þess. Byggt er á kenningum um viðtöku nýjunga (*diffusion of innovation theory*) sem þróaðar voru um miðja 20. öld innan bandarískrar landsbyggðafélagsfræði (*rural sociology*). Greinilegt samræmi er á milli kennilegra skilgreininga á þeim vandamálum sem leysa þarf til þess að nýjung breiðist út, og þeim aðferðum sem stjórnvöld beittu í kynningu kvarnarsteinsins á 18. öld. Sjá má breytingar í átt að einfaldara en þó mun fjölbreyttara formi og útliti í hönnun íslenskra kvarnarsteina eftir endurvakninguna sem m.a. er hægt að rekja til nýtingar á innfluttum kvarnarsteinafyrirmyndum og lítilli sérhæfingu íslenskra handverksmanna.

Saga kvarnarsteinsins á Íslandi sýnir að það var ekki inngróin íhaldssemi og stöðnun sem orsakaði að ýmsar aðrar nýjungar Innréttinganna náðu ekki fótfestu. Fátæk og lítt menntuð bændastétt í samfélagi sem byggði á sjálfsþurft hafði hvorki forsendur né ástæðu til að meta nýjungar út frá utanaðkomandi efnahagslegum sjónarmiðum ríkisvaldsins. Kvarnarsteinar voru nýjung sem hægt var að aðlaga samfélaginu innan frá án róttækra breytinga á samfélagsgerð eða hagkerfi. Þegar kvarnarsteinarnir voru kynntir var þeim útbýtt víða og voru því vel sýnilegir. Þeir voru fjótt tilfinnanlega hagkvæmir og hentugir til frekari framleiðslu og mótunar í nánasta umhverfi viðtakenda sem allt hjálpaði til þess að frekar var hægt að aðlaga þá að samfélaginu til langs tíma litið. Út fyrir landsteinana gefur rannsóknin greinilegar vísbendingar um eðli aðlögunar og þróunar í viðtöku tækninýjunga í fábreyttum og strjálbýlum bændasamfélögum.

Abstract

Innovations introduced in connection with the New Enterprises in Iceland in the second half of the 18th century have long been considered largely unsuccessful, but a more detailed analysis of the reception of particular innovations has been lacking. After a series of unsuccessful experiments in cereal cultivation a decision was made early in the 1770s to start the import of unground grain and revive indigenous quernstone production all around Iceland. The revival was successful beyond expectations and quernstone production was continued into the early 20th century.

The aim of this thesis was threefold: 1) to piece together the historical chain of events and analyse the ideology behind the revival of indigenous quernstone production, 2) to identify which aspects in the revivals' management, introduction and public participation were crucial for its progress and eventual success, and 3) identify any potential changes in Icelandic quernstone typology that may have taken place in connection with this late 18th century revival. The analysis is based on available historical information regarding the revival's execution and its key participants; general models of Icelandic pre-industrial social structure and economy; the availability of indigenous raw materials and a typological analysis of the Icelandic quernstone assemblage from first settlement into modern times.

As an example of innovation acceptance in a rural society, the revival of quernstone production in Iceland gives a rare chance to analyse both the process and its archaeological consequences. The analysis is mainly structured around diffusion of innovation theory developed within American rural sociology in the mid-20th century. There is clear correspondence between the defined parameters that need the most attention for successful innovation diffusion in an underdeveloped rural society, and the methods employed by the Danish-Icelandic government during the successful introduction of the quernstone in the late 18th century. A clear change can be detected in Icelandic quernstone design towards a simpler but highly varied form after the revival, which can be traced to the influence of imported quernstone models and the Icelandic farming craftsmen's non-specialised experience in general handicraft.

The quernstones' history in Iceland shows that it was neither ingrained conservatism nor stagnation that caused many of the innovations introduced by the New Enterprises to fail. A poor and uneducated class of farmers in a society built on subsistence farming had no reason to value innovations in terms of the wider improvement ideology of the state. The quernstone could be assimilated into society from within, without radical changes in social structure or economy and it was made widely accessible to the general public. It was quickly and clearly advantageous to the whole community and suitable for further production and development in the recipients' immediate environment, which helped to integrate them successfully into society in the long term. Beyond Iceland this research gives clear insights into the nature of the evaluation, adaptation and developments in the reception of new technologies in pre-industrial farming societies.

Acknowledgements

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Diffusion of Innovations: Evaluating Unfamiliar Paths Towards Change

With the benefit of hindsight it now appears that this mighty enterprise (by 18th century standards) was bound to founder on the essential backwardness and intransigence of the Icelandic economy.

Lýður Björnsson (1998, p. 175).

Perhaps on closer analysis it would become apparent that the system is at fault for not providing an innovation more appropriate to the individual´s needs, and so the individual may be quite justified in rejecting the new idea.

Rogers et al. (1988, p. 321).

In the late 19th century the rotary quernstone (Figure 1.1.) had a fixed niche within all Icelandic society, from the richest farms to many a poor villager. Mills, both water and windmills were common in the countryside, although they were mostly used in the summer, while the hand querns were ubiquitous and could be used all year round. Imported grain was often transported home from trading posts on horseback in sacks, and at home, grain and meal were stored in sacks (isl. *sekkir/tunnusekkir/hærusekkir*) and/or wooden chests (isl. *kornbyrður*). Unground grain had a longer shelf life than meal and was ground either daily or in bulk. At farms and in a few small villages that had set up mills grain was often ground for neighbours, sometimes for a small price, but in the winter the handquern was the main medium for grinding. Rye (*Secale cereale*) and pearled barley (*Hordeum vulgare*; isl. *rúgur* and *bankabygg*) were

Figure 1.1. An Icelandic rotary quernstone from Hnausar in Meðalland, Vestur-Skaftafellssýsla. Hewn in 1867 by farmer Einar Ólafsson from the farm Slýjar. The stone is preserved at the Skógar museum in Rangárvallasýsla. Photo by Sólveig G. Beck.

the main imported grain types that were then finely ground with these querns; for bread (e.g. flatbread, dumplings (isl. *soðkaka/soðbrauð*), fried bread (isl. *laufabrauð*) and rye bread), for blood gruel, blood sausages and liver puddings, soups and meal gruel, while barley was also sometimes soaked unground overnight and boiled or crushed (Anna Sigurðardóttir, 1985, pp. 101-104, 117-120; Helga Sigurðardóttir, 2009, pp. 29, 337-339; Sveinbjörn Rafnsson, 1983, pp. 83-87; *ÞÞ. 60*; *ÞÞ. 314*; *ÞÞ. 2073*). Indigenous quernstones were commonly used and hewn from igneous rock, both in the countryside and in some fishing stations along the Icelandic coastline (Guðmundur Þorsteinsson, 1990, p. 170; Jónas Jónasson, 1945, pp. 53-54; Lúðvík Kristjánsson, 1985, p. 202). Farming craftsmen made quernstones in small quantities and older men and wanderers sometimes travelled between farms and sharpened them (isl. *klappa upp*) for a small remuneration (Guðmundur Þorsteinsson, 1990, p. 173; Hannes Pétursson, 1984, p. 92; Sæmundur Stefánsson, 1929, pp. 22-23). Women and dependants (isl. *liðléttingar*; children, the disabled and/or old people) took care of the time-consuming and hard work of grinding the grain in a handquern. Often standing/sitting for a long time in the kitchen, the pantry or in the corridor, even in the barn; singing, composing or telling stories to pass the time (Anna Sigurðardóttir, 1985, pp. 144-145; Elínborg Lárusdóttir, 1950, pp. 81-82; Sigurður G. Magnússon, 1997, pp. 37, 60 and 63; Sæmundur Stefánsson, 1929, pp. 22-23; *ÞÞ. 410*; *ÞÞ. 6611*; *ÞÞ. 7345*; *ÞÞ. 7493*; *ÞÞ. 7579*; *ÞÞ. 7636*; *ÞÞ. 8075*). Curiously however, only a 150 years earlier in the first half of the 18th century, unground grain was very rarely imported. The rotary quernstone was an uncommon sight and only used in a few high-status households to bruise malt for brewing and in one very isolated and small area in southern Iceland to grind wild lyme grass (isl. *melgresi*; *Elymus arenarius*). So why, and how, did quernstones spread across the whole of Iceland and local quernstone production develop in such a short period of time?

In the early 18th century Iceland was an island dependency of the Danish-Norwegian monarchy and Icelandic, pre-industrial society has long been considered under-developed and stagnant, suffering from trade restrictions, lack of investment and deep-rooted conservatism. The daily life of the populace traditionally revolved around farming and fishing, primarily for subsistence. Indigenous goods exchange was governed by age-old internal price regulations, and external market exchange was controlled through the Danish Trade Monopoly between 1602-1787 (Gísli Gunnarsson, 1987, pp. 229-268; Gunnar Karlsson, 2009, pp. 315-328; Hastrup, 1990, pp. 280-285). At the time, the island was without urban towns or cities and the population that numbered around 40-50 thousand was widely distributed within a very old network of farmsteads and seasonal fishing stations (Árni D. Júlíusson, 2013a, p. 265; Lýður Björnsson, 2006, pp. 43-49). Things started to change, however, at the turn of the 18th century when the Danish government turned its attentions to economic reform and evaluating the island's human and natural resource potential became a larger concern. Throughout the 18th century much effort was put into developing Iceland´s economic policy and increased importance was attached to strengthening rural society with improvements in education, formal apprenticeship and manufacture (Hrefna Róbertsdóttir, 2008, pp. 129-181).

To push this reform agenda a group of Icelandic government officials and major landowners, led by the first Icelandic treasurer Skúli Magnússon (isl. *landfógeti*), founded a corporation in 1751 that is generally known as *The New Enterprises* (isl. *Hið íslenzka hlutafélag/Innréttingarnar*). Their reformist ambitions mainly focused on the establishment of urban centres and the development of Icelandic agriculture and fisheries through the introduction of more modern methods and technologies. The aim was to revitalise the economy for the good of the island's inhabitants and the government's coffers (Hrefna Róbertsdóttir, 2008, pp. 29-30; 2011, pp. 53-55; Lýður Björnsson, 1998, pp. 31-47; 2006, pp. 128-138). With government sponsorship The New Enterprises began implementing and experimenting with new methods, e.g. in fishing and fish processing; sulphur mining (Jóhanna Þ. Guðmundsdóttir, 2008) and salt production; cereal cultivation (Gunnar Karlsson, 1964) and milling; house building and stone masonry (Hörður Ágústsson, 2000, pp. 271-286); kitchen gardening (Jóhanna Þ. Guðmundsdóttir, 2012) and field management; sheep breeding, tanning, weaving (Hrefna Róbertsdóttir, 2008) and rope making (see Lýður Björnsson, 1998 for a general overview). Householders were bombarded with demands for changes in their traditional work routines. This was done through a combination of varied laws and ordinances; through foreign specialists advocating new methods; and through complex innovations such as decked fishing vessels and nets, spinning wheels and horizontal looms, mills, ploughs, foreign vegetables and reindeer, wheelbarrows and horse-drawn carts that added further complications.

These reform attempts met with considerable scepticism and out of six proposed new urban centres, only Reykjavík thrived. The farmers had to evaluate and interpret the usefulness and potential influences of varied innovations in their everyday life for either good or bad, while being unfamiliar or unaware of (or simply indifferent about) the innovations' relevance to a wider and more elusive context of 'socioeconomic progress'. Although the history and success of each innovation has not been analysed in much detail, it is clear that a large portion of these reform ideas and experiments were either abandoned fairly quickly or petered out within a few years and The New Enterprises were dissolved in the very early 1800s. For this reason, they have for a long time mostly been considered a failure, with the Icelandic farming community blamed for being too backward and unresponsive to be able to accept economic progress on such a large scale (Lýður Björnsson, 1998, p. 175). However, it is a truth universally acknowledged that Rome was not built in a day. Even though many reform ideas failed to survive in the long term, a few of the innovations introduced did take root and develop. Examples include a diverse range of improvements, from formal trade apprenticeships, to the introduced reindeer which run wild in Iceland to this day; from kitchen gardening to spinning wheels and horizontal looms and fishing nets (Elsa E. Guðjónsson, 1991, pp. 20-26; 1993; Jóhanna Þ. Guðmundsdóttir, 2012; Jón Þ. Þór, 2002, p. 91; Lýður Björnsson, 1998, p. 167). These changes, and more, slowly gained foothold, developed and spread within Icelandic society into the early 20th century.

The failed experiments also led to new ideas and contingency responses. One such example is the rejection of indigenous cereal cultivation, which in turn led to a large increase in the import of unground grain and the revival of Icelandic quernstone production. In times of famine or want in Iceland, the supply of meal and other necessities had often been inadequate and imported meal often of second-rate quality and/or damaged during transport (Gísli Gunnarsson, 2017, pp. 231-232; Jón J. Aðils, 1902, pp. 56-57, 62-69, 114-115 and 121; 1971, pp. 441-443). The revival of indigenous cereal cultivation was therefore one major aim of the Icelandic government officials leading The New Enterprises, but their attempts were largely unsuccessful, however. Past analyses have explained this by various factors, such as inadequate planning, lack of manpower and disinterest among the general population, insufficient funding and expert knowledge, and unusually cold weather conditions (Gunnar Karlsson, 1964, pp. 28-30; Kristrún A. Ólafsdóttir, 1997, pp. 17-23; Lýður Björnsson, 1998, pp. 53-57, 163-164; Páll Vídalín and Jón Eiríksson, 1985, pp. 90-102). As it was becoming clear that reviving indigenous cereal production on a large scale was not going to work, in 1767 Skúli Magnússon suggested that import of unground grain (rye, barley and oats) should be increased and the import and/or production of handquerns (Figure 1.1) and mills should be explored

(Bergsteinn Jónsson, 1958, p. 14). This idea was received with much more enthusiasm. After the idea had been considered in more detail and approved by Icelandic government officials, the Exchequer in Copenhagen decided to support the project by arranging for the import of unground grain at lower prices (mostly rye), production rewards and a shipment of 200 free quernstones. The government's initial ideas of organized large-scale local production and distribution of querns through the main trading centres did not go exactly according to plan. Instead quernstone production became established as part of the general cottage industry, thus achieving the overall goal, albeit through slightly different means than initially formulated. In recognition of this, the government decreed in 1784 that Icelandic quernstone trade would not become state regulated. Between 1770 and 1790 many Icelandic farmers and skilled craftsmen all over the island responded to this new opportunity, finding good quernstone materials, manufacturing and transporting the finished product successfully themselves. Gradually the quernstone became a common household item all around the island through combined local production and small-scale import of foreign quernstones, and it remained so up until the early 20th century.

The variable outcomes of The New Enterprise's many reform experiments can give a very valuable empirical insight into the nature of innovation diffusion under isolated conditions in a pre-industrial, kinship-based rural society, for history, ethnology and archaeology. The general developments of the quernstone production revival project and its various participants can be traced through historical documents in surprising detail. This history also raises many new questions, however, e.g. regarding the nature of craft specialisation in Icelandic society and its role within the economy; the extent and influence of raw material availability; the nature of the production and product distribution and its evaluation, acceptance and assimilation into the farming economy, as well as innovation complexity; the general farmers' level of technological skills and the size and social influences of the groups capable of undertaking such production in the late 18th century. Many quernstones and fragments dating from the 9th up to the early 20th century have been unearthed and preserved all over Iceland (75% Icelandic, 25% foreign). They represent the quernstones ubiquity at the time of its abandonment and in the last seven years this assemblage has been recorded in detail (The Icelandic Quernstone Catalogue can be found at www.opinvisindi.is). Combined, the detailed historical data and the quernstone assemblage have provided grounds for analysing the development of this single innovation diffusion episode and its fragmented archaeological consequences side by side, within a known socioeconomic context.

To bridge the middle-range between past historical developments and the archaeological record in a meaningful and reliable way Everett M. Rogers' (2003) stage model, the *innovation diffusion paradigm,* was selected as the main theoretical framework. Faced with a mountain of varied historical records, all offering fragmented and jumbled glimpses of this past innovation diffusion episode, the paradigm provided important guidance and structure to what and how historical information would potentially be relevant and useful, and what could be set aside. It directed attention to a multitude of different factors that could have affected the ability/willingness of the Icelandic people to accept the innovations, but it was not considered to offer any immutable or predictable answers. It gave scope to find ways to consider any of those factors visible in historical sources to then either accept or discard them as important in connection to this specific event.

The aim of this research project is to break down and analyse the development of this historical undertaking with the aid of Rogers' paradigm, as well as drawing inspiration from behavioural archaeology and ethnoarchaeological research on the manufacture of metates and manos still used today to grind maize in isolated highland Maya villages in Central America. The innovation diffusion paradigm was mainly developed over a 50-year period (1950s-2003) within American rural sociology through studies on the diffusion of agricultural innovations among rural farmers in the American Midwest. It also drew inspiration from detailed research into the nature of innovation diffusion conducted within a range of fields (agriculture, communication, family planning, education, health, law enforcement etc.) in the Americas, Asia and Africa (Rogers, 2003, pp. xv-xxi). In the paradigm, innovation diffusion is arranged into a series of interdependent stages, with parameters for consideration ranging from conditions prior to innovation diffusion and general project planning, to the strength of communication networks and an innovation's form and function. All factors that can affect success or failure in innovation diffusion must be considered, anticipated and solved for it to be successful and long lasting, whether they be natural, social, economic or ideological. The paradigm proved valuable in directing this investigation of how political, mercantile and social dynamics in Iceland influenced the execution and developments of the quernstone revival project, and understanding why this small aspect of the ambitious reform agenda met with success, while many others petered out. Many clear parallels can be identified between the methods which the paradigm suggests are needed for successful introduction of an innovation, and the late 18th century methods used in the governmental initiation of quernstone production in Iceland.

The analysis is divided into nine chapters and has been structured in such a way that it begins at the initiation of the project with the introduction and setup of the innovation pair, i.e. the imported grain and the quernstone, and ends with a detailed analysis of any potential drawbacks and advantages to be found in their production and use. The Icelandic quernstones' life history is long and complex, but the main focus will be on the late 18th century when indigenous quernstone production was revived all around the island by the general farming community with governmental support. Following this first introductory chapter comes a short a description of the methods applied during data collection, the analyses of the quernstones; the organisation of the quernstone catalogue, and methods for selecting and surveying raw material procurement sites for further study. The second half of Chapter 2 provides a short introduction to Rogers' *innovation diffusion paradigm*, along with Michael Schiffer's (2010, pp. 97-100) breakdown of *innovation complexity* (or *performance characteristics*) from within the realm of behavioural archaeology and Michael T. Searcy's (2011, p. 8) life cycle model of the Central American grinding stones. A general overview of the political, religious and socioeconomic context in late 18th and early 19th century Iceland is found in Chapter 3. Chapter 4 recounts the history of the quernstone production revival as a government initiative mainly between 1770 and 1790 and follows the general lines in the developments in grain and quernstone import up to the early 20th century. Chapter 5 focuses on the profiling and evaluation of Icelandic craftsmen, especially those that took on quernstone production; their social status, their level of craft specialisation, geographical range, and their social influences. Based on official ordinances for Iceland and reports and correspondence between Icelandic government officials and the Danish Exchequer from the late 18th century, it was possible to identify the main project participants and their roles, and to characterise government tactics used in the innovation introduction, and in turn estimate their influence on the innovation process. In Chapter 6 the Icelandic quernstone assemblage is typologically classified from the 9th up to the early 20th century to identify any significant pre- and post-1750s changes in foreign import and product design connected with the quernstone production revival. The assemblage is also evaluated to get a clearer picture of indigenous raw material exploitation and what it can reveal regarding the level of Icelandic craft specialisation. In Chapter 7 available historical descriptions of raw material extraction methods are analysed to identify potential changes in production methods through time, and the availability of raw materials, and geological and geographical trends in quernstone production and import are mapped. The historical records also allow an evaluation of how the quernstone as a product fit into the existing rural economy with regards to goods exchange, product distribution and exchange values. In Chapter 8 the general logistics of quernstone production, the quernstones' complexity as an innovation, price and its general use are also considered regarding potential effects they may have had on innovation adoption or rejection. To conclude, the historical narrative is drawn together into a rounded whole, the main factors responsible for innovation diffusion failures and victories are identified and the final conclusions drawn together in the 9th and final chapter.

This historical archaeological reconstruction of the failure of cereal cultivation and the revival of indigenous quernstone production in Icelandic pre-industrial agropastoral society demonstrates, that while *ready access* to innovations and *opportunities for flexible* and *graduated localised innovation reproduction* within the receaving society are important contributing factors, successful innovation diffusion is mainly dependent on the premise that the innovations‘ *economic utility* and their *compatibility with traditional social relationships merge* successfully and preferably *enhance* one another clearly, quickly and as widely as possible. Most especially when it comes to the socioeconomic relationships between the key participating craftsmen, the innovations and their perspective patrons. The historical data preserves glimpses of the social attitude, participation and evaluation of the innovations and the rate of acceptance, while the archaeological assemblage represents the fragmented but final outcome of innovation success.

~ Chapter 2 ~

Detecting Pivotal Social and Material Aspects of an Innovation Diffusion Episode within Historical Archaeology

Interest in the stones used to grind cereals (e.g. saddle querns and rotary querns in Europe and the Middle-East, and metates and manos in the Americas and Africa) as an essential household appliance is certainly nothing new. One of the first overviews, *The History of Corn-Milling: Handstones, slave and cattle mills* by Richard Bennett and John Elton came out in England as early as 1898 (Bennett and Elton, 1898). In 1909 Henry S. Crawford published a short paper on Irish handquerns that at the time had only recently fallen out of use (Crawford, 1909). Years passed, but around the mid-20th century archaeologist E. Cesil Curwen (1937, 1941) published two papers in *Antiquity* on the development and typology of British quernstones and in 1943 Gordon Childe followed his lead and wrote about the "Rotary Querns on the Continent and in the Mediterranean Basin". In Childe's view, *diffusion* formed a large piece in the puzzle of the origins of English quernstones. He praised Curwen's efforts and encouraged archaeologists to turn their attention to recording data on the quernstones gathering dust in Continental museums, for only then *"can a serious history of rotary mills and their diffusion be attempted"*. As Childe wove his way north into Scandinavia and down south into Spain, through Central Europe into the Mediterranean and towards the East into Palestine, Syria and Egypt with the combined aid of historical sources and archaeological finds, he reached the conclusion that "*the role of armies thus equipped as agents in the diffusion of rotary querns can hardly be overestimated* […] *But another distributive agent might be the merchant ship.* […] *the recognition that more than one type of rotary quern was current in the Mediterranean basin in the latter half of the last pre-Christian millennium should warn us against any dogmatic attempt to derive all British querns from one single type–the Celtic beehive, though that was certainly the first adopted in southern England.*" (Gordon Childe, 1943, pp. 19 and 25). In 1946 Judith T. Philips also put together a paper distinguishing between what she called Hunsbury, Yorkshire and East Anglia quern types. Through her analysis she noted a clear distinction between northern and southern British quernstones and suggested that they could respectively be derived from central Europe north of the Alps and from the Mediterranean. Finally, she came to the conclusion that "*one may, perhaps, with some confidence ascribe the introduction and diffusion of the rotary quern in this as in other areas of Britain to Iron Age B influence*" (Philips, 1946, p. 82).

Such early research interest in quernstones was not only in England. In 1955 Crawford published an abstract from a translated German article about the querns, quarries and tools of Mayen in the Eifel in Germany written in 1950-1951 by Josef Röder where saddle querns were thought to have been replaced by rotary querns through Southern influences during the La Téne period and trade in half-finished products was already being traced into Belgium, to Switzerland, southern England and north to Hedeby (Röder and Crawford, 1955, pp. 68, 75-76). Interest in this famous German quernstone trade even reached Iceland, where in 1969 an unknown author published a short thought on quernstone use. In the article the German quernstones and their geographical distribution formed a large part of the narrative, and the author wondered whether they could perhaps even have been transported to Iceland in the late 18th century (Unknown, 1969). In 1965 the first International Symposium on Molinology was held. In its wake The International Molinological Society (TIMS) was founded and this West-European society actively encourages the study of mills in all sizes shapes and forms (www.molinology.org, 2019). It is interesting to note that the second publication of the society's *Bibliotheca Molinologica* published in 1976 was called *Windmills and watermills in Iceland* (Beenhakker, 1976) and the journal *International Molinology* has been published since 1994.

Quernstones and millstones have been unearthed in hundreds, if not thousands of excavations, however (similar to Icelandic archaeological research in general) it wasn't until past the mid-1970s that interest and publication specifically directed at analysing their production, provenance and development took off. In 1976 Parkhouse describes the Dorestad quernstones and speculates among other things on their movement through trade into Southern and Eastern England (Parkhouse, 1976; see also Parkhouse, 1997 for his analysis on the distribution and exchange of Mayen querns in medieval Northwest Europe) and in 1980 Kars published an analysis of the Dorestad querns' petrography and their wear and tear (Kars, 1980). In 1982 Major contributed a description of millstone production in the Eifel Region (Major, 1982), although his synthesis is mainly based on the work of Peter Hörter and Josef Röder in Germany during the 1950s-70s (see Röder and Crawford 1955 above). Tucker (1977, 1982, 1984, 1987) tackled millstones and described their production in 18th - 19th century England and Scotland through historical sources and fieldwork, and in 1986 King published a detailed synthesis of the petrology, dating and distribution of saddle querns, rotary querns and millstones found in Bedfordshire, Buckinghamshire, Hertfordshire and Middlesex in England (King, 1986).

In the course of the 1990s, publication and increased interest continued to diffuse in France (e.g. through the efforts of Alain Belmont and Owen Ward; Belmont, 2006, pp. 283-286, vol. II), Wales (Ward, 1990, millstones; S. Watts, 1996; 1997, rotary querns), Sweden (Carelli and Kresten, 1997; Peter Kresten and Elwendahl, 1994; P. Kresten, Elwendahl, and Pettersson, 1996), Denmark (Jørgensen, 2002), and into Norway around 2000 (Baug, 2015a, p. 11), where research interest in quarry sites and querns all over the country is still going strong (see e.g. Baug, 2015a, 2015b; Baug and Jansen, 2014; Grenne et al., 2008; Grenne and Meyer, 2009; Hauken and Anderson, 2015a, 2015b), and Germany continues firmly on its course (see e.g. Gluhak and Hofmeister, 2009; Gluhak and Hofmeister, 2011; Hörter, 1994). Today the International Colloquium on the Archaeology and Geology of Mills and Milling has been held five times (France 2002 and 2005, Italy 2009, Norway 2011 and Spain in 2014). International research cooperation has provided and inspired both a large database of raw material procurement sites in Europe accessible to everyone on-line (Alain Belmont and Fritz Mangartz, http://meuliere.ish-lyon.cnrs.fr, 2006a-d, CNRS (Centre national de la recherche scientifique)), and a number of compilation publications (see e.g. Belmont, 2006; Hockensmith, 2009a; Peacock, 2013; Selsing, 2014), as European 21st century quern- and millstone research has enveloped the Middle East, Africa and post-colonial North-America (see also e.g. Hockensmith, 2009b) as well.

General quernstone research east of the Atlantic has mainly been focused on raw materials, their types and their provenance, on reconstructing trade networks and mapping and understanding production methods. Less attention has been given to constructing (or at least publishing) typologies and ethnographic studies of quernstone use and how and why it may have spread, but this is slowly changing (see e.g. Alonso, 2019; Alonso et al., 2014; Hamon and Le Gall, 2013; Hauken and Anderson, 2015a; Parton, 2011). Although research into querns and mills in Europe and Scandinavia indeed has a rich history, and the Icelandic rotary quern certainly traces its origins from that region (see Chapter 6 for further detail), the inspiration for this project came from ethnoarchaeological research on the other side of the Atlantic. In particular the inspiration came from three North-

American research programs which focused their interviews and observations largely on 20th century grinding stone masons (spa: *metateros*) and their production of *metates* and *manos* in Central-America. In 1982 anthropologist Scott Cook published his study *Zapotec Stoneworkers: The Dynamics of Rural Simple Commodity Production in Modern Mexican Capitalism*, conducted in the valley of Oaxaca in the highlands of Southern Mexico (Cook, 1982). In his study Cook documented all aspects of rural home-production of metates and manos, their use in the peasant household, their production, distribution and market exchange. Five years later the results of a similar program, the Coxoh Ethnoarchaeological Project, were published (Hayden, 1987). It was funded by the New World Archaeological Foundation but planned on the spot by Brian Hayden after it became clear during fieldwork in 1978 that some Highland-Maya peasants in Guatemala were still using stone tools to produce metates and manos. The program was specifically designed to gather information on all forms of lithics (mainly grinding stones) used in rural daily life in three highland villages. In addition, all stages of production and marketing of one metateros living in the village of Malacatancito were recorded in detail, especially the methods used and subsequent refuse distributions, to aid in later interpretations of archaeological lithic assemblages (pp. ix-xi). Finally, in 2011 Michael T. Searcy published his research on the production and use of metates and manos in three highland Maya groups also in Guatemala, but this time the metateros' methods recorded involved more modern, metal tools. Searcy focused his attentions on describing production both in the quarries and in the home, as well as detailing different modes of procurement, the stones' general use-life and maintenance in the home through to final discard, and considering their archaeological implications (Searcy, 2011).

Within Hayden's research program Gayel Ann Horsfall (1987) applied *design theory* to the ethnoarchaeological data gathered during the project. Horsfall considered the functional, socioeconomic and ideological interactions and constraints at all levels of metate production, use and exchange, both within and between the participating villages. Her evaluation of the influence of modern European technologies on metate use (and sometimes gradual abandonment) made reference to an early version of innovation diffusion theory (quoting Rogers and Shoemaker, 1971) while considering the level of acculturation and connectivity of the different villages to the larger and more modern population centres and markets (Horsfall, 1987, p. 366). Horsfall's approach led this author to Rogers' (2003) *innovation diffusion paradigm.* In the later 2011 study, Searcy used Michael Schiffer's flow model approach developed within *behavioural archaeology* and formed his own model while "*recording the modern life cycle of manos and metates to create archaeological analogies*" (Searcy, 2011, p. 8).

Archaeological methodologies have improved by leaps and bounds in the last 50 years. However, the problem of inferring human behaviour from history and/or remaining material culture in meaningful ways long after the fact, still remains a heavily debated issue. Behavioural archaeology has long since proven its worth for archaeological research and Rogers' sociological innovation diffusion paradigm has been slowly finding its way into this sphere in recent years. Scholnick (2012) identified and interpreted adoption rates (commonly observed as S-shaped cumulative frequency curves in innovation diffusion research, for further details see below) and spatial distributions and isolations of chosen 17-18th century stylistic motifs on New England gravestones. Eerkens and Lipo (2014) also partly used the innovation diffusion paradigm (again research mainly based around cumulative frequency curves) on a larger scale to interpret the geographical spread and potential explanations for adoptions and abandonments through time of certain pottery technologies among hunter-gatherers in the Great Basin in the American southwest. In 2015 Östborn and Gerding (2015) used similarity network analysis to track the diffusion of fired bricks in Hellenistic Europe and in 2016 they took their project further (Östborn and Gerding, 2016) as they interpreted their results within the wider historical and sociological contexts (influenced e.g. by the works of Rogers and Swedish geographer Torsten Hägerstrand), as they attempted to estimate the potential in social influence of varied agents taking part in brick diffusion. That same year Scharl (2016) also considered the spread of copper metallurgy into Central Europe in the 5th and 4th millennia BC on a regional scale (i.e. macro-level) using a simplified version of the innovation diffusion paradigm as she split the process into two headings, information flow and adoption/implementation, resulting in innovation diffusion (or transfer). And finally, a year later Thér et al. (2017) used a combination of *cultural transmission theory*, behavioural archaeology (i.e. performance characteristics) and sociological innovation diffusion research (e.g. concepts of innovation visibility, communication, change agents and opinion leaders) to interpret the diffusion (or *transmission*) of pottery technology in Central Europe in the Iron Age. No published work was found however, where the innovation diffusion paradigm has been used to reconstruct a single, detailed past empirical example of innovation diffusion under isolated conditions.

For this study Rogers' paradigm and Schiffer and Searcy's ideas of an objects life cycle and evolution (see more detail below) are combined to serve as a framework while disentangling the complex natural and socioeconomic driving forces and constraints at work during the Icelandic rotary quernstone production revival in the late 18th and early 19th centuries, as well as identifying potential changes in the quernstones materiality and typology during that time. This chapter has been split into three sections. The first section gives an overview of the main historical sources used while tracking the Icelandic quernstone and its production history, and details the methods applied during general quernstone registration and fieldwork conducted for this project. In the second section Rogers' *innovation diffusion paradigm*, Schiffer's *artefact behaviour characteristics* and Searcy's *life cycle model* are explained in more detail. In the final section these approaches are drawn together to form a framework to direct the reconstruction of the Icelandic quernstone revival and aid in the interpretation of the results.

2.1. The Data and the Methods of the Quernstone Project

2.1.1. The Historical Research

Before this current research project into Icelandic quernstone production began the topic had never been considered in any detail. Furthermore, knowledge of how this group of Icelandic material culture came into existence had faded into the background. At the start of the project expectations of finding much information regarding such production in Icelandic historical sources were rather low, but as historical research progressed threads of information worth further pulling started turning up in various places. Through further guidance from historians Dr. Hrefna Róbertsdóttir and Professor Már Jónsson regarding the existence of potentially useful written sources in The National Archives of Iceland these expectations improved. The end result was a substantial collection of historical information that could be collated to illuminate an interesting chapter in Icelandic history, the revival of indigenous quernstone production in the late 18th century, and a long list of its human agents.

Many different sources provided fragmentary information such as annals, old magazines and newspapers storing information covering everything from agricultural instructions to gossip and adverts[1], travel journals, place name records, varied general descriptions of folk customs, folk lore and natural landscapes and geology, archaeological surveys, pre-1900 biographies and estate records, and genealogy tomes, to name just a

[1] Available at the ever-expanding digital library www.timarit.is, 2018.

few. The more important and substantial information however, was gathered mainly from these collections: 1) *Diplomatarium Islandicum* (various letters, contracts, cartularies, court judgements and other documents written 834-1590), 2) Rit þess konunglega íslenzka Lærdómslistafélags (RÍL; society publication 1781-1798), 3) *Lovsamling for Island* (*LFI*; a collection of legal codes and statutes published between 1096 and 1874), 4) *Alþingisbækur Íslands* (*AÍ*; or Acta comitiorum generalium Islandiæ, registers from the Icelandic legislative assembly 1570-1800), 5) Rentukammerskjölin (archives regarding Iceland from the Danish Exchequer, mainly information from the 18th century, search engine available at http://skjalaskrar.skjalasafn.is), 5) the published archives of Landsnefndin 1770-1771 (Bergsteinn Jónsson, 1958, 1961; Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018), 6) The National Archives Census Database (www.manntal.is), and 7) The Folk Custom Collection of the National Museum (Þjóðháttasafn, answers to questionnaires from the general public regarding Icelandic folk customs sent out by the National Museum since 1960s, search engine in Icelandic available at www.sarpur.is). A list of 47 raw material procurement sites (Table 7.1) and over one hundred names of craftsmen known to have very likely taken part in quernstone masonry at some point from the 18th to the early 20th century (Table 5.2) have been recorded. Guðmundur M. H. Beck, amateur genealogist, farmer and historian, collated the information pertaining to the craftsmen's time of birth and/or death. With the intriguing history of the quernstone production revival, the interest in innovation diffusion was born, but without cataloguing and analysing the quernstones themselves the story would be seriously incomplete.

2.1.2. The Quernstone Catalogue

The quernstone assemblage was catalogued over a period of 3 years, between the summer of 2013 and late winter 2015. All quernstones were recorded whenever and wherever they were encountered during fieldwork, whether they were located in museums or private ownership. General information on all available quernstone finds from the late 9th to the early 20th century was collected in 2012 and early 2013 by reviewing excavation reports and publications, museum collection registries (many available on-line at www.sarpur.is), and by directly contacting The National Museum and all the main heritage museums around Iceland. Before work began on cataloguing the collections in the summer of 2013 a considerable time was also spent reviewing and describing some of the more common

Icelandic rock types both in hand sample and thin section under the tutelage of the late Dr. Sveinn Jakobsson (1939-2016), geologist at the Institute of Natural History. At the end of fieldwork in 2015 thirty-one museums and institutions had been visited all around the country

During the first stage of fieldwork in the east and north of Iceland in 2013 (Sólveig G. Beck, 2013b) it became clear that a considerable number of 19th and early 20th century quernstones had been preserved in private ownership all around Iceland that warranted closer attention. However, due to time and financial restrictions, only a small portion of this quernstone group could be recorded. It was decided to look more closely at five rural districts (isl.: *hreppur*): Leiðvallarhreppur in Vestur-Skaftafellssýsla, Skriðdalshreppur in Suður-Múlasýsla, Skriðuhreppur in Eyjafjarðarsýsla, Saurbæjarhreppur in Dalasýsla and Neshreppur utan Ennis (or Ingjaldshólshreppur) in Snæfellsnessýsla (Figure 2.1), as demarcated in the mid-19th century (*JJ*, 1847, pp. 9-12, 147-149, 170-172, 293-296 and 371-372). The districts were selected for a mixture of reasons directed by the preceding historical research into quernstone masons, material procurement sites and their geographical location. Due to time restrictions all areas needed to be located outside of larger towns. Neshreppur at Snæfellsnes was the only district that included two very small fishing villages Rif and Hellissandur (present population ~540). It was also the only selected district where all of the farms registered in 1847 had been abandoned. All farms registered in 1847 that were still inhabited during fieldwork within these five districts were contacted in search of quernstones and, with the owners' permission, visited in person if a quernstone had been preserved.[2] With the gracious help and knowledge of the late Skúli Alexandersson (1926-2015) the two villages were covered in only three days. Leiðvallarhreppur was selected for its location in an area where the last vestiges of indigenous quernstone production remained in connection with wild lyme grass[3] (isl. *melgresi*; *Elymus arenarius*) utilization in the late 18th century. Skriðdalshreppur, Skriðuhreppur and Saurbæjarhreppur were selected as many of the quernstone masons rewarded or known for quernstone production in the late 18th century resided in those

[2] In most cases farmers and owners could be contacted either with a direct phone call or through information from neighbours or knowledgeable locals. Only a handful of cases came up where a farm had to be skipped as owners could not be contacted. Owners permission to stop by and register known preserved quernstones was always kindly granted.

[3] See Garðar Guðmundsson (1996) for a general overview of its exploitation in Iceland.

areas (Figure 2.1). Information on possible raw material procurement sites was also found in all five districts (see Chapter 7).

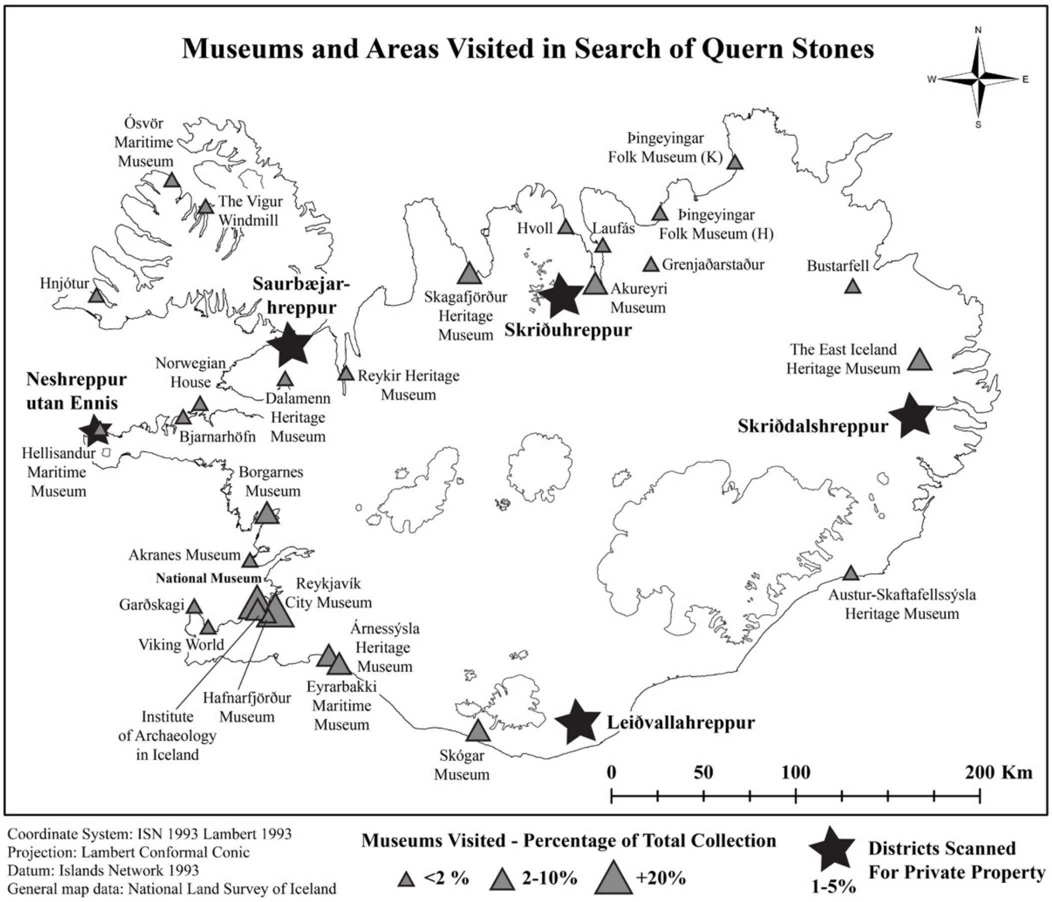


Figure 2.1. Geographical locations of museums and rural districts around Iceland visited in search of quernstones.

As of 2018 the quernstone catalogue contains 490 finds in total (see the Icelandic Quernstone Catalogue at www.opinvisindi.is). The catalogue structure is inspired by the work of Hauken and Anderson (2015a, 2015b) on the quernstone assemblages at the University Museum of Archaeology in Stavanger. The quernstones are listed in the catalogue in the order they were registered to make it easier to add future quernstones. Each quernstone was counted as one find as very often only half of a working quernstone was preserved. A working quernstone pair was therefore counted as two but the assemblage contains about 80 pairs (~190 finds)[4]. Whole quernstone pairs make up ~17% of the assemblage, single runners ~37% and bedstones ~22%. The rest of the assemblage, or ~34% of the finds, are undiagnostic quernstone fragments and unfinished rough-outs.

[4] In a few cases it is doubtful that the two quernstones fit together as a pair, even though it has been presented as one at its location.

Where multiple fragments of the same rock type were recovered together in the same context and/or could be conclusively shown to be part of a single quernstone they were counted together as one find. About 86% (n=422) of the assemblage is located at museums while about 14% (n=68) are in private ownership (Tables 2.1 and 2.2). Despite their difference in size both groups contain about 75% of finds made of indigenous rock while 25% are foreign. Foreign querns were easily identified, as mica schist, sandstone and conglomerate rocks commonly used in foreign quernstones do not occur naturally in Iceland. The foreign volcanic rock querns have a frothy-like matrix that differs to the Icelandic rock types They are clearly Modern and mass-produced, as they show elements of sophisticated production processes never practiced in Iceland. The foreign quernstones have most likely origin in Norway (Hyllestad, Saltdal and Selbu), Sweden (possibly Malung and Skåne) and mainland Europe (possibly Germany).

The majority of the finds are curated at The National Museum of Iceland (~33%). In the whole assemblage there are 177 artefacts (~36% of the museum assemblage) recovered in archaeological excavations and of those, 69 finds (~14%) have an unknown context. These 14% are mostly from two, late 20th century excavations at Bessastaðir[5] and Stóraborg[6], along with random finds recovered at various farms due to erosion or development. At the time of recording all finds recovered in archaeological excavations are kept in Reykjavík at The National Museum, the Reykjavík City Museum and the Institute of Archaeology in Iceland, all located in Reykjavík, along with one in Keflavík at the Viking World exhibition. It is likely that in the future, all finds stored elsewhere will eventually end up at The National Museum.

Most quernstones that are currently curated at Icelandic heritage museums were originally mostly personal property in the 19th and early 20th centuries and were acquired or donated after the mid-20th century, when most Icelandic heritage museums were being founded. Such museum acquisitions have been counted at 249 finds (~50%), and of those, 96 (~20%) have no known origin. At heritage museums outside the greater Reykjavík area it can be relatively safely deduced that quernstones are mainly from the museums' local district or county. However, a few 19th/20th century pairs and fragments stored

[5] Most of the artefacts actually have a context but have not been allocated a specific time period yet.
[6] Finds picked up through the years at the farm mounds sea erosion face or could not be given a reliable context during excavation.

Table 2.1. Breakdown of the quernstone museum assemblages around Iceland. The total % represents each museum's part of the whole assemblage (N = 490).

Museum Assemblages					
Location	**No. of querns**	**Total%**	**Pairs**	**Icelandic**	**Foreign**
Institute of Archaeology in Iceland	13	3	0	12	1
The National Museum of Iceland	161	33	10	120	41
Reykjavík City Museum, Árbær	29	6	1	28	1
Hafnarfjörður Museum	13	3	3	11	2
Icelandic Institute of Natural History	3	0.6	0	1	2
Viking World, Reykjanesbær	1	0.2	0	1	0
Garðskagi Museum	2	0.4	0	1	1
Hnjótur Museum	4	0.8	2	4	0
A-Skaftafellssýsla Heritage Museum	9	1.8	3	9	0
The East Iceland Heritage Museum	13	2.7	2	8	5
Bustarfell Museum, Vopnafirði	3	0.6	1	0	3
Þingeyingar Folk Museum, Kópasker	3	0.6	0	2	1
Þingeyingar Folk Museum, Húsavík	9	1.8	1	7	2
Grenjaðarstaður Museum, Aðaldalur	4	0.8	2	4	0
Hvoll Museum, Dalvík	2	0.4	1	2	0
Laufás Museum, Eyjafjörður	4	0.8	2	4	0
Skagafjörður Heritage Museum	13	2.7	4	8	5
Árnessýsla Heritage Museum	18	3.7	6	18	0
Eyrarbakki Maritime Museum	10	2.0	2	7	3
Skógar Museum	43	8.8	10	37	6
Bjarnarhöfn Museum, Snæfellsnes	4	0.8	1	1	3
Hellissandur Maritime Museum	2	0.4	0	0	2
The Akranes Museum Centre	9	1.8	1	9	0
Byggðasafn Borgarfjarðar	11	2.2	3	11	0
Norwegian House, Snæfellsnes	8	1.6	1	3	5
Volcano Museum, Stykkishólmur	2	0.4	1	0	2
The Dalamenn Heritage Museum	7	1.4	2	4	3
The Vigur windmill, Ísafjarðardjúp	6	1.2	1	0	6
Ósvör Maritime Museum, Bolungarvík	3	0.6	0	1	2
Reykir Hertage Museum	2	0.4	1	2	0
Akureyri Museum	11	2.2	5	5	6
Total:	**422**	**86**	**66**	**320**	**102**

Table 2.2. Breakdown of known quernstones in private ownership around Iceland. Total % represents each group's part of the whole assemblage (N = 490).

Private Ownership					
Location	**No. of querns**	**Total%**	**Pairs**	**Icelandic**	**Foreign**
Suðursveit	4	0.8	2	4	0
Neshreppur utan Ennis*	8	1.6	1	4	4
Breiðavík	1	0.2	0	1	0
Ólafsvík	1	0.2	0	0	1
Saurbæjarhreppur*	6	1.2	1	4	2
Skriðuhreppur*	7	1.4	2	5	2
Skriðdalshreppur*	16	3.3	4	11	5
Leiðvallahreppur*	12	2.4	2	12	0
Reyðarfjörður	3	0.6	1	2	1
Vallahreppur	3	0.6	0	2	1
Núpasveit	4	0.8	2	4	0
Skagafjörður	2	0.4	0	1	1
Ljósavatnshreppur	1	0.2	0	1	0
Total:	**68**	**14**	**15**	**51**	**17**

**Rural districts specially scanned for quernstones in private ownership.*

at The National Museum in Reykjavík can only be identified as being Icelandic.[7]

Privately owned quernstones (Table 2.2) are generally recorded wherever they were encountered during fieldwork, whether they were located at the place of lodging (often with family and friends) or known areas of raw material procurement (see Chapters 6 and 7). In a few instances heritage museum curators could also point out locations of privately owned quernstones in the neighbourhood. The majority of the privately owned quernstones have a known history and most appear to be from the 19th or early 20th century. Querns recorded outside the five chosen rural districts were mostly incidental finds that do not give any significant clues regarding spread or total quantities of preserved quernstones within their respective districts. They were not used for anything except to represent either Icelandic or foreign quernstones in the main analyses. In the five selected rural districts 49 quernstones in total were registered, which on average is ~10 preserved finds (from 6 up to 16 querns) for each district. In 1847 there were over 150 rural districts (*JJ*, 1847) across the whole country so it can be roughly estimated that

[7] Finds mostly from a private collection, *Ásbúðarsafn,* donated to The National Museum in whole without a proper registry.

at least 1500 quernstones from the 19th and early 20th centuries may be preserved in private hands in Iceland.

The quernstones were measured with the aid of a folding rule, a smaller hand ruler (10 cm) and a diameter chart. Rock type (colour, grain size, textures) for each quernstone was described and classified with the aid of a hand lens, available reference materials and personal experience. Smaller fragments were weighed with the aid of a small, digital scale (<500 gr) while the large fragments and whole stones were weighed with a digital bathroom scale. Relative proportions of components (i.e. vesicles, phenocrysts/ porphyroblasts and groundmass) were obtained by visual estimates using standard percent area charts (see e.g. Barnes and Lisle, 2005, p. 170). The quernstones were photographed with a Canon EOS 450D camera with a standard 18-55 mm lens and their texture with a macro lens (100 mm). The texture surfaces were lit up obliquely with a simple hand light to accentuate vesicles and/or other surface details. Surfaces suitable for photographing unweathered or undegraded rock textures were rarely completely flat so patches of rock out of focus could not be helped but were avoided where possible. Quernstone drawings in the catalogue were based on the work of Jaccottey et al. (2014, pp. 137-139) and dressing patterns were classified following Lepareux-Couturier (2014, pp. 152-156).

About 34% (165 finds) of the quernstone assemblage has an unclear origin, context and/or age range. Any discussion regarding changes in typology or material import through time is only based on the remaining 66% (325 finds). All quernstones in the assemblages, however, are included in the assessment of what materials have been exploited in quernstone making or imported to Iceland and when evaluating the general Icelandic quernstone design and complexity. No chemical analyses were carried out on the indigenous materials, whether they are raw materials from procurement sites or quernstones. Provenance research was deemed too complicated and costly compared to the limited results they were likely to provide. Icelandic rock types used for quernstones, which is mainly vesicular basalt, are too homogenous in terms of their chemical composition for provenance identification. Furthermore, there are too many, and potentially unknown, small-scale material procurement sites. No information was found regarding export of Icelandic quernstones, except for one example where a farmer in Vopnafjörður took his quernstones with him when he emigrated to the United States (craftsman s65; Table 5.2). Two Norwegian quern fragments unearthed at Kúabót in Álftaver (quern no. 363) and in Vestur-Landeyjar (quern no. 365) were analysed in 2015 to ascertain their provenance through the courtesy of Gurli B. Meyer and the Geological Survey of Norway (NGU) in Trondheim with good results (see further discussion in Chapter 6).

2.2. Important Considerations for Understanding Innovation Diffusion

2.2.1. The Innovation Diffusion Paradigm

Innovation diffusion is here considered a process that encompasses a multitude of factors affecting and causing the spread of innovation between and by humans, in time and space within a dynamic, socioeconomic, ideological and natural environment. The definition of an *innovation* used here follows Barnett (1953) and Rogers (2003) as an idea, method, or object that is considered new by an individual or other deciding unit (all inventions can be considered to be innovations but all innovations cannot be considered inventions, which are formed through study, experimentation and/or even by coincidence). The innovation can be a local invention, a foreign discovery or an old innovation with a renewed purpose, but the nature of their diffusion follows very similar paths and face similar obstacles. The innovation diffusion process has been divided into four main components by Everett M. Rogers and is presented here with only very slight modification (indicated with brackets) for the purpose of this research: 1) an *innovation*, 2) is *communicated* through varied *channels*, 3) in *time* [and *space*], 4) among members within [and between] *social systems*, resulting in either *adoption* or *rejection* that in turn bring varied consequences, both for the innovations and the receiving social systems. This communication or information transfer can take place between a) two or more individuals (Rogers, 2003, pp. 5-6 and 11), b) individuals and their experiences within their environment (natural, social, ideological, economical), and/or c) individuals and things.

Innovation does not necessarily mean brand new knowledge or inventions, as innovations may exist for a long time before an adopter is ready, has a need or opportunity, to develop interest and form an opinion of its usefulness. Successful adoption and long-term usage very often cause modifications/adaptations of the diffused innovation, its function and/or purpose (Rogers, 2003, pp. 12 and 180-188). When considering material culture, information transfer in space and time can take place through varied human agency and/or interactions: 1) correspondence and education (e.g. verbal and/or physical communication and/or writing; see also *cultural transmission*; Kroeber's (1940) idea of *stimulus diffusion* would fall under this heading and his term could very well be used to encompass this type of diffusion), 2) through population movement (e.g. through marriage, travel, population expansion, migration, forced relocation, war; *demic diffusion*, see Plog, 1973) and/or 3) transfer of things in space (e.g. trade, memorabilia, gifts, theft; or what we could call *material diffusion*). Feuer (2016, p. 72) also distinguished between *external diffusion* from one culture to another, and *internal diffusion* taking place within a culture. The adoption and adaptation of a material innovation cause complex *geographical distribution* patterns (see e.g. Hägerstrand, 1952; 1957; Östborn and Gerding, 2016; Scharl, 2016; Scholnick, 2012) and changes of material typology and production methods in time and space as innovations and humans *correspond* and *interact* (see e.g. Hodder, 2012; Ingold, 2013) as well as varied levels of adjustments and changes within a receiving social system (e.g. its *institutions*, see Kristiansen and Larsson, 2005) during and following innovation *integration* (Linton, 1937, p. 334). These various aspects are of course very often intertwined and hard, or even impossible, to separate in a purely archaeological context long after the fact, but the *innovation diffusion paradigm* has highlighted certain aspects in interactions between humans, objects and their environment that can help direct research and analyses of historical records and artefact assemblages and they need to be addressed to move towards more meaningful, after the fact explanations of innovation diffusion.

2.2.2. The diffusion paradigm foundations

The innovation diffusion paradigm is the result of a detailed synthesis that was slowly developed over 40 years of research and developments within contemporary rural sociology, through human communication and behaviour studies around the world, often during times of radical change. In this short introduction to the fundamental elements of the *innovation diffusion paradigm* all definitions and terms follow Everett M. Rogers (2003). The main factors necessary to consider in more detail in innovation diffusion research are illustrated in Table 2.3. The nature of innovation diffusion and what contributes to innovation success or failure has been comprehensively studied since the middle of the 20th century across continents, cultures and time, in both developed and underdeveloped cultures. Rogers' clear and concise 2003 synthesis covers everything from research history to the most recent criticisms and disadvantages in such research projects published up to the early 21st century. As innovation diffusion is dependent on people, information flow, the structure of their socioeconomic system and natural

Table 2.3. Important factors to consider in innovation diffusion analyses according to Rogers (2003).

CHARACTERISTICS OF THE DECISION-MAKING UNIT *The unit can be an individual, group, company, settlement etc.*	1. Socioeconomic characteristics	Social class or structure, beliefs and religious institutions, level of craft specialization, exchange system types, settlement patterns etc.
	2. Personal variables of adopters	Upbringing, education, experience, personality (innovators, early adopters, early majority, late majority, laggards).
	3. Communication behaviour	Nature of general communication and information channels, level of social connectivity between units and population mobility.
	4. Natural environment	Environmental factors affecting a unit's innovation decision e.g. raw material availability, landscape complexity, climate changes etc.
CONDITIONS PRIOR TO INNOVATION	1. Previous practice	What a considered innovation is replacing.
	2. Felt needs/problems	Reason/s for innovation.
	3. Innovativeness	Prior unit tendencies to innovate.
	4. Norms of the encompassing social system	May not change much during the adoption process unless it is forced.
THE INNOVATION DECISION	1. Optional decision	Individual choice.
	2. Collective decision	Consensus of a group or subgroup.
	3. Authoritative decision	Decision by relatively few individuals with power, status, or technical expertise. Can be a large-scale forcing agent either toward adoption or rejection.
COMMUNICATION CHANNELS *The potential for, and extent of, knowledge distribution has to be evaluated.*	1. Interpersonal	Communication between adopters and their neighbours, family, change agents, opinion leaders, government officials, religious leaders, co-workers, immigrants, travellers etc.
	2. Media	TV, radio, newspapers, magazines, books, letters etc.

KNOWLEDGE OF AN INNOVATION *Evaluation of the level of access to and need for required knowledge for successful adoption.*	1. Awareness knowledge	Information on the existence of an innovation, information can be diffused through interpersonal communication with or without population movement, media or interaction with the innovation itself.
	2. How-to knowledge	Information necessary to use an innovation properly.
	3. Principles knowledge	The functioning principles underlying the workings and production of an innovation. Rarely needed today but could have been crucial for successful adoption in pre-industrial societies.
THE INNOVATION *A. Three intrinsic elements of an innovation.*	1. Form	The observable physical appearance and substance of an innovation.
	2. Function	The contribution made by the innovation to an individual's life or to the social system.
	3. Meaning	The subjective and frequently subconscious perception of the innovation by individuals in a social system.
B. Innovation characteristics within a social context.	1. Relative advantage	Advantage as perceived by the adopter, in pre-industrial society advantage was rarely considered from a strictly economic point of view.
	2. Compatibility	How well innovation fits with the adopter's norms and environment.
	3. Complexity	Innovation can be split into hardware and software; minimal complexity makes re-invention and adaptation easier and adoption more likely.
	4. Trialability	Level of opportunity to test out an innovation without much risk involved, less risk makes adoption more likely.
	5. Observability	Innovation visibility and proximity to potential adopters, the presence of simple blueprints or models is important at decision stages 4 and 5.

environment, there are many aspects that need to be considered e.g. regarding how people learn and communicate, the character of their innovativeness, their education and status within that system. The observer learns the essential elements of any action or behaviour through observation, imitation and experimentation, communicated either verbally or physically. *Innovation diffusion* is therefore strongly related to *social learning* (also called *cultural learning* or *cultural transmission*, see e.g. Eerkens and Lipo, 2007) as both rely heavily on information exchange through interpersonal communication and networks.

For simplification, diffusion scholars have split the complex *innovation diffusion process* into six stages:

1. *Wants/Needs/Problems Identified.*
2. *Research:* Birth/discovery/awareness of an innovation.
3. *Development:* The innovation, its usefulness and compatibility.
4. *Production and distribution*.
5. *Diffusion and adoption:* Introduction and instruction for adopters through *change agents/agencies* and *opinion leaders* and their social networks, resulting in the innovation being either accepted or rejected.
6. *Consequences.*

Rogers (2003, pp. 138-164 and 195) stressed however, that these stages are first and foremost for guidance, as in general diffusion research there are never sharp lines between these stages and very often some of them do not occur and/or happen in a different time order. These stages rarely unfold so neatly, and accidents and coincidences in the innovation process always have to be expected.

The diffusion process can be classified as a *centralized* or *decentralized system*. In centralized diffusion systems completed innovations are introduced by centralized expert sources that diffuse them to potential users, often through rigid planning (top-down diffusion). In decentralized diffusion systems however, innovations originate from multiple local sources (bottom-up) and evolve as they are adjusted to potential users and their situation as the innovations diffuse through *social communication networks.* As with the diffusion stages when actual systems are analysed or constructed, they are rarely so cut and dry and are usually some form of a hybrid of the two. In a decentralized system, innovation adopters can be more in control and manipulate the diffusion process to fit more closely with their needs and problems, but this is only possible when the users are either all experts in the innovation and/or when the innovation is at such a low technological level that intelligent laymen can easily take advantage of it. A decentralized system is most successful when adopters have fairly homogenous needs and live in similar conditions (Rogers, 2003, pp. 394-398).

For our purposes here there are five main threads in the innovation diffusion process that need to be considered in more detail; 1) the *change agents* and the functionality of *social communication networks*, 2) the main stages in the adopters *innovation decision*, 3) the strength of *interpersonal communication channels* and the importance of *opinion leadership* in reaching *critical mass*, 4) the level of innovativeness of potential *adopters* and 5) innovation complexity and its usefulness to potential adopters within a targeted social group.

2.2.3. The change agents and the functionality of social communication networks

A *change agent* is an individual charged, either by himself as an *independent agent* or by a *change agency* (e.g. company or government), with introducing and spreading an idea or innovation to a potential group or individuals to adopt. The change agent serves as a motivational link between a change agency (or resource system) and targeted adopters and facilitates the diffusion of an innovation by establishing communication with early adopters and providing them with suitable technical assistance and solutions. The change agent is a go-between, connecting two worlds and is often regarded by adopters (especially low status adopters) as an outsider with low credibility, especially if he is a government employee or represents other forms of authoritative or high-profile groups or institutions. The adopters' perception of the change agent and his actions reflects their opinions of his innovation so he must be clearly client oriented and fully understand their needs if he is to enjoy higher credibility. If the innovation does not have beneficial consequences for adopters the change agent's reputation and credibility suffers and *innovation negativism* can develop when the adopters' experience results in suspicion and negativity towards all future innovations (Rogers, 2003, pp. 156, 179, 245, 366-377).

The change agent is rarely in a position to persuade people to adopt permanently as his credibility only extends to instructional knowledge, unless he is an independent agent seen by his followers to have nothing to gain. The agent needs to be in a social position between the change agency and the adopters. If he wants to encourage *interpersonal communication* and diffusion of his innovation to the general public, he can only communicate indirectly with people of lower social status through well-selected *opinion leaders* closer to himself on the socioeconomic ladder. An innovation is usually more successful if a change agents' goal from the start is to shift the public to a position of self-reliance. By developing their targets' technical competence and ability to evaluate innovations on their own, the change agent makes himself and his change agency unnecessary (or undetectable) and reduces the chance of public mistrust and later innovation abandonment. Change agents are needed in the diffusion of innovations to *bridge*[8] gaps in technological competence, socioeconomic status, religion and language between their change agency and their focus groups. Such differences make it difficult for change agents to communicate directly with less educated individuals of lower status. The change agents need to set up networks and encourage communication both between and within targeted social groups to spread knowledge of their innovation both horizontally and vertically in a social system (*homophilous* and *heterophilous* connections). Congruity within social classes is very conductive in spreading information horizontally between peers and speeding up the diffusion process but it can also be a barrier, limiting the spread of an innovation between social networks (or social classes) so innovation diffusion has to involve social connections that are incongruent up to a certain degree for information to be able to flow into and between different networks (Rogers, 2003, pp. 304-308, 340-341, 380-386 and 390-391). To minimize social incongruence between change agents and their clients, the change agent must target individuals who are similar to himself, whom he can easily convince to try the innovation and spread the news. In turn they have to be able to connect with others, sometimes lower in the social ladder, and act as their *opinion leaders*. People who have already adopted the innovation they are introducing, i.e. practice what they preach, have a higher level of credibility in their followers' eyes (Rogers, 2003, pp. 383-386).

2.2.4. The five main stages of the adopter's innovation decision

The innovation-development process usually begins with individuals recognizing a need or a problem that needs an innovation solution, or when they are introduced to an innovation that sparks an interest. This creates motivation to familiarize themselves with

[8] *Bridges:* Conducting interpersonal links in a system, especially important in conveying information about innovations, more crucial in diffusion of information rather than the actual adoption decision.

the innovation, test it out and finally adopt it or reject it. The decision process of an individual thinking of adopting an innovation has been split into five stages:

1. *Knowledge:* A person familiarizes themselves with an innovation and its function.
2. *Persuasion:* A person forms an opinion towards the innovation.
3. *Decision:* A person explores an innovation which leads to a choice to reject or try it out more thoroughly.
4. *Implementation:* A person starts using the innovation.
5. *Confirmation:* A person seeks confirmation of an innovation-decision to either commit to it and pass it on to others or reject it permanently.

(Rogers, 2003, pp. 166-170 and 190-199)

Introducing new innovations and ideas will have little effect if an individual exposed does not consider it relevant to his or her needs or feels it to be in contrast to their attitudes and beliefs. If that is the case the innovation does not get past either the knowledge or the persuasion stage. If an innovation is considered potentially useful (whether it be functionally, financially and/or socially) people seek further information through credible sources and near peers. They assess the innovation's advantages and disadvantages to their particular situation and form a more informed positive or negative attitude towards it. An innovation brings with it three main types of knowledge that needs to be communicated to/gathered by potential adopters gradually through the decision process:

1. *Awareness-knowledge*: Individuals become aware of an innovation through communication networks. Movement from this first stage to the second can last from days to decades, if not millennia.
2. *How-to-knowledge*: Directions on how the innovation works, how it is used.
3. *Principles knowledge*: Information regarding the *functioning principles* behind an innovation, how it is made and why it works (Rogers, 2003, pp. 172-173).

Awareness-knowledge is essential to adopters at the decision stage when they are forming their opinions and modern change agents are advised to focus mainly on this aspect of the innovation in their diffusion efforts. Usually people do not adopt an innovation without testing it first to experience first-hand whether it can be useful and assimilated to their own situation. Observing peers adopting an innovation successfully can in part substitute for personal experience. The decision stage is concluded with either acceptance or rejection of the innovation, although it does not exclude later abandonment. If the innovation is accepted the implementation stage is largely about continued use, thinking and deciding whether the innovation can be a permanent addition to the adopters' reality or if he runs into logistical problems that cause him to later reject it (Rogers, 2003, pp. 172-173 and 390-391). The knowledge and decision stages of the innovation-process are easier to differentiate than the others. Passing through the innovation-decision process takes most individuals a long time that can be measured in years. Even though an innovation is finally accepted there is nothing to guarantee that it will not be discontinued later in time if socioeconomic conditions change and/or it loses its usefulness (Rogers, 2003, pp. 166-202 and 214-218).

2.2.5. Interpersonal communication channels and the importance of opinion leadership in reaching critical mass

Individuals communicating and exchanging ideas and experiences of innovations through *interpersonal communication channels* drive the diffusion process. Such communication is very important at the persuasion stage and all later stages in the innovation-decision process. Strongly held beliefs and attitudes are rarely changed unless it is through personal communication between peers connected by interpersonal channels. All individuals are part of a *personal communication network*, a group of people with shared characteristics and often close in physical distance. Network links within such groups are easier and more straightforward than outside them. Generally, information flows in patterns through *communication networks* between interrelated individuals. These patterns have elements that have been differentiated and classified. Messages move between people through communication channels that have been categorized into two groups depending on (a) who/what drives the information forward and (b) where it comes from:

a. *Interpersonal* and *mass media channels*
b. *Localite* and *cosmopolite interpersonal channels*

Mass media channels (e.g. publications, television, radio) are most important during the knowledge stage in modern innovation diffusion. The concept of *interpersonal channels* is used to represent face-to-face information exchange between two or more individuals. Such exchange is especially important when peers are persuading each other to move beyond their comfort zone and change habits by adopting unfamiliar ideas. Interpersonal channels also have to be able to cross social hurdles, e.g. when individuals look for information from opinion leaders that are physically close but more educated, of higher socioeconomic status and have further reaching social networks. In underdeveloped countries *cosmopolite interpersonal channels* occupy the place of mass media, linking people with outside sources that do not belong to their social group. Such channels include contact with change agents and travellers moving in and out of a social system. Like the change agents, cosmopolite channels are most important at the knowledge stage, as innovations have to move between social systems and levels for them to diffuse (*weak ties*). Opinion leaders and early adopters are more likely to be exposed to cosmopolite channels. They then act as *interpersonal localite channels* during the diffusion process for their less change-oriented peers (Gunnar Karlsson, 2001; Rogers, 2003, pp. 204-208, 212-213, 307-308, 337 and 341-342).

Innovation moves through interpersonal networks and *opinion leadership* has been proved very important in the diffusion process. *Opinion leaders* are trusted role models, active members that adhere to fixed norms in a social system. In diffusion research they have been observed to have higher technical competence and higher socioeconomic status than later adopters but still remain socially acceptable. Their networks are more cosmopolite than of the average individual as they have extensive interpersonal network links and good access to mass communication channels and change agents. This makes them an influential portal for new ideas into a system and their social position enables them to influence other individuals' general attitudes or behaviour. Such individuals however are few in a social system as most people have very little chance to influence change in any considerable way. Opinion leaders can be *monomorphic* or *polymorphic* depending on whether they act as leaders for one or more topics. In developing countries authority figures in society are often leaders in opinion on a multitude of important topics e.g. education, politics, religion, fishing and agriculture. When change agents recruit possible opinion leaders their efforts are magnified, and their diffusion campaigns are more likely to be successful. In modern diffusion research change agents seek out knowledgeable individuals (e.g. religious leaders, administrative officials, long-time residents in a social system) in a position to identify influential social role models capable of serving as opinion leaders, but opinion leaders can, like change agents, also be self-designated. The general public seeks guidance about innovations from peer opinion leaders that are seen as being more knowledgeable and/or technically competent. They reduce uncertainty in the adoption of innovation by communicating to their followers the appropriate information needed to be able to start trying it out without further outside help. Opinion leaders are the product of a social system with norms and beliefs and they mirror that system. If the social system favours change the opinion leaders are innovative and also favour change, but if the system is traditional the opinion leaders are not very innovative, and their community is more likely to remain traditional. Where a social system is faced with more significant changes however, people are often divided, but the opinion leaders are the ones that lead progress by experimenting with new innovations and ideas before others in their community (Rogers, 2003, pp. 308-320 and 388-390).

Individuals have adoption *thresholds* while social systems (e.g. communities or social groups) have a *critical mass*. The average individual is very aware of their social place and needs a given number of peers in their social group to adopt an innovation successfully before they can be convinced to follow suit. Innovators and early adopters have a low threshold and launch the diffusion process, while later adopters have a higher threshold for innovations. Once opinion leaders in a system adopt an innovation and start endorsing it, the number of followers in their personal network system increases exponentially, and their cumulative efforts become more and more effective and widespread as more people adopt (the *diffusion effect* or *contagion*, see Valente 1995, p. 12). The critical mass in a social system usually involves opinion leaders and it is reached when the number of adopters has increased to such a level (>3-16% adoption in most systems) that further adoption becomes self-sustaining simply by its own social momentum. The critical mass is stronger when the early adopters are influential, highly respected and central within a social network. After critical mass is reached the innovation spread cannot be stopped, it assimilates to the social norm and further adoption becomes easier for individuals with lower thresholds, although some innovations never diffuse to an entire population or social group (Rogers, 2003, pp. 223, 300, 343-362 and 388; Valente, 1995, pp. 79-90).

2.2.6. The generalised adopter categories

People adopt innovation over time, but some are quicker off the mark than others. Rogers' stressed that at the start of any diffusion project it is crucial to identify who actually make the innovation decisions within a chosen social system in order to be able to direct introduction efforts towards the right people. Through diffusion research it has become clear that successful innovation distribution results in a majority of cases (although not always like e.g in the case of innovations that cannot be discussed freely for some reason like AIDS prevention and contraceptives) in a normally distributed bell-shaped *frequency curve* and an *S-shaped cumulative adoption curve* (see also e.g. Henrich, 2001; Valente, 1995). The S-curve is formed as the adoption process usually starts off slowly (*take-off stage*) before it accelerates up to a point when 50% of the system members have adopted (*intermediate stage*) before the adoption curve starts to slow down again and finally peters out (*saturation stage*). According to Hägerstrand the curves' level of symmetry can vary, especially at the take-off stage which can show considerable variation in length, i.e. have a short or long initial tail (Hägerstrand, 1968, p. 174). When more than 20% of adopters have accepted an innovation in a system it may be impossible to stop its spread. Based on the normal frequency distribution and the premise that human traits (e.g height and intelligence) are generally normally distributed, Rogers grouped adopters in a social system into five categories depending on their innovativeness (Figure 2.2); 1) *the venturesome innovators* (2.5%), 2) the *respected early adopters* (13.5%), 3) the *following early majority* (34%), 4) the *sceptical late majority* (34%), and 5) *the traditional laggards* (16%). Innovators and early adopters can be of various age but are generally of higher socioeconomic status, better educated, have a greater opportunity of upwards social mobility and are more socially active. They are more travelled individuals that are well-connected both outside and inside their social system. They actively seek information and display a more positive attitude towards innovations and change than later adopters and laggards (Rogers, 2003, pp. 272-285 and 297-299; see Figure 7.3 p. 281 and also early vs. late knowers p. 174).

2.2.7. Innovation complexity and its usefulness to potential adopters

Innovations have many sides and consequences that need to be considered by potential adopters during the diffusion process. In diffusion research an innovation has to be viewed in terms of:

1. *Form:* the innovation's physical appearance and material composition.
2. *Function:* its contribution to the life of a person/group in a social system.
3. *Meaning:* subjective/unconscious assessment of innovations by person/group.

(Rogers, 2003, p. 451)

Ordinary people are reluctant to try out a new innovation if there is much risk involved, whether it is social, physical or financial. Being able to easily observe an innovation in

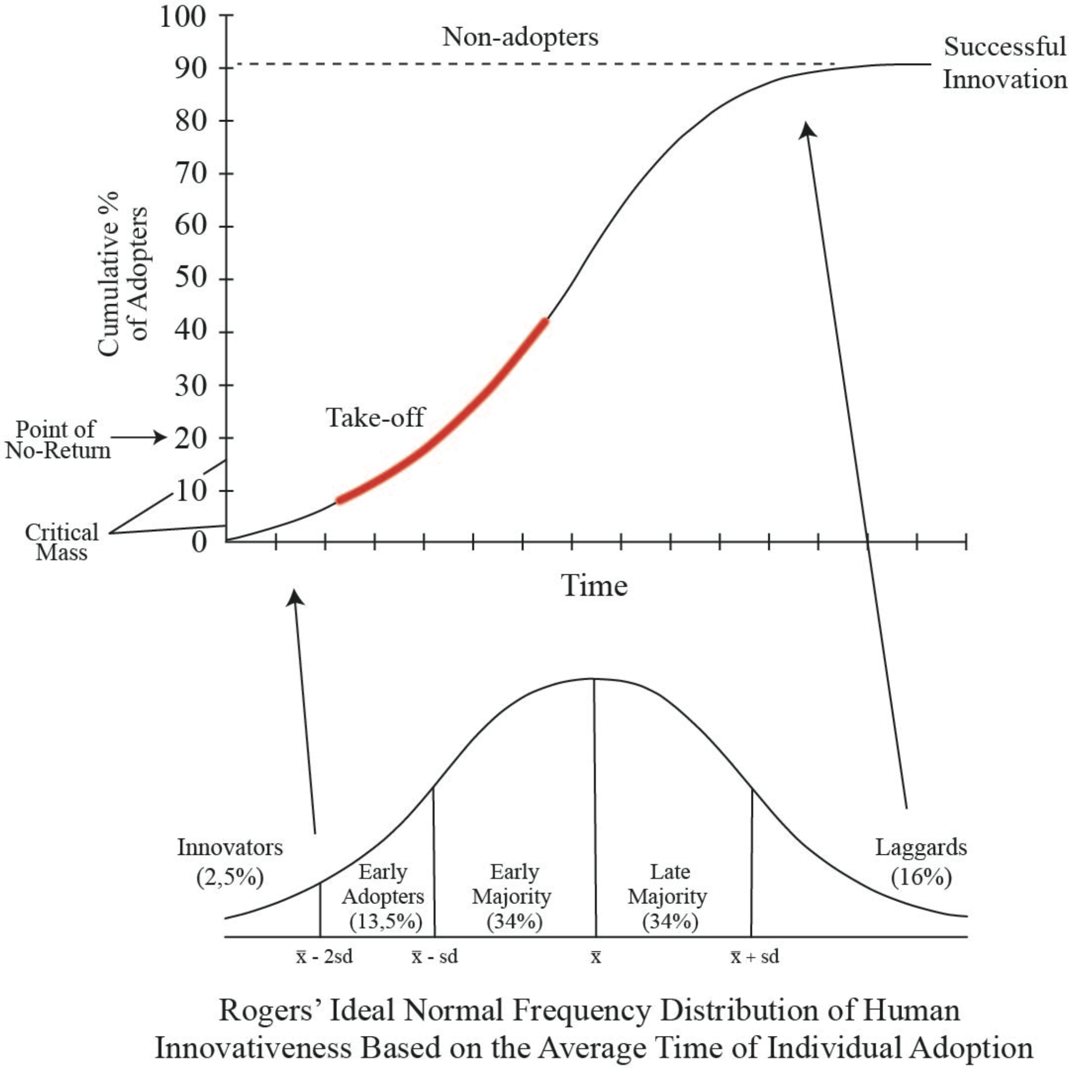


Figure 2.2. An ideal example of an S-shaped accumulation curve of one successful innovation diffusion (above) and Rogers' suggestion for adopter categories based on their level of innovativeness. The figure is a reconstructed combination of figures 1-2 and 7-3 in Rogers, 2003, pp. 11 and 281 (see also Rogers, 1969, pp. 291-301).

action through trusted peers and to try it out themselves without much cost or effort in order to witness its usefulness first-hand goes a long way in helping an innovation diffuse, especially if they can make it themselves. According to Rogers (2003, pp. 180-187 and 221-223) the main attributes of innovations and their introduction that influence adoption in a social system are:

1) *Observability and trialability.*
2) *Relative advantage and compatibility to the members in a social system.*
3) *Innovation complexity and potential for re-invention.*

When an innovation is clearly visible in society, easily observed and communicated from person to person, the rate of diffusion increases. To increase the *observability* of an innovation, change agents often set up demonstrations of innovations through peers or opinion leaders. Change agents also often attempt to speed up diffusion and make innovation testability and individual behaviour change easier for targeted adopters in a system by offering *incentives,* e.g. by lowering the starting costs with free samples, giving out rewards in cash or in kind for use, distribution and/or production. Trialability is more important for early adopters in the beginning stages of diffusion as later adopters often follow the opinion of their peers already using an innovation. The diffusion of an innovation is usually successful if its *relative advantage* is clearly visible to the targeted audience and individuals trying them out can feel the benefits within a short amount of time. In modern diffusion research preventive innovations (e.g. vaccinations and condoms) are very difficult to introduce, as their advantage is not clearly experienced, and their benefits take a long time to become apparent. Relative advantage has to be perceived as being better than the norm and can include e.g. positive economic return, improving social status and/or the saving of time and energy. It is interesting to note that through diffusion research it has become evident that in developing nations the economic aspect of innovations (e.g. financial return) are considered less important to peasant farmers than social approval. Potential gain in social status can be highly motivating but it is mainly a strong impetus for adopters early in the innovation process: the *innovators*, *early adopters* and the *early majority*. Adoption for status gain can even result in *overadoption*, i.e. the out-of-control acceptance of things that are useless and even harmful to the adopters involved. The innovation's *compatibility* with the adopters' values and beliefs, needs and everyday work routine is also very important, but it has been found to be less important than relative advantage. When these aspects are met to the satisfaction of a potential adopter the diffusion process is easier and moves at a faster rate. Individuals have to view and interpret an innovation through their life experiences within an often deeply rooted and unforgiving social system. If the innovation is not strongly compatible with social norms the uncertainty and risk is increased and the adopter has a harder time in assimilating the innovation to their reality. Packing two or more closely interrelated innovations together (*technology clusters*) has been found to facilitate diffusion, especially when they are functionally inter-related (Rogers, 2003, pp. 14-15, 229-236 and 240-250).

Last, but not least, we have to consider the *complexity* of the innovation itself and the potential and advantages of *adaptation* and *reproduction* in the diffusion process. Innovations rarely have similar or completely fixed components, as one is more complex than another, and re-inventions and/or adaptations are often possible, if not essential, to diffusion success. An innovation is essentially composed of *hardware*; the physical innovation and the materials needed to make it, and *software;* the information covering how and why it works and how to use it. If an innovation is too complex to understand in the context of the adopters' *indigenous knowledge system* this complexity can be a barrier, the rate of adoption is slow, and the innovation is more likely to fail. We have mentioned that *principles knowledge* is considered largely unnecessary in the diffusion of modern innovations but regarding potential for re-invention/adaptation that knowledge is crucial. Higher potential in innovation adaptation and easy reproduction results in a faster rate of adoption and a higher degree of sustainability after diffusion efforts end. Adopters can be classified as *active modifiers* and *passive acceptors* of innovation. Individuals at a higher level of craft specialization are often first to adopt and when innovations are more flexible these individuals can play a role in the implementation stage in redesigning and adjusting the innovation's parameters to their own situation and solving logistical problems along the way. This also benefits less knowledgeable later adopters within their social system and successfully adapted innovations can fit into a wider range of social conditions. When considering the degree of adaptation most *core elements* of an innovation can be sorted and analysed to identify similarities and differences between the originals and the copies. Adaptation is often a simplification and it is easier when the core elements are only loosely related and flexible. It was discussed above that innovation diffusion has been shown to be more successful when a change agents' goal is to make adopters self-reliant from the start. Encouraging and teaching adopters to change and adapt innovations to their situation very often helps adopters consider the innovations more as theirs and increases the chances of successful innovation diffusion (Rogers, 2003, pp. 152-153, 164-165, 180-187, 219-259 and 451).

2.2.8. Adding the archaeological material perspective: Schiffer's performance characteristics and Searcy's metate life cycle model.

Essentially Rogers does not provide any tools to break down the core elements of an innovation or how to estimate or measure innovation complexity. To help us evaluate in more detail what material aspects need to be considered in the adaptation and reproduction of the Icelandic quernstone during its diffusion we look to Michael Schiffer's (2010) behavioural archaeology and Searcy's (2011, p. 8) model of the metate life cycle. Similar to Rogers (2003, p. 101) Michael B. Schiffer (2010, p. 100) has also suggested that models and frameworks need to be kept sufficiently general and abstract in order to aid later researchers in forming questions and trusty interpretations of their specific cases. At the same time, it should not prevent them from expanding and readjusting said models for the future. In Schiffer's opinion developing a reliable *technology-transfer-model* (Schiffer, 2010, pp. 91-96) from the artefacts' perspective is necessary in order to focus more directly on material culture and its development and interaction with its social and environmental contexts. His model was meant to help analyse invention, modifications and redevelopment (re-invention/adaptation/ reproduction) of technologies during their formulation and integration. Clear parallels can be drawn between the basic tenets in Schiffer's approach and Rogers' earlier synthesis of sociological approaches to innovation diffusion as they both formulate general step-by-step headings to aid in the breakdown of various complex processes and their interaction. The only essential difference between Schiffer's approach and Rogers' is that the former considers material culture evolution through the narrow lens of technological characteristics, while the latter considers more the wider socioeconomic aspects. Schiffer (2010, p. 91) considered the *life history* of a *technology type* or artefact to consist of four stages very similar to Rogers' earlier classifications (see above):

1) *Invention* (classified as one type of innovation by Rogers).
2) *Replication or manufacture* (adaptation/production).
3) *Adoption* (acquisition and/or consumption).
4) *Senescence* (consequences/developments after manufacture and acquisition stop; following Kacy Hollenback).

Schiffer also suggested that pertinent technological knowledge has three major components:

1) *Recipes*: raw materials, tools and furnishings, the knowledge base available for production, use and problem solving (Rogers' *how-to knowledge*).
2) *Teaching frameworks*: Human communication and interaction in order to transmit skill and know-how through e.g. imitation/demonstrations, verbal instructions, trial and error, practice (i.e. *cultural transmission, experimentation* and *education*).

3) *Techno-science*: operational principles of technology (Rogers' *principles knowledge*).

As there is little difference between Rogers' and Schiffer's stage classifications, mainly Rogers' terminology will be used here as it is older and more user-friendly. In 2011 Michael T. Searcy (p. 8) used Schiffer's ideas of artefact life history to formulate a life cycle model for the Central-American metates and manos during his study where he split their life cycle into five interconnected stages:

1) *Manufacture*: The nature of raw material procurement, transport, available tools, production methods, product storage etc.
2) *Purchase/exchange*: Its marketing and its place in exchange (goods/money/gift etc) and relative importance within the socioeconomic system.
3) *Storage and/or use*: How it is stored and its place and importance within daily life in the home/workshop.
4) *Breakage*: Nature of use life, and level of wear and tear, potential for reuse.
5) *Reuse and/or discard*: level of innovation reuse and where and how it is discarded.

These headings can easily be reused to help focus the research of the Icelandic quernstone and aid in the interpretation of its production revival.

Schiffer views technological development as a reaction to any kind of shift in environment (or *lifeway factors*) and/or what he calls *producer pressure* caused by competition in a craftsman's environment, whether it be economic or social (see also Hodder, 2012 for discussion on human-thing engtanglements and their influence in culture change). In Schiffer's view this shift forms a need for technological alternatives and/or adaptations that cause alterations resulting in either evolution or regression in technological development and processes, as well as causing a knock-on effect within an artefacts chain of existence, or its *behavioural chain*. Schiffer provides us with more detail to add to one of Rogers' five *innovation characteristics*, i.e. *innovation complexity* as it pertains to adopters, by considering the *performance characteristics* (both symbolic and functional) of artefacts, a concept somewhat similar to Hayden's vague idea of *adaptive variance* (Hayden, 1978; the possibility of somehow estimating the complexity and/or influence of a diffused trait on a receiving system). Following Bleed (1986) Schiffer (2010, pp. 97-100) and Skibo split artefact *performance characteristics* into two *families*:

a) *Ease of manufacture:* potential for raw-material procurement, material processing and manufacture (adaptation/re-invention/reproduction, flexibility of core elements).
b) *Ease of maintenance:* potential for maintaining and continually using artefacts (innovation continuance and integration).

They stress that to come closer to detecting or explaining potential technological changes all performance characteristics thought to be relevant in any artefacts' *behavioural chain* should be *valued* and listed in a *performance matrix* in order to identify any *performance priorities* to aid in the dissection and understanding of that change (similar to Rogers' ideas on the evaluation of an innovations relative advantage and disadvantage).

To conclude, combining together the various approaches of Rogers, Schiffer and Searcy, they essentially suggest six main factors that need to be considered when estimating the complexity of material innovation or innovation composites in order to identify potential reasons for acceptance or rejection, and to estimate the scope for innovation adaptations and its continuance during diffusion:

1) *Ease of initial observation and access to relevant information* (awareness, principles and how-to knowledge), *both pre-existing and new.*
2) *Ease of application and relative advantage of use* (trialability, level of comfort, time and work savings).
3) *Ease of maintenance* (e.g. frequency and cost of repairs, tools and spare parts) *and innovation durability.*
4) *Ease of continued manufacture* (e.g. complexity/interchangeability of core elements and availability/expense of raw materials, parts or tools).
5) *Ease of acquisition* (access to/production cost of innovation for prospective buyers) *and demand*.
6) *Socioeconomic profitability* (profits/prestige) *and compatibility* (ideological context; religious, political etc.).

2.2.9. Spatial Scales and Patterns in Innovation Diffusion

Finally, before we dive into the quernstone production revival we also need to briefly consider how innovation diffusion is observed in space. According to Rogers' innovation diffusion can often have unpredictable consequences. He considered innovation diffusion consequences from the perspective of the individuals and/or social systems involved and classifies them as *direct to indirect*, *anticipated to unanticipated* and *positive to negative*. In his view the desirable outcome of an innovation diffusion project would be integrating an innovation into a society in a positive and dynamic way, without causing *disequilibrium* or creating/further exasperating social inequalities, but too often it did not work out that way (Rogers, 2003, pp. 436-471). However, this would certainly not have been a concern in the 18th century where the clarity between class distinctions was commonly very desirable. Other important consequences of the innovation diffusion process are spreads and/or concentrations of knowledge and material things in time and space; appearances and disappearances (acceptance vs. abandonment) and typological changes of artefacts that can form complex distribution patterns when mapped. However, Rogers (2003, 90-91) only briefly mentions the importance of geographical space in innovation diffusion and does not go into much detail beyond mentioning Swedish cultural geographer Torsten Hägerstrand and his very influential 1950s computer simulations of the diffusion process through varied cultural traits, like e.g. the telephone and the car. In 1968 Hägerstrand wrote a short summary on innovation diffusion where he suggested that research into modern and historically recorded diffusion events could help with the interpretation of the past, similar to what Margaret T. Hodgen (1942 & 1950) had done before him. In his view diffusion developed in two dimensions, the spatial and the social, as the diffusion process progressed through human contact within a social network. He pointed out that diffusion could be considered at varied levels (individual, urban/rural, regional and/or national) and occasionally even had to be considered at all of them to properly understand observed diffusion patterns. Through his research he suggested four stages in spatial diffusion which were reflected in the S-shaped accumulation curve (or *curve of cumulative growth*; see discussion above and Figure 2.2):

1) *Primary or take-off stage* → centres or clusters of cultural traits emerge.
2) *Diffusion stage* → hold-up in primary centres, spreading increases in other areas, new centres appear, and regional contrasts are evened out.
3) *Condensing stage* → use/spread of cultural traits gradually increase within all areas, usually happening fast.
4) *Saturation stage* → further increase is impossible without change in given conditions.

Hägerstrand observed the stages passing in succession but stressed that none of the stages necessarily developed to the end, resulting in complex geographical patterns that needed to be interpreted within their social context (Hägerstrand, 1952, pp. 16-17). Within

Hägerstrand's urban contexts, innovations were observed to commonly diffuse from larger to smaller centres (*the hierarchy effect*). On the ground at the individual level, the *neighbourhood effect* or the *contagion effect* (i.e. neighbours observing and influencing each other's adoption behaviours more than others further away, e.g. through interpersonal communication), caused innovation to expand outwards from the centres of spread similar to a wave, unless they hit areas of e.g. cultural differences, settlement gaps or natural barriers, stopping diffusion or forming pockets of non-receptive areas. In more rural environments the neighbourhood effect was considered more influential in innovation diffusion but Hägerstrand also pointed out the importance of estimating the *spatial range* of the various participants (the geographical extent of their social network) within the receptive diffusion systems. Occasionally, unpredictable jumps of varied lengths beyond the wave fronts occurred, forming new diffusion centres through time, while behind the fronts, adoption gradually condensed and finally reached saturation levels when the innovation had caught every potential adopter (Brown, 1981, pp. 20-22; Hägerstrand, 1968, pp. 174-176). In a synthesis of innovation diffusion research 30 years after Hägerstrand's first findings, Lawrence A. Brown (1981, pp. 40-45) split the spatial perspective into two categories, the *spatial scale* and the *spatial form*. He stressed the importance of being aware of the varied geographical scales of innovations diffusion, which he split into *national, regional* and *local scale*, with each connected by an *interface*. Just as Hägerstrand had done before him, Brown also noted three main spatial patterns that had been observed through varied diffusion research projects; *hierarchical*, *neighbourhood/contagion*, and *random patterns*, that could manifest themselves in different combinations at each level, most often two or three types mingled together. Whether or not these observed patterns can be utilised in any way to understand the Icelandic data, however, remains to be seen.

2.3. The Guiding Paradigm

Rogers' innovation diffusion paradigm was gradually developed and tested in the second half of the 20th century through diffusion research within rural sociology on multiple continents, and in the last two decades it has been slowly finding its way into archaeology. General quernstone research, however, didn't really take off until the 1970s in the United States, Great Britain and Europe and only established its footholds in Scandinavia at the beginning of the 21st century, mainly in Sweden and Norway. Such research has mainly been directed towards raw material procurement and provenance, production methods and reconstructions of trade networks, while interest in quernstone typology and its diffusion in social space has lagged somewhat behind. In Iceland, interest into the history, import and indigenous production of quernstones can be traced back to the late 1960s but detailed research of this artefact group only began in 2012. Over six years the history of the Icelandic quernstone was examined in detail from every angle. The quernstone database was compiled during field work between 2012 and 2016. It now contains information on 490 quernstones and fragments, found both in private ownership and in museums.

The Icelandic quernstones' recorded history has revealed an interesting example of a late-18th century innovation diffusion episode that can be historically reconstructed and directly compared to the resulting artefact assemblage and any changes that may have occurred as a result. In order to analyse and understand this innovation diffusion episode, three key aspects and their interconnectivity need to be carefully considered:

1) the people and their pre-existing knowledge base, their communication behaviours and innovation decisions,

2) the complexity of the innovation(s) in question, and

3) their directive spatial surroundings.

Innovation diffusion can develop in varied forms and result in different combinations of spread patterns (hierarchical, contagion/neighbourhood and/or random) across and between interconnected national, regional and local spatial levels. At each level, varied social, ideological, political and natural forces can mould and shape human decisions (Figure 2.3) as well as the innovations and their spread in a variety of ways. Administrative and geographical factors can direct and/or hinder information flow and formations of innovation centres, and restrict population movement. Access to and availability of natural raw materials can hinder or encourage reproductions and adaptations, and human ideologies can bolster or discourage innovation acceptance. To understand innovation diffusion, it is therefore also important to consider previous conditions and what the innovations are supposed to improve or replace, the characteristics of the decision-making unit, and the nature of the innovation decisions.

The decision can be authoritative, a group effort or simply a personal preference, and range from being meticulously planned and strictly executed by change agents and/or agencies, to being unintended and completely random. Consequently, it is important to identify the basic units of acceptance and who are the main axles in particular innovation

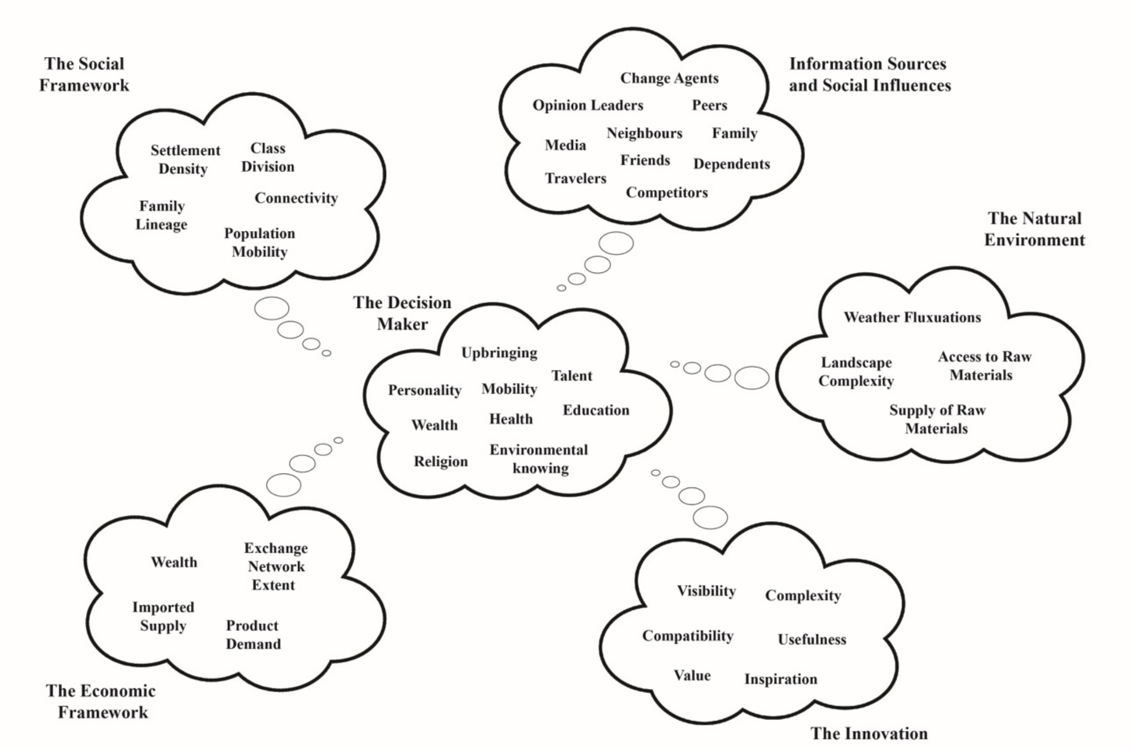


Figure 2.3. Varied forces acting on decision makers during innovation diffusion.

decisions at every level, to be better able to understand innovation reception and spread. Potential innovation adopters can be roughly split into those who create and those who buy (innovators/active modifiers, early and late adopters/passive acceptors), those who hang on (side-adopters) and those who don´t participate at all (non-adopters). Innovativeness and curiosity can be found within all social classes, as can cautiousness and backwardness. All people can form positive and negative views towards different innovations, but the more affluent, educated and socially connected are more likely to participate in innovation, unless incentives are used to lower risks and uncertainties to encourage more cautious people to join in.

For a material innovation to spread widely, many different adopters have to have an opportunity to test out the innovation and/or observe it in action. The population must preferably be strongly socially interconnected and/or mobile, both within and between levels and communication pathways must be far reaching for optimal distribution of information and knowledge in space (weak and strong links, local and cosmopolitan network connections). It is also important who presents the innovation and where it comes from. Opinion leaders are important initial targets if an innovation is to be accepted and they can also increase the rate of adoption. Experienced relative advantage of an innovation can be social, political and/or economic, as indeed, can the varied pressures in the adopters' environments. The innovations themselves and/or social and political influences seduce, infect and breach individual innovation thresholds and cause critical mass in the accepting systems, and sometimes even overadoption of innovations, seemingly without rhyme or reason.

Adopters must have access to enough pertinent information about how to use it and, if it turns out to be relevant and compatible to their wants and/or needs, preferably be able to reproduce it for themselves and others. How useful the adopters' pervious education and level of craft specialisation is, to facilitating the continuance of the innovation, depends on the complexity of the innovation itself. Continued usage and further spread also depends on the access to and/or cost of raw materials for the innovations' core elements, the amount of effort needed to maintain it and its durability. The innovations' cost affects the potential for other adopters to acquire the innovation easily enough, i.e. for those not in a position or willing to make it themselves. Successful diffusion results in the innovations' seamless or dynamic integration into to the receiving social structure along with varied typological developments and adaptations, but it can also cause problems, disequilibrium and even collapse as innovation consequences slowly come to light. Seamless integration does not necessarily ensure 100% saturation, however, or exclude the possibility of later abandonment of an innovation if conditions change down the line, as indeed happened with the Icelandic quernstone in the early 20th century, but that is the back-end of the story.

It will be revealed in the coming chapters whether the happenings in the late-18th century quernstone revival can be reconstructed and interpreted through this 21st century synthesis of innovation diffusion. In Chapter 3 the characteristics and practices of the Icelandic socioeconomic system prior to the innovation introduction are laid out to give general context. With the aid of extensive pre-existing historical research, a picture is painted of the nature of the main Danish and Icelandic governing forces, both religious and secular; the external and internal trade environment; information exchange and available media; education and apprenticeships, and the schedules of people's everyday lives. An attempt is also made to explain the extent and direction of general population mobility around the island and, through the diaries of a young 19th century farmer and scribe, the strong interconnectedness of the community in daily life, to demonstrate that information pathways and public communications were generally strong and widely linked, despite primitive means of travel and underdeveloped road systems.

In Chapter 4 the origins and developments of the innovation ideas and decisions (i.e. the failure of the cereal cultivation revival and the resulting compromise of imported unground grain and quernstones) and the governmental introduction tactics (information distribution, rewards, free querns etc.) are collated from scattered historical documents into a fairly coherent narrative. The roles and general influences of change agents and other initial participants and potential opinion leaders in the projects are outlined and the extent of potential demand for locally produced quernstones is roughly estimated based on average cereal consumption and imported unground grain. It is also considered whether the government tactics, especially the imported grain and quantity of imported querns and already produced quernstones, may have had the potential to trigger critical mass within the social system, i.e. ensuring sufficient momentum for the innovation to continue spreading without further government involvement, regionally and nationally. To conclude, an attempt is made at a rough approximation of what the acceptance accumulation curve may have looked like in terms of the acceptance of quernstones and unground grain from the available historical data.

As querns and grain were being imported, many men formed an opinion whether to buy and/or make a quern for testing and/or selling. Specific details of individual innovation decisions will never be approachable in any detail so long after the fact. But querns had to be produced locally and historical documents provided the names of many men (farm hands, farmers, craftsmen and priests) who were willing to take part in such production in the late 18th century and later. To get at least a little closer to any possible incentives or reasons these active modifiers might have had in making quernstones and the geographical extent of their social networks, in Chapter 5 their age, occupation and social standing are considered in detail. Their potential as opinion leaders, their mobility and interconnectivity are also evaluated in order to determine how far they would have travelled for work and how far and how effectively they could have spread their opinions and handicraft.

In Chapter 6 the archaeological results of this innovation episode, the Icelandic quernstone assemblage, is considered with regard to what range of raw materials (i.e. stone, wood, iron) were actually used to make a functional quernstone and any detectable changes in typology, before and after the quernstone production revival. The only raw material that actually needed some serious fresh consideration with regard to availability and transport were the serviceable local rock types necessary to make a good quernstone and Chapter 7 is dedicated to forming an idea of their availability, proximity and accessibility to the general farmer and craftsman in Iceland, and of the nature of general quernstone acquisition.

Lastly, Chapter 8 considers the innovation factors; the varied costs and profits, pros and cons in accepting, producing and using unground grain and quernstones, rather than cultivating cereals themselves or sticking to the status quo and ready ground meal. To tie the final bow, the general picture of this innovation diffusion episode and main deductions and conclusions are drawn together in Chapter 9, along with a short discussion of the advantages and shortcomings of this approach and further necessary research. To begin this journey the attention will now be directed towards introducing the general Icelandic socioeconomic context in the late 18th century.

~ Chapter 3 ~

The Icelandic Socioeconomic Context for Innovation Diffusion in the 18th Century

Understanding the general socioeconomic context plays a crucial part in successfully entangling an episode of innovation diffusion, as well as understanding how ideas and opinions spread and why and how innovations are adapted and developed, during innovation introduction, their acceptance or rejection. The aim of this chapter is to give the reader a modest overview of the general Icelandic socioeconomic conditions that the innovation pair was introduced into during the second half of the 18th century, to better understand the myriad of forces at play during this episode of innovation diffusion. The chapter has been split into six sections. The first section focuses on describing the internal governmental organisation and administrative regions, and the main roles of government and church officials, while in the second section the foreign trade environment is introduced. This part of the overview is mainly based on existing research by Árni Daníel Júlíusson (2013a), Gísli Gunnarsson (1987, 2017), Gunnar Karlsson (1964, 2009), Lýður Björnsson (1998, 2006), Loftur Guttormsson (2000), Harald Gustafsson (1985) and Einar Laxness and Pétur H. Árnason (2015), among others. In the following four sections 3.3.-3.6, the focus is directed more towards painting a picture of the Icelandic peasant community, the publics' busy work schedule and their general sustenance, education, population mobility and information exchange. This latter part of the overview is largely based on the research of Jónas Jónasson (1945), Lúðvík Kristjánsson (1982, 1985), Sigurður G. Magnússon (1997), Jón Jónsson (1998), Jón Þ. Þór (2002) and Árni Daníel Júlíusson (2013a), among others.

The Icelandic socioeconomic structure was simplistic and rigid, but the populations' interconnectivity in daily life through cooperation and communication was strong, and seasonal mobility was frequent and often far reaching. The island was without villages, guilds or formal vocational education and import of basic and affordable necessities often left something to be desired. In turn however, the population was adeptly self-reliant and self-sufficient, and well-practiced at working with varied types of raw materials during general handicraft, both for the general running of the household and other external good-exchange beneficial to it.

3.1. The Nepotistic Oligarchy: Icelandic Governing Forces

3.1.1. The Secular

From the mid-17th until the early 20th century Iceland was a dependency of the Danish monarchy. During this time all executive and legislative authority was formally in the hands of the king, and the Danish Exchequer (isl. *Rentukammer*) in Copenhagen largely directed Icelandic socioeconomic affairs on his behalf. The king's general representatives (Figure 3.1) in Icelandic affairs were a governor (isl. *stiftamtmaður*), regional governor/s (isl. *amtmaður*) and a royal treasurer (isl. *landfógeti*). The governor was usually a Danish official who never resided in Iceland until after 1770 when Lauritz Andreas Thodal took office and moved to Bessastaðir (Figure 3.2). Icelanders never held the office of governor with the exception of Ólafur Stefánsson, who held it between 1790 and 1806. Originally there was only one regional governor who resided in Iceland but in 1770 the island was split into two administrative regions (isl. *amt*), *Norður-* and *Austuramt* and *Suður-* and *Vesturamt*. Seventeen years later, Suður- and Vesturamt was split permanently into *Suðuramt* and *Vesturamt,* which remained separate regions until the early 20th century. Iceland therefore had 1-3 regional governors in the 18th and 19th centuries. In the beginning they were mainly Danish, but after the mid-18th century it became more common that they were Icelandic. The regional governors oversaw all general judicial, educational and ecclesiastical administration in Iceland that was considered outside the purview of the church. The most influential regional governors in Iceland during the second half of the 18th century were major landowners Magnús Gíslason (1752-1766) and his son-in-law Ólafur Stefánsson (1766-1793), along with Stefán Þórarinsson (1783-1824), son of the sheriff of Eyjafjarðarsýsla. Hans von Levetzow was also a foreign regional governor in the south between 1787 and 1790 but his main contribution was strengthening the postal service between government officials and the trading posts. The royal treasurer also resided in Iceland and handled the kings' finances, oversaw his properties through royal stewards (isl. *umboðsmaður konungseigna*) and monitored trade affairs. The first Icelandic treasurer was Skúli Magnússon (1749-1793), also a major landowner, and after his tenure the office was held either by a Dane or an Icelander until it was abolished in the early 20th century (Einar Laxness and Pétur H. Árnason, 2015, pp. 27, 303-304, 411-412 and 478-479; Lýður Björnsson, 2006, pp. 15-19; Páll Ólason, 1950, p. 421; 1951, pp. 81-82, 291-292 and 339-340).

The main administrative regions were split further into counties (isl. *sýsla*) headed by sheriffs (isl. *sýslumaður*; Table 3.1), numbering between 18 and 21 (Figure 3.2). The counties were split into around 160 yet smaller rural districts (isl. *hreppur*). Each district had at least 20 assessed farms (isl. *lögbýli*) and was headed by 1-5 district officers (isl. *hreppstjórar*). The king appointed, or had to give official approval, for all candidates applying for the highest administrative offices from the sheriffs up. The Supreme Court in Copenhagen was officially the highest judicial authority in Icelandic affairs while the island's internal judicial body was the Icelandic parliament or *Alþingi*. *Alþingi* was held once a year in Þingvellir for 1-3 weeks in July. Heads of parliament were two lawmen

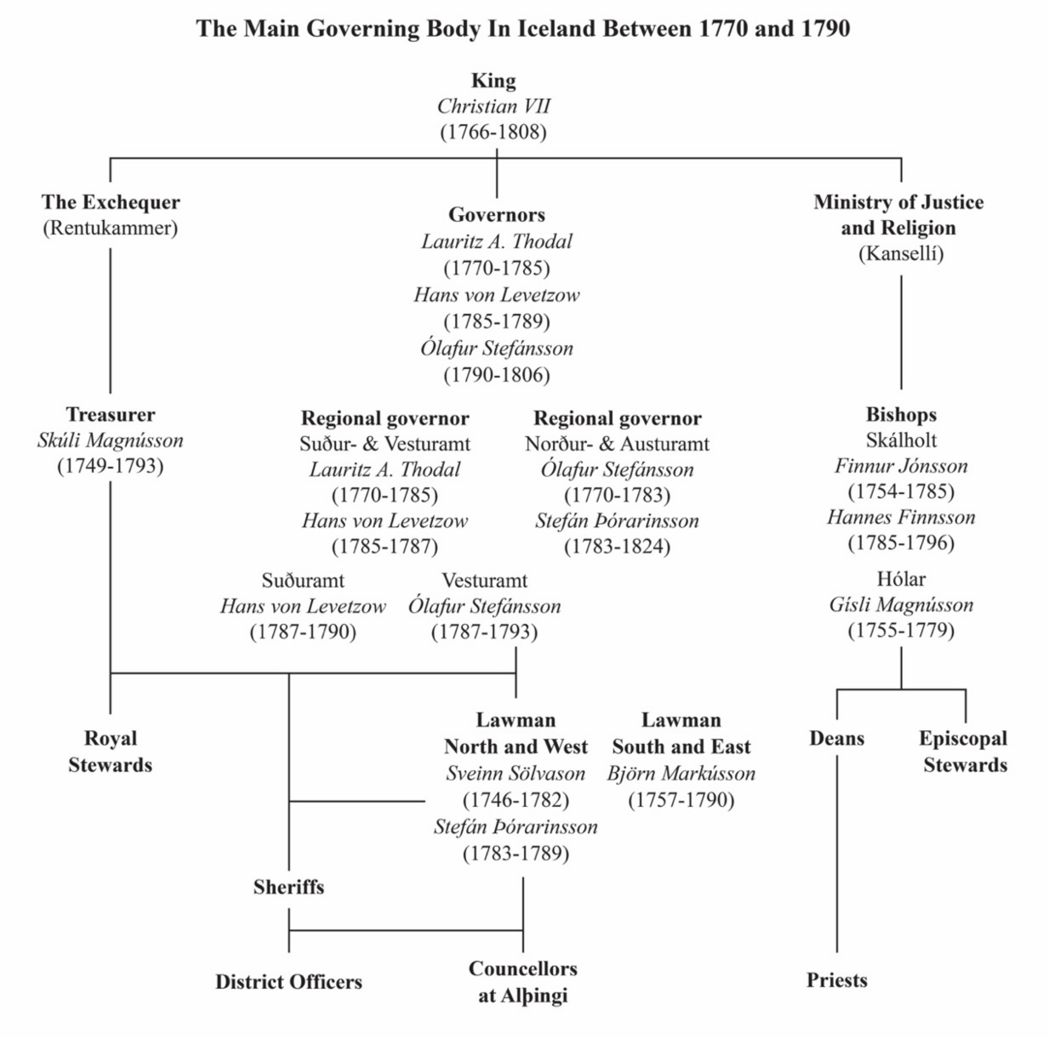


Figure 3.1. The names and positions of government officials residing in Iceland during the initial stages of the quernstone production revival (1770-1790; see further discussion in Chapter 4). The two governors that came before Lauritz A. Thodal are not named as they never came to Iceland and had no clear connection to the process. Note that Thodal, Ólafur Stefánsson, Levetzow and Stefán Þórarinsson held multiple positions, on occasion even at the same time. This arrangement is mainly based on Lýður Björnsson (2006, p. 18).

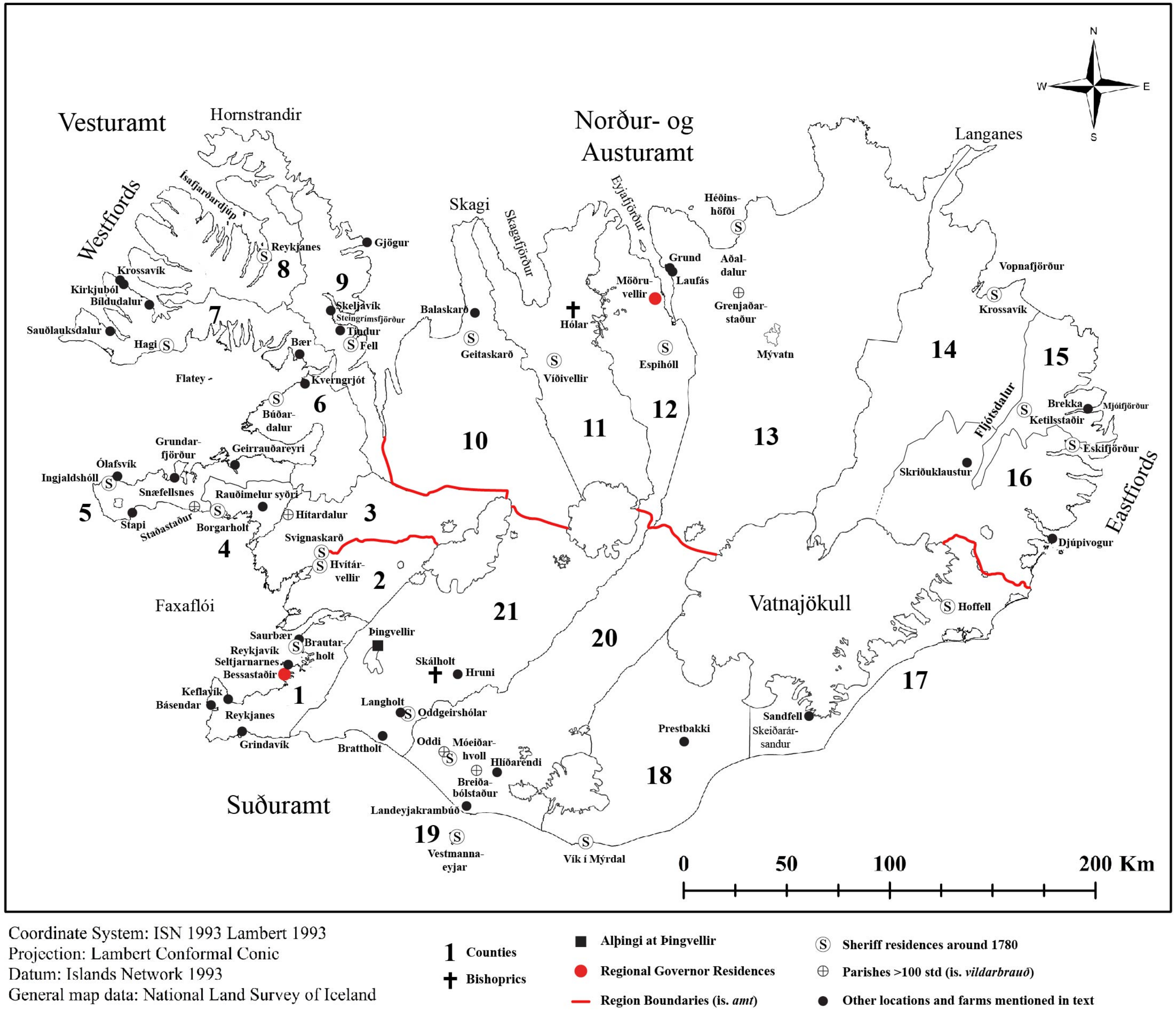


Figure 3.2. Areas and general locations mentioned in the text in Chapters 3-5. See Table 3.1 for county numbers and names. County lines are roughly based on map data generally available from The National Land Survey of Iceland and in Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, p. 636.

Table 3.1. This table lists Icelandic sheriffs in office when the Danish Exchequer requested reports on quernstone production efforts in the year 1783 and their residences. Reports from 15 out of 21 sheriffs have been preserved (Yes/No; see further discussion in Chapter 4 and Table 4.1). When the matter was formally discussed at Alþingi in 1770 a few of them were not in office (NIO) for the participating county or sent an assistant (A). Ten counties seemingly did not have a representative present (NP) at Alþingi in 1770 at all. See Figure 3.2 for the geographical locations of the sheriff residences (Bogi Benediktsson, 1881-1884, 1889-1904, 1905-1908, 1909-1915; Heimir Þorleifsson, 1996, pp. 28-30).

Sheriff	County	Residence	Alþingi 1770	Report 1783
Vigfús Þórarinsson	1. Gullbringu- and Kjósarsýsla	Brautarholt, Kollafjörður	NIO	N
Jón Eggertsson	2. Borgarfjarðarsýsla	Hvítárvellir	Y	Y
Guðmundur Ketilsson	3. Mýrarsýsla	Svignaskarð	NP	Y
Páll Axelsson	4. Hnappadalssýsla	Borgarholt	Y	Y
Jón Arnórsson (eldri)	5. Snæfellsnessýsla	Ingjaldshóll	NIO	Y
Magnús Ketilsson	6. Dalasýsla	Búðardalur	Y	Y
Bjarni Einarsson	7. Barðastrandarsýsla	Hagi	NP	Y
Jón Arnórsson (yngri)	8. Ísafjarðarsýsla	Reykjarfjörður, Reykjanes	NIO	Y
Halldór Jakobsson	9. Strandasýsla	Fell in Kollafjörður	NP	N
Magnús Gíslason	10. Húnavatnssýsla	Geitaskarð, Langidalur	NP	N
Vigfús Scheving	11. Skagafjarðarsýsla	Víðivellir in Blönduhlíð	NP	Y
Jón Jakobsson	12. Eyjafjarðarsýsla	Espihóll	Y	Y
Vigfús Jónsson	13. Þingeyjarsýsla	Héðinshöfði	NP	Y
Guðmundur Pétursson	14. Norður-Múlasýsla	Krossavík in Vopnafjörður	A	Y
Pétur Þorsteinsson	15. Mið-Múlasýsla	Ketilsstaðir at Vellir	NIO	N
Jón Sveinsson	16. Suður-Múlasýsla	Eskifjörður	NP	Y
Jón Helgason	17. Austur-Skaftafellssýsla	Hoffell	NP	N
Lýður Guðmundsson	18. Vestur-Skaftafellssýsla	Vík in Mýrdalur	Y	Y
Sigurður Sigurðsson	19. Vestmannaeyjasýsla	Unclear	NP	N
Þorsteinn Magnússon	20. Rangárvallasýsla	Móeyðarhvoll	NP	Y
Steindór Finnsson	21. Árnessýsla	Oddgeirshólar	A	Y

(isl. *lögmenn*) overseen by the governors. The lawmen were mainly Icelandic and after the University of Copenhagen started teaching law in 1736, they were usually educated there. They executed their duties in the presence of a specially appointed legislative council (isl. *lögréttumenn*) who dropped in number as the 18th century passed, from 24 prior to 1735, down to four in 1796. In the early 18th century district officers or sheriffs within each county appointed the legislative council but after 1732 this right passed to the governor, treasurer and/or the lawmen themselves, leaving the highest judicial authority for the whole island in the hands of a select few from the landowning elite. The council members were always more affluent farmers, often from the regions closest to Þingvellir (Einar Laxness and Pétur H. Árnason, 2015, pp. 11-14, 205-207, 343-345 and 502-504; Gísli Gunnarsson, 1987, p. 18; Lýður Björnsson, 2006, pp. 19-26; Trausti Valsson, 2002, p. 161).

Holding the position of sheriff or district officer often required travelling and was both time-consuming and difficult. Sheriffs collected taxes and other revenue for the king within their county and reported to the royal treasurer. Sheriffs were duty bound to attend parliament every year on behalf of their county and other duties included general law enforcement, custody and/or punishment of minor offenders, supervision of trade, and communicating information regarding parliamentary decisions and other official matters. The sheriff also supervised the work of their county's district officers and any committees formed. Until 1809 the district officers were usually 3-5 taxable farmers, chosen by their peers and officially appointed by the sheriff at an annual spring, or census, assembly within their district (isl. *manntalsþing/vorþing*; Figure 3.5). The district officers were in charge of holding district assemblies (isl. *hreppaþing/haustþing*) for general information flow, district administration and supervising the communal activities of farmers within their districts. They collected the church tithes (see discussion below) and the provisions needed for farmers chosen to travel to parliament each summer (isl. *þingfarakaup*). District officers also coordinated with the parish priests in all matters pertaining to mandatory social support and placement of the poor and the needy in various households and were obligated to curb any begging or vagrancy within their district. Chosen district officers were generally respected, more affluent farmers who held the office for a long time and were more capable of helping out the less fortunate when times were hard. The positions of both sheriffs and district officers were often passed down from father to son or their sons-in-law, although the position could also be filled by family members of other government officials (e.g. bishops, priests, legal representatives, royal stewards and rich farmers) positioned in the upper echelons (Einar Laxness and Pétur H. Árnason, 2015, pp. 205-207, 353-354 and 569-570; Gustafsson, 1985, pp. 77-81; Haraldur Guðnason, 1975, p. 135; Lýður Björnsson, 2006, pp. 19-28; Ólafur Sigurðsson, 1894, pp. 239-241 and Þorkell Jóhannesson, 1955, p. 340 and 394).

3.1.2. The Church

Icelandic religious history and its administrative structure has been researched in much detail and this summary is based mainly on the syntheses of Loftur Guttormsson (2000, pp. 121-141, 148-156 and 163-169) and Þórunn Valdimarsdóttir and Pétur Pétursson (2000, pp. 65, 69-70, 73 and 78). With the Reformation in the mid-16th century Iceland officially became Lutheran and the king became the highest religious authority until the early 20th century. The king's ministry in Copenhagen (isl. *kansellí*) controlled all general church administration in cooperation with the bishops and the governor (isl. *stiftsyfirvöld*) of Iceland. Iceland was divided into two bishoprics, Skálholt in the South and Hólar in the North (Figure 3.2). The two bishops had to be formally approved and appointed by the king, often based on recommendations from the retiring bishop and/or the governors. Interested individuals could also present themselves to the king as willing candidates for the position but only if armed with recommendations from influential Icelandic supporters. An episcopal candidate preferably had to have a degree from the University of Copenhagen in theology or philosophy and was tested in the presence of the king and a representative of the University before consecration could take place. The bishops in office during the quernstone revival project development in the 1770s and 80s were Finnur Jónsson (1754-1785) at Skálholt, who was later succeeded by his son Hannes Finnsson, and Gísli Magnússon (1755-1779) at Hólar (Figure 3.1). After Gísli Magnússon died, two other bishops took over the northern bishopric before 1790 but their presence was short-lived, and they likely had very little to do with the project.

Within the two bishoprics there were around 180 parishes in total. In the 18th century only five parishes (isl. *vildarbrauð)* were valued at more than 100 state dollars (isl. *ríkisdalir*) and these were appointed by the king through the ministry (Figure 3.2). As with the bishop seats, priests serving these wealthy parishes preferably had to have university education and serving them was often a stage on the road to becoming a bishop. These were Breiðabólstaður and Oddi in the South, Staðarstaður and Hítardalur in the West and Grenjaðastaður in the North. Parishes valued between 40-100 std were appointed by the governor at the recommendation of the bishops (isl. *gæðabrauð*) but for parishes worth less than 40 std the bishops were allowed to pick three candidates for the governor to choose from. The bishops however had an exclusive right to appoint the priests who were to serve the two cathedrals. Until the mid-18th century priests within each county, or deanery (isl. *prófastsdæmi* ~17-21), elected the rural deans but after 1746 the bishop appointed them directly. The bishop and governor remained in control of most parish appointments until the late 19th century. The bishops were responsible for managing episcopal property on behalf of the King, for general supervision of all parishes and upholding law and order among the clergy within their diocese. The bishops and the rural deans were required to travel regularly around their regions and report to their superiors through visitations, usually in July and August. The bishops' role was to report on the state of parish churches, public education and priests' performance, to hold parish assemblies and keep the clergy on the straight and narrow. Visitation reports from the bishop to the King after the mid-18th century suggest that concerns revolved much more however, around revenue and church management rather than priests' general competence or the public's education and the state of religion. At the end of the 17th century the two bishoprics owned 16% of all assessed farms in the country and the bishops were responsible for managing the bishoprics holdings and returns. In each diocese a steward chosen by the bishop managed day-to-day affairs and acted as his advisor. The stewards in charge of general management and collecting and transporting revenues from the smaller tenant divisions run by lesser agents, were also chosen by the bishop (~15 *umboð* in total, including e.g. valuable fishing stations in Þorlákshöfn and Grindavík).

In Iceland there were two Latin schools (isl. *latínuskólar*) run by each bishopric under the bishops' supervision until around 1800. They were mainly operated to prepare sons of the upper classes for the priesthood or further education abroad, although exceptionally gifted students from poorer families were admitted through scholarships at the recommendation of a priest or affluent benefactor. The bishops controlled who was admitted and the administration was comprised of one headmaster and one teacher at each school. In each school there were generally 15-24 students at any one time and long into the 19th century most graduates were considered qualified enough to become parish priests. In 1741 the Danish church administration sent bishop Ludvig Harboe along with Jón Þorkelsson, a former Skálholt headmaster, to Iceland to inspect the state of education and assess the quality of clerical education and the literacy of teenagers. Harboe was bishop at Hólar between 1741 and 1745 and was also in charge of the bishopric of Skálholt between 1744 and 1745. According to Gunnar Karlsson (2000, p. 170) it is likely that around this time about half of the nation was literate. After their travels, Harboe and Jón put forth detailed suggestions for education reform in Iceland both within the schools and in the parishes. Therefore, in the second half of the 18th century parents were required to make sure their children learned to read, and parish priests were to regularly monitor their progress. Between 1740 and 1780 fifty Icelanders graduated with a theology degree from the University of Copenhagen. Icelandic graduates received regular grants to study at the University of Copenhagen along with free lodgings.

Of the 180 parishes over 80% (150) brought in less than 50 state dollars a year. The wealthiest parishes were off limits to those who could not afford higher education. Governors were in charge of granting smaller parishes at the recommendation of the bishops, but the least desirable parishes were to be given to priests who had graduated through scholarships. The bishops were expected to send the governors a yearly report on all the graduates. Priests in the poorest parishes could only hope for a better parish in their future and most had little say in where they were sent if they were deemed worthy of a transfer. A priests' income depended largely on the rent of land and livestock owned by the parish church holdings. Private tutoring was also an important source of extra income for priests and such tutoring was expensive. Priests were responsible for overseeing children's basic religious education within their parish through regular visitations (more often children generally travelled to the priest's residence for tutoring rather than vice versa) and/or during mass on Sundays, which generally took place in Icelandic.

According to Guttormsson (1998, pp. 147-149; 2000, pp. 149-153) parish priests considered it well within their rights to hand over their parish to their sons as if it was their legal inheritance and/or negotiate parish exchange with other priests, and the bishops rarely opposed such petitions. Guttormsson has demonstrated that many sons of priests became curates before their fathers retired and priests were often in a good position to pay for their sons' education, or simply educate them themselves. More than half of the clergy (at least 50-60%) had a close relative (father, grandfather) who was also a priest. Others were very likely to have fathers who could pay for their education such as more affluent tenant farmers, government officials (sheriffs, lawmen, stewards etc.) and even in a few cases successful craftsmen (see more detailed discussion in Chapter 5). Parishes sometimes even supported a chosen parishioner through school. However, less than 10% of educated priests had higher education in theology beyond that which could be had at Skálholt and Hólar (Loftur Guttormsson, 1998, p. 149). Priest rotation was much more common in the poorer parishes compared to those lucrative enough to keep within the family and if priests moved between parishes it was often within the same deanery. Around a third of the clergy served the same parish all their life and a priest's tenure often ran from 10 to 40 years in the same parish, which was also often the parish or deanery of their birth. Priests could lose their position e.g. for excessive alcohol abuse or having illegitimate children, but their punishment was usually only temporary (Loftur Guttormsson, 1998, pp. 147-149; 2000, pp. 148-159 and 163-169; Þórunn Valdimarsdóttir and Pétur Pétursson, 2000, p. 73).

3.1.3. The Landowning Ruling Class

Excepting the emergence of Reykjavík as a town in the second half of the 18th century, urbanisation did not start to any degree in Iceland until after the mid 19th century. Assessed farms (isl. *lögbýli*) and agricultural production were considered the backbone of society, forming the main basis of income for the Icelandic ruling class and any tendencies toward urban settlement formation, e.g. at trading or fishing stations, were successfully resisted for a long time. Fishing was the other main industry, but no one could own or run a fishing boat unless they owned or rented a part in an assessed farm as well. Very little differences in general subsistence practices are therefore detectable between regions in Icelandic pre-industrial society. At the beginning of the 18th century assessed farms numbered at just over 4000 but only 5% of them were owned by the resident farmer (or ~350 farms). About 95% of all Icelandic tax paying farmers (numbering ~5900 in the early 18th century as many farms were held by two households and sometimes more) were tenants paying yearly rents to the king, the church or private landowners. The crown's holdings were mainly old monastery properties (overseen by Icelandic or Danish stewards, similar to the two bishoprics') and important fishing farms in Vestmannaeyjar and on the Reykjanes and Snæfellsnes peninsulas. The landowning families constituted Iceland's ruling class and although the island was a part of the Danish monarchy its government was in essence largely an internal, nepotistic oligarchy. The private property (52%) was in the hands of only ~3% of the nation. The income from most church farms also went to rich Icelandic landowners. The few powerful families not only owned most of the land and collected a large portion of its income, but also controlled most local government offices (i.e. lawmen and sheriffs, and post mid-18th century, regional governor and treasurer positions as well) and parliament proceedings, the bishoprics and the best parishes through pro forma royal approval. Appointments of lawmen, sheriffs and bishops were commonly for life and often passed on within/between the ruling families. Even where some form of higher education was required only the more affluent could afford such education anyway and men who graduated from grammar school on scholarships had little hope of advancement above receiving a modest parish. In the mid-18th century only three exceptions can be named where men of more modest means were appointed bishops (sons of farmers or legislative witnesses) but this was through the direct interference of the Danish bishop Harboe, and old traditions quickly bounced back after his involvement in Icelandic affairs ended. As mentioned above a man applying to be bishop preferably had to have a degree in theology or philosophy from the University of Copenhagen, but often Icelandic family lineage and other connections weighed heavier when there was more than one candidate. The families were so strongly inter-related that permission from the King was often needed for marriages between them due to close ties of sanguinity. At all levels of society marriage was arranged more often than not between heads of families or guardians to further the interests of the family, ahead of any emotional transaction between bride and groom. If men, for some reason, resigned from office before their death, they could usually name their successor (often son or son-in-law), and if they were forcibly removed from office it was usually for offences towards, or at the behest of, other ruling families vying for the position, rather than any great concern for public welfare (Árni D. Júlíusson, 2013a, pp. 253-258 and 272-274; Bragi Guðmundsson, 1985, pp. 102-105; Gísli Gunnarsson, 1987, pp. 18-19; Loftur Guttormsson, 2000, pp. 126-129, 131-133;).

3.2. The Monopolised Foreign Trade Environment

Historian Gísli Gunnarsson (1987; 2017, pp. 207-283) has done extensive research on the Danish Trade Monopoly in Iceland which started in the early 17th century and it was formally abolished in 1787. This overview is based on his 2017 synthesis. Gunnarsson splits Iceland into two economic areas; the Danish area (mainly Snæfellsnes, Reykjanes and Vestmannaeyjar, see region 1 in figure 3.3) where most surplus production was absorbed, largely in fish by the crown and Danish merchants (30%); and the Icelandic area where most surplus production was collected by rich landowners in land and livestock rents (70%). Icelandic trading posts were run either by merchants on behalf of Danish trading companies (from Copenhagen and/or within the Danish kingdom after 1787), or the king himself (1759-1763 and 1774-1787). When the king was not running the trade, the right to trade was auctioned by the crown to get the highest possible rent, which reached its peak in the mid-18th century. Little is known about illegal trade, but it is mainly thought to have been between farmers and foreign fishermen (British, French, German and Dutch) exploiting the Icelandic fishing grounds, especially in the North, West and East. In that context farmers mainly traded woollens for tobacco, iron pots and liquor, but by the mid-18th century the Icelandic government had largely put a stop to such trade. The island was split into ~20 trading areas with up to 25 trading posts all around the coast (Figure 3.3). The greatest density of trading posts was in western Iceland where all the main fishing centres were located, reaching from the Westfjords, across the Snæfellsnes Peninsula south to the Reykjanes Peninsula. In Gunnarsson's estimation on average 20 ships would arrive around the island in early summer with goods and leave in the autumn with Icelandic produce. Merchants were required to sail to their harbours each year, even when times were hard and not much produce to export. For this reason, the majority of the Icelandic ruling class claimed that the Danish trade monopoly was the best option to secure regular trade all around the country. Gunnarsson also pointed out,

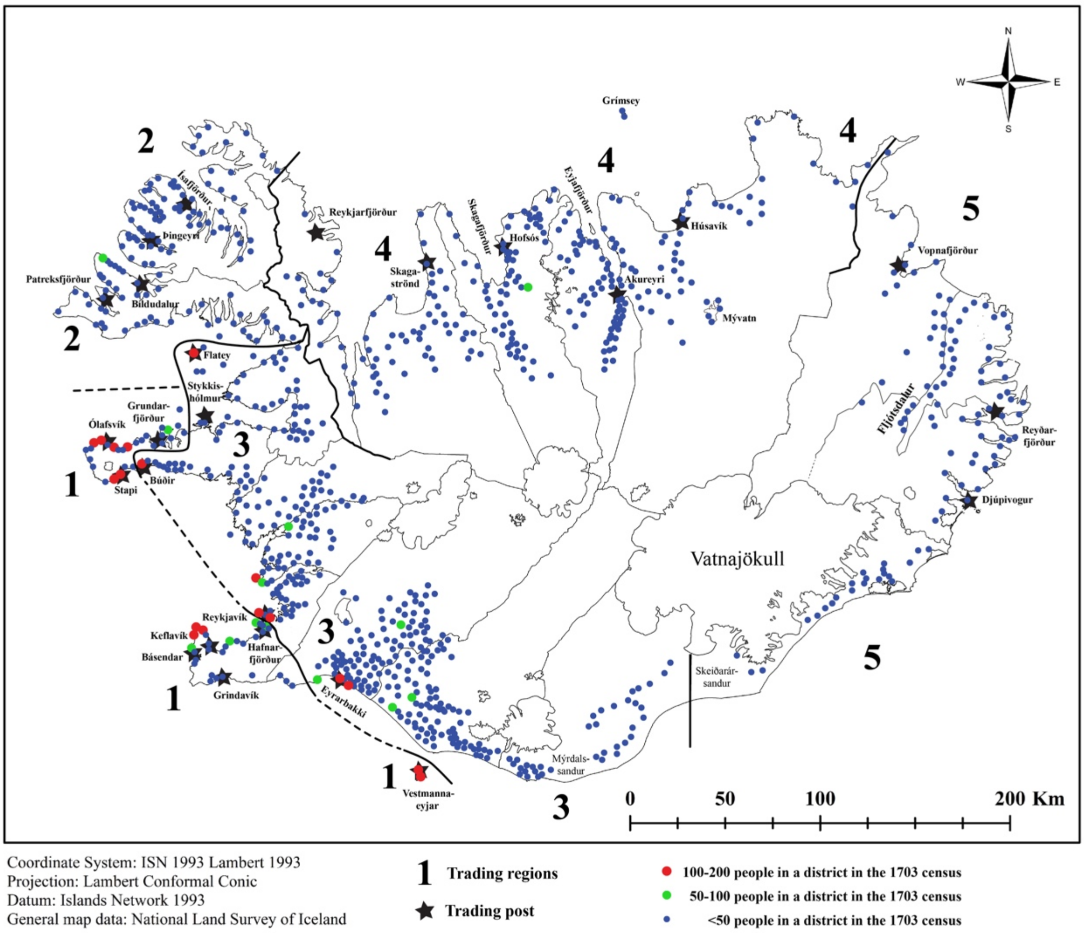


Figure 3.3. Population distribution in Iceland according to the 1703 census and the general demarcation of trading regions in the 18th century. A reconstruction of figures by Sigurður S. Þórarinsson (1974, p. 41) and Gísli Gunnarsson (1987, p. 47).

that foreign merchants were not allowed to stay over the winter, run fishing boats or hire Icelanders for any work, and he suggests that that meant all trade profits left the country and very little thought was directed towards technological improvements or general investment in the Icelandic fishing industry. The crown, the largest landowners and the church ran the fishing industry through their tenants. Sheriffs were only allowed to open the trading posts during the winter in emergencies. In the late 18th century merchants were finally allowed to stay for longer periods of time and take more part in the fishing industry, but their involvement did not become significant until the second half of the 19th century (Gísli Gunnarsson, 2017, pp. 207-283).

Coinage did not become a significant part of trade in Iceland until the second half of the 19th century. The trade was dominantly goods exchange at fixed rates, unconnected to market prices in Europe. The rates remained in good accordance with the island's 700--year-old, fixed internal price regulations called *Búalög* (*Búalög*, 1775; Arnór Sigurjónsson, 1966) until the late 19th century. Product value in both internal and foreign trade was generally measured in standards of fish or homespun cloth (isl. *landaurareikningur,* 240 fish (*málfiskur*, >45 cm long or stockfish weighing ~1 kg) = 1 hundred (see also discussion of farm values below) = price of 1 good milking cow twice calved (*kúgildi*) = 1 average horse = 6 sheep (unsheared with lambs in May) = 120 *reikniálnir* or *ells* of homespun cloth = 4 Danish state dollars (isl. *ríkisdalir specie*) or 4 Danish state dollars and 48 shillings (isl. *ríkisdalir courant*)). Independent price determination or changes were illegal but Icelanders were not subjected to any risk of inflation in connection with foreign market fluctuations, except in connection with prices of grain and fish (Gísli Gunnarsson, 1987, p. 30; 2017, pp. 216-221 and 227-233; Gustafsson, 1985, p. 299; Mörður Árnason, 2002; Laxness and Árnason, 2015, pp. 209, 287-288, 298 and 416-417).

Trading stations served all Icelanders, but wealthier farmers and landowners still had better access and stronger leverage and resources to acquire the best, imported goods ahead of the general public. Each assigned merchant had exclusive rights to all viable marine and agricultural goods produced within his region. The main Icelandic exports were stockfish and fish oil, woollens and animal products such as meat, skins, feathers and butter. In order to attract Danish merchants to the Icelandic market, Icelandic fish was valued at a considerably lower price than in Europe, making the merchants' margins for profits for fish much higher than for agricultural products, as the fish could later be sold at much higher prices than it had been bought. The low fish prices were also meant to subsidize prices of imported staples and supplies to everyone, mainly meal, but also e.g. timber, metal and materials for fishing and tar. Meal, textiles, liquor and tobacco on average made up around 60-70% of import sales values. When times were good the public was encouraged to take out product loans with the merchants for one year at a time, which often gave the merchants leverage to force the public to trade. Failing to pay debt was considered socially disgraceful and could be harshly punished. The public however could not deposit goods with the merchant to collect later when needed and more often than not merchants refused to pay out or accept money for imported goods as the exchange rates were much more unfavourable than payment in goods (Gísli Gunnarsson, 2017, pp. 207-283). Very little trade in indigenous products, other than the common exports mentioned above, passed through the official trading posts.

3.3. The Everyday Life and its Packed Schedule

3.3.1. The General Living Conditions

Árni D. Júlíusson (2013a, p. 265) divides Iceland into three types of social environments, 1) manorial farms (isl. *höfuðból*) with 10 up to 100 people (including both bishoprics), 2) rural, agriculturally based tenant farms (assessed farms, isl. *lögbýli*, and their crofts, isl. *hjáleiga*), and 3) fishing crofts (isl. *þurrabúð*) without livestock where the main occupation was fishing. Everyone was legally required to work for or rent a farm or croft, and most sheriffs, district officers, priests and craftsmen also lived on and ran a farm to some degree as their basic source of income. In the 18th century the population hovered on average around the 45 thousand mark, but in times of hardship (either due to diseases and/or bad years) it could drop down as low as 30-35 thousand. As the 19th century passed the population gradually increased and in 1900 stood at ~78 thousand. Most of the farms were located below the 200 m contour line, which constitutes only about 25% of the country's area (25 thousand km^2)[9]. In the early 18th century the population (~50 thousand inhabitants) was spread fairly evenly around the island or between 14-25% in each of the five main geographical areas (East 14%, North 23%, Westfjords 19%, West 25%, and the South 19%). The population has always been largely concentrated in the lowlands within valleys and along the narrow coastal belt. Population was densest (+3000 inhabitants) in the richest agricultural regions around Eyjafjörður and Skagafjörður in the North and in

[9] The highlands (>500 m altitude) are 40-50% of the country.

the Southwest in Rangárvallasýsla and Árnessýsla, as well as on the western tip of Snæfellsnes and Reykjanes peninsulas where fishing farms and crofts were abundant in the vicinity of rich fishing grounds and several trading posts (Figure 3.3). This distribution changed very little until the mid-19th century when fishing villages started to develop (Gísli Gunnarsson, 1987, p. 47 and figure 2.4; Lýður Björnsson, 2006, pp. 45-51; Manntalið 1703, 1960, pp. 34-41). An assessed farm was rarely more than 2-5 km from its neighbour and they ranged in worth from <12 hundred (hundred, small), 12-24 hundred (average), 25-48 hundred (above average), 49-59 hundred (very good) and >60 hundred (manors), depending on how much livestock it was estimated to be able to support (Lýður Björnsson, 2006, pp. 37-38). Two or more farming families sometimes rented larger assessed farms between them (isl. *tvíbýli*, *þríbýli…*) and within the boundaries of farms there were often smaller tenant crofts (isl. *hjáleigur*). Four houses were a standard requirement for each rented farm, a living room (isl. *baðstofa* or *skáli*), a kitchen (isl. *eldhús*), a pantry (isl. *búr*) and a cowshed (isl. *fjós*). All housing and other general farming and fishing structures were built mainly from turf and stone (Figure 3.4), whether they were built by the rich or the poor, whether they were living quarters or e.g. sheep sheds (isl. *fjárhús*) or folds (isl. *réttir*), smithies (isl. *smiðjur*), stables (isl. *hesthús*), walls (isl. *garðar/veggir*), hay shelters (isl. *heygarður*), boat shelters (isl. *naust*) or fishing huts (isl. *verbúðir*). If the structure had a roof the frame was usually timber and brushwood (large whalebones were sometimes used in coastal areas) with a thick turf cover on top of a layer of twigs or flagstones. Timber was expensive and difficult to acquire, especially where driftwood was scarce. Therefore, only churches in the most affluent parishes (e.g. at Bessastaðir, Skálholt and Hólar) were built entirely from timber, and panelling on the inside of living quarters was only used at the richest manors and church farms.

Figure 3.4. A turf and stone farmhouse at Lækjarmót in Víðidalur. The photo was taken in 1924 by Peter J. Sørå and is owned by Ljósmyndasafn Reykjavíkur (PSÖ 110). Note the quernstone lying against the wall of the house furthest to the left.

The living quarters were commonly a passage house (isl. *gangabær*), with the rooms (kitchen, pantry, storage etc.) built transversely out to the sides from a single passage. The main living room (isl. *baðstofa*, used by most in the household for sleeping, eating and working) was usually placed highest in the building at the inner end of the passage within very thick walls and roofs, to preserve warmth as much as possible. Size and quality of the housing depended largely on available resources and initiative of the residing tenant farmer. Windows were kept small and few in number and could rarely be opened. In some areas the cowshed was built below the main living room (isl. *fjósbaðstofa*) to exploit the livestock's body-heat, with only a thin and/or open timber floor between them. During the coldest months indoor work often took place in the cowshed or in the kitchen by the hearth, as fuel was mainly used for cooking and metal work. Livestock was sometimes even kept in the empty rooms within the house for extra heat. Timber dwellings with stone foundations first appeared in the village of Reykjavík and trading stations during the second half of the 18th century but it was only as timber became more easily acquired in the mid-19th century that churches built entirely of timber became more common (Árni D. Júlíusson, 2013a, p. 265; Hjörleifur Stefánsson, 2013, pp. 68-73 and 89; Hörður Ágústsson, 2000, pp. 31-77 and 95-105).

3.3.2. The People

Around the turn of the 19th century ethnographer Jónas Jónasson (1945, p. 337) described the Icelandic people as quiet, secretive, mistrustful and unsocial, industrious but slow moving, prone to drinking and smoking but otherwise frugal, demure and god-fearing. While the official religion may have been Lutheran the Icelandic public was strongly superstitious and peoples' faith and their folk medicine was strongly influenced by a mixture of fatalistic Christianity (god in heaven, demons and devils in hell) and traditional beliefs (paganism, trolls, elves and dwarves, ghosts and ghouls, witchcraft and enchantments, dreams and psychic abilities and natural phenomena). As mentioned above, in the early 18th century tenant farmers counted ~5900 and their dependent crofters were around ~1200, or around 7100 households in total and these numbers of households changed little until the late 19th century. In 1845 tenant households were still around 6000 or ~80% of the population (Gísli Gunnarsson, 1987, pp. 18-19; Lýður Björnsson, 2006, pp. 37-38). The average farming household consisted of a farmer and his wife, their children and servants, dependents and paupers. In the 18th century, and most of the 19th, household size was commonly 3-6 persons for each household ("Manntalið 1703," 1960, p. 22). As life expectancy was short and people often married late there were rarely more than two generations within one family. The farmer was the head of the family and controlled all revenue earned from work performed (fishing, crafting etc.) by his household, whether it was his wife, children or other dependents. In return the farmer was responsible for their keep (Lýður Björnsson, 2006, pp. 58-62). In the 18th century a male farm hand was due 60-120 ells of homespun cloth for a year's service (Gísli Gunnarsson, 2017, p. 36), and salary (see further discussion of currency below) was mainly paid with farm produce (mainly in clothes, food or livestock) and housing, as money (i.e. coins and bills) was rare.

Work options for the general public were for a long time very limited. If a man could not find or afford a farm or croft to buy or rent, he was required by law to become a servant (isl. *vistarband*) as early as 15-16 years of age. This helped provide farmers on assessed farms with a steady supply of cheap labour. Labourers (both men and women) were required to have a legal abode for a whole year and the majority lived as servants but a small number were able to hire themselves out seasonally – usually in high summer (isl. *kaupafólk*). Workers were free to find themselves a new household to serve in after their year was over, which maintained a degree of mobility of the workforce, but until the early 19th century if a worker owed any taxes in their district they could not leave until the debt was paid. The Moving Days took place at the turn of April/May, four days where farm hands intending to change masters or farmers moving farms were allowed to travel unimpeded between counties. People could sidestep the system by renting a small piece of land or take up residence with a tenant farmer but remain otherwise free to work on a chosen craft (isl. *húsmaður*), but this was rare and mainly done by older, retired farmers or farm hands. If labourers found a position with a good master, they could easily spend their entire working life in service of the same master. In such cases their children (usually born out of wedlock) often inherited their parents' position. Farm labourers were not allowed to start a family/marry until they could afford to rent or buy a farm or croft of their own and in the 18th and 19th centuries around ¼ of the population was unwed. The farmers themselves could also move farms with their family from time to time, as most of them were tenants and subject to the landowners' whims. Few could afford or had an opportunity to buy a farm as the upper echelons held on to most properties with a tight fist. Wandering between districts or counties without a special licence from a sheriff or district officer was forbidden and harshly punished. According to a royal decree in 1746 (isl. *Húsagatilskipun*) only men who paid a tithe for property with a value of 10 hundred (see discussion of values above) or more (isl. *lausamenn*) were allowed by licence to move freely. After 1783 wandering was forbidden entirely by law, with or without a licence, and freelancers were required to hire themselves as farm hands, although craftsmen and fishermen traveling to and from the coast every year during the fishing seasons were still exempt. In the early 19th century residence by the seaside was illegal unless a person rented or owned property, which could feed either one cow or six sheep (isl. one *kúgildi*) and maintain a vegetable patch for their own keep. While freelancing may have been legal before 1783, it was not popular, and in the 1703 census only 73 men were registered freelancers. People therefore rarely lived and/or worked in a single place in their lifetime, and while vagrancy was illegal and despised, preventing it entirely was very difficult and people used varied means to find ways around these laws (Jónas Jónasson, 1945, pp. 251-256; Laxness and Árnason, 2015, pp. 331-332, 549 and 555-557; Lýður Björnsson, 2006, pp. 59-63; see also Vilhelm Vilhelmsson, 2017).

3.3.3. The Farming Year

A general overview of the whole working year for an average farm or croft can be seen in Figure 3.5. Fertilizing the fields was the first seasonal task on the farm in the spring in late April/May when snow cover had melted, i.e. where manure was not all used as fuel. Spring growth generally started around the same time when average temperatures rose above 2-3 °C (Páll Bergþórsson 1957, 32). As fuel people used anything that worked as a heat source and could not be put to better use, ranging from dried turf, peat and manure, that were most common, seaweed, driftwood and brushwood, to stripped fish and bird carcasses soaked in liver-oil dregs when absolutely necessary. Farmers also burned wood for charcoal in the spring. The cow and sheep sheds were mucked out, and peat was dug. The clods and muck were spread out so that the drying could commence as early as possible before they were stacked and left out over the summer. Where resources were scarce the fields were cleared of excess dung (sheep, horse and cow), which was added to the fuel stacks for drying. The spring was also a time for cutting turf and general maintenance of houses and other structures after the long winter (Jónas Jónasson, 1945, pp. 56-60, 93-95).

Keeping sheep was the Icelandic farmers' main livelihood. In the early 18th century more affluent farmers in the best agricultural districts in the South and North had on average 3-5 cows and 50-100 sheep (ewes and wethers) but commonly households had no more than 1-2 cows and 30-50 sheep (Árni D. Júlíusson, 2013a, pp. 239-243). As early

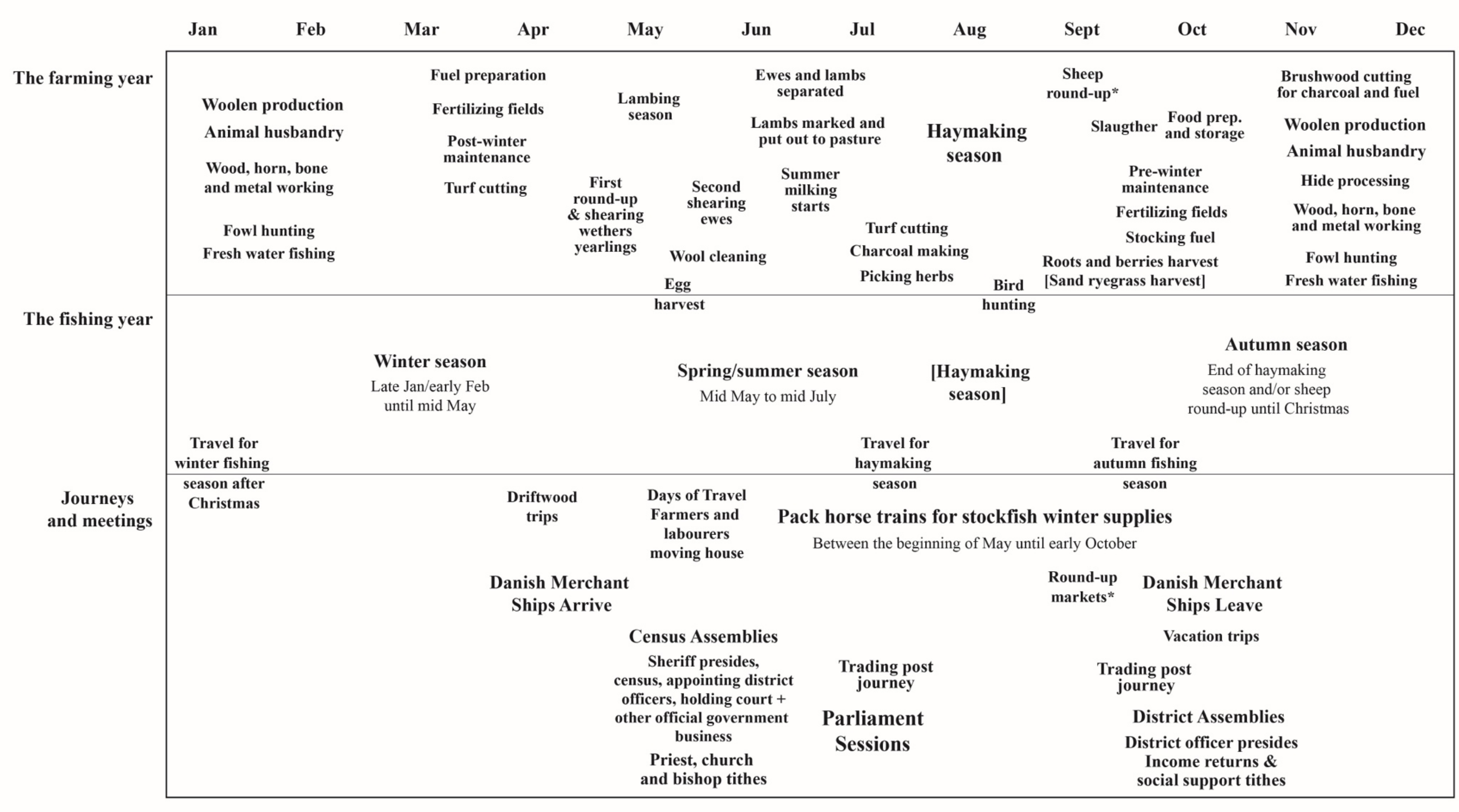


Figure 3.5. Yearly general chores, travels and obligations of the public in Iceland in the 18th and 19th centuries.

as the beginning of May any sheep not with lamb or gelded (e.g. yearlings and wethers) were sheared and released into highland pastures. Early May was also time for egg collecting, mainly in bird colonies by the sea. Around mid-May the lambing season started which could take from a week up to a month depending on the number of sheep in a farm's flock. After the second week of lambing the separation of ewes and lambs started (isl. *stekkjartími*). For 2-3 weeks the lambs were kept separate from the ewes in a sheepfold (*stekkur*) overnight. During this time the ewes were sheared and hand-milked, the lambs were ear-marked and chosen rams gelded. All farmers had their own ear mark/s. As the lambs were marked children were often given young lambs, which through time became the foundation for their own future flock. In late June when most lambs were a monthold, they were separated from the ewes permanently (isl. *fráfærur*). The ewes were kept in pastures around the main farm or in a shieling and milked day and night in another sheepfold (isl. *kvíar*). The lambs were kept at home for another week (isl. *lambaseta*) before they were driven into highland pastures at the end of June/beginning of July. This was considered the last chore of spring (Jónas Jónasson, 1945, pp. 60-76 and 154-176)

In July and August the ewes were milked and kept in check during the day in their pasture. During the summer cows were kept outside around the clock and milked with the ewes. Most of the milk was processed into cream for butter and skimmed milk for cheese, skyr (milk curds) and whey. The time after all the sheep had been put to pasture until haymaking started could be 2-4 weeks depending on how long the lambing season was and how fast the grass grew. During this time farmers prepared all the tools needed for haymaking (scythes, rakes, packsaddles, tackle etc.) and cut turf for buildings and haystack coverings. Such turf could also be an important trade commodity. Another resource was wild herbs, which were both exploited as a general food source and for trade (e.g. 4 herb barrels were equal in value to 1 barrel of meal/cereal in the 18th century). When snow had melted and vegetation had recovered in the heathlands, it was time for a 1-2-week camping trip into the highlands to gather and process herbs (e.g. lichens and thyme). The herbs were mainly added to gruel, skyr, sausages and bread (Jónas Jónasson, 1945, pp. 39-41, 76-87). Kitchen gardening did not become common in Iceland after the mid-19th century except perhaps in the *Suðuramt* where they were accepted a littler earlier or the late 18th-early 19th century (Árni D. Júlíusson, 2013b, p. 20; *JJ*, 1847, pp. 404-411; Jóhanna Þ. Guðmundsdóttir, 2012). One trip was sometimes taken to the trading post with goods produced over the winter to trade before haymaking season started in mid-July, for meal/grain, iron, timber, tobacco, liquor and other general necessities. Besides travelling on foot, boats and horses were the main means of transport for both men and goods. The road systems were little more than basic, natural horse and walking trails without any man-made roads or bridges. None the less they were perfectly functional, although some routes could not be travelled except during the summer. Larger rivers had ferries with a modest toll while horses had to swim. Such crossings could sometimes be extremely dangerous (Jónas Jónasson, 1945, pp. 70-75; Laxness and Árnason, 2015, pp. 117-118; Lúðvík Kristjánsson, 1985, pp. 468-473).

The haymaking season usually started past early July, depending on the rate of grass-growth. Extra workers were often hired for the season and usually turned up in mid-July (12th week of summer) as the spring fishing season ended (see below). During this period workdays could last up to 16-18 hours. Once dry, the hay was transported on horseback and usually stacked in an open, turf and stone enclosure (isl. *heygarður/heykuml*) next to the animal sheds on the home farm and/or in pastures further afield. For long term storage the hay was weighted with rocks and covered with turf once it had settled. In a few areas, workers had to be spared from haymaking in August to hunt alcid (auks, puffins, guillemots, murres etc.), gannet and fulmar nestlings by the sea as well as slaughtering moulting geese and whooper swans inland and gathering their feathers. In Iceland farmers rarely kept chickens or geese as livestock until the 19th century. The haymaking season was usually considered over by the end of September (Jónas Jónasson, 1945, pp. 76-87 and 196-202).

The sheep roundups (isl. *göngur*) in the highlands usually began in mid-September and lasted from 1-2 days up to a week. The district officers (see discussion above) decided how many men should be recruited from each farm for the job, usually depending on the size of its flock. All the sheep were herded to communal sheepfolds in each district where they were counted and sorted before the owner could take them home for the winter. Rarely were all the sheep accounted for in late September and searching for sheep in the highlands could go on for some time into winter. When times were good the farming community would have a feast (isl. *slægjur/töðugjöld/engjagjöld*) at the end of September (often on *Mikjálsmessa*, Sept. 29th) to celebrate the end of the haymaking season and the beginning of slaughter time. Slaughter time usually lasted until late October (isl. *vetrarnætur*), but older ewes were sometimes not slaughtered until later in winter. Meat was transported to the trading posts and sold after slaughter, especially in the North, South and East. Some merchants also bought sheep on foot. This was commonly a farmer's second trip of the year to the trading posts, to stock up on necessities after a busy summer.

The total number of trips will have depended on the farm's distance from the trading posts. In an average year the first snow fell sometime between the end of August and October (Jónas Jónasson, 1945, pp. 87-99; Markús Á. Einarsson, 1976, pp. 105-108).

Every part of slaughtered livestock was used and/or eaten. Meat (sheep/cattle) was usually dried, smoked and/or salted (rare as salt was expensive) while the extremities, the offal and blood were used in patés, as well as boiled jellies, blood gruel and puddings and liver sausages that were stored in whey. As an old religious taboo, abstaining from eating horsemeat was a strong national conviction. All skins were shaved and dried. Other autumn activities included general maintenance on the farm, transporting the now dried fuel inside for storage and finish the second fertilization of the home fields. Late August and into September was also a time to harvest roots (e.g. angelica) and berries (e.g. crowberries, blueberries and brambleberries), and for harvesting wild *lyme grass* (isl. *melgresi*, *Elymus arenarius*) for grain (mainly in Vestur-Skaftafellssýsla, county 18 in Figure 3.2). Cereals (mainly barley) were not cultivated successfully in Iceland in any quantity until the 20th century (see further discussion in Chapters 4 and 7). Dulse was also a regular food staple but mainly in the South and West. It was usually collected during opportune tides at the end of August when it was well grown and then dried. As with wild herbs dried dulse and other edible coastal fauna was also an important food source used in exchange for other staples (Jónas Jónasson, 1945, pp. 34-55, 87-98 and 175; Jón Þ. Þór, 2002, pp. 150-151; Lúðvík Kristjánsson, 1980, pp. 40-126;).

In the 18th and long into the 19th century the yearly production on a single tenant farm never reached much beyond providing for the household and paying rents and dues (Árni D. Júlíusson, 2013a, p. 246). The rent was paid once a year and was traditionally ~5-10% of the farm's value without much consideration for land deterioration or fluctuations in returns. The rent was paid in various ways although the general medium was the farm's main produce of hay, livestock, butter, woollens and/or fish (isl. *landaurar*, see definition of value above). Paying rents in coin (isl. *ríkisdalir/skildingar*) was very rare but not unheard of. Tenant farmers also rented milking livestock from their landlord (cows and/or ewes, isl. *leigukúgildi*) and care of those animals took precedence by law. Other obligations of work (isl. *kvaðir*) were also often attached to a farm rented from the King or the Church, such as fishing, cutting hay, shepherding and various transport obligations but this was mainly in the fishing districts in the West and Southwest. More affluent farmers could pay to be exempted from such obligations (Árni D. Júlíusson, 2013a, pp. 152-157 and 258-263). The landowners' obligations were to maintain the farm-buildings and renew worn or dead milking livestock but there was a growing tendency in the 18th century for landowners to transfer this responsibility to the tenants. Tenants had no rights when it came to their tenure and could be asked to find another farm to rent and leave during Moving Days at a moment's notice (Árni D. Júlíusson, 2013a, pp. 270-273).

The main food staples of the general public were meat (sheep/cattle/bird/whale/seal; dried, smoked, salted, sour, drippings) and dairy products (butter, skyr and cheese, along with whey both for drinking and food storage) that had not been traded and/or exported, and gruel made with skyr, milk and/or water, rye meal and/or herbs (isl. *hræringur, blönduhræra, mjölgrautur/mjölmjólk*, *grasagrautur*). Other nourishment included meat soups and blood, offal and meat sausages (isl. *blóðmör, lifrarpylsa, bjúgu*), fish products (fresh or dried fish, roe, oil, shark meat) and unleavened bread (mainly flatbread; isl. *flatbrauð/mjölkaka/glóðarkaka*). The ratios between farm and sea products at mealtimes depended on distances to the coast and its resources, where fresh fish was eaten more often. Out of all those types of foodstuffs, dried fish and butter were the most important, while meal made up the smallest portion (Guðmundur Jónsson, 1998, p. 26; Jón Þ. Þór, 2002, p. 125; Ólafur Ólafsson, 1791; Sólveig G. Beck, 2013a). In the 17th-19th centuries rye was produced on a large scale in Scandinavia and Eastern Europe where it made up a significant part of the diet (Kent, 1983, p. 175). In mid-18th century Iceland imported cereals were dominantly in the form of rye meal (Guðmundur Jónsson and Magnús S. Magnússon, 1997, pp. 434-443 and table 10.5; see further discussion in section 4.2.2) and cooking and consumption revolved chiefly around cereal produce largely being in that form.

In general, the meal was consumed as gruel (isl. *mjölmjók,* or meal milk, being the most common, alongside *hræringur*, a mixture of skyr and gruel) all year round in the mornings and evenings. A porridge of barley grain (isl. *bygggrjónagrautur*) or meal gruel were also eaten for breakfast on Sundays and holidays. The poorest however, had to be content with meal gruel only for special occasions such as Christmas and Easter. Meal was also used on occasion e.g. in soups, blood sausages at slaughter time, and in flatbread. Farmers of average and greater affluence ate flatbread, likely e.g. at lunchtime during hay harvest, and such bread was also eaten on special occasions, both on farms and in the fishing stations. Farm hands and other workers were given more and often better food during times of higher workloads (Guðmundur Jónsson, 1998, p. 26 and 35; Ólafur Ólafsson, 1791, pp. 177-179, 181-182, 185, 206 and 211; Sveinbjörn Rafnsson, 1983, pp.

84-87; Þorkell Bjarnason, 1892, pp. 195-197). It has been estimated that until the early 19th century consumption of meal in Iceland was about 70-80 gr a day on average/per person (or about 10% of the required daily diet; Árni D. Júlíusson, 2013a, p. 156). Meal was never imported in sufficient quantities to fully meet public demand and was often rationed by the merchants and hoarded by the most affluent (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2016a, pp. 415, 332, 437, 501, 523, 554, 571, 576, 578, 626, 641, 654, 664 and 751). How large a portion of the population actually bought cereals is unclear, but it could be suggested that the poorest families in Iceland (i.e. farmers and crofters renting more meagre farmland), would be least likely to spend much capital on it, except perhaps for special occasions. To give a rough idea of how far an 80-gram average of meal could stretch, it can be extrapolated that an average family of five would consume ~150 kg a year. As an example, this could be roughly transformed into two good portions of gruel every day (e.g. in meal milk, isl. *mjölmjólk*, ~60 gr/two dainty female fists of meal in a litre of water or milk a day[10], ~110 kg) for each family member, 25-30 liver and blood sausages from 6 sheep at slaughter time (~5 kg; Hússtjórnarskólinn, 2017) and a single piece of flatbread (17 cm diameter, 2 mm thick) a day per person for every Sunday, plus the three months of summer (~40 kg; Helga Sigurðardóttir, 2009, p. 421). In baking and sausage making, dried moss and herbs were very often used as well to save on meal expenditures by as much as 50% and could thereby increase the possible amounts suggested (Helga Sigurðardóttir, 2009, pp. 29, 336-339 and 421; Þorkell Bjarnason, 1892, p. 196). Coffee, sugar and flour only became common after the mid-19th/early 20th century (Jónas Jónasson, 1945, p. 54; Sveinbjörn Rafnsson, 1983).

The general workday in winter started at first light. Winter was a time for general chores such as chopping wood for charcoal making in the summer and gathering the brushwood for fuel, fishing (both fresh water and marine) and hunting fowl (mainly ptarmigan). Seals (e.g. grey and speckled) were clubbed, netted and/or speared in spring but also around mid-October for meat, blubber and oil, mainly in the Northwest and West. As with all other animals exploited, everything was used from the head to the flippers and processed in a similar way to other meat (Jónas Jónasson, 1945, pp. 42-44 and 66-67; Jón

[10] Documentary sources suggest that meal milk (isl. *mjölmjólk*) consisted of 1-2 fists of meal in a liter (isl. *pottur/2 merkur*) of water or milk (Anna Thorlacius, 1916, p. 25; Finnur Jónsson, 1945, p. 323). A small at home experiment showed that a female fist of meal weighs ~25-30 gr. 60 gr of meal boiled for 10 minutes in a liter of water and left to cool make a good amount of gruel with a consistency of wobbly chocolate pudding (although far from being as appetizing). Note that meal will often have been supplemented in gruel by combining it, or simply largely substituting it, with wild herbs and mosses.

Þ. Þór, 2002, p. 150; Lúðvík Kristjánsson, 1980, pp. 309-334). Whales were very rarely hunted and acquiring whale meat and blubber was usually only possible when whales stranded (Jón Þ. Þór, 2002, p. 147). The main winter chores were general animal husbandry, wool and skin processing and production (isl. *tóvinna*), and other general handicraft in metal, wood, bone, horn and stone, either for export and/or domestic goods exchange (Jónas Jónasson, 1945, pp. 99-128; see further discussion below).

The animal husbandry revolved mainly around making sure the animals had something to eat outside as long as possible before having to cut into the hay supply. Horses were usually made to survive the winter outside with very basic shelter and only given something to eat if absolutely necessary, although sometimes the best saddle horses (isl. *reiðhestar*) were sheltered in a stable on the farm. The cows were kept inside in the evening but let outside in the day in early winter but as weather deteriorated, they were kept indoor around the clock. Men rationed the hay while the women did the milking, although cows were generally not milked in the wintertime until the 19th century. Sheep were made to run free and feed outside on anything remotely edible at least until Christmas (seaweed and withering grass and heather, turf and roots etc.). During this time, it was the shepherds' job to make sure they had access to feed without straying too far. This was very cold and arduous work and usually done by grown men. When it was time to start rationing hay around Christmas and the rams were let in with the ewes, all the sheep were still kept outside as much as possible in the day but kept inside a sheep shed or shelter either at the farm or in more distant pastures during the night. Hay was rationed very sparingly, and a farmer's goal was to have as much hay as possible left over in the spring, while simultaneously getting as many sheep as possible through the winter. These two things however did not always go smoothly hand in hand and resulted in varied, and too often rather brutal, outcomes for the sheep and horses (Jónas Jónasson, 1945, pp. 99-102).

At the farm the task of processing skin and wool and producing winter socks, mittens and leather shoes for the family started as soon as the slaughter time was over. In general clothes were mostly woollen, either knitted or woven by hand from spun yarn, and men, women and children as young as 6 all took part in the work. However only men took care of tanning rawhide and fulling homespun cloth, which was hard work. Skin was used e.g. for shoes, oilskins, saddles and ropes. When general work for the family was done the work of producing woollens (mainly mittens, socks and sweaters) for export took over. The production took place over the whole winter and the working hours (isl. *kvöldvökur*) were often long, especially before Christmas as the people wanted as much of the work as possible to be done before that time (Jónas Jónasson, 1945, pp. 3-4, 102-114 and 121-122). Sometimes one person was spared work to read or someone would tell stories or recite poetry for the household and the workday usually ended with a reading/recitation of religious texts (isl. *húslestur*). Piety at home was considered an important part of Lutheran religious life as bad weather and impassable roads often prevented the attendance in church services in the wintertime (Jónas Jónasson, 1945, pp. 359-362; Loftur Guttormsson, 2000, pp. 175-178). The light source was usually oil (fish, shark or seal) or horse fat, and tallow candles for Christmas. This made the air in the living quarters where people were working cramped together often rather foul (smoke and odour) during the long working hours. Other winter tasks were e.g. spinning horsehair, braiding ropes and general wickerwork (mainly willow). Men who had the skill and opportunity for working metal (mainly iron, copper and tin (or brass), but also in a few cases silver and gold) or carving (e.g. wood, bone, horn and whale teeth) spent their time during the winter fixing and/or crafting tools, utensils, vessels and even furniture for the farm or to exchange e.g. for other domestic goods and raw materials (wood, wool, food, leather, hide, cloth etc.), for services and/or accommodation (see further discussion below). This could often make for a significant improvement in the household's general returns (isl. *búhnykkur*). The tools used were also very often home-made as most farms had at least a basic forge and smithy (Jónas Jónasson, 1945, pp. 3-5, 114-122, 439).

3.3.4. The Fishing Year

How fishing seasons were planned and how long they lasted varied between areas but depended mainly on when fish (e.g. cod, haddock, halibut, lumpfish and catfish) was in season and circumstances were best for fish processing. Fish was mainly dried as salt was expensive, so the weather needed to be cool enough for the fish not to rot or be destroyed by flies and maggots. Very little fishing took place between the start of the haymaking season in mid-July when as many hands as possible were needed to get in the hay harvest until round-up mid-September, except perhaps on a small scale for the household needs when time could be found. In some areas no fishing took place until after the main slaughter period in October. In the autumn the fishing season (autumn/former season) usually lasted from mid-September after the haymaking season until Christmas (Figure 3.5). The winter season usually started mid to late January and lasted until mid-May, while the period between mid-May and mid-July was called the spring or summer season (Jón Þ. Þór, 2002, p. 123; Lúðvík Kristjánsson, 1982, pp. 365-378).

Fishing stations (isl. *ver*) were scattered along the coast all around the country and numbered at least ~300-350 places in total, but still only about 16% of the population lived on farms with access to fishing grounds all year round. The fishing stations were often located on remote peninsulas and islands as close as possible to good fishing grounds and natural fish routes. Most of them, or ~40%, were along the Western seaboard (Westfjords, Snæfellsnes and Reykjanes; Figures 3.2 and 3.3) while around 20% were in each of the North, South and East quarters. In the west and southwest people were therefore much more dependent on fishing than agriculture and the Snæfellsnes and Reykjanes Peninsulas were the two main areas where people from other regions (mainly the North and the Southwest agricultural regions) came to fish and buy or collect stockfish. Western fishing farmers were required to pay their rents and other expenses in fish, as it was more valuable as an export commodity (Gísli Gunnarsson, 1987, pp. 25-26; 2017, p. 228; Jónas Jónasson, 1945, pp. 68-70). During the fishing seasons men commonly lived and worked on site in specially built but primitive small huts (rock, turf and timber/whale bone) or tents (isl. *verbúð*) during the seasons (Jón Þ. Þór, 2002, pp. 96-100; Lúðvík Kristjánsson, 1982, pp. 27-75).

Fishing methods were very primitive and run as cheaply as possible (for maximum profits) in open rowboats taking from 2 up to 8-10 oarsmen (isl. *tví-*, *átt-* and *teinæringar*) plus the foreman. The largest boats took 12 oarsmen, but they were very rare. The boats were mainly equipped and run or rented out by the crown's representatives, the Icelandic bishoprics and larger church farms. The king owned most of the largest fishing farms in Vestmannaeyjar and in the Reykjanes (Grindavík, Básendar, Keflavík, Hafnarfjörður) and Snæfellsnes peninsulas (Stapi, Ólafsvík, Grundarfjörður; Figure 3.2). Foreign merchants were by law not allowed to run boats or hire Icelanders to work for them. For a place on a boat any fisherman had to pay the owner part of his catch and standardized fish shares varied in number depending on the fisherman's place and purpose on that boat. For access to fishing station premises and their local resources boat owners had to pay a toll (isl. *vertollur*) to the landowner, usually in fish (Jón Þ. Þór, 2002, pp. 80-81 and 110-111; Lúðvík Kristjánsson, 1985, pp. 181-194). Icelandic boat builders constructed and/or maintained the boats with a mixture of driftwood and imported wood, likely mostly on commission or on order. The fishermen were tenant farmers and/or their sons and farm hands, sent by their landlords (e.g. richer tenant farmers, priests, government officials), and a few freelance workers on their own time. Farm hands were obligated to hand over most, if not all, of their catch to their master. Teenagers were sent to sea as young as 14-16 years old. Where tenant farmers in smaller or poorer families took part in the fishing the women, unfit older men and children were left in charge of the livestock and household. It has been estimated that between 1770 and 1881 the number of available berths increased from around 9000 to around 11.500 (Jón Þ. Þór, 2002, pp. 82-83). Fishing was mainly done with line, hook (iron) and sinker (rock or lead). Sails were uncommon until the 19th century and as a rule not used on boats with fewer than 6 oarsmen (isl. *sexæringar*). Nets for fishing cod were also used after 1750 but initially only by those who could afford them in a few places on Reykjanes south of Faxaflói (Jón Þ. Þór, 2002, pp. 78-84, 87-91 and 114).

The fishermen’s food rations also had to be brought from home and if they wanted fresh fish it had to be taken from their own share. Rations varied depending on the workers’ social station and level of prosperity and/or generosity of their masters. The rations mainly consisted of the cheapest foodstuffs, most commonly e.g. water and whey, butter and suet and fish oil, heads and entrails. Some also brought along mutton, patés and flatbread or steamed bread from home or simple meal (rye or barley) but this was rare. Boat owners sometimes also provided a small portion of meal on site (isl. *skiplag*) for each berth (isl. *skipshlutur*), although mainly in the South and the West. For those who worked on salary (isl. *á kaupi*) meal could be had in exchange for butter. In the 19th century grain was sometimes ground at the fishing station. Usually women were hired each season to clean the huts and the workers’ clothing, as well as cook fish (isl. *soðning,* usually the discard that was not exported) and gruel, often made from water or whey, meal, and sometimes even butter, provided by the workers (Jón Þ. Þór, 2002, pp. 119-120; Lúðvík Kristjánsson, 1982, pp. 451-467).

Although the fishing seasons were dedicated to fishing, days spent on shore could be up to ¾ of the whole season, e.g. due to bait shortage, sea ice or bad weather. In periods of layover, work could be split into general chores and personal projects. The chores would be e.g. fish and bait processing and other general maintenance of structures (e.g. the huts, boathouses, drying walls and shelters), tools (hooks, lines, weights etc.) and clothes (oilskins and woollens) needed for the fishing season to run smoothly. Some farmers and farm hands took farm work with them from home but also went hunting, were hired for local odd jobs like weaving, fulling or making oilskins, or did handicraft, e.g. from drift wood, horn, bone and fish skins, either for themselves or by order (Lúðvík Kristjánsson, 1985, pp. 197-203 and 442-454).

Fish was largely wind dried (stockfish, isl. *skreið*) both for export through the main trading stations and domestic consumption in the 18th century, but during the late 18th and 19th century salting fish became more and more common, especially for export. As with the trips that farmers took to the main trading posts during the summer, so were their trips to the fishing stations to buy or collect stockfish and fish oil at similar times before and after the haymaking season, preferably combining the two. No household could do completely without stockfish as part of its consumption. Domestic trade of stockfish for agricultural products mainly took place at the fishing stations. Business was largely built on trust and often long-established exchange arrangements. Fish for export was transported to the trading stations. Such trips usually started around mid to late June when packhorses had recovered after the long winter and/or the highland routes became passable. If winter was hard the horses were sometimes not ready for a long and arduous journey until July. Renting parts or whole horses for stock fish transport by multiple farms was common but the number and expense of trips depended mainly on the buyers' proximity to the trading station. The horse trains varied in size but could become very long (up to 50-60 horses) and carry heavy loads. The transported fish would usually be an owner's share being collected or someone was sent to trade for available stock. When the autumn season started the rationed food was sometimes transported to the fishing station on horseback and fish transported back home (Jón Þ. Þór, 2002, pp. 122-124; Lúðvík Kristjánsson, 1985, pp. 468-473).

3.4. Public Education and Apprenticeship

In Icelandic there is an old saying: *'Ekki verður bókvitið í askana látið.'* Loosely translated it means 'book learning does not put food on the table'. According to Loftur Guttormsson (1983, p. 163) children were taught how to work and adopt standard farming practices and routines from the age of 5 or 6. In his study of the 1703 census and other 18th century documentary sources Guttormsson (1983, p. 84 and 104) concluded that over 80% of children lived with their parents or close relatives up to the age of 10. As they grew older, they slowly took on more work, and after the age of 15 most lived at other farms as labourers. Only around 1/3 of a farmer's offspring between the ages of 15-34 still lived with their parents (Loftur Guttormsson, 1983, p. 165). In Iceland's 18th and 19th century, rural society upbringing and education took place largely within the home. Guttormsson also roughly estimated that because of Harboe's educational reforms (see discussion above) in the 1740s over 90% of the nation were judged capable of reading basic religious texts by 1790, but education still rarely reached beyond *pragmatic literacy* (Hybel and Poulsen, 2007, p. 104), i.e. teaching basic skills in reading and writing for the sake of piety. Parents and/or heads of the household were responsible for children's education and discipline. After the mid-18th century parish priests were to monitor their education in the home or teach them themselves, making sure that all children could read and that they had basic knowledge of Christian doctrine (the Lord's Prayer, the blessing, benedictions, verses and prayers) before the age of 14 or 15 (Jónas Jónasson, 1945, pp. 274-278; Loftur Guttormsson, 1983, pp. 80-81 and 167). But educating the lower classes was not considered a priority. In 1737 scholar Jón Ólafsson from Grunnavík (1996, pp. 20-21, 23 and 77) described what he felt was important to consider in regard to a boy's education and his opinions are a good representation of the upper-class view of general public education:

> '*Now the boy had reached as far as learning to read, write and calculate, and that is useful to everyone, whether it be in play or study, superiors or underlings, or however which way life plays out. This I think he should have finished in his tenth year, or the eleventh at the latest. Then it is the parents' responsibility, to consider their finances, and the boy's aptitude, and intelligence, whether he should be taught handicraft, or academic study, beyond what he has already acquired. If it is within his means, then this is important, even though he is not very intelligent. But be he poor, it is vanity to pursue his academic study, unless he has sufficient intelligence. By this I mean good memory and good understanding.* [...]. *If he is unfit for academic study; then he is still useful for some form of handicraft; as many are so obtuse, that they cannot grasp, but those things they see and feel, and therefore learn through simple routine, that they are useless in pondering invisible things. And this is not to be criticized, for intelligence has many facets.* [...] *it is more fitting to teach them proper handicraft, and not plague them with books, for by this the parents reap nothing but money wasted, torturing the child, and removing better times, that way the child will be of little usefulness from then on. But good handicraft is daily bread, and most can learn it.* […] *a person that has learnt some form of good handicraft or other, he will always have something to save his life and provide for himself, even though he never finds himself enduring famine and poverty, and even if he loses everything he owns.* […] *good handicraft is in essence the best inheritance, and imperishable, which men can provide to their children.*'

Less affluent farmers commonly put more emphasis on teaching their children practical work such as knitting and animal husbandry rather than reading and writing. As an example, in the late 18th century bookbinder Þórarinn Sveinsson (b. 1777) from Skarðskot in Leirársveit, wrote a part of his autobiography (Þórarinn Sveinsson, 1923, p. 320 and 344). When he was young he was very bookish and the parish priest wanted to educate him further but his mother refused, as she would not pay for his education and his older brother (who was their mother's farm hand) tried to keep him away from reading and writing (see also Elínborg Lárusdóttir, 1950, pp. 15-15 and Sigurður Ingjaldsson, 1957, pp. 46-47, for other examples of children having their longing for education suppressed). Those who had the means to pay could stay with their parish priest for a while to learn to write and do sums. Priests and learned men would also provide people who really wanted to learn to write with the written ABC's to practise from at home, but this was uncommon and farmers who were elevated to the post of district officer often had trouble executing all their duties due to insufficient education. Books were difficult to acquire and often old and worn and paper for writing was expensive. Ink was homemade and the writing tools were mainly feather pens (*Íslenska alfræðiorðabókin*, 1990, p. 107; Jónas Jónasson, 1945, pp. 274-278).

In Denmark craftsmen adopted European traditions of formalized practical training, or apprenticeship, as early as the 14th century. Such training was supervised and controlled by guilds and training included serving time as journeymen, wandering around practising their craft until they could claim the position of master themselves (Hybel and Poulsen, 2007, pp. 82 and 259-283). In Iceland guilds never formed and formal education and apprenticeship was not established until the early 20th century (Jón Ó. Ísberg, 2004, p. 39). The Icelandic customs practiced long into the 19th century may therefore represent traces of social traditions in rural home production and handicraft practiced in the Danish Kingdom and beyond prior to the 14th century, before medieval guilds, formal educational systems, and systematic mass production for market trade evolved and were established.

Little is known about the nature of general handicraft training in Iceland, but it was rarely formal apprenticeship. Self-sufficiency and thrift were crucial on every possible level within the household economy of the less affluent tenant farmer, and industriousness was considered next to Godliness. Up to the age of 15 at least, a father or relative and likely sometimes even hired farm hands, were responsible for teaching boys basic skills in how to make, maintain, fix and reuse tools and objects necessary to the running of a farm from bone (and/or teeth), horn, skin, wool, hair, wicker, wood, stone and metal. The metal was mostly iron and a smithy was on almost every farm, but some crafting farmers could also work with copper, brass, silver and gold, and many were considered *very* good at it (Kristmundur Bjarnason, 1961, pp. 55-77; Jónas Jónasson, 1945, pp. 56-130; Mohr, 1946, p. 94 and 97; Páll Vídalín and Jón Eiríksson, 1985, p. 46). To be considered a good candidate for craftsmanship was a point of pride. If finances or opportunity allowed, boys who showed talent were sent for a time to a talented farmer or craftsman for training (isl. *sendir í læri*), e.g. carpentry or metalworking, which could be considered a form of apprenticeship. In his autobiography Sveinsson (1923, p. 327 and 336) comments on a young man at Neðraskarð in Leirársveit (Figure 3.7) who seems to have been sent to his uncle at a young age in the late 18th century, and likely learned from him how to be a craftsman:

> '*There were two farm hands* [at Neðraskarð after district officer Magnús Árnason died (1741-1795), who himself was a good craftsman] *and the third a teenager, 18 years old, with great potential; he was the sister son of the late Magnús, he had raised him from a very young age, and loved him very much, for he was a budding craftsman* [smiðsefni] *and pretty good in all things.*'

In the long run however, the farmers and farm hands were mostly self-taught craftsmen at various levels regarding to talent and proficiency, working for themselves and their neighbours without any formal education. Some took part in handicraft for trade and exchange as early as 13-14 years of age (Sigurður Ingjaldsson, 1957, pp. 40-41, 51 and 122). In his autobiography Sigurður Ingjaldsson (1845-1933) from Balaskarð (Figure 3.7) tells how he and his older brother became interested in handicrafts before the age of 15. They started whittling spoons (isl. *spónarsmiður*) and decorating them with carvings (e.g. roses and inscriptions (isl. *höfðaletur*)) for payment, first from their father and later their neighbours, after observing their farm hand Gísli (the whittler) and his brother Jóhann (the carver) doing such joint projects on the side. The decorations had to be paid for separately (Sigurður Ingjaldsson, 1957, pp. 40-41).

In 1783 official regulation was set where craftsmen who had been approved by the sheriff were allowed to accept wages daily or weekly (dags-/vikulaun; *LFI*, 1854, pp. 683-686). When the formation of the first Icelandic towns was formally approved in 1786 all master craftsmen who bought a citizen permit (isl. *borgarabréf*) were legally allowed to practice and teach their craft according to the rules and regulations of the Danish Kingdom (*LFI*, 1855, p. 346). Government officials wanted to attract foreign craftsmen with various specialties to Iceland to work in the towns. However, in 1787 the Exchequer suggested to governor Levetzow that perhaps it would be more efficient and cheaper to recruit and set up Icelandic craftsmen or laymen of varied skills in the towns, even if they were without official education, as they would have a level of specialisation and knowledge better suited to Icelandic conditions (*LFI*, 1855, pp. 394-395). How these matters were resolved is unclear but in the late 18th and early 19th centuries it became more and more common for young men to travel abroad to learn a craft. In 1805 master carpenter Borgström is reported to have agreed to move to Reykjavík and teach young men his trade. His Icelandic students were to enjoy all legal rights afforded to other officially enrolled students within the kingdom (*LFI*, 1856, p. 768) and without a doubt this will have applied to students taught by Icelandic master craftsmen as well. However, handicraft education did not in any way become localized in the towns until the late 19th century.

One Icelandic craftsman was Gunnlaugur Guðbrandsson Briem (1773-1834) who studied both woodcarving and law abroad in the late 18th century. He became sheriff at Grund in Eyjafjörður (Figure 3.7) in 1805 and served as such until his death. Briem was the son and grandson of priests and was fostered after his father's death by provost Björn Halldórsson in Sauðlauksdalur in Barðastrandasýsla (Rúnar Þ. Þráinsson, 2012, pp. 8-10). Briem raised seven children (5 sons and 2 daughters) and while his youngest son Jóhann Kristján became a priest at Hruni, his third son Ólafur Eggert Briem (1808-1859) studied carpentry (*húsasmíði*) in Copenhagen between 1825 and 1831. Ólafur took over the farm at Grund after his father passed away, and ran a large household of 30 people, including 10 farm hands. At Grund Ólafur took on many students (isl. *smíðapiltur/smíðasveinn*) during his lifetime, 2-4 at a time mainly between the ages 18-25, including his nephew Tryggvi Gunnarsson (1835-1917), son of parish priest Gunnar Gunnarsson at the wealthy church farm Laufás in Eyjafjörður (Figure 3.7). After receiving general education at home until his confirmation at age 14 under the tutelage of his uncle Jóhann Kristján, Tryggvi then studied carpentry with Ólafur Briem for 3 years, or to the age of 18 in 1853 when he received his apprenticeship certificate. Such official certificates will then have been a fairly new concept. In turn Tryggvi Gunnarsson later took on more students (alongside running a farm), and between them Ólafur Briem and Gunnarsson passed on their knowledge and experience to many others in the second half of the 19th century (Þorkell Jóhannesson, 1955, pp. 26-32, 84-99 and 209-218).

Ólafur Briem and Tryggvi Gunnarsson came from the upper class and had the opportunity and means both to study and later take on students at home on their farms. As was mentioned above, taking on apprenticeship abroad in any craft was fairly uncommon before the second half of the 19th century but not unheard of. It is very likely that such knowledge and experience was also carried forward in a similar tradition between relatives and/or masters and students in Iceland prior to that time. There has to have been some social tradition in place to recognise a person's right to claim their technological talent worthy of a higher salary (see e.g. Rule, 1987, p. 104 and 108) and bypass the tight regulations and restrictions regarding permanent residence and travel in Iceland. It is likely that men who wanted to claim higher pay had to earn themselves a reputation for their skills through practice over a long time, similar to foreign journeymen in other countries, within their home district and beyond. As craftsmen had to be approved officially by the sheriff in every county to be able to accept daily/weekly wages in 1783, it may well be that it was also the sheriffs' duty to acknowledge or certify craftsmen in some way before that time, likely in cooperation with their masters and/or advocates.

3.5. Indigenous Handicraft and Goods Exchange

According to the *Búalög* in 1775 (Arnór Sigurjónsson, 1966, pp. 47-48) craftsmen's work had a higher value than general farm work. Only craftsmen and stewards had a right to claim a salary worth 120 ells per month (isl. *hundraðskaup*, 4 ells a day for work plus 2 ells for food), while general male labourers only earned up to 80 ells a month (Þórarinn Sveinsson, 1923, p. 290). Craftsmen were able to claim a salary on a short-term basis, i.e. for days, weeks and/or months rather than the full year as general farm labourers were forced to do by law, but anyone with initiative could practice general handicraft and use it to help make their way in the world through service and/or goods exchange. Opportunities for craftsmen to work in maintaining or building houses or churches were few and short-term so most such income had to come from homemade handicraft products (Þorkell Jóhannesson, 1955, pp. 104-106). Such products were very varied and could range from e.g. small spoons (isl. *spónn*) and rope loops (isl. *reiphagldir*) often made from horn or bone, up to large wooden furniture and metal finery e.g. for clothing and saddles. The raw materials were generally horn (ram or cow/bull), bone (fish, whale, sheep, cow), wood and metals (iron, copper and brass, silver and gold) but any material that could be usefully formed or worked for modest profit or expenses was exploited wherever possible. The most common and steady business beyond necessary production for home and work was in e.g. making and/or fixing horse tack (saddles for men or women (isl. *söðlar/söðlasmiður*), bridles, stirrups etc.) and horseshoes; tools and utensils from imported metal (e.g. isl. *drifsmiður*) or wood, wooden furniture and coffins, wooden vessels and containers (isl. *klápasmiður*), spoons (isl. *spónasmiður*) and carving. Woodworking was most common where driftwood was easily acquired along the coast e.g. in Hornstrandir in the Westfjords, in Skagi in Skagafjörður and Langanes Peninsula (Figure 3.7) in the Northeast (Jónas Jónasson, 1945, pp. 51-52, 67-68, 114-123 and 231-235; Þórður Tómasson, 2002, pp. 151-152; 2008, pp. 202-211). Projects were either done by order or independent production exchanged/sold to locals and/or at larger gatherings, such as Alþingi, county and district meetings, at autumn round-up, and/or on travels e.g. to and from trading posts and fishing stations.

Products were often exchanged for general staples such as food, tools and utensils, more raw materials or for work, and commissioned work was usually paid for in the same way (Jónas Jónasson, 1945, p. 89; Þórður Tómasson, 2002, pp. 178-183; 2008, pp. 202-205). In his autobiography Sigurður from Balaskarð (1845-1933) tells of how he spent a significant amount of time making spoons during the winter. He took e.g. skins, clothes and food for his commissioned work while some customers simply let him keep half of the spoons he had made from the materials they had provided him with (Sigurður Ingjaldsson, 1957, pp. 76-81). Halldór Jónsson from Tindur (Figure 3.7), an 18-year-old farmer's son and unofficial local scribe, registered his good exchanges in his diaries for the year 1890. In his registries it is noteworthy that nothing was considered for free, not even between father/son, brothers, family or farm hands. Everything could be considered as an asset with a set value, from the smallest scraps of wool and small tasks, to furniture and livestock. Exchange of goods, raw materials and/or work was common, between the brothers, between the brothers and the farm hands (both male or female), and likely between father and sons too. As a rule, the most important medium of general exchange was farm (meat, wool, milk products, skins) and fish produce (fish, shark, liver) but for his work as a scribe Halldór also engaged in trading with ink, pens, paper, writing and reading materials. Agreements to exchange items/goods often took place over a period of time as payment was not always at hand at the exact moment of exchange/agreement (Sigurður G. Magnússon, 1997, pp. 12, 23-91, 242 and 248-250). Little exchange of such handicraft goods likely took place through the foreign merchants at the trading posts however, although it was not unheard of (Þórður Tómasson, 2008, p. 202). Internal exchange rates for both the work/time needed and the finished products were set in accordance with the old Icelandic price regulations (isl. *Búalög*/*landaurar*), which also largely governed exchange with the staple farm and fish products for export at the Danish trading posts (see section 3.2; *Búalög*, 1775; Arnór Sigurjónsson, 1966).

3.6. Information Exchange and Population Mobility

3.6.1. The Mobile Farming Household

As mentioned above a typical farming household in the 18th century consisted of 3-6 people, the farmer, his wife and child/-ren, farmhands (often a man and a woman) and other dependents. The family lived in close quarters and while working, people would entertain each other and discuss daily affairs. Their general chores mostly took place on the farm but general communication and cooperation with neighbouring farms and crofts would also be a common, if not a daily occurrence. All work was forbidden on Sundays and evenings would be spent reading and telling stories, reciting and playing cards or various board games. People attended mass during the day, when weather permitted, where they would hear the sermon and meet and exchange news, opinions and pleasantries with their priest and neighbours, to see and be seen. Church attendance was general but often the trip was long (Loftur Guttormsson, 2000, p. 358). On their way back from church, people would use the opportunity to visit more distant neighbours, friends and/or relatives along the way. Jónasson (1945, pp. 229-230) tells of a tradition where once over a summer people would also attend mass in another, more distant parish for variety, and spend the weekend traveling back and forth. Large feasts, e.g. weddings or christenings, were not common, but around Christmas and the New Year was a period when most families would celebrate together in some modest fashion compared to modern standards.

Within the districts, other shorter daytrips for farmers and farm hands would have included e.g. the general shepherding and the big communal round-up trip in the autumn discussed above, where sometimes even the whole family would attend on the last round-up day (isl. *réttardagur*). Every year in the spring and autumn farmers also commonly attended the census and district assemblies (Figure 3.5), usually held in one and the same place (isl. *þingstaður*) for each district (Lýður Björnsson, 1972, pp. 94-95, 128 and 151). Family visits were of course common when time could be spared but Jónas Jónasson (1945, pp. 249-251) also describes in detail a specific old tradition he calls ‘vacation trips’ (isl. *orlofsferðir*). In the autumn after the main chores were done, married women (more often poorer wives) would visit a relative or a former employer (often more affluent) within the district for a short stay. The visitor would come bearing modest gifts for the housewife and children (socks/mittens/caps, cakes and/or bread, thread etc.). Once the stay was over and the women had exchanged news and gossip the host was obligated to reciprocate for the gifts brought by the guest, always of equal or higher value (e.g. butter, wool, cloth etc.). Men would also go on such trips but according to Jónasson gift giving did not play as great a part in their exchange, although when it did, tobacco, liquor and small necessities for the farm work (nails, rope loops, cinches etc.) were more common.

Þingmannaleið (roughly translated as the parliamentarian route) is an old Icelandic term used to describe the distance travelled in one day and it measured just under 40 km (Mörður Árnason, 2002, p. 1811; average walking pace of a human is 5 km/hour). *Daghleypa* (a day´s run) was classified as three representative routes (3 *þingmannaleiðir*) or ~120 km (Mörður Árnason, 2002, p. 202). Traveling further afield e.g. to the trading posts or to collect stock fish, could take days or even weeks. County and district representatives had to travel once a year in the spring to the parliament in Þingvellir. They were compensated for their troubles however (isl. *þingfararkaup*, see above), and craftsmen had a right to compensation for distances travelled during work (Arnór Sigurjónsson, 1966, p. 48 and 66). As discussed briefly above many farmers and farm workers travelled from the farming areas in the North (mainly the Húnaþing, Skagafjörður and Eyjafjörður areas) and Southwest (Árnessýsla and southwest Rangárvallasýsla) to Reykjanes, Snæfellsnes and the Westfjords for the fishing seasons and to buy stockfish, while people in the East- and Westfjords usually went to fishing stations within their own counties (Figures 3.2 and 3.6). In turn many of those who lived in the main fishing districts in the West and the Southwest would travel every year in early July to the Southwest and North for work during the haymaking season. Movement between the Western and Eastern parts of the island east of Vatnajökull was rarer and the inhabitants of Vestur-Skaftafellssýsla in the South were somewhat isolated due to large expanses of sandy gravel plains (Mýrdalssandur and Skeiðarársandur) and bodies of water on either side of them.

During longer trips people (who could not travel by boat) would either sleep out in the open or in tents (very rarely done during the winter), in small travel shelters communally maintained on highland routes, or seek lodgings and hospitality on farms along the way. Jón Jónsson (1998) has discussed how hospitality was an ingrained, fundamental virtue in Iceland and strictly upheld by public opinion, religious morality and folklore (ghost stories and tales of warning). Turning away a traveller was considered disgraceful, especially when the host's means were clearly sufficient, but when times were hard people were often forced to turn travellers away for their own survival. Guests were rarely unwelcome as they were often good company and would bring news and variety to daily life. Some travellers had traditional stopping places along their routes. To prevent any traveller being a burden on the host, who was required to offer food and services, the socially accepted length of a guests stay was three nights (isl. *gestanætur*), unless the houseguest was trapped by bad weather. The proverb *Æ sér gjöf til gjalda* (a giver of gifts expects them to be returned with equal measure (preferably higher)) had deep roots in Icelandic society and most travellers would return the host's favour in some way, e.g. by helping on the farm (knitting, sewing, combing wool etc.), with small offerings (e.g. small handicraft objects or tobacco) or providing entertainment (reading, poetry, impersonations etc.), so hospitality rarely went unpaid (Jón Jónsson, 1998; Lúðvík Kristjánsson, 1982, pp. 391-392). In his autobiography Sigurður from Balaskarð (Sigurður Ingjaldsson, 1957, pp. 78-81) for example told how he partly paid for his food and lodgings as a young man on his long journey from the Northwest to the fishing stations close to Reykjavík (Figure 3.7) with horn spoons he had made himself. This custom of socially obligatory hospitality essentially also formed the foundation of primitive social security in the countryside. The households within each district took turns providing housing and food for the vagrants (often the disabled) who had nowhere to go or refused to settle (but were generally not allowed to wander outside their district), in return for various menial work, entertainment and/or news (Jón Jónsson, 1998).

For a long time, messages and news were mainly spread through personal communication (word of mouth) with neighbours, guests and travellers and mail was simply dispatched whenever and wherever an opportunity presented itself, unless one could afford to send special messengers. One of the ways vagrants could get away with traveling between districts, and even further afield, was by taking care of letters and/or messages for people to transport for modest payment. Some would also buy small merchandise at the trading posts and then travel the countryside between farms to hawk their wares. There was no organized postal service until the late 18th century, and long into the 19th century it was mainly to facilitate official communication between

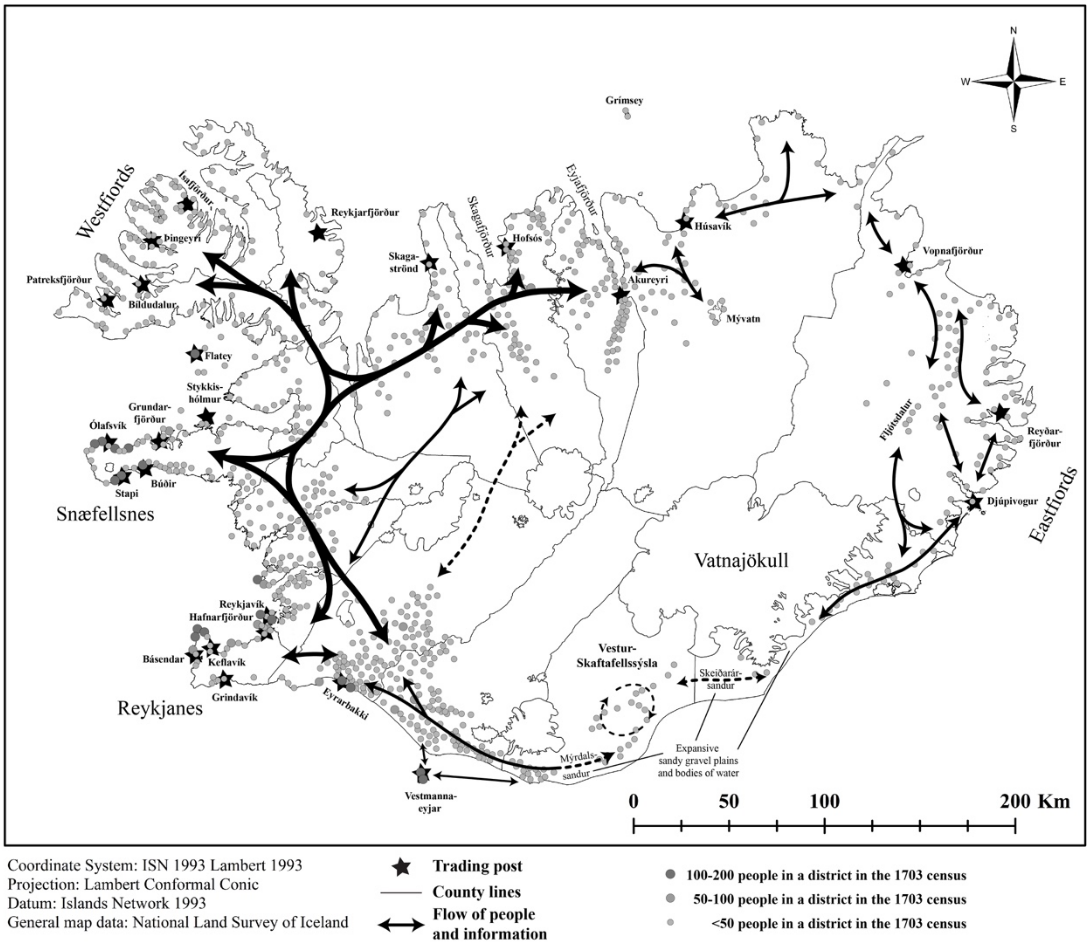


Figure 3.6. General population movements between regions in Iceland. Longer trips were mainly to visit trading posts and to buy stock fish, or for work; either during the fishing seasons mainly in the Westfjords, the Reykjanes and Snæfellsnes peninsulas and around Eyrarbakki, or for the haymaking season in July and August in the North and Southwest. The lines are meant indicate the most common travel routes and their frequency of use. They are not an exact representation of Iceland's complex horse track systems.

government officials (mainly sheriffs and the governors) and merchants. Although the first vestiges of printed mass media published in Icelandic started to appear in the late 18th century (e.g. Rit þess íslenzka konunglega lærdómslistafélags, 1780 and Margvíslegt gaman og alvara, 1798), newspapers and other general publications and journals (e.g. agricultural treatises and other instructional or public entertainment publications) didn't appear in any quantity until the second half of the 19th/early 20th centuries when printing was no longer controlled only by the church and/or the government. For a long time, proceedings, royal proclamations and laws presented at the assemblies at Alþingi in Þingvellir were generally written down and copies distributed between government officials (*Alþingisbækur Íslands/Lovsamling for Island*) to read out loud at public assemblies. This however was more often than not done in Danish, a language that the general public barely understood (Árni D. Júlíusson, 2013a, pp. 269-272; Guðjón Friðriksson, 2000, pp. 9-21; Heimir Þorleifsson, 1996, pp. 15-30; Jónas Jónasson, 1945, pp. 182, 226-230, 243, 247-254 and 385; Jón Jónsson, 1998).

3.6.2. The Mobile Farming Household and Its Geographical Reach

It is clear that through their daily work and routine long-distance travels, people maintained consistent personal communications and public interaction, forming complex and far reaching social and personal networks between farms, within and between all districts and counties. As mentioned above, farms were rarely more than 2-5 km from another but the distances and frequencies of these general human interactions and travels between neighbours need further consideration. One year from the diary of a young farmer's son named Halldór Jónsson (1871-1912) gives a more detailed insight into the nature of people's mobility and their social networks at the local and regional level. It gives some indication of which activities contributed to daily communications between farming households and how often and how far people travelled during their routine. The diary entries were written in 1890 in the very early beginnings of the Industrial Revolution in Iceland and cover in detail the life of the household at Tindur in Miðdalur in Strandasýsla (Figure 3.7) between January and June, and October through December. The months between July and September were not transcribed for the diary's publication (Sigurður G. Magnússon, 1997), but this time will have been largely spent taking part in the haymaking season on the farm and the sheep round-up (Figure 3.5).

Tindur was an average sized tenant farm valued at 12 hundred, located by a general route commonly taken between Steingrímsfjörður in the east and Gilsfjörður and Króksfjörður in the west. The size of its household was slightly larger than average or 10 people, the farmer and his four sons, their paternal grandmother and four other dependents (two men, two women). Níels Jónsson (b. 1870), the eldest son in the family was a craftsman and general handyman along with his father Jón Jónsson (b. 1840), as well as also being a fisherman. Halldór, the second eldest (b. 1871), did a lot of work as a scribe and an artist and was also an avid reader. In 1890 his trading largely revolved around acquiring reading materials and ink, colours, paper and pens for his work and no opportunity was missed to exchange goods or work for these materials, whether it was

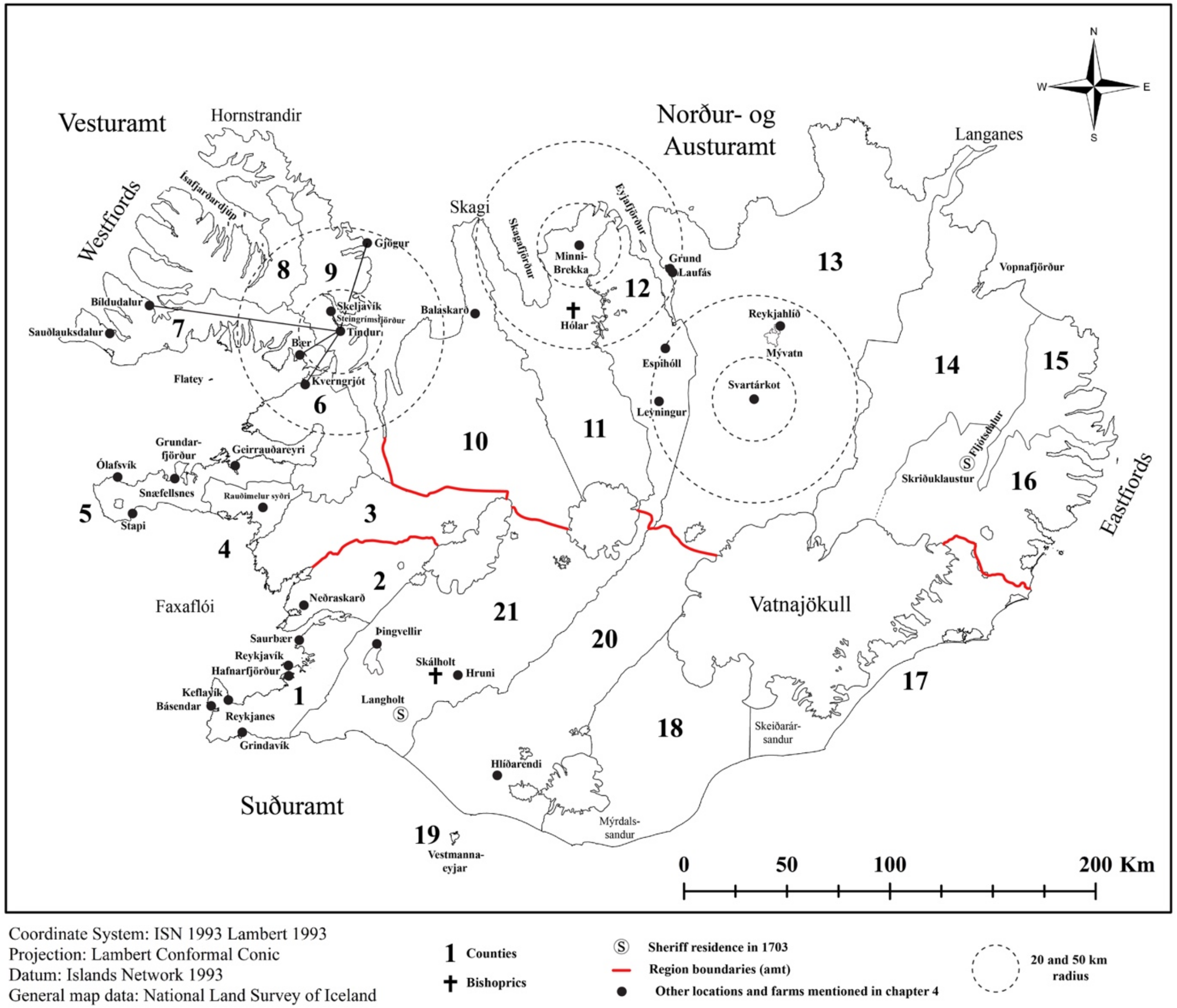


Figure 3.7. The estimated main activity areas of the tenant farm Tindur in the 19th century, along with Minni-Brekka and Svartárkot (see further discussion in Chapter 5).

building and repairing turf walls. Níels, Ísleifur and Magnús seem to have been the ones who went fishing during the winter while Halldór stayed at home with his father and the farm hands. Magnús, the youngest, took shorter trips to the sea for shark fishing in Steingrímsfjörður and came home sporadically while Níels and Ísleifur went further afield, likely to Gjögur and possibly Bíldudalur. The younger brothers Ísleifur and Magnús hired themselves early on as farmhands to neighbouring farms (e.g. the church farm Tröllatunga) (Sigurður G. Magnússon, 1997, pp. 12 and 23-91).

Over the 9 months roughly 630 errands were recorded to (~260 errands) and from (~370 errands) Tindur in total to/from 45 different places, the majority of which are located in the Westfjords (Strandasýsla, Ísafjarðarsýsla, Barðastrandarsýsla and Dalasýsla). About 85% of all the registered errands were connected to farms within a 20 km radius around Tindur (Figures 3.7 and 3.8). The varied purposes of the errands can be seen in Figures 3.9 and 3.10. Errands with an unspecified purpose are around 30% of all the errands recorded, but about 75-80% of those errands both to and from Tindur are from farms within the valley Miðdalur itself (i.e. mostly between the closest farms Gestsstaðasel, Miðdals-gröf and Gestsstaðir, <5 km radius) and mostly connected to the daily life of the farmers, their family and farm hands in agriculture and fishing. The most common reason for errands from Tindur was acquisition, processing or trade of food (13%) mostly from or at neighbouring farms in Miðdalur. Animal husbandry was also a common reason for travel (~13-17%) both to and from Tindur (e.g. for slaughter, breeding or castration), but 70-80% of all those errands were either for fetching, herding or looking for sheep. Very often single trips had more than one purpose. The longest trips the brothers took were for fishing (Gjögur and possibly Bíldudalur), for medicine for themselves or for their neighbours

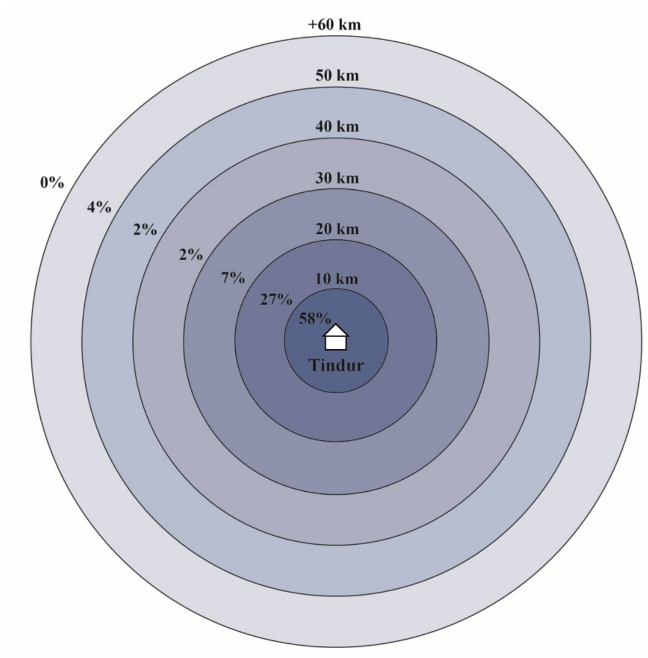
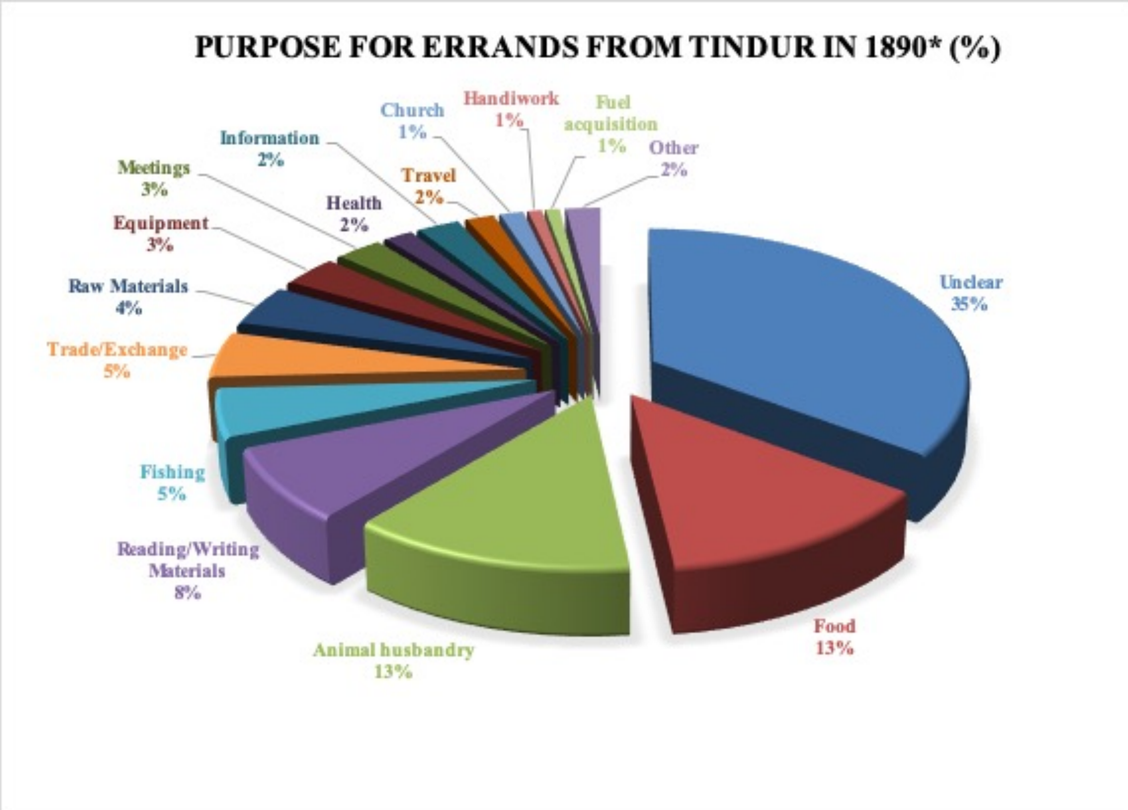
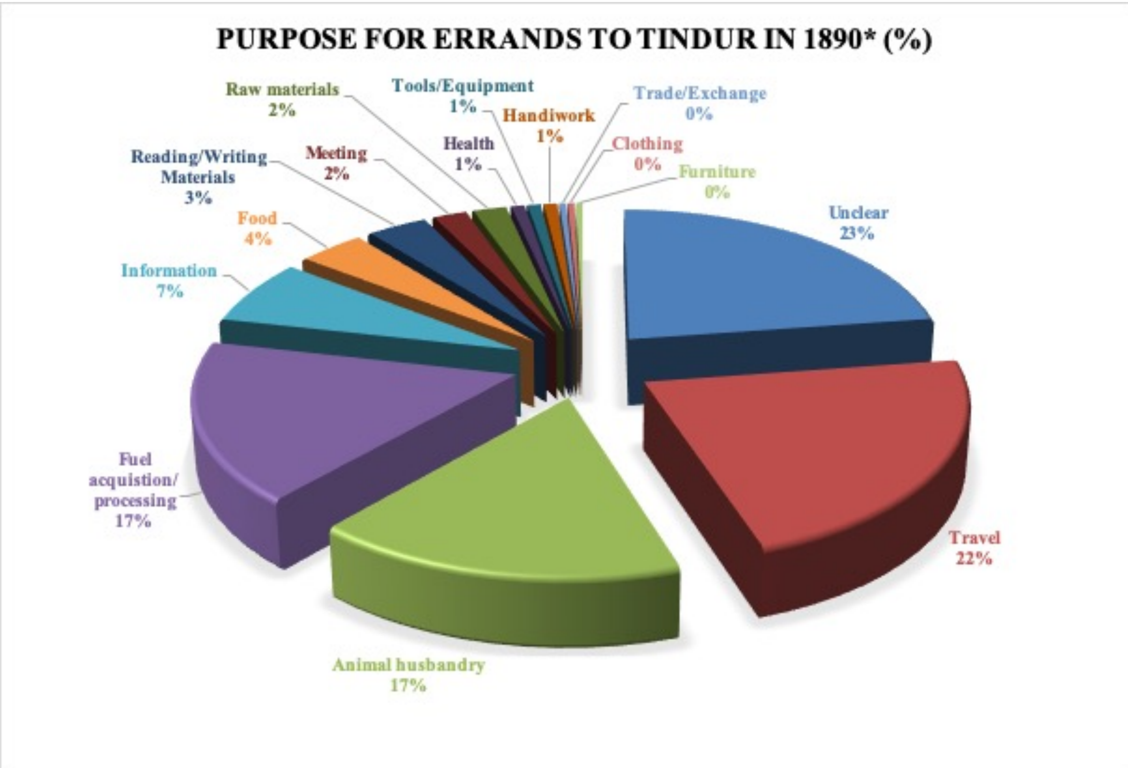


Figure 3.8. Percentage and distance to origin of trips and errands to and from Tindur in Miðdalur over a nine-month time period in 1890.





Figures 3.9 and 3.10. Purposes for errands recorded by Halldór Jónsson to and from Tindur in Miðdalur in Strandasýsla in 1890.

(which they were paid for; to Kverngrjót in Saurbær and Bær in Króksfjörður (home of the closest district physician)) and for goods exchange at ship in Skeljavík further north in Steingrímsfjörður and in Bíldudalur (Figure 3.7). About 22% of people's errands to Tindur in 1890 were arrivals passing through due to e.g. travel or sheep herding (58 visits in total, on average 6-7 visits a month), with people often staying overnight on their way to other undisclosed destinations. Often the people brought news, notes regarding local meetings and goings on in the area, or letters, either directly to Tindur or for them to transport or pass on further afield (*JÁM VII*, pp. 403-405; "NACD", 2017, census 1890; Sigurður G. Magnússon, 1997, pp. 12, 23-91, 242 and 248-250). Through general farm work (especially sheep herding traditions and sheep's often-unpredictable behaviour) and travels of both family members (e.g. for fishing and acquisition of other necessities) and passers-by, the farm was strongly socially connected to its neighbours and beyond in a fundamental and permanent way.

3.7. Conclusions

This general overview gives a rough idea of the general socioeconomic conditions in 18th century Iceland into which the two innovations, cereal cultivation and quernstone production, were introduced. The island was a dependency of the Danish monarchy which constituted its highest official judicial and religious authority. This North-Atlantic island was inhabited by a small population of ~45-50 thousand people, the majority of which were strongly religious and fatalistic protestant tenant farmers and crofters of modest to low affluence. There were no villages or towns and the population was distributed between 6-7000 tenant farms (70-80%) and crofts (20-30%). The crofts were often strongly connected to the larger tenant farms or accumulated close to the fishing stations, especially in the West. The majority of these farms was fairly evenly spread within fiords and valleys, both inland and all along the islands' coastline. The island was divided into ~20 major administrative regions called counties. The counties were split between 1-3 regional governors who were often foreign and absent, but yet meant to direct the local county sheriffs heading each one. In turn the counties were split further into smaller units of farming districts (~160) and parishes (~180), headed by district officers and Lutheran priests who lived among, and were often closely connected to, the local population. The majority of these positions and responsibilities were whenever possible handed down within the same families and therefore the islands local governance, both the secular and the spiritual, was largely in the hands of only a few land-owning families who owned a majority of the farms and crofts (~50%) alongside the church and the king. All communication and information-exchange, whether personal or official, was commonly interpersonal, through verbal messages and/or letter-writing. Supervision of public education was the responsibility of the church and such education was largely aimed towards very basic pragmatic literacy in the name of piety.

The islands inhabitants where somewhat isolated and only Danish merchant ships were allowed to make annual trips to summer trading posts, situated at varied intervals along its coastline. Foreign merchants were required to sail to all the trading posts every year but were not allowed to take any active part in local production. The daily life of the farming community was dominantly occupied and sustained by sheep farming, fishing and handicraft, mainly for their own general subsistence and local goods exchange, but also for goods exchange at the trading posts in varied quantities depending on their level of affluences (fish products and/or meat and woollens in exchange for imports, mainly timber, iron, meal, tobacco and liquor). Food was mainly agricultural produce, stockfish and that which could be had from the wild larder, both animal and plant. Everything was eaten, used, traded or burned. On average cereals only constituted about 10% of the people's diet at the turn of the 18th century and they were largely imported in the form of meal.

Year-round the majority of the workforce was spread between farming households and fishing stations. Majority of farms and crofts were strongly interconnected through their homogenous farming practices and socioeconomic responsibilities, and cooperation and interaction were frequent between neighbouring farms. Travel was mainly for official assemblies, trading, haymaking and fishing; and in the case of the latter two, especially in the more westerly counties where the majority of fishing and trading stations were located. Road systems were very basic and travel often difficult, but a large part of the population nevertheless travelled seasonally over large distances; on foot, on horseback or in boats. Showing hospitality and giving shelter to passing travellers was as much a social expectation as it was important to reciprocate said hospitality in return with modest payment in goods and/or work (often some form of handicraft) or entertainment, and without overstaying such a welcome. Handicraft was a fundamental part of daily life, and the population functioned without formal guilds, apprenticeships or detailed craft specialisation. Such knowledge and education were commonly passed on in the home and/or between close, and often male, relatives. Many farmers could work with varied raw materials, ranging from gold to sheep horns, although the main types were iron, wood, bones, horn and stone. This knowledge will have stood many farming craftsmen in good stead as they took on quernstone production in the second half of the 18th century. Icelandic farming craftsmen, their handicraft and social influence will be covered in more detail in Chapter 5. For the time being, however, we turn our attention to telling the story of how public cereal cultivation was rejected and ideas of import of unground grain and indigenous production of quernstones in Iceland came about.

~ Chapter 4 ~

The Authoritative Decision: Beginning the Revival of Indigenous Quernstone Production

> *Those who commonly hew quernstones are located here in the jurisdiction* [isl. þingsókn/hreppur] *wherever useful rocks can easily be found, along with a few people in Leiðvallaþingsókn* [in Meðalland] *who similarly obtain and hew such stones for a set price and transport them to the trading post for a little extra. To sell quernstones in the county is a little difficult at the moment as many are sceptical about the project. But to get the participants to hew and transport such stones to the trading post for the set price and a little transport fee, not to mention the promised reward, was considered a good solution when I talked to certain men about it. Production will be considered at the first opportunity when the slaughter season is over, which will likely be very unproductive this year, as all grass is burned and no dry day in sight due to the effects of fire* [volcanic eruption] *that causes swift ruin for both animals and people.*[11]

Sheriff Lýður Guðmundsson
Vík, Skaftafellssýsla
18. August 1783

As the sheriff of Skaftafellssýsla wrote these words (*ÞÍ. Rtk. B10.6.29*, 1783) in reply to the Danish Exchequer's inquiries about developments in quernstone production within the county, the 1783-1784 Laki eruption (isl. *Skaftáreldar*) had lasted a little over two months. By that time, yearly import of unground grain and the revival of indigenous quernstone production had been progressing slowly with governmental direction and encouragement for over 12 years and was to continue until 1790. The eruption lasted for 8 months and in the end over 10 thousand people (~20%) and more than 60% of all livestock had perished, primarily from fluorine poisoning and, in the long term, starvation and disease (Sveinbjörn Rafnsson, 1984, pp. 163-170; Thorvaldur Thordarson and Self, 1993, pp. 238-244). In the year following the eruption, import of grain (mainly rye and pearl barley) increased substantially through governmental aid making it more important than ever to have access to a quernstone. This is clearly demonstrated by the sheriff Guðmundur Runólfsson in Gullbringu- and Kjósarsýsla in 1770 when he described how the poor in Reykjavík were "*forced in order to prolong their life to cut it* [unground rye] *as tobacco on a board with a tobacco iron*" in order to consume it. This was due to them having been denied access to a quernstone at the trading post without payment (Hrefna

[11] All English translations of Icelandic and Danish documents and texts are done by this author. Wording and punctuation is kept as close to the originial text as possible.

Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, p. 76). By that time unground grain had been imported in small quantities at least since 1767, likely at the behest of treasurer Skúli Magnússon.

Governmental directions, human agency and natural disasters have variable effects on project execution and innovation progress. However, estimating the extent of their impact and efficacy, or lack thereof, long after the fact will always prove difficult. In this chapter the failure of cereal production and the quernstone revival project's development and execution under government leadership mainly between 1750 and 1790 are described in detail. The description is largely based on 18th century documentary sources. The aim is to catalogue the role of the main participating government officials, or *change agents*, and their attitude towards the projects, as well as government tactics used during the initial stages of the innovation process and any effects they may have had. The chapter has been split into five sections. The first outlines the driving forces behind the innovation ideas. In the second section the nature of the initial planning of the quernstone production revival and its participants is described, especially regarding developments in import of unground grain up to the early 20th century, initial information distribution and government incentives such as the import of 200 free quernstones and production rewards. The third section covers any further governmental directions for indigenous production procedures and attempted price regulations, before indigenous quernstone production is declared free and continued without further government input. In the fourth section the varied roles and potential influences of the participating change agents and their tactics for better or worse are drawn together and discussed. The main conclusions are then collated in the fifth and final section.

The main period of active government participation lasted over 40 years between 1750 and 1790. After the rejection of cereal cultivation plans and careful reconsideration, the ideas of importing unground grain and developing indigenous quernstone production, gained general support from top government officials and religious leaders. Once Icelandic government approval was verified the Danish Exchequer started importing unground grain on a growing scale and provided free foreign quernstones for demonstration and guidance through the trading companies for all the trading posts around the country. Rewards were given out once a year for nine years to boost the public's interest in local production and the trading companies were obliged to accept the product for sale. Once all the major planning aspects were finished, any further project execution was mainly left in the hands of the sheriffs, priests and district officers who were expected to carry on the work (demonstrating the innovations' usefulness to the public, supervision of raw material search, recruitment and encouragement of craftsmen and farmers etc.) and/or lead by example within their respective counties. Their participation and influences will be discussed further in Chapter 5.

4.1. The Forcing Agents: Collective Causes and Calls for Change

4.1.1. The Boiling Cauldron

Iceland is a geographically isolated island out in the middle of the North-Atlantic, but in the 18th century it was far from being ideologically isolated. As the century passed, more and more effort was being put into bolstering agriculture and manufacture to increase production and revenues of the Danish state's, not just in Denmark, but also in all its dependencies and outposts (Hrefna Róbertsdóttir, 2008, pp. 127-128). Iceland became a place of interest, and efforts to strengthen Iceland's' economic policies through police ordinances and legislation increased. Numerous scientific expeditions were sponsored in the 18th century by the government to catalogue its human and natural resources for utilisation and improvement (Hrefna Róbertsdóttir, 2008, pp. 129-181). Among the educated upper classes in Iceland, political, economic and religious ideologies were united in a common goal in the second half of the 18th century. Socioeconomic ideals of the *Enlightenment* merged with *cameralism* and *pietism*, resulting in a *physiocratic policy* (isl. *búauðgistefna*) aimed at strengthening rural society, e.g. through vocational education and agricultural reform with active government involvement, as well as affirming the hierarchical structure of the state and traditional social class divisions. Constant sedulity in piety, industry and respect for the law were strictly demanded from the public, to be enforced by the head of every household (lat. *paterfamilias*) for the common good of both society and the state (Einar Laxness and Pétur H. Árnason, 2015, pp. 77, 189-190, 209-210 and 523; Lýður Björnsson, 2006, pp. 113-114 and 128; Vilhelm Vilhelmsson, 2017, pp. 52-60). Simultaneously however, the Icelandic public was experiencing some serious environmental setbacks.

In the late-17th century the islands' population numbers dropped 17% over a period of 25 years, and the 18th century was not much better. In 1707-1709 smallpox spread through the country resulting in 16 thousand deaths (over 30% of the nation). Glaciers advanced and sea ice became a regular visitor, wreaking havoc with the already short summer and slow growth rate of grass. Hay harvests failed, livestock starved, and fishing became difficult, if not impossible, for periods of time resulting in serious consequences for the people who based their livelihood on little else. Between 1751 and 1759 12.5% of the population died from starvation and another smallpox outbreak in 1752. In 1783-1784 Iceland experienced the second largest volcanic eruptions of the millennium, the Laki eruption, at which point even suggestions of total evacuation of the island were aired. In the two years following the eruption, fluorosis, starvation and disease caused the death of over 10.000 people (20% of the population) as livestock perished in large numbers (70% of sheep and just under 40% of cattle were lost) due to them and their feed being poisoned by eruption fallout and fumes (Árni D. Júlíusson, 2013a, pp. 235-237; Lýður Björnsson, 2006, pp. 30-36, 46-49 and 209-217; Sveinbjörn Rafnsson, 1984, pp. 163-170; Thorvaldur Thordarson and Self, 1993, 2003). The nature of the Danish monopoly trade and general indigenous goods exchange only exacerbated the problem, as the main export goods were fish, woollens and meat. In times of famine there was little produce to export to begin with and very little money in circulation to buy meal as backup. The nature of the goods exchange also meant that merchants were reluctant, and even refused, to exchange meal for anything other than export goods that were essentially mainly food (Gísli Gunnarsson, 2017, p. 220).

Various ideas of economic reform and technological progress had started surfacing within the Icelandic ruling class at the end of the 17th century but for a long time amounted to very little. Around 1750 thirteen Icelandic officials and wealthy landowners, with treasurer Skúli Magnússon in the lead, started an ambitious project of general reform in Iceland. This became commonly known as *The New Enterprises* (isl. *Innréttingarnar*). The project was intended to breathe new life into Icelandic agriculture and fisheries by introducing more modern methods and technologies that would increase production (e.g. in fishing, boat building, textile industry, horticulture, exploitation of mineral resources, e.g. salt and sulphur, and more), for the good of the economy and the islands' inhabitants (Hrefna Róbertsdóttir, 2008, pp. 29-30; Lýður Björnsson, 1998, pp. 31-47). In November 1751 Niels Horrebow and Skúli Magnússon submitted extensive reform ideas to the Danish King (Gunnar Karlsson, 1964, p. 20; Kristrún A. Ólafsdóttir, 1997, pp. 10-11; Lýður Björnsson, 1998, pp. 34-36), and early in the following year, the king accepted all their proposals and the enterprise was awarded a 10.000 state dollar grant (Lýður Björnsson, 1998, pp. 41-42). The operations were mainly located in and around

Reykjavík during the second half of the 18th century and introducing and teaching modern techniques and technologies to the wool and fishing industries was its main concern.

From the start however, the enterprises were plagued by financial setbacks and conflicts with Danish merchants who felt their territory was being invaded; incompatibility with old traditions, conflicting opinions, and unforeseeable obstacles such as bad weather conditions and outbreaks of scab imported with foreign sheep meant for their sheep breeding programs; setbacks that infected all other innovation efforts connected to them (Lýður Björnsson, 1998, pp. 157-167). One of the aspects that failed was reviving indigenous cereal cultivation, which had previously died out between the 11th and 16th centuries (Gunnar Karlsson, 2009, pp. 163-166; Þorkell Jóhannesson, 1965, pp. 45-46; see more detailed description in Chapter 6). And in the wake of that failure, another idea was born and developed successfully from the ashes of the old one, the import of unground grain and the revival of indigenous quernstone production.

4.1.2. Experimental Indigenous Cereal Cultivation

In the second half of the 17th century sheriff Vísi-Gísli Magnússon (d. 1696) experimented with growing barley, rye and/or lyme grass in the south of Iceland (Ingólfur Guðnason, 1998, pp. 146-156; Gunnar Karlsson, 1964, pp. 6 and 9-14). His experiments were small scale but were taken by some as an indication that cereals might be cultivated in Iceland on a larger scale. At this time however there was not much interest in such cultivation. The prevalent view of scholars and government officials was that it was not viable due to cool climate, unfavourable soils, and lack of knowledge and equipment. It was argued that the average farmer or tenant could not afford to spare farmhands, time or fertiliser on such ventures without risking their livelihood and this view was still strong around 1750 when Lawman Bjarni Markússon applied for a state grant in Denmark to start experimenting with growing barley, rye and oats in Iceland (Gunnar Karlsson, 1964, pp. 6-9 and 18). The government granted Bjarni 200 state dollars for the venture. Bjarni settled in Skagafjörður with a Norwegian farmer who was expected to provide the experience, but their experiments failed (Gunnar Karlsson, 1964, pp. 18-19; Kristrún A. Ólafsdóttir, 1997, pp. 7-9; Lýður Björnsson, 1998, pp. 33-34).

Around the same time as Bjarni was applying for his grant for experimental cereal cultivation in 1750, The New Enterprises were taking form. Icelanders had for a long time complained about the quantity and quality of imported meal; not only was it often of second-rate quality to begin with, it was also often spoiled during transport across the North Atlantic (Jón J. Aðils, 1902, pp. 56-57, 62-69, 114-115 and 121; 1971, pp. 441-443; Gísli Gunnarsson, 2017, pp. 230-232). One major aim of The New Enterprises was therefore to revive indigenous cereal cultivation. Based on the ideas of Sheriff Bjarni Halldórsson in Húnavatnssýsla, fourteen families from Denmark (8) and Norway (6) were transported alongside necessary agricultural equipment to Iceland in the spring of 1752 and lodged with government officials and rich landowners in Iceland (Gunnar Karlsson, 1964, pp. 20-21; Kristrún A. Ólafsdóttir, 1997, pp. 10-16). The families were to remain for 8-10 years and experiment with barley, rye and oats. However, most of them abandoned the project between 1754 and 1756, and by 1762 they were all gone (Gunnar Karlsson, 1964, pp. 28-29; Kristrún A. Ólafsdóttir, 1997, pp. 19-20; Lýður Björnsson, 1998, p. 53). This ambitious foray of The New Enterprises into cereal cultivation failed, and this has been blamed on inadequate planning, insufficient funding and unusually cold weather conditions in the 1750s (Gunnar Karlsson, 1964, pp. 28-30; Kristrún A. Ólafsdóttir, 1997, pp. 17-23). In 1760 and 1761, a pioneer in Icelandic horticulture, reverend Björn Halldórsson, also experimented with cereal cultivation but, as with all the other experiments, cold weather is thought to have been what prevented any success (Gunnar Karlsson, 1964, p. 32). However, despite these cultivation failures, interest in reviving cereal cultivation did not die.

Enthusiastic local government officials certainly did not all give up in the late 1760s and the cereal cultivation experiments were renewed. In 1768 regional governor Ólafur Stefánsson suggested that experimentation should continue as he was convinced that cereals could grow in Iceland if the right seeds were chosen and cultivation was handled properly (Kristrún A. Ólafsdóttir, 1997, pp. 31-32), which in essentials was in good agreement with Jón Eiríksson konferensráð, the Icelandic representative in Copenhagen (Páll Vídalín and Jón Eiríksson, 1985, pp. 46, 76-77 and 99-104). Another supporter and enthusiast was reverend Olaf Anderson Borreby in Bornholm in Denmark and in 1769 Borreby suggested to bishop’s assistant Hannes Finnsson the founding of an Icelandic agrarian society. At the behest of Sheriff Brynjólfur Sigurðsson that same year two students, Björn Björnsson and Magnús Jónsson, were sent abroad to study. Björn (14 years old) was sent to Levanger in Norway to study cereal cultivation and gardening, while Magnús (20 years old) was sent to reverend Borreby in Bornholm to learn how to make all necessary instruments connected to cultivation. In the summer of 1770, The Icelandic Agrarian Society was formally founded. Its members are mostly unknown, but they are thought to have come from the upper tiers of society (Gunnar Karlsson, 1964, pp. 40-49; Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, pp. 599-600; Kristrún A. Ólafsdóttir, 1997, pp. 41-43). Yet another enthusiast came to Iceland in the summer of 1770, the Norwegian governor (isl. *stiftamtmaður*) Lauritz Andreas Thodal. Whether he was ever a member of the Agrarian society is unclear, but he became one of the most active practitioners and supporters of cereal cultivation. The First Land Commission 1770-1771 was also founded to investigate Icelandic living conditions and suggest viable economic and social improvements. The commission members were all essentially outsiders; Andreas Holt vice-consul in Oslo, Þorkell Fjeldsted, lawman in the Faroe Islands, and Thomas Windekilde, a merchant at Eyrabakki (Lýður Björnsson, 2006, pp. 178-183). Their task was to consider the best methods to revive cereal cultivation and estimate the feasibility of cultivating the Icelandic lyme grass on a more permanent basis (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2016a, p. 84 and 86).

Between 1770 and 1771 The First Land Commission received hundreds of letters and reports from all social classes. Judging by those reports enthusiasts among the population were few and far between as only a few reports mention cereal cultivation at all, and interests, views and opinions of government officials and religious leaders meant to lead the way were divided regarding the proper approach. There were certainly sceptics among the upper classes (sheriffs, district officers and priests) who considered it impossible or simply pointless and preferred further support to better existing farming practices (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2016a, p. 430; 2016b, p. 330 and 581; 2018, p. 391). Others considered such cultivation indeed to be a difficult problem but if it was Gods will that it succeeded as it had in the distant past it would be a good addition to the household economy (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2016a, pp. 421-422, 572 and 588). Sheriff Magnús Ketilsson in Dalasýsla stressed the need to teach people the right methods. He did not doubt that cereals could well be cultivated in Iceland, but he felt that cultivation could be resurrected without great cost and considerable effort in soil improvements. In his view, prizes would not be enough encouragement (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2016b, pp. 214, 227, 266 and 337).

Despite the poor results of the cultivation experiments directed by the imported Danish and Norwegian families, there were also still some that had not given up on the idea to get outsider help. The sheriff of Ísafjarðarsýsla wanted Norwegian and Swedish farmers to lead the way in cultivation experiments (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, p. 375). In Árnessýsla Sheriff Brynjúlfur Sigurðsson offered to make a farmstead available for a Norwegian farmer and his family for 10 years and reverends Halldór Finnsson and Jón Teitsson in Gaulverjabær wanted ploughs imported for every parish in the county (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2016b, p. 539; 2018, pp. 599-600). Others were not so forgiving. The priests of Vestur-Skaftafellsýsla specifically asked for sensible, selfless and unbiased men to experiment and teach them cereal cultivation, while a couple of district officers in Gullbringusýsla wanted a young and hard-working Icelandic man to teach them. Two farmers in Aðaldalur in Þingeyjarsýsla (Figure 3.2) also wanted a cultivator (isl. *akurmaður*) to teach them to tame and cultivate their local lyme grass for the common good (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2016a, p. 181 and 567; 2016b, p. 468). Today lyme grass is widespread in sandy areas all around the island (Hörður Kristinsson, 2007) and it is very likely that it was no different in the late 18th century, although it was seemingly only exploited to any great extent in Skaftafellssýsla.

After considering all reports, the commission supported continued experimentation with the backing of Governor Thodal, and recommended that it continue but on a much smaller scale than before (Gunnar Karlsson, 1964, p. 35; Kristrún A. Ólafsdóttir, 1997, p. 38). Any men willing to experiment with cereal cultivation received no state funding or backing other than yearly shipments of various seed varieties to be redistributed for free. This slowed all developments down considerably as most members of the Agrarian Society were unwilling to put their own money into the venture, although they did not stop. In 1771 Þóroddur Þóroddsson published a detailed essay on cereal cultivation in Icelandic, *Einfaldir þankar um akuryrkju,* which

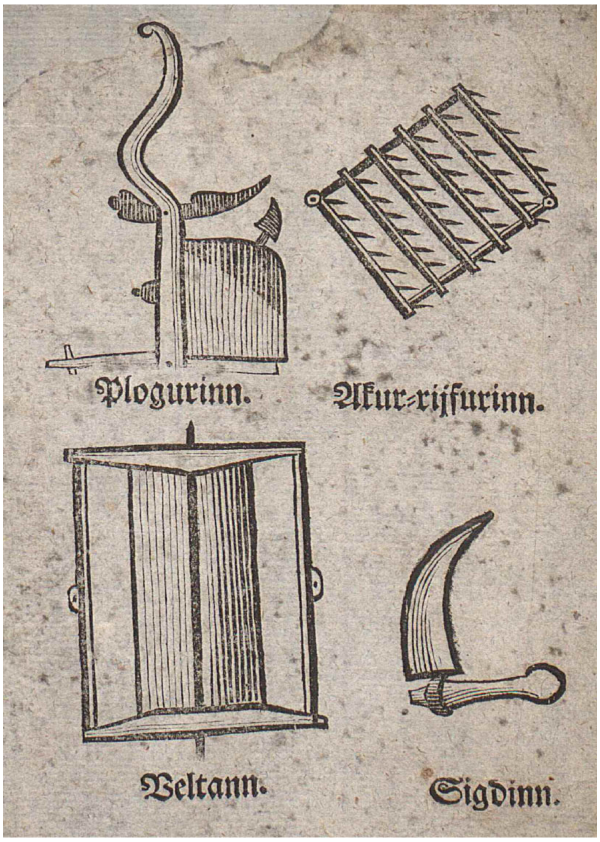


Figure 4.1. The tools considered necessary to sow and harvest cereals successfully (Þóroddur Þóroddsson, 1771, p. 157).

was copied and spread for free. In it he tackled everything concerning how best to approach cereal cultivation from A-Z; from explaining where the foreign families had gone wrong and what soil improvements were needed for various cereal types, to which implements were most needed (Figure 4.1) and how best to store the grain once harvested. Borreby was also still supportive and in 1772 he gave the Agrarian Society Danish agricultural equipment to experiment with. In 1773 Þóroddsson was sent to Sweden to study agriculture and natural sciences, and in the same year Björn Björnsson and Magnús Jónsson returned to Iceland, having completed their training. By then their biggest supporter, Sheriff Brynjólfur Sigurðsson, had died however, and no provisions had been made for their future living arrangements. They spent the next two years doing small experiments with various society members, Björn in Árnessýsla and Rangárvallasýsla and Magnús in Gullbringusýsla. The Agricultural Society only paid them a small salary in 1773 and 1774. After that the society was more or less finished. By 1775 Björn had turned to other work. Magnús persisted but in 1777 he passed away at Nes by Seltjörn after a two-year struggle trying to acquire a permanent residence and funding to continue what he had been educated to do in the first place (Gunnar Karlsson, 1964, pp. 44-49). Þóroddsson returned in 1779. The plan had been to make him an agricultural agent, but as he disagreed with the administration on how to approach agricultural reformations his stint was just as short (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2016a, p. 123; Páll Ólason, 1952, p. 124). All this effort however, did not inspire many.

4.1.3. The Failure of Indigenous Cereal Cultivation Experiments

Gunnar Karlsson (1964, pp. 60-75) collected information on ~50 cultivation experiments conducted between 1768 and 1780 mostly done by government officials, merchants and rich landowners. The most diligent practitioners were Governor Thodal at Bessastaðir, Sheriff Magnús Ketilsson in Búðardalur in Dalasýsla and apothecary Björn Jónsson in Nes near Reykjavík in Southwest Iceland. Experiments were done mainly with barley, rye, oats, wheat and lyme grass. The greatest successes occurred in the mid-1770s and lyme grass and barley were found to be most suitable for Icelandic conditions (Árni D. Júlíusson, 2013b, pp. 289-290; Björn Þorsteinsson and Bergsteinn Jónsson, 1991, p. 270; Gunnar Karlsson, 1964, pp. 67-70). The decision to keep cultivation experiments going on a smaller scale may have been controversial, but as we compare large- and small-scale cereal cultivation examples in more detail, it was likely a better way to proceed in terms of the Icelandic context if any success was to be had, even if all efforts failed in the end. Equipping and convincing a few farmers to cultivate cereals on a large scale will have been much more complicated (if not a totally lost cause), than encouraging many to try it for the family on a much smaller and cheaper scale.

As an example, apothecary Björn Jónsson at Nes made eight beds in 1769 and 1770 with dry soil tilled and mixed with sea sand, where he sowed rye, wheat, Faroese and Danish barley and Icelandic lyme grass. The rye (the Icelanders' regular staple) and the wheat germinated but died early on, and the yields of Danish barley were fairly low at <0,1 kg/m^2. His best results were achieved with the Faroese barley harvested after 24 weeks (May to end of October) and Icelandic lyme grass sown in lee from northern winds and harvested after 16 weeks (23 May-28 Sept; Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, pp. 637-640). Both the seed types therefore yielded about 0,3 kg/m^2. This is a yield essentially not that far from average grain yields achieved in Icelandic 20th and 21st century experiments with barley, where they have varied between 0,2-0,5 kg/m^2 after around 20 weeks (20-50 hkg/ha DM; Hrannar S. Hilmarsson et al., 2017, pp. 20, 24 and figure 11a). Þóroddur Þóroddsson (1771, p. 77) suggested that a good-sized field to start with could be about 65x65 m (~4200 m^2), although he also commented that even just a 15x15 m (225 m^2) plot would be adequate as well. If barley cultivation with an average yield of ~0,3 kg/m^2 had been meant to sustain the whole island (roughly ~1200 tons on average at the time) through large scale production in more sheltered agricultural regions inland, e.g. in Árnessýsla, Eyjafjarðarsýsla, Skagafjarðarsýsla, Múlasýsla and Borgarfjarðarsýsla, ~20-25% of all the tenant farms in these counties (or ~400-500 farms) would likely each have had to take on a cultivation area the size of a large football field (~4 km^2 area in total at least). Sowing, attending and harvesting such a large area would have required long hours of work and complex equipment, such as draught animals that needed training and ploughs and harrows (isl. *akurrífur*) made from expensive and mainly imported iron, timber and leather, not to mention storage space for them. The fields would have required complex watering systems, large amounts of fertilizer that was already largely being used as fuel, and would have taken up a large part of the time and energies of the farmers and their farm hands. The farms would also have needed housing space to store the grain (isl. *kornhlöður*) and large corn drying kilns (isl. *sofnhús*), who in turn also needed fuel. From there, the grain would have had to be transported to the trading posts or collected by consumers in the summertime, adding yet another destination to a farmer's already busy summer schedule (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, p. 331; Þóroddur Þóroddsson, 1771, pp. 70-73 and 126-130). And when harvests failed, the loss would have been that much harder for a self-sufficient household that had little else to fall back on in terms of income and food to survive the winter. None would have undertaken or risked so much in the short term without secure financial support, and that was not readily available.

At the opposite end of the spectrum, if an average family of five required about 150 kg of barley grain for the year (see section 3.3.3 and further discussion in Chapter 8), plus seed for replanting (~1-2%+), it would only have needed ~500-600 m^2 plot of good dry soil, an area (25x20 m) similar in size to what later became a good-sized kitchen garden (Birna Lárusdóttir, 2011, p. 176). The area would have had to be sheltered from the worst winds and rain and any encroachments of livestock (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2016b, pp. 331-332; 2018, p. 637), e.g. with garden or house walls, hills and/or woodland, and be ready for sowing and fertilizing as early as possible in April/May, a time when there was plenty of other work to be getting on with. The garden would have needed tending until the new growth took off, regular watering, plenty of sunlight (Abbott, 2017) and mild weather into late September/early October to be certain of a good harvest. Where workload is concerned the tilling, sowing and harvest with the aid of hand tools (sod cutters, spades, pitchforks, sickles, scythes etc.) will have been somewhat time consuming and hard physical work, at least in the beginning when the plot had to be initially constructed. A farm needed relatively basic equipment for threshing and winnowing, a small corn drying kiln for times when the grain was still too soft/damp at harvest time, and for grain storage a 220-250 L grain chest (isl. *kornbyrða*; or ~1x1x0,25 m in dimensions) to be kept in a cool dry place. Many farmers could easily maintain and even make their own tools and equipment and they were not afraid of hard work. Þóroddsson (1771, pp. 69-75 and 126) at least, was certain that Icelandic blacksmiths were more than capable of making ploughs (i.e. Norwegian ploughs, not the Danish which he considered unnecessarily complex) and any other tools needed, and that harvesting methods already practiced in Skaftafellssýsla for lyme grass for example would suit very well all over Iceland for other cultivation as well, despite being time consuming. All things considered; at this smaller scale more affluent Icelandic farmers, district officers and priests sufficiently interested in giving cultivation a try, i.e. those who would have constituted the more important opinion leaders, would have been more than capable of doing so with the equipment and knowledge already existing and/or had been made available to them.

Very few of them seemingly ever did, however, which formed a significant barrier to further data collection and spread of pertinent information and knowledge applicable to cereal cultivation in Icelandic conditions, and the social influences necessary for small scale cereal cultivation to take off. Cultivation was also not feasible in all areas around the island. Experiments were done in very few places and mainly in the South and Southwest (*LFI*, 1854, p. 295; Kristrún A. Ólafsdóttir, 1997, pp. 19-20), resulting in few centres from where ideas could spread further afield, minimal innovation visibility and localised accessibility. The innovation did not inspire enthusiasm with either the right or enough people. Just as with information on quernstone production, general information on how to approach cereal cultivation in Iceland was indeed distributed in enough detail, e.g. with Þóroddur Þóroddsson's (1771) pamphlet for anyone interested in experimenting, but Sheriff Magnús Ketilsson in Dalasýsla pointed out that cultivation was expensive, and warned that small prizes would not be enough to draw people into experimenting (Hefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, p. 337).

And he seems to have hit the nail fairly well on the head. In 1776 the authorities had still not given up on encouraging cereal cultivation and promised 1-3 state dollar rewards to anyone capable of growing ½-1 barrel (possibly ~70-140 L) of ripe barley or rye (*LFI*, 1854, p. 295). However, judging from all the rewards handed out and recorded in "Rit þess konunglega íslenzka lærdómslistafélags" between 1780-1793, the attentions of the locals were mainly directed towards tasks such as revamping abandoned farms, building rock and turf walls, finding fuel resources, field amendments and irrigation, kitchen gardening (potatoes, cabbages, beets etc.), fox hunting, boat and mill building, quernstone production and many other tasks that had little directly to do with local cereal cultivation. At least very few, if any, seem to have been able to harvest amounts worthy of a reward, and why should they if the rewards did not even come close to covering the cost of production? Only one crofter, Gunnlaugur Sigurðarson from Múlakot in Rangárvallasýsla, seems to have been rewarded in 1782, for acquiring (isl. *afla*) 1½ barrels of ripened barley ("RÍL III," 1782a, p. 282). This was only a year after scholar Sæmundur Magnússon Hólm published a pamphlet on lyme grass exploitation in Vestur-Skaftafellssýsla was published. Perhaps Sigurðarson was indeed active and lucky enough to have grown imported barley himself, but it seems equally likely that this barley was indeed lyme grass (on occasion called Icelandic barley) which could just as well have been harvested somewhere along the sandy banks of Markarfljót. Cereal cultivation experiments in the 1770s were mainly supported and/or performed by men of high status, such as e.g. government officials like the governors, the treasurer and the sheriffs, a scribe, an apothecary, a foreign priest and the students (Kristrún A. Ólafsdóttir, 1997, pp. 41-48). Meanwhile the general public and the more important potential opinion leaders (i.e. the priests and the district officers) generally observed from the side-lines as the mixture of many disagreements of top government officials and cultivation experiments in the 1770s built up an innovation reputation of unpredictability and below average success. And any news of failures, or indeed lucrative successes, would have spread far and wide.

The largest obstacle was essentially that cereal harvests in the early experiments failed too often, and not surprisingly, as so many things could go wrong during the long time period it took for cereals to develop. Cereal cultivation was a multi-layered and risky innovation; a long-term commitment with many steps that needed to be completed correctly over almost half a year, but each time without guaranteed success. Good dry soil needed to be ploughed and tilled well enough, the growing medium needed to be the right mixture of soil/sand/clay and fertilizer, which was usually needed on the hayfields and/or as fuel. Planting had to be early enough for the grains to ripen before winter, but late enough to keep the seed from being damaged. The seeds needed to be of good quality and suitable variety, be buried at the right depth, and in large enough quantities to get a good harvest, but without overcrowding each other. Weeds had to be pulled so as not to suffocate the seedlings, they had to be well sheltered, and watered regularly without being drowned, and temperatures had to stay high enough as long as possible into the fall for the grain to ripen (Abbott, 2017; Hrannar S. Hilmarsson et al., 2017; Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, pp. 214, 266 and 637-640; Páll Vídalín and Jón Eiríksson, 1985, pp. 99-105; Þóroddur Þóroddsson, 1771).

In addition, no farmer could control the weather, and the fluctuating lengths and temperatures of the growing season in the 18th and early 19th centuries were likely too often problematic. Þóroddsson´s pamphlet was detailed with regard to many things concerning cereal cultivation. However, a significant shortcoming is his suggestion of timing estimates needed for cultivating barley. He recommended six row barley from

Norway for Icelandic conditions and stated that it only needed 2-2 ½ months in the ground to bear fruit (Þóroddur Þóroddsson, 1771, pp. 112-113). It has been shown however, that for good yields of barley it likely requires 4-5 months in the ground in Iceland today (Hrannar S. Hilmarsson et al., 2017 see figure 6, p. 20), when mean annual temperatures are at least 1°C higher (mean temperatures of the growing season 7,6-10,5°C) than in the 18th and 19th centuries (Hanna et al., 2004, p. 1197; Hrannar S. Hilmarsson et al., 2017, p. 25; Larsen et al., 2011, pp. 2727-2729). Þóroddsson (1771, p. 120) did suggest that May (three weeks before Whitsun) would be a good time to sow any spring seeds. But if any farmers had considered less than 3 months to be enough for barley cultivation in Icelandic conditions, and perhaps planted the seeds e.g. to grow between June/July-August/September, their crop yields would likely have been relatively poor. Hrannar S. Hilmarsson et al. (2017, p. 25-26) have demonstrated a clear correlation between higher yields and higher mean temperatures during the Icelandic growing season (May-September), but they do also stress that, although very important, it may not always be the sole deciding factor. From their synthesis of modern Icelandic barley cultivation experiments it can be tentatively suggested that for respectable yields to be more likely, the mean annual temperature during the growing season should preferably be above 8°C. If we consider 19th century temperature recordings from Stykkishólmur in Snæfellsnes in the West of Iceland (Hanna et al., 2004, p. 1197; Guðmundur Jónsson and Magnús S. Magnússon, 1997, pp. 35-39) it is clear that mean temperatures fluctuated from year to year. During the growing season they were above 8°C in 24 years out of 55 (~44%) between 1841 and 1895. This ratio is fairly similar even when only the markedly cold spell of 1881-1895 is demarcated (6/15 years, ~40%). During this short period the average temperatures of the growing season were between 5,6-9,3°C, or 1-2°C lower than in the late 20th/early 21st century. With regard to temperature variations during the barley growing season ~40-45% of the years in the 19th century could therefore potentially have supported good yields of barley. As climatic conditions in the 19th century are thought to have been marginally better than in the 18th (Áslaug Geirsdóttir et al., 2009, pp. 107-110) it is probable that productive years in the latter would at least have been no more numerous. Although they may not necessarily have been any fewer either, especially in the more southerly regions on the island were annual mean temperatures will likely have been at least 1°C higher than in the Snæfellsnes area in the West (Hanna et al., 2004, pp. 1196-1201).

This percentage gives some idea of how relatively poor the odds of achieving good yields may have been in cultivation experiments from year to year, just with regards to temperature fluctuations, not to mention all the other things listed above that could go wrong during cultivation experiments in the 18th century. Jón Eiríksson (Páll Vídalín and Jón Eiríksson, 1985, pp. 76-77) assumed that harvests would fail from time to time but did not consider it to be too serious an obstacle. However, one failure will have been one too many where the resources of subsistence farmers were seasonal and often scarce, and workloads were already in the extreme, even if cultivation was only attempted on a small scale. The additional work needed to be done around/during the lambing season, sheep shearing and the spring fishing season (Figure 3.5), a time when farmers and fishermen already had plenty of other things to do. Farmers would have been unwilling to acquire expensive tools and/or spare workers to sow, tend and harvest a crop that would more than likely only bring small rewards, where it did not fail entirely. Around 1780 experiments had indeed once again largely ceased, and in 1783 Iceland was devastated by the *Laki* volcanic eruption. No significant progress was made in this field again until the 20th century (Árni D. Júlíusson, 2013b, pp. 289-290; Björn Þorsteinsson and Bergsteinn Jónsson, 1991, p. 270).

4.2. The Quernstone Production Revival

4.2.1. Considering the Alternative: Unground Grain, Querns and Mills

The chequered progress of 18th century cultivation experiments made it clear that such production was unviable (Lýður Björnsson, 2006, p. 132), but the seed had been planted and the idea grew and developed. In 1767 Skúli Magnússon suggested that import of unground grain (rye, barley and oats) should be increased and the import and/or production of *hand querns* and *mills* should be explored (Bergsteinn Jónsson, 1958, p. 14). From this time on unground grain was imported to Iceland in small quantities, likely for a trial. One of The First Land Commission's many objectives was to estimate the feasibility and financial gain of installing Norwegian handquerns and small mills in Iceland (Bergsteinn Jónsson, 1958, pp. 12-14; Lýður Björnsson, 2006, pp. 180-181). In July 1770 the matter was taken up at Alþingi in Þingvellir (Bergsteinn Jónsson, 1958, pp. 36-41) and discussed by the commission members and government officials present (see Table 4.1 for the names of those who signed the minutes):

Regarding the 5th instruction item, that for the merchants and consequently the Icelandic public it could be economic to import unground rye instead of meal. Water mills could well be set up but would likely be useless during the winter. In such cases hand querns would serve and could be around 6 in each district [þingsókn]. *In Skaftafellssýsla quernstones made of lava rock are used to grind wild oats* [lyme grass], *on which holes serve instead of hewing or pecking* (Bergsteinn Jónsson, 1958, p. 41).

Table 4.1. Members of The First Land Commission and other government representatives present in July 1770 at Alþingi at Þingvellir where import of unground grain and imported hand querns was officially discussed (see also Table 3.1 and Figures 3.1-3.2).

The Committee Members	**Status**
Anton Holt	Vice-consul, Oslo
Þorkell Fjeldsted	Lawman, Faroe Islands
Thomas Windekilde	Merchant, Eyrabakki
Eyjólfur Jónsson	Committee registrar
Government officials	
Ólafur Stefánsson	Regional governor
Björn Markússon	Lawman
Magnús Ólafsson	Assistant lawman (vísilögmaður)
Sigurður Sigurðsson	Royal steward (klausturhaldari)
Arngrímur Jónsson	Lawspeaker (lögsagnari)
Sheriffs and assistants	**County**
Guðmundur Runólfsson	1. Gullbringu- og Kjósarsýsla
Jón Eggertsson	2. Borgarfjarðarsýsla
Páll Axelsson	4. Hnappadalssýsla
Jón Árnason	5. Snæfellsnessýsla
Magnús Ketilsson	6. Dalasýsla
Erlendur Ólafsson	8. Ísafjarðarsýsla
Jón Jakobsson	12. Eyjafjarðarsýsla
Guttormur Hjörleifsson, assistant to Pétur Þorsteinsson	14. Norður-Múlasýsla
Jón Arnórsson (older)	15. Mið-Múlasýsla
Lýður Guðmundsson	18. Vestur-Skaftafellssýsla
Jón Jónsson, assistant to Steindór Finnsson	21. Árnessýsla

From the minutes it can be extrapolated that ~950-1000 hand querns were considered sufficient to serve the whole island. No doubt sheriff Lýður Guðmundsson provided the information on the hand querns from Skaftafellssýsla and potentially the number of querns thought necessary for each district were based at some level on quernstone ownership within that county. The commission then sent out enquiries to other government officials in Iceland (i.e. sheriffs, bishops and priests) for ideas and views about the import of unground grain and the feasibility of local quernstone production. On the basis of the comments and replies received, the commission members concluded that import of unground grain instead of meal would be cheaper, although, as with meal, keeping the grain dry through transport and storage would likely be problematic. They determined that small windmills and hand querns would be more efficient as they were cheaper, smaller and needed less constructional timber. They also suggested that mills could possibly be rented out and that building them close to the trading posts could be helpful (*ÞÍ. Rtk. B5.7.18*, 1774).

In March 1774 a royal decree was issued where The Exchequer was given permission to do anything it considered viable to bolster the regeneration of the Icelandic economy. The decree copied the commission's suggestions (*LFI*, 1853, pp. 670-671, article 5; *LFI*, 1854, pp. 41-42, article 5). Both documents claimed that at the time no ideal rock types had been found to make quernstones and that further enquiries were being made. However, at least two government officials, Finnur Jónsson bishop of Skálholt and Guðmundur Runólfsson sheriff in Gullbringu- and Kjósarsýslur (1753-1780), had mentioned in their replies to the commission in the spring of 1771 that Icelandic rock was used in quernstones for grinding *wild "oats"* (very likely *lyme grass*) in Skaftafellssýsla (Figure 4.2) and *malt* in undisclosed locations (most likely in Skálholt). Guðmundur Runólfsson had also suggested that suitable rock materials could possibly be found in Kjalarnesþing in his county and offered to send the commission a sample (Bergsteinn Jónsson, 1958, p. 86; 1961, p. 66; Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, p. 43).

Figure 4.2. Lyme grass (isl. *melgresi) in Skaftafellssýsla. Photo by Sólveig G. Beck.*

In small areas in Skaftafellssýsla on the southern coastline the wild lyme grass had been exploited for grain for centuries (Gunnar Karlsson, 1964, p. 18; Sigurður Þórarinsson, 1974, pp. 38-41). Although imported meal had made querns largely redundant in other parts of the country their production was maintained in

Skaftafellssýsla, e.g. in Meðalland, where wild lyme grass was exploited into modern times (Bergsteinn Jónsson, 1961, p. 66; Garðar Guðmundsson, 1996; Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, p. 663; Már Jónsson, 2015, pp. 92-101; Sæmundur Magnússon Hólm, 1780, pp. 26-60; 1781, pp. 139-167)[12]. Querns (likely both indigenous and imported) for grinding malt are also reported in a few high-status locations in 16th-18th century documentary sources, for example the governor's residence at Bessastaðir (*JÁM III*, pp. 192-219; *ÞÍ. Rtk. B7.1.17*, 1774-1776) and the bishops' residences at Skálholt (*DI XI*, 1915-1925, pp. 652 and 656-657; Bergsteinn Jónsson, 1958, p. 86) and Hólar (*DI IX*, 1909-1913, p. 299; *DI XI*, 1915-1925, p. 853; *DI XV*, 1947-1950, p. 217), most likely in connection with beer brewing or liquor distillery (Gísli Guðmundsson, 1928, pp. 7-43; Guðbrandur Jónsson, 1943, pp. 94-109).

In September 1774 the Exchequer sent governor Lauritz Andreas Thodal (1770-1785, who was at the time also serving as regional governor of Suður- and Vesturamt) and regional governor Ólafur Stefánsson (1766-1806, then governor in charge of Norður- and Austuramt) an enquiry requesting information on how quernstones in Skaftafellssýsla were made and used, and whether they could be used for grinding imported grain. They also requested samples for evaluation and expressed hopes that in the future, grain could be distributed to all the inhabitants of Iceland without transport damage (*ÞÍ. Rtk. B7.1.17*, 1774-1776). In late summer 1775 Thodal sent the Exchequer four samples (identified in the text as samples A-D) of rock aboard two separate ships. The first sample was one small quernstone pair from Skaftafellssýsla made of lava rock with small vesicles (sample *A*). The second and third samples were another quernstone pair with a bedstone made from lava rock (*B*) with much larger vesicles and a runner made of "graystone" (*C*) of unclear origins. Thodal stated that the second pair had been used successfully to grind malt, but rye had not been tried. The final sample (*D*) was an unworked rock found at Þingvellir, which Thodal was certain could be used to grind rye, although he was sceptical about whether it could be transported successfully over long distances. In February 1776 Thodal was sent an evaluation report of the samples.[13] Quern *A* from Skaftafellssýsla was deemed perfectly acceptable but the committee suggested that perhaps larger quernstones (120-160 cm in diameter) should be produced for further testing. Sample rocks *B* and *D*,

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[4] See further discussion in Chapter 6.
[13] The report was signed by Christian Wæssing, Friderich Hallander, and Nicolai Nissen.

which had large vesicles situated far apart, were deemed unsuitable. The “graystone” material (*C*) was said to be dubious but could possibly be useful for very dry rye but whether it too was vesicular is unclear. It became clear that suitable rock materials for quernstone production could be found in Iceland but whether it was widespread or just in one place remained uncertain (*ÞÍ. Rtk. B7.1.17*, 1774-1776).

In August 1775 Thodal and Stefánsson sent the Exchequer a detailed report, where they discussed practical problems of grain import, quernstone production and transport. They felt that increased import of grain would be very useful and they suggested that people should do the grinding themselves either at home with hand querns or in small mills in their neighbourhoods, because it would be cheaper and more convenient both for the consumers and the merchants, not having to spend time and money on grinding the grain in Denmark before shipping. According to historian Gísli Gunnarsson (2017, pp. 230-231) the cost of barrels and grinding was about 25% of the total import cost. Thodal and Stefánsson suggested that it would be best to import quernstones and small water- and windmills from Norway and/or Denmark but recommended a modest start with only a few mills at places like Hólmurinn in Reykjavík, Hafnarfjörður, Borgarfjörður and Ísafjörður to plant the idea and spread word of its usefulness. They suggested the querns could be imported either from Denmark or through Trondheim from Selbu in Norway (Grenne et al., 2008; *ÞÍ. Rtk. B7.1.17*, 1774-1776). Scholar Ólafur Olavius (1965a, p. 207) who travelled around Iceland in 1775-1777 also mentions Swedish and Finnish quernstones produced with sandstone, so perhaps some of the imported quernstones could have come from there, but no further historical corroboration of import from those origins during this period has been found. Import of unground grain was considered advantageous for the Icelandic public, as grain was easier than meal to store over long periods of time and that way it could be ground only when needed. This meant the meal was always fresh, as well as it being much cheaper for the public to grind their own grain. In April 1776 the Exchequer released a circular to all sheriffs in Iceland announcing the beginning of import of unground grain and the introduction of hand querns to Iceland (*LFI*, 1854, pp. 236-237; *ÞÍ. Rtk. B10.4.19*, 1780).

4.2.2. The Imported Grain

Innovation compatibility with Icelandic socioeconomic norms will likely not have been a problem where meal consumption was concerned, as it was already such a regular and familiar part of the peoples' diet. If there had been a project pushing Icelanders towards eating horsemeat, the reactions would likely have been very different (Jónas Jónasson, 1945, p. 42 and 93). The public's previous experiences with imported meal of poor quality and insufficient amounts had already encouraged calls for improvements and after failed attempts at indigenous cultivation, import of unground grain will very likely have generally been considered an acceptable potential solution to that problem. Import figures available for the 18th and 19th centuries are somewhat patchy, but it is possible to build a general picture of the import of cereal products to Iceland up to the early 20th century. What actually governed the amount of public meal consumption in the late 18th century is unclear, whether it was limited by the Icelandic consumers ability to buy more, or if the profit margin were not sufficient for the merchant to take up room from other more lucrative goods on the few ships sent. Likely it was a combination of the two. Statistics Iceland (isl. *Hagstofa Íslands*) has compiled information on the general worth of cereal produce (isl. *kornvörur*) imported in this time period as well as general population size. In Figure 4.3 this information has been paired to demonstrate the general developments in the values (purchase prices) of imported cereal produce post-1770. In terms of volume the import of grain and meal in the 1770s was fairly stable, hovering between 1000-1500 tons, but as expected, there was a spike in prices around 1783 with the Laki eruption and increased import of cereals. Post-1786 import values fall again (~750 tons; mainly a decrease in rice, ship bread and barley, along with malt and hops, see Figure 4.6) but import statements show that total import quantities of rye (both meal and grain) remain fairly similar (Figure 4.5), albeit rocking more unevenly between 800-1800 tons per year. In 1784 pearl barley (isl. *bankabygg*, barley grain without its outer husk and bran) first appears as an import. As the 1780s passed it slowly replaced regular hulled barley and became a common import (Guðmundur Jónsson and Magnús S. Magnússon, 1997, pp. 440-441), and from then on was ground alongside rye grain up until the early 20th century (*ÞÞ. 314*; *ÞÞ. 411*; *ÞÞ. 2073*; *ÞÞ. 2101*; *ÞÞ. 2112*).[14] At this point the government had likely given up hope that farmers would use the barley to grow some themselves. This may also have dissuaded people from feeding the unground barley to the livestock rather than grinding it themselves. It was also likely easier to grind and quicker to cook (Berkley Wellness, 2016). Perhaps it became something for the more affluent farmer to aspire to

[14] In 1822 one barrel of pearl barley was valued at 12 state dollars vs 1 barrel rye only 8 std (M. Jónsson, 2018, p. 233).

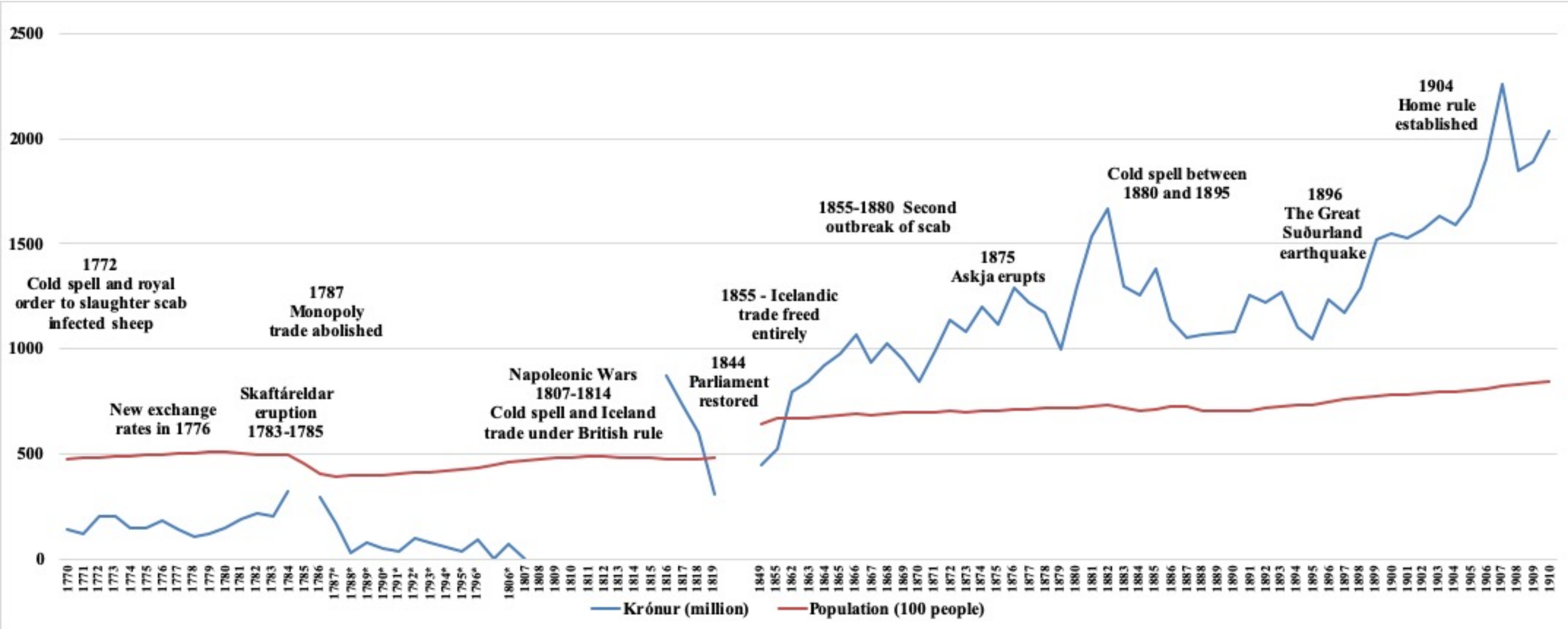


Figure 4.3. The development of Icelandic population size alongside the monetary values (old ISK) of all cereal produce (isl. kornvörur; rye and barley grain, rye meal and flour, beans, rice and bread) imported to Iceland from the second half of the 18th into the early 20th century (see also Figures 4.4-4.7). Import values between 1787 and 1806* are roughly estimated by this author based on prior import quantities and values to demonstrate the decrease in such import after the Laki eruption. Information regarding import in the years 1764-1819 can be found in Hagskinna (Guðmundur Jónsson and Magnús S. Magnússon, 1997, pp. 436-443). Information on population size and import in the years between 1849 and 1910 is available at www.hagstofan.is, the homepage of Statistics Iceland (Hagstofa Íslands).*

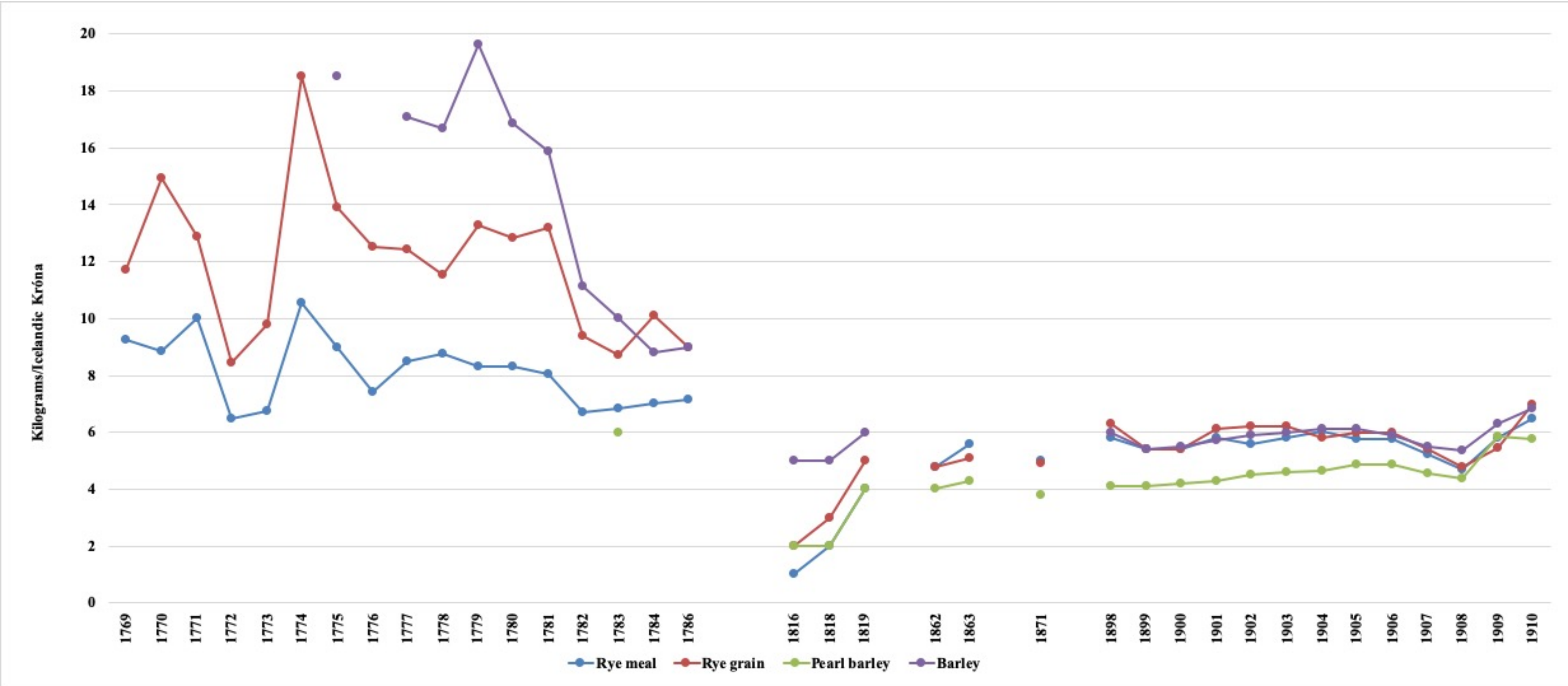


Figure 4.4. Rough developments in volume prices (kg/ISK) of imported grain and meal available from the mid-18th up to the early 20th century.

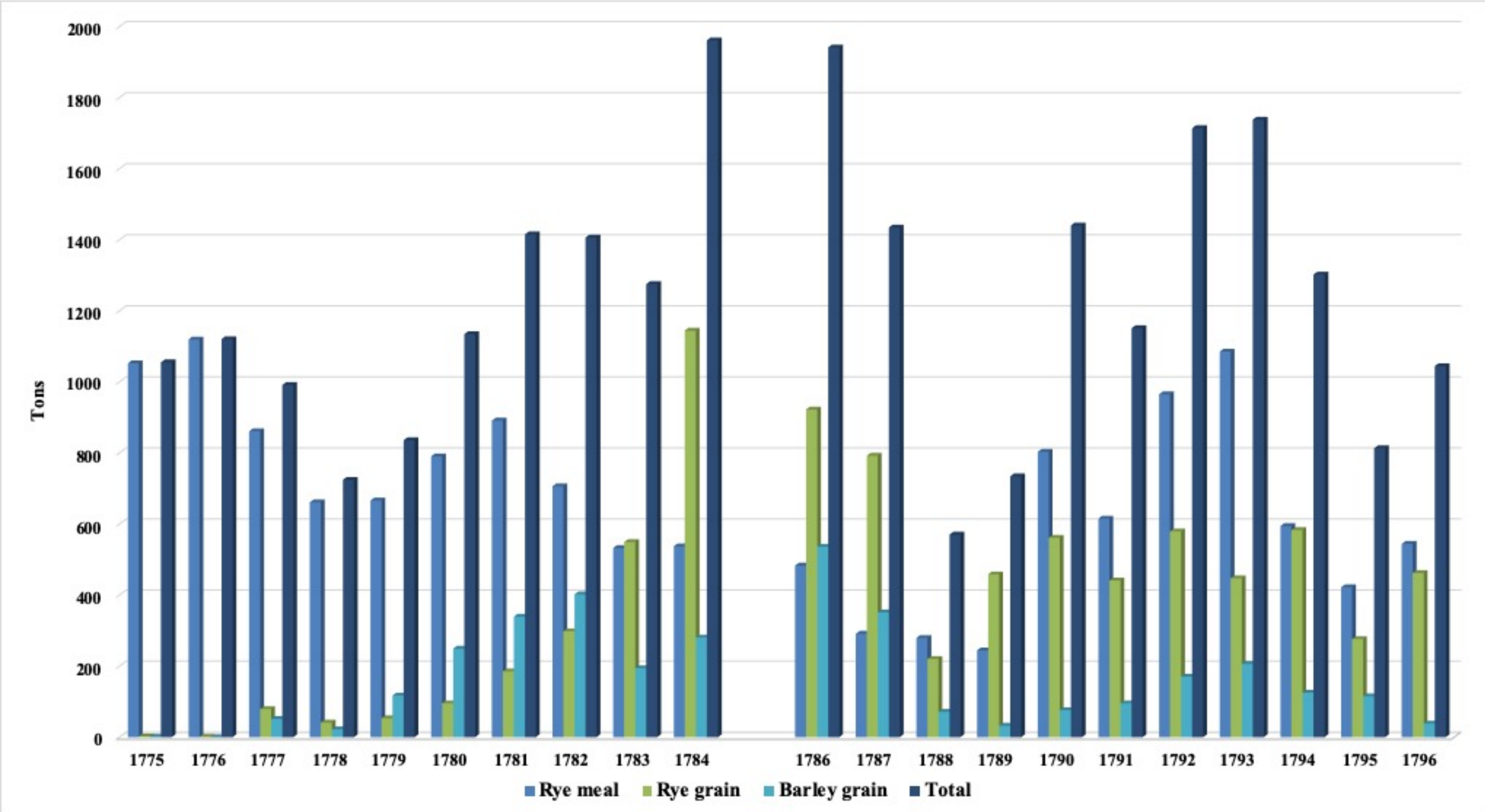


Figure 4.5. Import of rye meal and grain (rye, barley and post 1784 pearl barley) in tons between 1770 and 1796 (Guðmundur Jónsson and Magnús S. Magnússon, 1997, pp. 438-442) 1796 compared to their total import. After import of grain is commenced by the government there is no significant increase in total import beyond the norm until 1784 due to the Laki eruption.

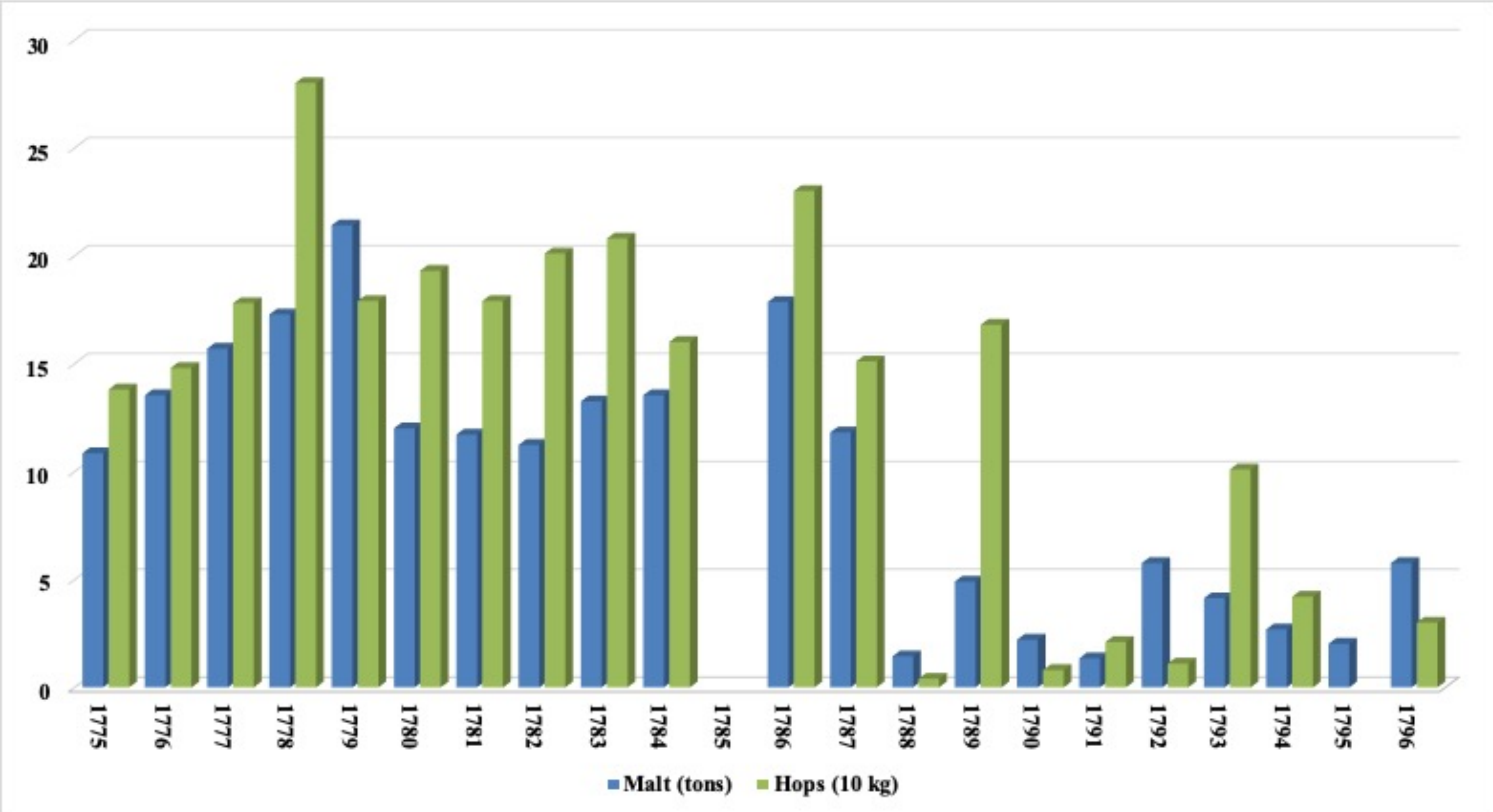


Figure 4.6. Imported quantities between 1775 and 1796 for malt (metric tons) and hops (10 kg).

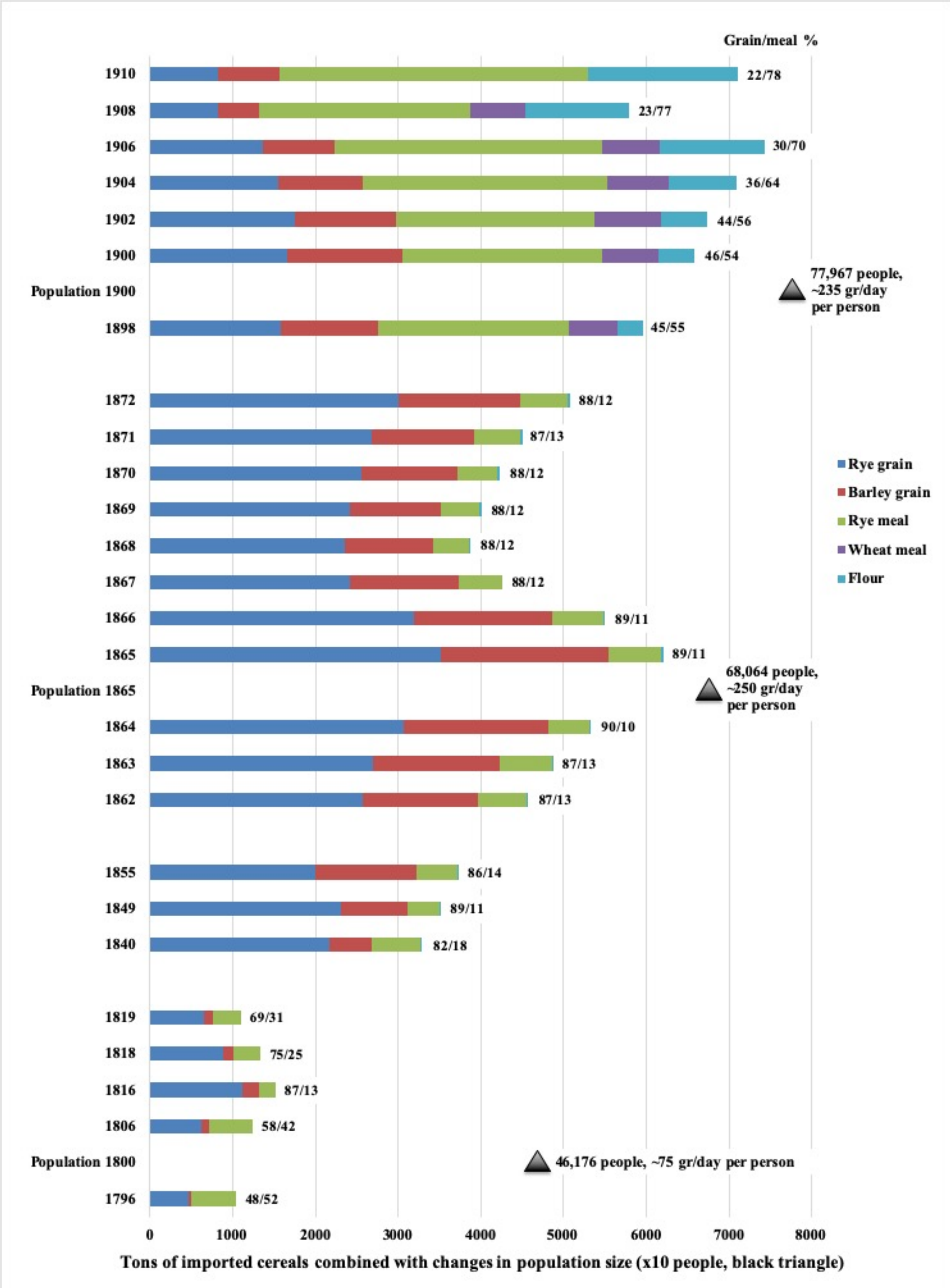


Figure 4.7. The general development of grain and meal import quantities (metric tons) and grain/meal ratios (%) between the late 18th and early 20th centuries alongside changes in population numbers and consumption averages.

besides rye, as pearl barley was a more processed product and therefore more expensive (Figure 4.4).

The average import quantity of meal and grain hovered around the 1200 tons mark into the early 19th century. Unfortunately, available information on general import of goods to Iceland in the first half of the 19th century is very scant mainly due to conflicts and general upheaval in trading organisation on the island during and after the Napoleonic Wars (1807-1814) when trade in Iceland fell under the rule of the British (Anna Agnarsdóttir, 2008, pp. 95-120; Gunnar Karlsson, 2008, pp. 212-216). Between 1816 and 1819 total import of cereal produce dropped somewhat (to ~700 tons, mainly rye grain, peas, barley, rice, hops and hardtack). In 1819 the total import of meal and grain was around 1100 tons. As inflation wound down, prices of grain and meal also dropped, and between 1816 and 1819 the value of rye meal and rye and barley grain changed from being 1 kg/ISK up to 4 kg/ISK for meal, and from 2 kg/ISK up to 4 and 5 kg/ISK for the grain. When import records start to improve around 1849 flour appears in the import statements. Total import quantities had increased to about 3500 tons and the differences in volume prices between grain and meal (kg/ISK) had started to peter out (Figure 4.4). After 1810 merchant ship arrivals became more frequent (*Landshagir I*, 1858, pp. 82-83). In 1855 restrictions on Iceland trade were lifted completely and slowly Icelanders took over and gained more insight into their own trade affairs (Lýður Björnsson, 2005, pp. 16-22). The local communities became better able to compensate and react when indigenous food production fell short, and in the 1850s farmers were encouraged for the first time to establish emergency food stores for each district, which included imported cereals. Import of grain and meal gradually increased through the 19th century and in 1910 yearly import had reached about 7400 tons (Indriði Einarsson, 1912, pp. pp. XVIII-XIX; Lýður Björnsson, 1972, p. 244).

The general developments in import of cereals suggest that between 1800 and 1900 general consumption of cereals increased from ~75 gr/day up to 235-250 gr/day on average per person. However, for our purposes it is most important to get an idea of how much of this import was actually grain that had to be ground (see further consideration of grinding and consumption in Chapter 8). In Figure 4.7, available import statements have been condensed to show the general developments of import quantities and grain/meal ratios (%) between 1796 and 1910. Import numbers were mainly compiled from *Hagskinna* (years 1796-1819; Guðmundur Jónsson and Magnús S. Magnússon, 1997, pp.

442-443) and reports on Icelandic general affairs from the late 19th and early 20th centuries (Indriði Einarsson, 1909, pp. XXII-XXIII; 1912, pp. XVIII-XIX; *Landshagsskýrslur 1900*, 1901, p. 349; *Landshagsskýrslur 1902*, 1903, p. 383; *Landshagsskýrslur 1905*, 1906, pp. 20-21; *Landshagsskýrslur 1907*, 1908, pp. XX-XXI; *Landshagsskýrslur '99*, 1899, p. 201; *Skýrslur um landshagi I*, 1858, pp. 86-87 and 590-592; *Skýrslur um landshagi III*, 1866, pp. 480-485 and 589; *Skýrslur um landshagi IV*, 1870, pp. 52-53, 64-65, 336-338, 584-586 and 858-860; *Skýrslur um landshagi V*, 1875, pp. 160-162, 390-392, 732-734 and 756-758).

Import of unground grain started in 1767 but until 1777 it was likely only imported by special order and never exceeded 20 tonnes. When import of unground grain was gradually increased (Figure 4.8) after the royal decree was issued in 1776, there was no change in the total import quantity beyond the norm (~700-1100 tons), although import was very unstable between 1777 and 1796 compared to previous years (Figure 4.5). No documentations of instructions or guidelines for merchants with regards to the handout of the imported unground grain have been found so it is not clear whether merchants were obliged to sell people both unground grain and meal or whether people were allowed to make up their own mind with regards to what they bought. Between 1783 and 1796 (the 1784-1786 Laki Haze (isl. *Móðuharðindin)* famine years and its aftermath excluded) on average a 50/50 ratio of meal to grain was imported, in a range between 70/30 up to 40/60. Therefore, between 40-70% of cereal produce previously bought and used on a regular basis as meal, had to be ground during that period. Farmers had to grind it themselves or have it ground for them. In 1784, 1786 and 1787 the meal/grain ratio increased to roughly 30/70 on average so, as the total amount imported was 15-30% higher than normal, simultaneously around 70% of the import likely needed to be ground before use. From 1788 up to 1796 grain/meal ratios hover around 50/50 but in the early 19th century the ratio had reached between 70/30 and 80/20. By the mid-19th century grain constituted 80-90% of all cereal import, and despite the total quantities imported changing slightly from year to year, the ratio ~90/10 continued into the 1870s. Import of grain reached its peak in 1865 when rye and pearl barley grain together weighed about 5500 tonnes. It is interesting to note that at this point in time about 40% of all the imported rye meal and wheat was shipped to Reykjavík, 20% to Ísafjarðarsýsla (12% wheat) and Barðastrandarsýsla (8%) in the Westfjords, and 9% to Eyjafjarðarsýsla (largely wheat; Figure 4.9). Wheat was a luxury and likely only bought by the most affluent. The rye

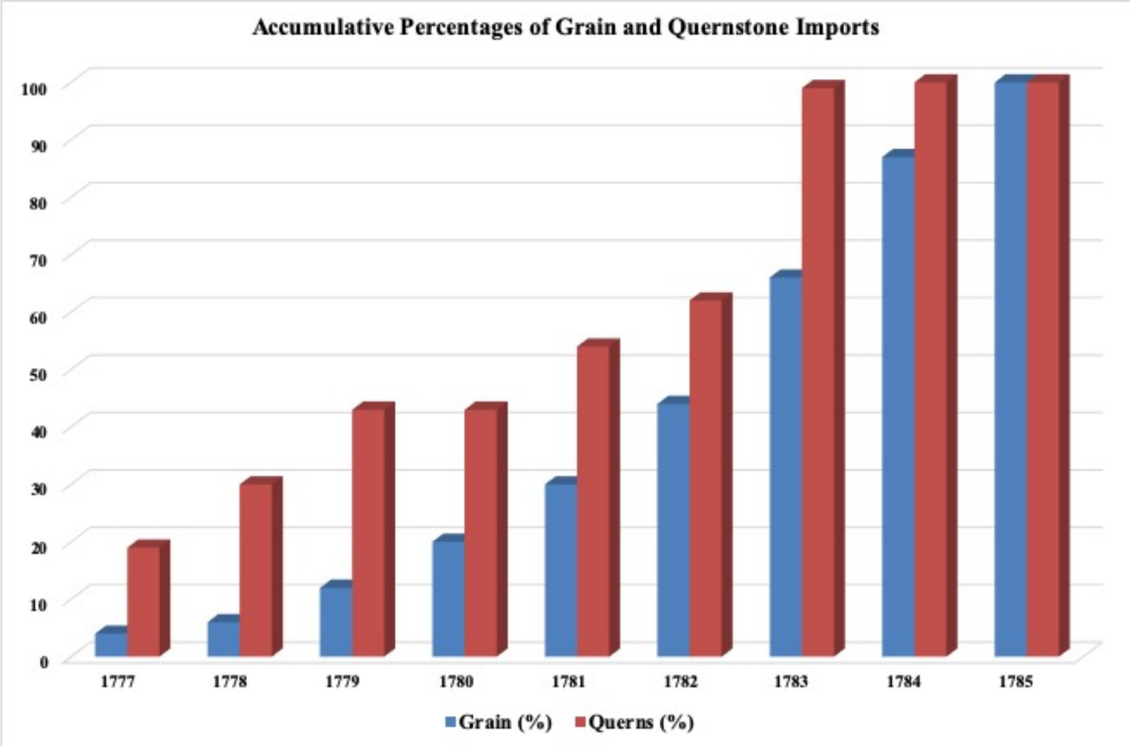


Figure 4.8. Accumulative percentage of grain and quernstone import between 1777 and 1784. The amounts of grain imported were increased gradually until 1784, while import of quernstones was more irregular (see also Figure 4.11).

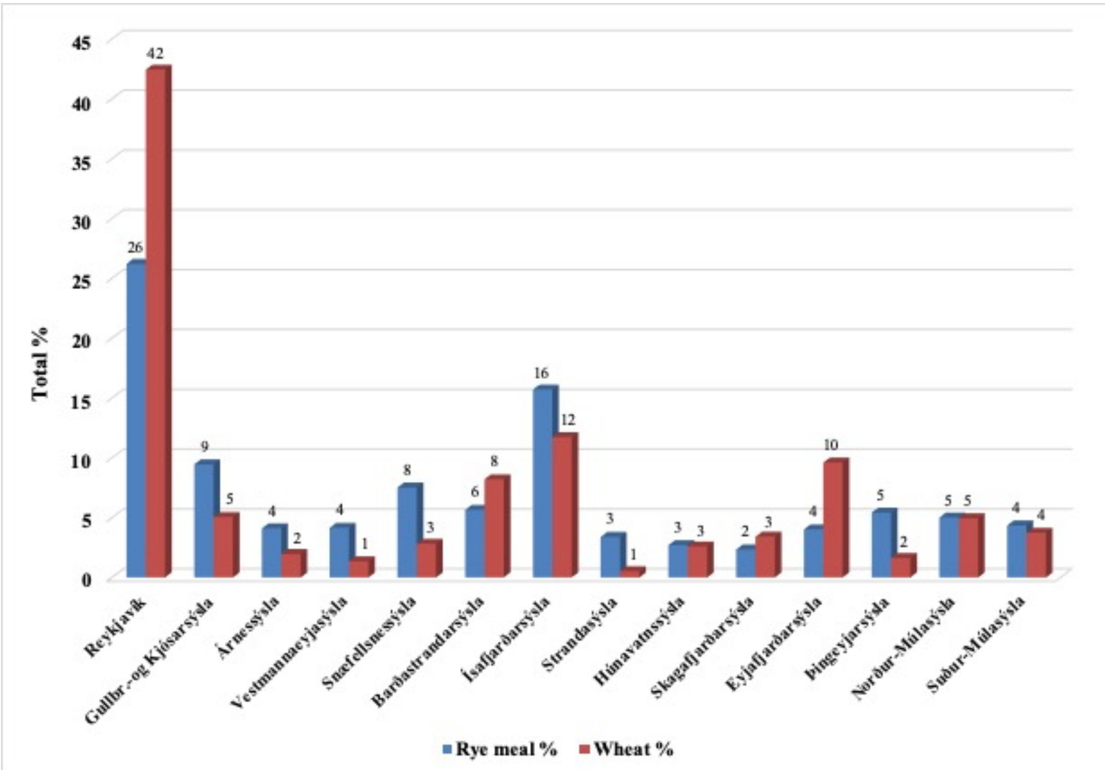


Figure 4.9. Distribution of imported rye meal and wheat (grain/meal ratio ~90/10) between 1849 and 1865 at the height of grain import.

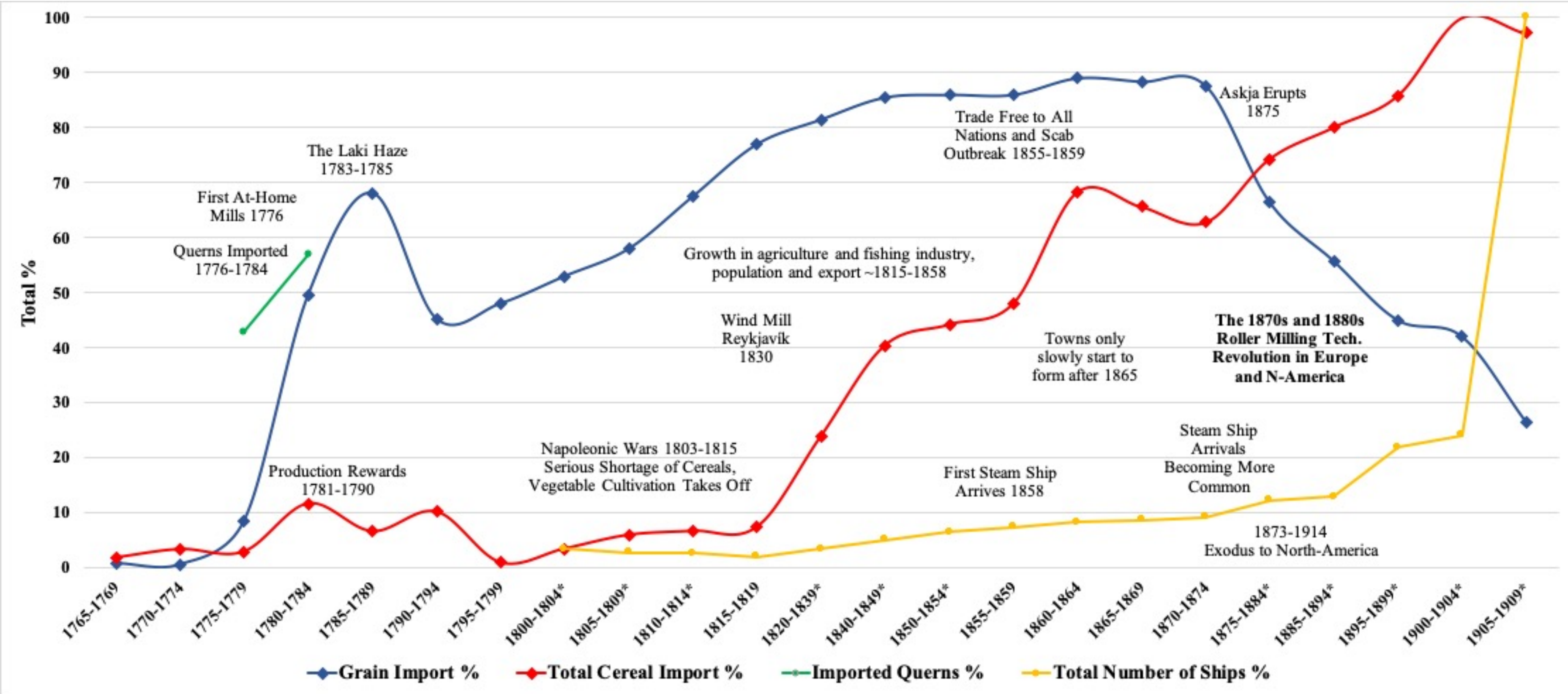


*Figure 4.10. Comparison of roughly estimated changes in the percentages of imported unground grain (rye and barley), against changes in cereal import beyond the average import quantities between 1750-1764 (~880 tons) and merchant ship arrivals beyond the early 19th century norm (~40-50 ships/decade; Indriði Einarsson, 1912, pp. xi-xvj). Quernstones (~618 querns) were imported between 1776 and 1784 (*vague import numbers). At some point between 1872 and 1895 import of unground grain dropped considerably and mass-produced meal took over as the common import without any clear drop in total import of cereals.*

meal, however, was distributed fairly evenly between counties (2-5%), although the fishing counties, Gullbringu- and Kjósarsýsla, Barðastrandarsýsla, Snæfellsnessýsla, and especially Ísafjarðarsýsla where smaller crofts and fishing stations were much more common, received somewhat more than the rest (6-16%), i.e. households and places where quernstones were likely to be less common (see further discussion below). Between 1872 and 1895 the grain/meal ratio dropped down to 45/55 again, and by 1910 grain was only about 20% of the total import, or ~1600 tons. This drastic change could partly have been due to stronger trade connections and more reliable transport methods (Figure 4.10). The largest factor, however, is without a doubt the large technological leaps in roller milling technologies both in Europe and North America in the 1870s and 1880s, making mass produced flour widely and cheaply available (Watts, 2000; Velkar 2012, pp. 192-199). Never-the-less, for over 100 years, grain constituted a major part of all cereal import which in turn called for quernstones to grind it.

4.2.3. Two Hundred Free Quernstones: Models for Thought and Deed

In 1775 a farmer from Zealand in Denmark, Ole Nielsen, came to Iceland to experiment with cereal cultivation and stayed until 1780. In the beginning Nielsen lived at Hlíðarendi in Fljótshlíð in Rangárvallasýsla but in 1776 he had relocated to Brattholt in Flói (Figure 3.2) in Árnessýsla (Gunnar Karlsson, 1964, pp. 61-62). According to Ólafur Olavius (1965a, pp. 73-75), Nielsen was a very active maker of quernstones while he was in Iceland. He made querns from indigenous rock for his neighbours in Árnessýsla and many people in Rangárvallasýsla as well and gave instruction in their use. It is possible that he taught people in both counties to make quernstones as well. However, one man teaching the craft would not have been nearly enough to spread the knowledge sufficiently or keep the project going. The Exchequer had decreed in 1776 that it would be sufficient to start with small hand querns, which the public could obtain for a modest price and use in their own homes. The Exchequer was cautiously optimistic that with time the Icelandic people could produce their own quernstones. The Second Royal Trading Company was supposed to start importing grain and hand querns that same year and querns were to be distributed for free to all sheriffs and others who were interested in grinding their own grain. The quernstones were to be used to grind grain by the more prominent members of society to encourage the public to follow suit, as well as to provide physical models for those who wished to start making querns from indigenous rock (*LFI*, 1854, pp. 236-237; *ÞÍ. Rtk. B10.4.19*, 1780). The circular states:

> [...] *with time* [hand querns] *will be produced by the inhabitants themselves, when models will be available, so that the people in Vestur-Skaftafellssýsla who already use such hand querns to grind their so-called wild corn are not alone, but also* [people in other counties will] *produce them and hew the stones from their own lava and other rock formations, that probably also will be found in most other places in the country.* […] *immediately this year* [1776] *they* [the trading administration] *are to import to as many trading posts in Iceland as possible, not just unground grain, but also some ready-made hand querns to use both as models and for general use, along with some quernstones*[15]*, that are to be delivered for free to interested parties, and this can be expected to continue, until this arrangement has taken off* (*LFI*, 1854, p. 237; translated from Danish by this author).

In May 1776 another royal decree was issued with a list of new exchange rates for the Second Royal Trading Company where new prices of unground grain and quernstones were made public. This was very unusual, as the prices had not been changed for over 70 years (*LFI*, 1854, pp. 333-353; Lýður Björnsson, 2006, pp. 198-200). Examples of different products and their worth, both imported and exported, can be seen in Table 4.2

Table 4.2. Exchange rates in state dollars (std; ríkisdalir) and shillings (sh; skildingar) for Icelandic trade published in May 1776 and April 1787 (LFI, 1854, pp. 333-353; LFI, 1855, pp. 383-393).

Product	**Quantity**	**1776**		**1787**	
		Std.	**Sh.**	**Std.**	**Sh.**
Imported					
Querns, pair	35-45 cm	2	74	2	48
	45-55 cm	3	19	2	88
Iron	40 kg	3	77	4	6
Barley	1 barrel	2	13*	3	64*
Barley flour	1 barrel	3	4	4	88
Rye	1 barrel	3	19*	5	0*
Rye flour	1 barrel	3	60	6	0
Exported					
Homespun cloth	24 ells	3	0	6	30
White wool	160 kg	16	56	27	80
Mittens, one thumb	48 pairs	1	52	2	16

* Minus the barrel

[15] Most likely referring to quernstones larger than hand querns, possibly meant for mills.

for comparison. The price of meal was higher in order to encourage people to buy cheaper unground grain instead, but this change only seems to have lasted the year (note the dip in kg/ISK in 1775-6 in Figure 4.4). Grain (rye, barley and oats) was only imported alongside the traditional rye meal in small quantities to begin with and did not start in earnest until 1777 (Guðmundur Jónsson and Magnús S. Magnússon, 1997, pp. 403-443; Figure 4.5). The sheriffs were cautiously optimistic about the venture (*ÞÍ. Rtk. B7.4.30*, 1776; *ÞÍ. Rtk. B7.4.32*, 1776). In the fall of 1776, the sheriff in Dalasýsla ordered 100 barrels of rye, 100 barrels of barley and 20 barrels of oats. He thought that imported hand querns could become common within a few years and suggested that 10-12 quernstones would be needed in Dalasýsla, a county of fourteen parishes with roughly 235 farms in the 1801 census (*Manntal 1801*, 1979, pp. 143-189). He feared however that Icelandic production would be more difficult even if rock materials were found, as there was lack of good iron for tools to make the quernstones (*ÞÍ. Rtk. B7.4.32*, 1776). The bishop Gísli Magnússon at Hólar also promised to support the venture by accepting one of the imported querns and to encourage priests in his bishopric to lead by example (*ÞÍ. Rtk. B7.4.42*, 1776).

The first quernstone shipments seem to have arrived at Icelandic trading posts (Figure 3.3) in 1776 and 1777 (*Annálar 1400-1800*, 1987, p. 205; Guðmundur Jónsson, 2013, pers. comm.; Jónas Jónasson, 1945, p. 54; *ÞÍ. Rtk. B7.5.9*, 1776; *ÞÍ. Rtk. B8.5.4*, 1776; Figure 4.11). According to the 1776 circular, querns were to be handed out for free in each county to people interested in using or making quernstones until Icelandic quernstone production was under way (*LFI*, 1854, pp. 236-237) but already problems arose. Foreign quernstones were imported to Iceland (Figure 4.11). But it was unclear 1) how many querns were supposed to be free of charge, 2) how they were to be distributed between counties or 3) who was to decide when Icelandic quernstone production had become widespread enough for import of foreign quernstone to be discontinued. In 1777 merchants in Suður-Múlasýsla (Reyðarfjörður and Berufjörður) and in Barðarstrandasýsla (Patreksfjörður, Bíldudalur and Flatey) were reluctant to hand over any querns except against payment according to the new exchange rates and claimed they had no orders to hand out quernstones for free (*ÞÍ. Rtk. B7.8.36*, 1776; *ÞÍ. Rtk. B7.8.42*, 1777; *ÞÍ. Rtk. B8.4.32*, 1778). Perhaps the merchants chose to interpret the 1776 decree in such a way that only stones imported that year were to be free of charge and according to import statements no quernstones were sold that year (Figure 4.11). The querns seem to have been unevenly distributed and some sheriffs expressed displeasure about the low number of free quernstones they received compared to other counties. The people of Eyjafjarðarsýsla seemingly had access to only two querns through the merchant in Akureyri (*ÞÍ. Rtk. B8.5.4*, 1776; *ÞÍ. Rtk. B8.6.31*, 1778-1779) and the Skagaströnd trading

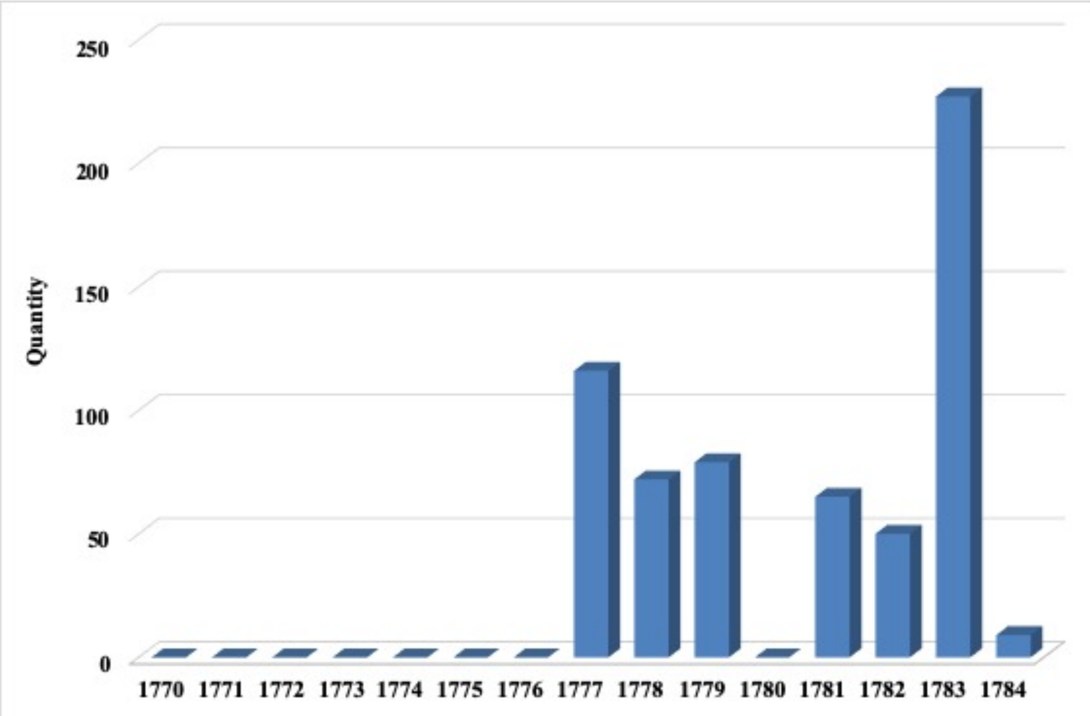


Figure 4.11. An estimate of quernstone import for the whole of Iceland between 1770 and 1784. The numbers are based on sales price figures, collected by Dr. Guðmundur Jónsson professor in history at the University of Iceland (unpublished information), and the average price of an imported quernstone in 1776 (~3 state dollars (isl. ríkisdalir); Table 4.2; Guðmundur Jónsson, 2013, pers. comm.).

post in Húnavatnssýsla only received three (*ÞÍ. Rtk. B8.10.29*, 1779), while the Bíldudalur and Patreksfjörður trading posts appear to have received at least 20 between them. These 20 quernstones were acquired most likely through the influence of the sheriff in Barðastrandarsýsla who took one for himself and distributed the others to priests and farmers close to the trading posts (*ÞÍ. Rtk. B7.8.36*, 1776; *ÞÍ. Rtk. B8.6.31*, 1778-1779). The sheriff in Suður-Múlasýsla was one of few who sent a formal complaint in 1777 about the merchants' unwillingness to hand over free querns and only he himself seems to have been allocated a pair (*ÞÍ. Rtk. B7.8.42*, 1777). He sent an order with his letter to the Exchequer for 75 quernstones to be delivered in 1778 that he wanted to distribute between the parishes in the Reyðarfjörður and Berufjörður trading regions[16] (Table 4.3). From those numbers it seems that the sheriff estimated that each quern could serve roughly 4-6 households.[17] The number of quernstones that the sheriff requested for each parish (isl. *sókn*) never exceeded 6, which was the same number of quernstones that was suggested at Alþingi in 1770 would be needed for each district (isl. *þingsókn*; see above).

This confusion slowed progress, as the imported quernstones were considered too expensive for the general public (*ÞÍ. Rtk. B7.8.42*, 1777; *ÞÍ. Rtk. B8.6.31*, 1778-1779). It was not until after further entreaty from Icelandic government officials that a royal decree was issued in April 1779 announcing that the Royal Trading Company would ship 200 querns to Iceland to be distributed for free to interested parties approved by the sheriffs (Table 4.4; *ÞÍ. Rtk. B10.4.19*, 1780). That same year prices of rye and barley grain seem to fall somewhat, but then only for one (barley) to three years (rye; Figure 4.4). Sheriffs, or individuals who had received querns at their behest but had had to pay for them, were to be reimbursed provided they had sufficient proof (*LFI*, 1854, pp. 477-478; *ÞÍ. Rtk. B8.8.15*, 1777-1779; *ÞÍ. Rtk. B10.4.19*, 1780). Out of the 75 querns requested by the sheriff of Suður-Múlasýsla (Table 4.3), only 11 free querns in total were allocated to his two trading posts, which is not surprising as the imported querns were supposed to boost and guide local production, not make it unnecessary. Whether all of the 200 querns reached their intended destinations is unclear. In March 1780 orders for over 100 quernstone pairs were on hold, as they had still not been received from Norway (*ÞÍ. Rtk. B10.4.19*, 1780), but most likely those querns reached their destination in the end. It is very interesting to note that according to import statements no quernstones were sold in Iceland in 1780 (Figure 4.11). This likely supports the idea that imported querns were distributed for free by the trading company the summer after the royal decree regarding free quernstones was issued in 1779, rather than no querns were being distributed in that year at all.

In Eyjafjarðarsýsla the sheriff was enthusiastic about grinding imported grain. However, he was sceptical that local quernstone production would be successful, but he

[16] Neither Þingmúlasókn nor the Skriðdalur area is included in his order. If the households in Þingmúlasókn were included in the number for the Vallanes area the households would be 40 resulting in 10 households for each quern.

[17] The roughly estimated number of households in each area, or parish, is based on a census from 1801 (*Manntal 1801*, 1980, pp. 392-472) when the population had again reached similar numbers (~47.000) as it had been in 1769 (~46.000) (Guðmundur Jónsson and Magnús S. Magnússon, 1997, p. 49), before the Laki eruption in 1783-1784, when 20% of the population died between 1784-1787 due to famine, cold and disease (Árni D. Júlíusson, 2013a, pp. 235-237; Sveinbjörn Rafnsson, 1984, pp. 163-170).

Table 4.3. An order for quernstones from sheriff Jón Arnórsson in Suður-Múlasýsla for the Reyðarfjörður and Berufjörður trading districts (ÞÍ. Rtk. B7.8.42, 1777). The estimated number of households in each area, or parish, is based on the 1801 census (Manntal 1801, 1980, pp. 392-472).

District	Parish	Querns	Households in 1801	Household per quern
Reyðarfjörður	Fljótsdalur	6	32	5.3
	Skógar	2	10	5.0
	Vallanes	4	26	6.5
	Eiðar	4	24	6.0
	Hjaltastaður	5	32	6.4
	Desjamýri	4	15	3.8
	Klyppstaðir	2	14	7.0
	Dvergasteinn	4	15	3.8
	Mjóifjörður	4	15	3.8
	Skorrastaður	6	33	5.5
	Hólmar	6	33	5.5
	Fáskrúðsfjörður	6	25	4.2
Berufjörður	Stöðvarfjörður	2	5	2.5
	Breiðdalur	6	28	4.7
	Berufjörður/ Berunes	6	22	3.7
	Hamarsfjörður	2	21	10.5
	Álftafjörður	6	19	3.2
	Total:	**75**	**369**	**5.1**

Table 4.4. The querns to be distributed by the Royal Trading Company in 1779 (ÞÍ. Rtk. B10.4.19, 1780).

Trading Post	Querns
Vestmanneyjar	6
Eyrarbakki	12
Grindavík	4
Básendar	8
Keflavík	12
Hafnarfjörður	8
Hólmurinn	12
Búðir	8
Stapi	12
Ólafsvík	4
Grundarfjörður	4
Stykkishólmur	18
Flatey	8
Patreksfjörður	8
Bíldudalur	8
Ísafjörður	8
Dýrafjörður	8
Skagaströnd	8
Reykjarfjörður	3
Hofsós	8
Eyjafjörður	10
Húsavík	8
Vopnafjörður	4
Reyðarfjörður	8
Berufjörður	3
	Total: 200

and others were still experimenting and trying to find suitable indigenous materials that could be used to produce serviceable quernstones. Ólafur Olavius names at least four men in Eyjafjarðarsýsla who had produced quernstones for themselves and for sale (Ólafur Olavius, 1965a, pp. 73-75; *ÞÍ. Rtk. B8.6.31*, 1778-1779). Ólafur Olavius also encountered blacksmiths and millers in Húnavatnssýsla who made use of sandstone from a mountain called Gedda (Gedduhryggur in Vatnsdalur; see e38 in Figure 7.2) that could possibly be used both for hones and querns (Pnr-Hvammur, 1919, p. 8; *LFI*, 1854, pp. 463-464; Ólafur Olavius, 1965b, pp. 205-207). Suitable rock materials were scarcer in some counties compared to others, but good progress was being made in at least five counties in the South and West of Iceland, where quernstone material was easier to acquire: Snæfellsnessýsla (*ÞÍ. Rtk. B10.6.37*, 1783), Árnessýsla, Rangárvallasýsla, Vestmannaeyjasýsla and Vestur-Skaftafellssýsla. In a summary from the Exchequer regarding complaints and reports filed in 1777-1778 it is mentioned that sheriffs in Árnessýsla and Rangárvallasýsla requested more grain to be shipped to Eyrarbakki trading post[18] as the public was very keen on buying it. Both counties already had large quantities of hand querns that were available for sale, made from indigenous rock materials (Ólafur Olavius, 1965a, pp. 74-75; *ÞÍ. Rtk. B8.4.32*, 1778). In August 1779 sheriff Lýður Guðmundsson declined the two imported pairs meant for Vestur-Skaftafellssýsla (Table 4.4)[19] as the county had no need for them. It had plenty of querns produced by the inhabitants themselves (*ÞÍ. Rtk. B8.10.13*, 1779).

4.2.4. The Carrot: Rewards for Individual Enterprise

While import of unground grain kept growing steadily (Figure 4.5) scholar Sæmundur Magnússon Hólm (1749-1821) published a paper on lyme grass harvesting in Vestur-Skaftafellssýsla in 1780 and 1781, potentially demonstrating the importance that had been set on encouraging experiments with this single indigenous grain type among the general population (Sæmundur Magnússon Hólm, 1780, 1781; see also 1958 (1781-1782)). He described how to ensure a good harvest, how to collect, process and store the grain, and discussed quernstone production and how the hand quern was used. The earliest records of rewards given to people for making quernstones are from 1781 ("RÍL II," 1781a, p. 269 and 275; "RÍL II," 1781b, p. 277 and 282). The Danish government (through a fund

[18] Most likely for the year 1779.
[19] From the 12 stones sent to Eyrarbakki.

called isl. *Mjölbótasjóður*[20]) and The Royal Danish Agricultural Society (dan. *Det Kongelige Danske Landshusholdningsselskab*) supplied the funding. In the first few years perhaps most of the imported grain was being ground with the imported querns, which would not have called for much indigenous production, and could partly be the reason for setting up the rewards.

In early 1783 the board of the Second Royal Trading Company agreed to accept locally produced quernstones for sale. To encourage people to bring querns to the trading posts for redistribution the craftsmen were to receive a small payment for transport costs in addition to the regular payment for the quernstones according to the published rates. In addition, small rewards were also suggested for each quernstone handed in and they were to become higher depending on how many pairs were brought each time. The lowest reward was to be one state dollar for six pairs (16 shillings/pair) and gradually increasing with the highest being 15 state dollars for 30 pairs (48 shillings/pair; *LFI*, 1854, pp. 688-690; *ÞÍ. Rtk. B10.3.11*, 1783)[21]. In March 1784 the rewards became fixed however, when the Exchequer set them at 16 shillings for small quernstone pairs, and 24 shillings for large pairs that were produced and used successfully. By that time, it had most likely become clear that the production of a single craftsman would rarely reach such numbers and setting a single price for each size group was no doubt cheaper.

Although the Exchequer had dismissed the idea of building small water- and windmills at the start of the project, sheriff Bjarni Einarsson published a small instructional paper in 1781 (Bjarni Einarsson, 1781; *ÞÍ. Rtk. B9.4.3*, 1770). The sheriffs' paper describes how to build small water mills over streams from turf, stone, wood and iron (Bjarni Einarsson, 1781, pp. 4-12). Einarsson had already built such a mill in 1778 at his farm Hagi with the aid of a Norwegian sailor and former millers' apprentice, Engelbret Larsen Hammer, living in Krossavík also in Barðastrandarsýsla (Ólafur Olavius, 1965a, pp. 21 and 74-76), and Jón Egilsson at Kirkjuból in Ketildalahreppur (Figure 3.2) built another in the same county ("IGD," 1997-2017; *ÞÍ. Rtk. B8.4.36*, 1778). In August 1780 mills had also been constructed in Eyjafjörður (1), Dalasýsla (1, possibly at Búðardalur) and Gullbringusýsla (1, most likely in Hafnarfjörður) (*ÞÍ. Rtk. B9.4.3*, 1770). When the paper was published five such mills had been built in Barðastrandarsýsla

[20] Between 1764 and 1774 The General Trading Company (isl. *Almenna verzlunarfjelagið*) was in charge of the Iceland trade. In April 1773 the company was heavily fined for importing spoiled meal to Iceland. This led to the formation of The Meal Compensation Fund (isl. *Mjölbótasjóður*) and its interests were mainly used for agricultural reform (Lýður Björnsson, 2006, pp. 157-158 and 197-198; *LFI*, 1854, p. 6).
[21] 96 shillings in 1 state dollar.

(Bjarni Einarsson, 1781, p. 3) and in the next few years copies of the paper were distributed to every county in Iceland (*ÞÍ. Rtk. B9.2.49*, 1781; *ÞÍ. Rtk. B9.7.31*, 1781; *ÞÍ. Rtk. B9.7.32*, 1781; *ÞÍ. Rtk. B9.8.22*, 1781; *ÞÍ. Rtk. B9.9.39*, 1781). In 1782 reverend Halldór Finnsson in Hítardalur in Mýrasýsla also built a mill and rewards were handed out for exemplary mill constructions in 1782 (1), 1784 (2), 1785 (1), 1786 (1) and 1787 (1; Table 4.5). Despite these early efforts small water- and windmills did not become widespread until the second half of the 19th century (Sigurður Ólafsson, 1893, pp. 169-170) and they were never as common as the hand quern. Commercial or large industrial mills never became a part of Icelandic society, with the exception of two large windmills

Table 4.5. People rewarded for quernstone and mill production (or both**) in Iceland from 1781-1790 (see also Table 5.2).*

Name	Birth/ Death	Social status	Location around 1775-1800	County	Reward
Páll Sigurðsson	1730-1799	Farmer and craftsman	Karlsá, Ufsaströnd	Eyafjarðarsýsla	2 std
Jón Jónsson	~1739-1810	Farmer, fisherman and craftsman	Sauðanes, Ufsaströnd	Eyjafjarðarsýsla	2 std
Jón Stefánsson, senior	~1749-1820	District officer	Sörlatunga, Barkárdalur	Eyjafjarðarsýsla	9 std
Jón Magnússon	~1723-1788	Farmer	Efstalandskot, Öxnadal	Eyjafjarðarsýsla	2 std
Jón Þorláksson	~1732-1804	Farmer	Sigtún, Eyjafjörður	Eyjafjarðarsýsla	2 std
Páll Sveinsson*	~1724-1804	District officer, farmer and silversmith	Steinsstaðir, Tungusveit	Skagafjarðarsýsla	?
Jens Lassen Busch	Unclear	Merchant	Ísafjörður	Ísafjarðarsýsla	silver medal
Jón Ásmundarson	~1735-1812	Farmer	Berserkseyri, Helgafellssveit	Snæfellnesssýsla	5 std
Guðmundur Ólafsson	~1710-1784	Farmer	Efri-Bægisá, Öxnadal	Eyjafjarðarsýsla	4 std
Eiríkur Guðmundsson	~1717-1805	Farmer	Írafell, Svartárdalur	Skagafjarðarsýsla	2 std
Jón Arngrímsson	b. 1759?	Farmer	Fitjar, Staðarbakki	Húnavatnssýsla	2 std
Magnús Ólafsson*	1746-1834	Priest	Berufjörður	Suður-Múlasýsla	4 std
Steingrímur Halldórsson*	1749-1786	Farmer and craftsman	Hnappavellir	Austur-Skaftafellssýsla	4 std
Benedikt Björnsson*	~1736-1835	Farmer and craftsman	Garðsá in Garðsárdalur	Eyjafjarðarsýsla	5 std
Jón Jónsson**	~1733-after 1803	Farmer and craftsman	Mýlaugsstaðir, Aðaldalur	Þingeyjarsýsla	9 std
Björn Thorlacius Halldórsson*	1743-1794	Merchant	Húsavík	Þingeyjarsýsla	20 std
Guðmundur Jónsson*	Unclear	Craftsman, farmhand	Garðar, Álftanes	Gullbringusýsla	10 std
Hallgrímur Jónsson	~1742-1814	District officer	Innri-Skeljabrekka , south of Andakílsá	Borgarfjarðarsýsla	6 std
Einar Eiríksson	~1721-after1804	Farmer	Flóagafl, Breiðamýri	Árnessýsla	4 std 10 sh

Sigmundur Sigurðarson	~1762-after 1820	District officer	Geitdalur, Norðurdal innwards from Skriðdalur	Suður-Múlasýsla	48 sh
Rustíkus Sigurðarson, brother of Sigmundur in Geitdalur	~1763-1803	Farmer	Arnhólstaðir, Skriðdalur	Suður-Múlasýsla	48 sh
Jón Jónsson, (pamfill?)	~1718-1796?	Farmer	Geirólfsstaðir, Skriðdalur	Suður-Múlasýsla	24 sh
Árni Jónsson	~1740-1813 (?)	Farmer	Haugar, Suðurdalur innwards from Skriðdalur	Suður-Múlasýsla	48 sh
Einar Eiríksson	~1749-1804	Farm hand	Ytri-Kleif, Breiðdalur	Suður-Múlasýsla	48 sh
Guðmundur Sturluson	~1728-after 1785	Farmer	Mjóanes, Vellir	Suður-Múlasýsla	48 sh
Brynjúlfur Ólafsson	~1756-1816	Priest	Sandfell, Öræfi	Austur-Skaftafellssýsla	40 sh
Páll Guðmundsson	~1747-1818	Farmer	Ármótsstekkar, east of Ölfusá	Árnessýsla	80 sh
Erlendur Ásbjörnsson (?)	~1747-1832	Farmer	Brjámsstaðir in Grímsnes	Árnessýsla	4 std 8 sh
Hallur Hróbjartsson	~1727-1808	Farmer	Búastaður	Vestmannaeyjasýsla	1 std 64 sh
Sveinn Sturlaugsson	~1728-1800	Farmer	Kleifar, Gilsfjörður	Dalasýsla	80 sh
Gísli Sigurðsson	~1720-after 1800	Farmer	Efri-Brunná, Saurbær	Dalasýsla	40 sh
Ólafur Gíslason, senior, son in law of Gísli Sigurðsson, Efri-Brunná	~1752-1791	Farmer	Stóri-Múli, Saurbær	Dalasýsla	24 sh
Ólafur Gíslason, junior, brother of Ólafur Gíslason senior, also son in law of Gísli Sigurðsson, Efri-Brunná	~1754-after 1804	Farmer	Efri-Brunná, Saurbær	Dalasýsla	40 sh
Jón Bjarnason	~1726-1804	Farmer	Máskelda, Saurbær	Dalasýsla	16 sh
Ólafur Jónsson	~1750-1798	Farmer	Neðri-Brekka, Saurbær	Dalasýsla	12 sh
Jón Þorleifsson	1762-1847	Farmer	Fremri-Brekka, Saurbær	Dalasýsla	12 sh
Guðmundur Bjarnason	~1745-before 1820	Farmer	Bjarnastaðir (Kverngrjót), Saurbær	Dalasýsla	24 sh
Ingveldur Ólafsdóttir	~1729-after 1800	Widow of district officer and craftsman Jón Jónsson 1722-before 1786	Neðri-Brunná, Saurbær	Dalasýsla	40 sh
Sigurður Gunnsteinsson	~1751-after 1803	Farmer	Hátún, Landbrot	Vestur-Skaftafellssýsla	32 sh
Þorlákur Sigurðsson	~1742-1801	Farmer	Hnappavellir, Öræfi	Austur-Skaftafellssýsla	2 std 64 sh
Hávarður Guðmundsson	~1745-1789 (?)	Farmer	Njarðvík, east of Héraðsflói	Norður-Múlasýsla	1 std
Gísli Halldórsson	1748-1825	Farmer	Snotrunes, Borgarfjöður eystri	Norður-Múlasýsla	24 sh
Einar Kortsson, loses both legs below knee in 1791	~1762-1846	Student and craftsman	Ás, Fell	Norður-Múlasýsla	1 std 16 sh
Ingjaldur Andrésson	~1752-1824	Farmer	Langavatn, Reykjarhverfi	Þingeyjarsýsla	24 sh

(Hólavallarmylla 1830 and The Dutch Mill 1847) in Reykjavík built in the 19th century (Árni Óla, 1952, pp. 125-130).

The rewards were originally intended to continue for three years until March 1787 (*LFI*, 1855, pp. 39-40; *ÞÍ. Rtk. B10.7.21*, 1784). In May 1787 the Second Land Commission requested that the rewards be continued for three more years (*ÞÍ. Rtk. B11.10.31*, 1787) and the Exchequer duly extended them until March 1790 (*AÍ XVI*, 1986, pp. 358-359; *LFI*, 1855, pp. 414-415; *ÞÍ. Rtk. B11.8.14*, 1787). Names of 44 people have been found who received rewards for quernstone production (38) and mill construction (6) all over Iceland between 1781 and 1790 (*AÍ XVI*, 1986, pp. 304-305, 330 and 565; *AÍ XVII*, 1990, pp. 27, 39 and 73-74; "NACD", 2017: 'Census 1816'; Hrólfur Kristbjörnsson and Jón Hrólfsson, 2013, pp. 88-89; "RÍL V," 1784, p. 289; "RÍL X," 1789, pp. 318-319; "RÍL VII," 1786a, pp. 277-278; "RÍL VI," 1785, pp. 267-268; "RÍL VII," 1786b, p. 275; "RÍL IV," 1783, p. 311; "RÍL XII," 1791, p. 261; "RÍL II," 1781a, pp. 269, 275; "RÍL III," 1782a, pp. 282, 286-287; "RÍL II," 1781b, pp. 277, 282; "RÍL III," 1782b, pp. 290-291; "RÍL VIII," 1787, p. 282; *ÞÍ. Rtk. B10.6.37*, 1783), which suggests that in this instance the reward system proved encouraging (Table 4.5).

4.2.5. Free Production without External Price Regulations

When the rewards were being considered in 1783 (*LFI*, 1854, pp. 688-690; *ÞÍ. Rtk. B10.3.11*, 1783) the Exchequer also wanted to regulate the local exchange rate for quernstones as prices were too varied between counties (see further discussion of exchange values in Chapter 8). In order to do so they requested detailed information as soon as possible from treasurer Skúli Magnússon and all the sheriffs in Iceland regarding;

1) Where serviceable rock materials could be found within each county and whether they were being or could be exploited, and if so how.

2) What the pair was selling for in each district and their diameter.

3) How long the distances were between craftsmen, the source materials and their closest trading posts.

4) Whether people were willing 1) to make quernstone production their main occupation, 2) to sell their products and for how much, or 3) to sell quernstones when their trading posts were too far away for viable transport.

The Exchequer received replies in varied detail seemingly from all but six counties in Iceland (*ÞÍ. Rtk. B10.4.19*, 1780; *ÞÍ. Rtk. B10.6.20*, 1783; *ÞÍ. Rtk. B10.6.22*, 1783; *ÞÍ. Rtk. B10.6.23*, 1783; *ÞÍ. Rtk. B10.6.25*, 1783; *ÞÍ. Rtk. B10.6.26*, 1783; *ÞÍ. Rtk. B10.6.29*, 1783; *ÞÍ. Rtk. B10.6.33*, 1783; *ÞÍ. Rtk. B10.6.34*, 1783; *ÞÍ. Rtk. B10.6.35*, 1783; *ÞÍ. Rtk. B10.6.36*, 1783; *ÞÍ. Rtk. B10.6.37*, 1783; *ÞÍ. Rtk. B10.6.38*, 1783; *ÞÍ. Rtk. B10.6.42*, 1783; *ÞÍ. Rtk. B10.6.43*, 1783). Based on these reports a general overview of the sheriffs' immediate concerns and the status of quernstone production in each county can be presented. The most detailed report came from Rangárvallasýsla (*ÞÍ. Rtk. B10.6.33*, 1783) where it was stated that only 7 years after the inception of the project at least 201 quernstones were in use in 20 parishes (Table 4.6; Figure 4.12)[22]. This means that there were about 1-5 households to each quern, or on average roughly one quernstone for every three households in the county. This is similar to the numbers that sheriff Jón Arnórsson had predicted would be needed for each parish in Suður-Múlasýsla (Table 4.3), where on average he envisioned one quern could serve around five households, but it also suggests that a higher number of households were acquiring quernstones than had been deemed necessary for each district.

The reports hinted that the public did not seem to have too much trust in the Second Royal Trading Company, and some craftsmen were reluctant to take their product to the trading posts. They were afraid that the merchants would deem the querns substandard and determine prices to their own advantage, but there were still a few who had provided trading posts with indigenous querns. Many craftsmen lived so far away from the trading posts that it was not viable to transfer the querns, as they would become too expensive after transport costs had been added. One craftsman had the merchant pick up the quernstones himself. In 1783 alone at least 225 quernstones were imported to Iceland (Figure 4.11) and in September that same year some trading stations had received so many imported querns through the trading company that they would not accept Icelandic querns for some years. This was the case for example with Búðir and Stapi in Snæfellsnes (*ÞÍ. Rtk. B10.6.37*, 1783). According to import statements at least 600 querns had been transported in total to Iceland by that time (Figure 4.11). For comparison, around 550-600 quernstones would have been more than sufficient to provide all the top Icelandic government and religious officials, all trading posts, parish priests and district officers

[22] Information is missing from at least five parishes: Voðmúlasókn (33 households), Marteinstungusókn (17), Hagasókn (14), Árbæjarsókn (17), Gunnarsholtssókn (9).

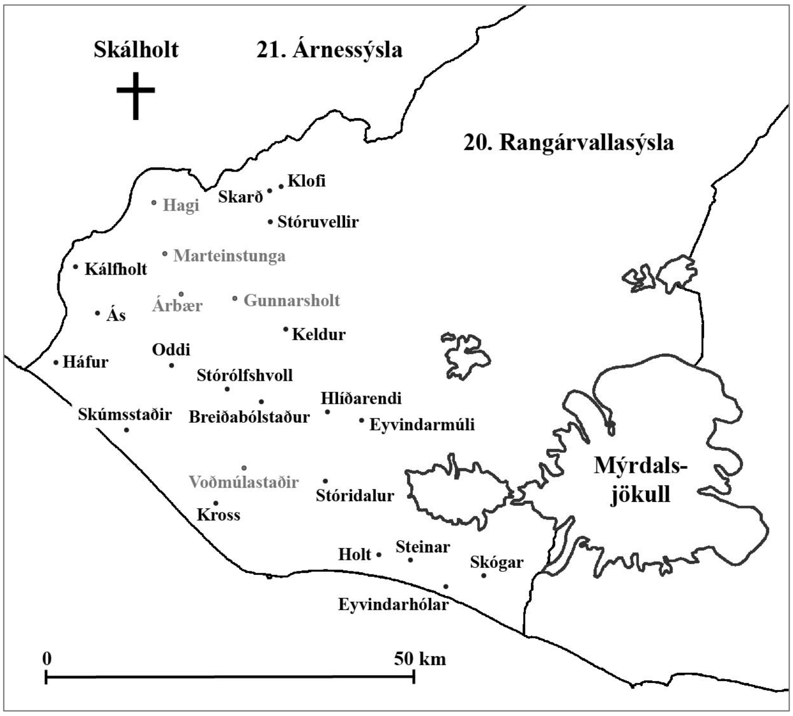


Figure 4.12. The church farms named in Table 4.6.
The farms from which reports are missing are coloured grey.

Table 4.6. Number of querns reported in a few parishes in Rangárvallasýsla in 1783. Information in this table is based on document ÞÍ. Rtk. B10.6.33 and a census of Rangárvallasýsla from 1801 (Manntal 1801, 1978, pp. 69-182).

Parishes in Rangárvallasýsla	Querns in 1783	Households in 1801	Households per quern
Eyvindarhólasókn	10	34	3.40
Skógasókn	7	9	1.29
Steinasókn	8	21	2.63
Holtssókn	11	52	4.73
Stóradalssókn	15	30	2.00
Teigs-, Hlíðarenda og Eyvindarmúlasókn	14	49	3.50
Breiðabólstaðarsókn	16	60	3.75
Krosssókn	15	47	3.13
Skúmsstaðasókn	12	27	2.25
Stórólfshvolssókn	8	26	3.25
Keldnasókn	14	22	1.57
Oddasókn	16	48	3.00
Kálfholtssókn	8	16	2.00
Háfssókn	10	30	3.00
Ássókn	6	8	1.33
Skarðssókn	10	17	1.70
Stóruvallasókn	16	22	1.38
Klofasókn	5	14	2.80
Total:	**201**	**532**	**2.59**

(when on average two officers are estimated to reside in each district) with one quern. The public, however, seems to have preferred to buy indigenous querns straight from the craftsmen at much lower prices, and sometimes over shorter distances than had to be travelled to the trading posts. Some simply made the querns themselves where materials were available. Many places were named where suitable rock materials could be found (see further discussion in Chapter 7) but often they would be far away from both the craftsmen and the trading posts, or the raw materials were considered barely sufficient for more than two or three querns. Where rock materials were available the biggest obstacles were thought to be expensive transport and limited supply of good iron for tools. Some counties reported a total lack of suitable raw materials due to the hardness of local rock, which made it difficult to shape, and in those counties the public was unwilling or unable to buy the more expensive foreign quernstones.

After reviewing all the reports, the Exchequer declared in March 1784 that production and trade in quernstones in Iceland would remain unregulated and the inhabitants free to procure a quernstone any way they thought best. As was mentioned above the Exchequer promised on that same day a set reward for each quernstone produced, to further encourage such production. No attempt seems to have been made to set a fixed price and the craftsmen seem to have had a choice of whether they brought their querns to the trading posts for distribution or if the craftsmen traded their product themselves, determining their own product value (*LFI*, 1855, pp. 39-40; *ÞÍ. Rtk. B10.7.21*, 1784). No doubt the Exchequer's decision to leave the indigenous quernstone trade free was strongly influenced by the fact that at the time the Icelanders were suffering the consequences of the *Laki* eruption, and between 1783 and 1787 import of grain was increased considerably (Guðmundur Jónsson and Magnús S. Magnússon, 1997, pp. 403-443; Figure 4.4) in an attempt to compensate for all the livestock lost (see more detail above). Grain was even fed to the livestock, for example in Barðastrandarsýsla, in an effort to keep the animals alive (Lýður Björnsson, 2006, p. 213), although how large a portion of the total import that would have constituted is unknown. And some did not stop wanting ready-ground meal.

In 1784 reverend Jón Steingrímsson from Prestbakki in Vestur-Skaftafellssýsla ordered two barrels of meal from trading posts in his two adjacent counties, Landeyjarkrambúð in Rangárvallasýsla and Djúpivogur in Austur-Skaftafellssýsla (Figure 3.2). His order came from the heart of a county without a trading post due to the extensively sandy southern coastline but known for its exploitation of lyme grass and quernstone production. The barrels were not available to him at the time of his order, but he does seem to have received them, albeit after a long wait (Jón Steingrímsson, 1913-1916, pp. 182-183; Kjartan Ólafsson, 1987, p. 42). It seems likely that lyme grass harvests failed but as Vestur-Skaftafellssýsla was known for its local quernstone production why did he not order grain, which had been made available for over ten years? Perhaps those that suffered the greatest consequences of the volcanic eruption will not have wanted to spend time or energy on grinding their own grain during this difficult time. Population numbers dropped and cereal cultivation efforts floundered, but as the import of grain increased drastically the need for quernstones certainly did not disappear during those hard times.

In April 1787 as the Second Royal Trading Company was coming to an end, a new royal decree was issued with a list of exchange rates (Table 4.2) where the prices of grain were raised quite a bit while the price of imported quernstones was only slightly lowered. No mention is made of a fixed exchange rate for indigenous quernstones and no indication of the export of such querns has been found (*LFI*, 1855, pp. 383-393; Lýður Björnsson, 2006, pp. 239-242). No indications or information has either been found suggesting that the Exchequer expected export or to gain any kind of profit from Icelandic quernstone production. After 1790 the government rewards seem to have stopped and their records fall mostly quiet on the subject of quernstones. The Danish government had ceased its involvement and expected the general public to be self-sufficient and carry on the torch.

4.2.6. The Potential Number of Querns Needed for the Imported Grain

According to Árni D. Júlíusson (2013a, pp. 288-293) around 70% of the population likely took part in goods exchange at the foreign trading posts each year in the mid-18th century. The most affluent brought exchange goods to the trading posts every year, while the average farmer travelled to the trading posts every other year or less. However, rye may have been one of the most common imported items bought by those who brought goods to the trading posts, whether rich or poor, although the poorer crofters were least likely to make the trip to the trading posts (Árni D. Júlíusson, 2013a, p. 290-291). If this was the case, it seems likely that a majority of the population was buying rye, albeit at varied times and intervals and in varied quantities. Grain was imported in fluctuating quantities but there was always meal imported to some degree alongside it. Post-1800 the meal import decreased from ~50% to 10-30% of the total import (Figure 4.7), which suggests that the habit of grinding had likely taken hold by the early 19th century. Total cereal imports never went beyond 1500-1800 tons however, at least until the 1820s or 30s. But regardless of who actually bought the imported grain, it had to be ground if it was to be used in the traditional way. The slow and steady import of unground grain without any increase in the total amount regularly imported will have been a considerable forcing agent in the innovation diffusion process. If a majority of the households were buying cereals each, or every other year, they would all have the potential of becoming quernstone owners. But how many quernstones were needed, or indeed wanted?

The total number of households in Iceland rocks up and down through the 18th century[23]. In 1703 the households number just under 8200 (just over 50 thousand people) while in the 1801 census they number about 7400 (~47 thousand people). Between 1770 and 1780 the population increases from ~48 to 50 thousand people. The average number of households during that time would therefore likely have been around 7800 households, with crofts ranging somewhere around 25% of the total. As we discussed previously, in 1770 ~950-1000 quernstones (for ~10-15% of the total number of households) were considered sufficient to introduce the quernstone around the island, which means that if no more querns had been imported or made, each quern would have had to serve around 7-8 households. However, this was never meant to be the final number of quernstones in circulation. When the sheriff of Suður-Múlasýsla ordered quernstones for his county in 1777 (Table 4.3) it was estimated that he considered one quernstone per 5 households on average (range generally 2-7 households) to be sufficient. If all sheriffs had asked for the same amount it would have meant ~1400-1600 querns in total for the whole country, which would have been enough for about 20% of the households. Perhaps this vision entailed quernstones mainly for those farmers most commonly buying cereals at the trading posts. In 1783 at least 200 quernstones were said to be in use in Rangárvallasýsla (Table 4.6) which means that ~30% of the counties' households were using a quern at that point in time and on average one quern likely served 2-3 households (a range of 1-5 households) for each quern (Figure 4.11). This could suggest that on average one quernstone could have served 2-5 households. Therefore, for an island with 7000-8000

[23] Note that one tenant farm could support more than one households, commonly two and occasionally even three (isl. *tví-, þríbýli*).

households in the early days when grain was about 50% of import, between 1400 and 4000 quernstones were likely needed.

As demonstrated above, on average only about half of the imported cereals was unground, at least into the very early 1800s. We cannot know if people bought grain, meal or perhaps a little bit of both. It is very unlikely that every household acquired a quernstone in the early stages while grain import was only 50%, there were always side adopters that had grain ground for them and certainly some crofters will not have bought much of cereals at all. At the height of grain import in the mid-19th century 90% of the imported cereals were grain, and consumption of cereals had increased from around 75 gr/day up to roughly 250 gr/day per person (Figure 4.7). In the mid-18th century the average import was 880 tonnes of meal a year. If the more affluent people in the Icelandic farming community had consumed about 200 gr a day at the time, that quantity would only have fed about 12.000 people (25% of the nation). With 5-10 people commonly to a

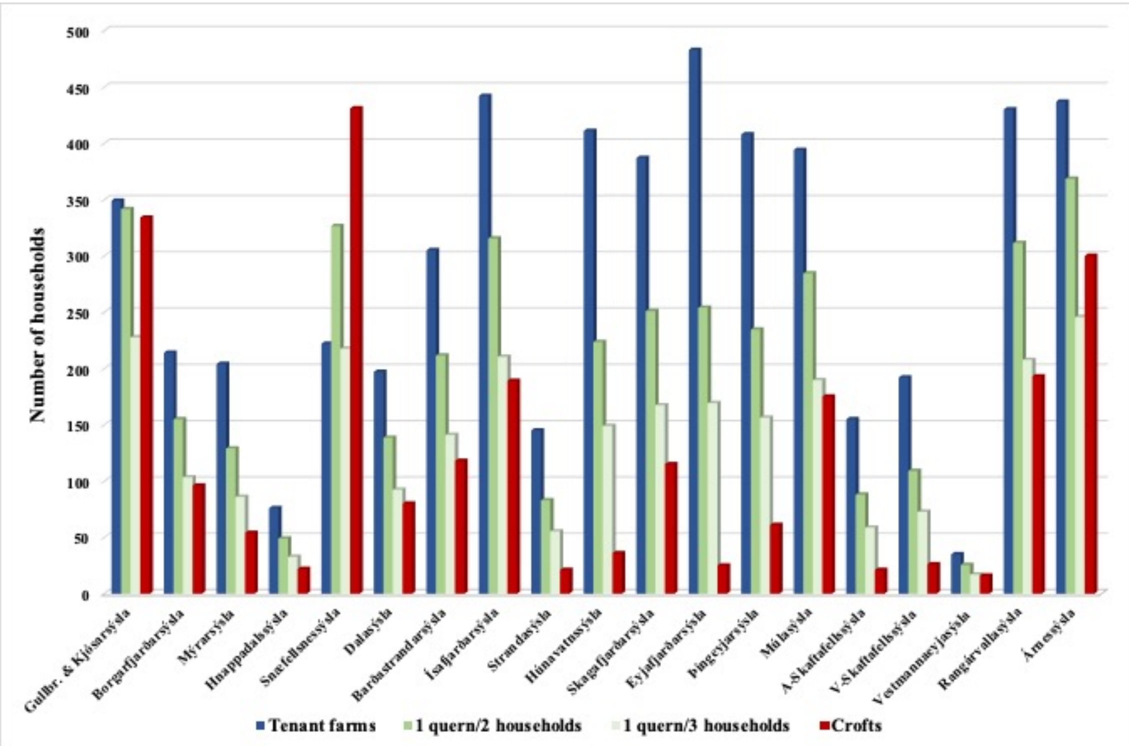


Figure 4.13. Distribution of farming households between counties (tenant farms (blue) and crofts (red)). Their numbers are a calculated average based on the 1703 and 1801 censuses. Between the numbers of farms and crofts are the estimated number of quernstones needed if one quernstones were serving 2-3 households. Note the high number of crofts (red) in the counties where fishing stations and trading posts were most common, especially Gullbringu- and Kjósarsýsla and Snæfellsnessýsla.

household it would only have covered yearly rations for about 1200-2400 households, or ~15-30% the of total number of households. As part of the 10% meal imported mid-19th century, rye meal was about ~600 tons on average a year. Wheat was an expensive luxury, so it is likely that where it was bought rye meal or grain was reserved for the help, and therefore cannot be used as a sign for an absent quernstone. Assuming consumption levels at 200 gr/day per person and 5-10 people in each household, about 800-1600 households at most (~10%-20%; most likely the poorest crofters and villagers, although a few general farmers with anti-quernstone views may very well have been part of that number as well) remained as non-adopters of the innovation pair, despite overall consumption of cereals having increased considerably. Although, potentially some of that rye meal may also have ended up at the fishing stations and been consumed by the fishermen during the fishing season where there was little room or time for quernstones.

If about 2400 of the households (~30%) consumed most of the imported cereals in the late 18th century, about 1200 of them would have needed a quern to grind the imported grain. However, the numbers in Rangárvallasýsla suggest that up to 30% of the households had indeed acquired a quernstone whether they needed it or not. According to import records at least 618 quernstones had been imported in 1784 (Figure 4.11). Whether the 200 free querns donated in 1779 are included in this number is unclear (although likely at least some of them must be), so we can only say that in 1784 ~600-800 quernstones had been imported in total. Along with the 200 quernstones in use in Rangárvallasýsla, likely mainly Icelandic, at least 800-1000 quernstones were available, if not all in use. Estimating that 1200-2400 quernstones were wanted around the whole island, at least 400-1400 more quernstone pairs were needed to meet the minimal demands of the sheriffs and the public before the Laki eruption. They would have had to be acquired either through import, which will likely have been minimal post-1783, or indigenous production (if ~75%, possibly ~300-1000+ querns).

If it is supposed that one quernstone lasted ~50 years (note that they could well have lasted longer or indeed shorter) and each household had one quernstone, the quernstones set up and made between 1770 and 1783 could well have been sufficient and served into the early 1800s when grain import started increasing again. With the Laki eruption, however, import of grain increased considerably in 1784-1787 and many more quernstone may have been produced in the last two decades of the 18th century. A single household that ground grain from the very beginning would have needed three quernstone pairs in total in the 150 years before quernstone use was discontinued in the first half of the 20th century. However, as the 19th century passed mills became more and more common and many farms may have started owning two querns, one handquern and one millstone. It can be roughly extrapolated that if one quernstone lasted 50 years, between 7000 quernstone pairs at minimum, and 25000 at maximum could have been used to grind grain in Icelandic households until the early 20th century. This would translate to about 5000-19000 indigenous quernstones (or ~75% as indicated by the recorded Icelandic quernstone assembly, see further discussion in Chapter 8).

Import of foreign quernstones post-1784 is unclear but between 1783 and 1784 import numbers drop from 227 stones down to nine (Figure 4.11). This could suggest that the ~600 querns that had at that point already been imported were thought to suffice as a start-up, at least for the time being. Published overviews of foreign imports between 1849 and 1910 never mention quernstones. Grinding stones (isl. *hverfisteinar*) used to sharped cutting implements (scythes, axes etc.) start appearing in the reports in 1864 (274 stones) and their quantities slowly increase until around 1870 when they numbered between 440-500 stones (*Landshagir IV*, 1870, pp. 59, 71, 351, 599 and 873; *Landshagir V*, 1875, pp. 175, 405, 747 and 771). This could suggest that quernstones were not imported in large enough quantities to be specifically mentioned (although it could also be that grinding stones and quernstones could have been lumped together). The quernstone assemblage suggests that they were about 25% of all the quernstones, which could translate to ~1700-6300 stones imported over 150 years, or ~10-40 stones/year. Even though they don´t seem to appear in the published overviews it must be considered very likely that import of foreign quernstones continued, at least after the island recovered from the Laki eruption in the 1890s and later, albeit in small quantities.

4.3. Change Agents and Tactics

4.3.1. The Change Agents: Their Main Roles and Influences

The main lines in the project's development between 1750 and 1790 can be seen in Figure 4.14. The government decision of getting the import of unground grain and indigenous quernstone production rolling in Iceland took time to accomplish. From the moment the idea was officially pitched in the late 1760s, to the start of grain and quernstone import post-1776, ten years had passed and that was only the start. Further government participation in project development and follow-up continued for another 14 years with the donation of the 200 free quernstones distributed to all trading posts (Table 4.4) around

1780, demands for progress reports by the Exchequer, e.g. in 1783, and production rewards between 1781-1790 (Table 4.5). This extended period of development is partly explained by the seasonal nature of governmental and trade communications between Denmark and Iceland, not to mention the rough internal road systems and the general absence of organised postal service and modern mass media, to help create awareness and distribute general information about innovations to the public. However, although available early mass media channels in Iceland (e.g. letters, printed official ordinances and instructional pamphlets) may have been sparse and may have spread information very slowly to those who could read, their distribution also often included and likely inspired interpersonal communications and discussions both between farming neighbours and across class divides (between sheriffs, district officers, priests, craftsmen and farmers), often at the same time (e.g. announcements and discussions at census and district assemblies and at church; Figure 3.5). The weak mass media did not make communication pathways in Iceland less effective, as most meaningful communications regarding innovation adoption/rejection decisions took place within interpersonal networks and through face-to-face interaction with friends, colleagues and/or neighbours. Despite distances between farms and the absence of towns or urban centres, communication networks were well established and far-reaching.

Official documents suggest that initial project development and execution was mainly in the hands of the governors and the Danish Exchequer, in cooperation with the sheriffs and the merchants (Table 4.7). These project participants can all be classified as *change agents*. The Icelandic government officials were all members of the land-owning elite, officially acting on behalf of the government, and the merchants were all foreigners pushing their own agenda. They will have had little influence over whether the individual farmer adopted the innovation being introduced for the long haul and they took little direct part in indigenous quernstone production (Table 4.7). Their most important contribution was introducing and demonstrating the innovation's usefulness and its technological principles, promoting it in a positive light and facilitating its further use within the population where it was needed, preferably as widely as possible, to increase awareness. and its accessibility and thereby boosting its rate of adoption. As an example, Jón Jakobsson sheriff of Eyjafjarðarsýsla, is reported to have only bought unground grain after 1776. He received two of the foreign quernstones sent to his county. He offered people bread from freshly ground meal, allowed farmers in his neighbourhood to try out

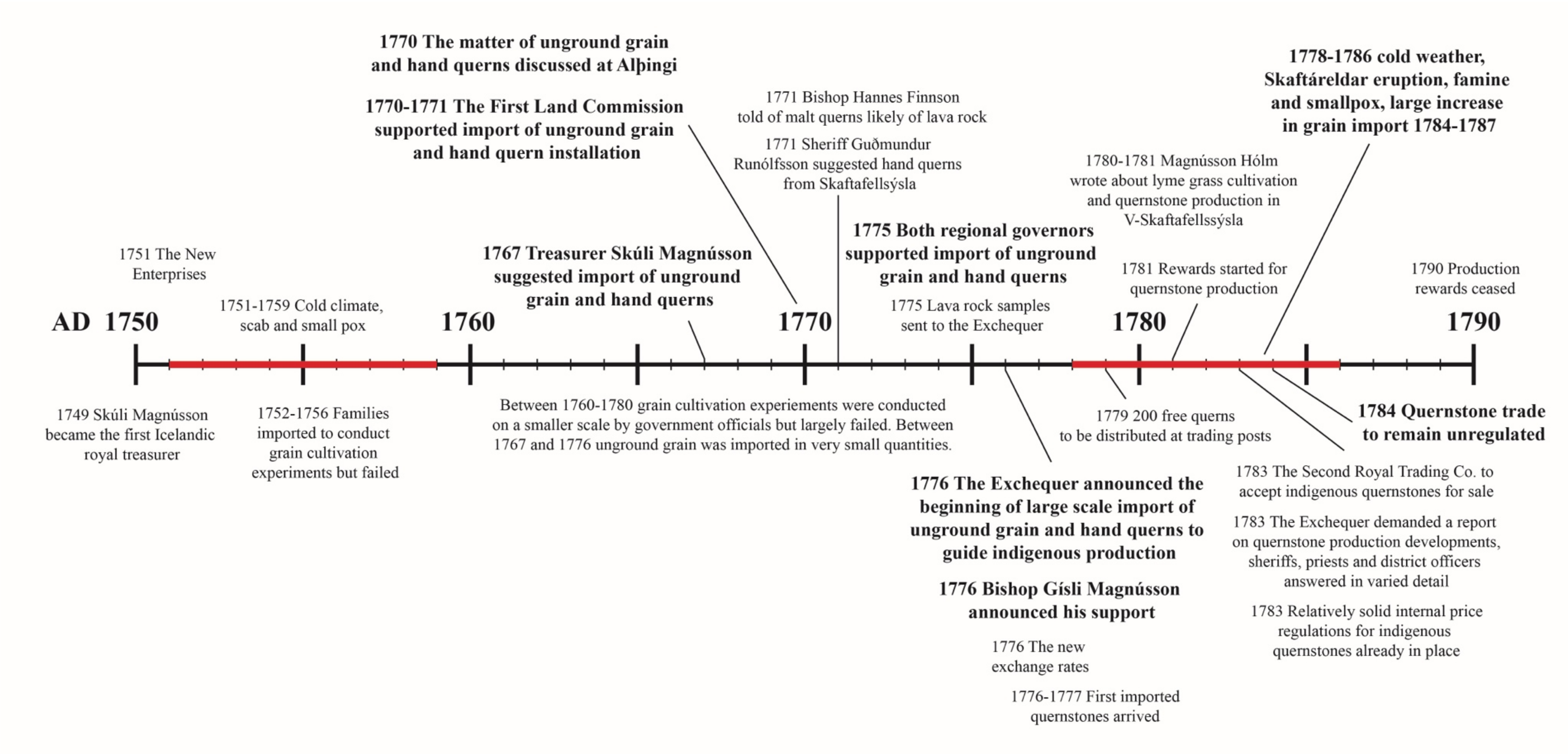


Figure 4.14. The timeline of some of the main influences and steps taken by the government during the innovation planning and introduction process that lasted almost 25 years.

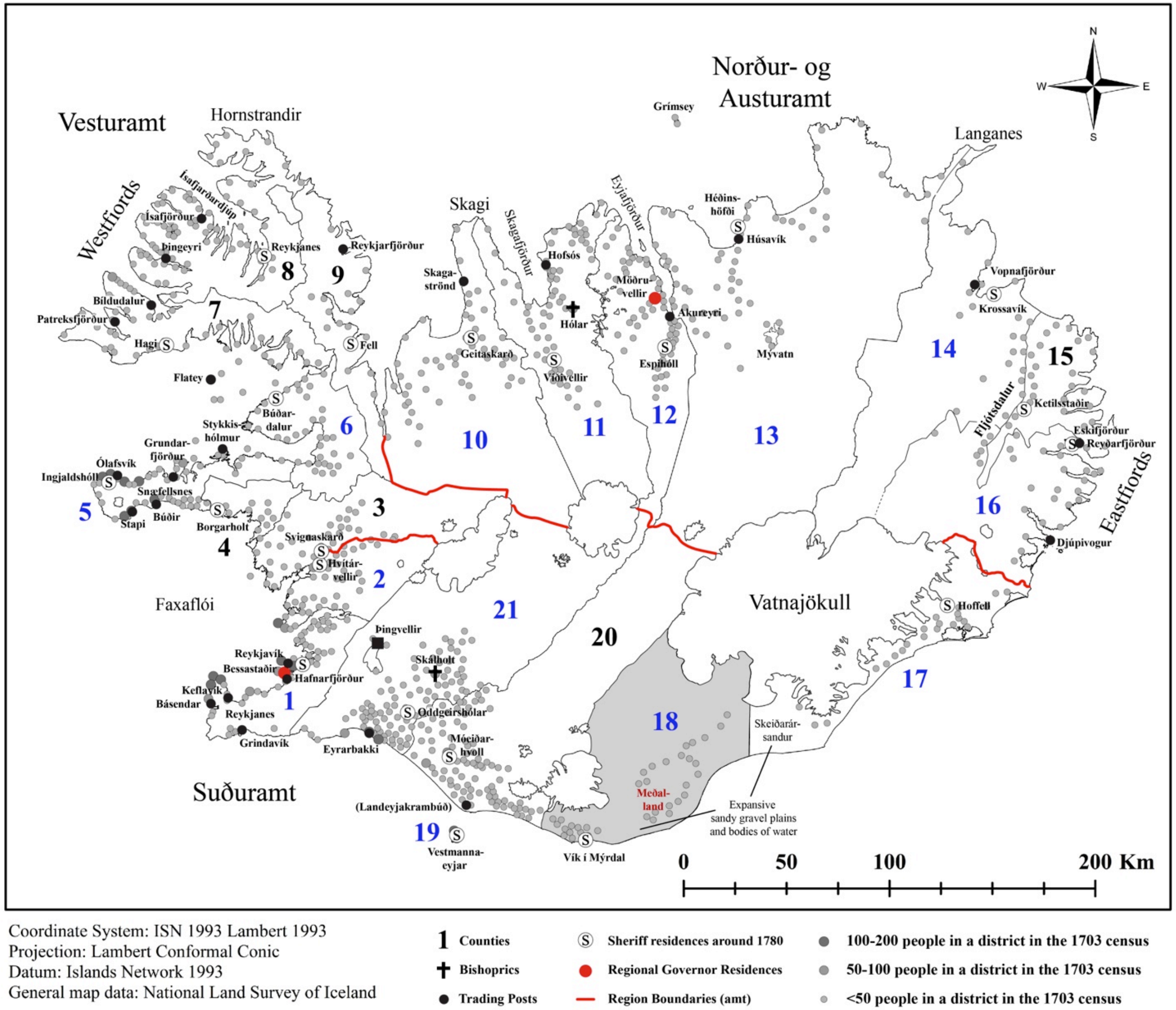


Figure 4.15. Multiple initial information hubs around the island. All trading posts were allocated free querns in 1779 (Table 4.4) and counties (Table 3.1) coloured blue handed out rewards to Icelandic masons between 1780 and 1790 (Table 4.5). Vestur-Skaftafellssýsla, home of the lyme grass quern, is coloured grey.

Table 4.7. Breakdown of the potential roles and general influences the main project participants had in the quernstone production revival (see further discussion of the classes below the sheriffs in Chapter 5).

Main Project Participants	Level of Participation	Assets and Experimentation in Project Development	Likely education/ training	Type of Knowledge/ Experience Provided	Main Information Communication Pathways	Geographical Mobility	Social Influence in Innovation Adoption
Governors/ Treasurer	Project development and logistics, information synthesis, planning and official execution	Foreign querns, possibly directed experiments in mill building (and potentially in indigenous quernstone production, e.g. Thodal at Bessastaðir)	If Icelandic, university degree/ Icelandic Latin school	Facilitated the flow of ideas, information and financial aid into the social system from abroad (national gatekeepers)	Alþingi, interpersonal communication with other government officials, printing and writing	Low within Iceland, likely employed stewards to oversee their assets, strong foreign contact	Low, perhaps stronger around their main place of residence
Merchants	Import and distribution of querns and unground grain. One merchant also part of The First Land Commission	Took part in foreign quernstone adaptation/refitting as querns imported unfinished, experiments in mill construction	N.d.	Facilitated access to/awareness of innovation, source of foreign principles knowledge (quernstone fittings and sharpening)	Seasonal and mainly at trading posts, interpersonal communication, writing	Low within Iceland	Very low, if any, important at the innovation introduction stage
Sheriffs	Project logistics and execution in county, information accumulation through subordinates (mainly priests, district officers and influential farmers)	Foreign querns, experiments in mill construction	Foreign university/ Icelandic Latin school	Facilitated information flow between highest level of government and the public in their respective counties, facilitated access to/awareness of innovation (local gatekeepers)	Alþingi, county assemblies, interpersonal communication, printing and writing (letters/ instructional pamphlets)	Moderate within Iceland, considerable within county, strong foreign contact	Fairly low to moderate, depends on reputation/ relationship with their subordinates, more important during innovation introduction stage
Priests	Directed information accumulation and reporting to sheriffs, alongside district officers and farmers in parish/district	Foreign querns, some experiments in mill building, likely along with quernstone production experiments but likely only to a small extent	Icelandic Latin school, university education uncommon and not required, handicraft training rare but when present commonly metalworkers	Mainly facilitated access to/awareness of innovation, a source of knowledge of innovation use and usefulness, and to a smaller extent innovation principles knowledge	County and district assemblies, sermons, interpersonal communication, writing and access to printing (letters, instructional pamphlets)	Low to moderate, mainly within their parish, little foreign contact	Commonly high, religious/social role models, educational supervisors and teachers, influence depends on adherence to system norms and their relationship with parishioners

District officers	Source of general district information e.g. on willing/competent participants and potential raw material procurement sites	Some likely received a free foreign quern or bought one, a few also experimented and received rewards for quernstone production	Home schooling, often also had handicraft training and/or experience, Latin school education rare	Facilitated innovation accessibility, information on its usefulness and principles, as well as landscape knowledge and sometimes technical advice for production	County and district assemblies, interpersonal communication, likely functional literacy	Low to moderate, mainly within their district, foreign contact uncommon	Likely moderate to high, civil servants, usually more affluent farmers, influence depends on their adherence to system norms and relationship with their subordinates
Farming craftsmen	Partial participants in indigenous quernstone production	Some likely received a free foreign quern or bought one, a few also experimented and received rewards for quernstone production	Home schooling, advanced handicraft training and/or experience common	Could facilitate innovation accessibility and provide all types of information on the innovation, awareness, usefulness, technical advice and some landscape knowledge	County and district assemblies, interpersonal communication, likely functional literacy	Moderate to high, at least between home and adjacent counties, foreign contact uncommon	Moderate to high, provided advanced handicraft training, more likely to be innovators and early adopters.
Tenant farmers	Main participants in indigenous quernstone production	Generally capable of making a quernstone, many rewarded for quernstone production	Home schooling, general handicraft experience common	Could facilitate innovation accessibility and provide some to all types of information on the innovation, awareness, usefulness, technical advice and landscape knowledge	County and district assemblies, interpersonal communication, commonly basic functional literacy	Low to high, depending on participation in fishing and proximity to fishing stations and trading posts	Low to high, depending on their affluence, social interconnectivity and technological savvy, likely range from innovators to late or non-adopters
Crofters	Few participants in quernstone production, known more commonly for grinding their grain at the neighbours	Capable of making a quernstone, none known to have received rewards	Likely some home schooling, general handicraft experience common	Facilitate information flow/innovation awareness within the system, weak ties	Interpersonal communication, basic functional literacy	Low to high, see above	Low, likeliest to be late or non-adopters
Farm hands/ hired hands	Few participants in quernstone production	Capable of making a quernstone, none known to have received rewards	Likely some home schooling, general handicraft experience common	Facilitate information flow/innovation awareness within the system, weak ties	Interpersonal communication, basic functional literacy	Low to high, see above	Low, likeliest to be late or non-adopters

the quern and explained its workings to anyone interested. He was optimistic that grinding unground grain at home would become common in a few years (Ólafur Olavius, 1965a, pp. 74-75).

Merchant influence was largely restricted to the trading posts. However, trading posts were situated within all regions and in almost every county and served as seasonal meeting places where merchants and farmers interacted and exchanged information (Figures 3.5 and 4.14). Merchant-client relationships will more often than not have been influenced by underlying tensions as merchants had the upper hand in almost any goods exchange, and as mentioned above, official documents suggest that some masons were reluctant to take their products to the trading posts for fear of unfair dealings. The merchants may have been able to persuade some to buy unground grain or even a quernstone, but most will not have had enough social credibility to influence customer's practice in their homes in the long run. Merchants seem to have executed their role in the quernstone project without too much objection. The part they played in this successful innovation diffusion, was to act as general product distributers, demonstrators and as an information source of foreign principles knowledge. For instance, as the foreign merchant in Ísafjörður, Jens Larsen Busch, who aided the project when he demonstrated the logistics of how a quernstone could be adapted to fit his customer's needs (Table 4.5).

In each county (Figure 4.15) the sheriffs formed the link between the highest governmental body and the general population. The sheriffs were usually members of the land-owning class, and in addition to their job they also ran some of the largest farms. They had higher education and had travelled abroad for that education, mainly to Copenhagen, as well as on government and family business (*cosmopolite channels*). They also had direct connection with their own superiors through parliament (*cosmopolite channels*), as well as with their subordinates in each county through annual census and district assemblies each year (*localite channels*). Their other necessary communications were handled by letter or through personal interaction. Þorsteinn Magnússon sheriff of Rangárvallasýsla e.g. had directions written regarding the quernstones structure and how it functioned and sent them to all the districts within his county (Ólafur Olavius, 1965a, p. 74).

During the development process the sheriffs were responsible for gathering knowledge about willing participants and about useful raw material sites within their county from their subordinates (*localite channels*). As sheriffs commonly had university education and ran a farm, they had insight into what innovations might be useful and what would be needed in project execution, both from the farmers point of view as well as from the economic standpoint. In the project execution the sheriffs' task was to allocate the free quernstones (Table 4.4), gather information on any and all progress, recruit men within their counties to take part and make/accept recommendations for rewards (Table 4.5). As the sheriffs were the highest authority within each county and tasked with upholding the law as well as being landowners, their level of credibility will have depended on their reputation and personal interaction with their subordinates; how well they balanced their attentions between their own interests and their followers'. If they were unsupportive of the project and did not lead by example the innovations will have been less likely to take hold within their county as they could seriously restrict information flow, or at least slow the adoption down considerably (*information gatekeepers*). If they a bad reputation and/or a tense or insecure relationship with their subordinates, they would not have been considered good role models (*opinion leaders*), and had little influence on public long-term innovation adoption, even if they took part in the project (Gustafsson, 1985, p. 313).

None of the sheriffs seem to have been particularly opposed to the quernstone project, however. Some of the 1783 sheriff reports are rather sparse in detail and do not reveal much enthusiasm, but most seem to have participated so they will likely not have restricted information flow to any degree. It is also likely that they all received a free quernstone to use (or were reimbursed for it later), so more innovative farmers could look to them for a quernstone to try out, for initial technical information and user experience. The sheriff households likely took little active part in indigenous quernstone production but at least some of the sheriffs may have experimented with building small water mills for their free foreign quernstones, as indeed sheriff Bjarni Einarsson did in Barðastrandasýsla in the late 1770s. Einarsson also participated in spreading information by writing a short treaty on watermills in Icelandic (Bjarni Einarsson, 1781) to aid others in such constructions, which was then distributed e.g. to other sheriffs. There was no information on quernstone production in his publication however, as Einarsson used an imported quern.

4.3.2 The Government Tactics: An Inadvertent Push Towards Critical Mass?

The government directive was for the island to become self-sufficient regarding quernstone production and there was a certain push factor in the slowly increasing import of unground grain at the expense of meal. When change agents aim for their clients to become self-sufficient regarding future use/renewal of an innovation and innovations are introduced in pairs or 'packages', diffusion is more often successful (Rogers, 2003, pp. 249-250 and 343-344). The government rewards (Table 4.5) for indigenous production had to be approved by the governors and/or sheriffs and parliament. By providing incentives (Rogers, 2003, pp. 236-239) like free quernstones and production rewards (1781-1790), and actively spreading them around the whole country, government officials were essentially encouraging local participation in production. The rewards lowered potential financial risks involved in project participation and encouraged the farming community to take part in reproducing and adapting the innovation to their needs. They increased innovation accessibility, trialability and provided dozens, if not hundreds, of varied hubs for further information flow (Figure 4.15), thereby potentially causing a faster rate of adoption. Ólafur Olavius (1965a, p. 73) commented that in 1778 all imported quernstones were already in use (188 querns imported to Iceland in 1777-1778) but it is unknown where all the imported quernstones meant as models ended up exactly. Historical evidence hints that, apart from the sheriffs, they will likely have found a home with priests, district officers, active farming craftsmen and/or more affluent farmers willing to participate (who very likely also had sufficient talent in handicraft), and perhaps could more easily afford them. The district officers were the sheriffs' most important connections in county, and they took a much more active part in the actual quernstone production. The fact that these initial major project participants all lived at different locations, in and within each county but were still central within their respective communities (the counties, the districts and the parishes), will also have helped increase innovation accessibility, distributed essential information even more widely, and provided opportunities for further trials.

It is impossible to know in detail at what rate quernstone use and production spread within the various counties but the rewards, the free quernstones and the active participation of at least some of the local government officials will have sped up the process. Potentially the government tactics could have helped trigger *critical mass* in the six years between the start of grain and quernstone import in the spring of 1777 and the Laki eruption in the fall of 1783. Social systems are considered to have critical mass when it comes to adopting innovations and in successful innovation adoption it is reached when 3-16% of potential adopters within that system have accepted an innovation. Past that point further innovation adoption essentially becomes self-sustaining, pushed forward by its own social momentum, also called *the neighbourhood effect*. When the 20% point has been reached in a system an innovation is considered unstoppable and inevitably becomes part of the social norm unless something prevents it from integrating properly in the long run. Iceland is of course the social system in this instance but as information and quernstones were distributed to all the sheriffs and the trading posts, each county could well be considered as a single system (or subsystem) as well. The government officials, priests, farming craftsmen and tenant farmers were all heads of a farming household, being the ones buying and/or making a quernstone, and most likely the ones to consume bread and other food made from ground rye and barley. This particular innovation decision will therefore have rested mainly on their shoulders and each household can therefore be considered the single, basic unit in the innovation process.

Over the six-year period (spring 1777- fall 1783) the import of unground grain was increased gradually to a ~50/50 grain/meal ratio, without affecting the total volume of cereals imported (Figure 4.5). This will have forced many who regularly consumed food made from meal to buy grain or else go without, and in the summer of 1783, 609 quernstones had been imported to Iceland (Figure 4.11). It is known that rewards for quernstone and milling experiments were handed out (Table 4.5; Figure 4.15) in Eyjafjarðarsýsla (7), Skagafjarðarsýsla (2, including 1 mill), Ísafjarðarsýsla (1 merchant for quernstone adaptation), Snæfellsnessýsla (1), Húnavatnssýsla (1), Norður- and Suður-Múlasýsla (3+8, including 1 priest+mill), Austur- and Vestur-Skaftafellssýsla (3+1, 1 mill), Þingeyjarsýsla (3, including 1 merchant+mill, 1 farmer+mill and quernstones), Gullbringu- and Kjósarsýsla (1, mill), Borgarfjarðarsýsla (1), Árnessýsla (3), Vestmannaeyjasýsla (1) and Dalasýsla (9). The number of rewards within each county may give at least some indication of the level of active project participation and/or social influences of its sheriff and district officers which would potentially have sped up the innovations' spread (see also further discussion of the influences of raw material availability in Chapter 7). The sheriffs in Dalasýsla, Eyjafjarðarsýsla and Suður-Múlasýsla at least were active in promoting the project. In Snæfellsnessýsla there was at least one enthusiastic quern mason that made 12 quernstone pairs from Icelandic rock and in Árnessýsla and Vestmannaeyjasýsla there was active participation as well. In Rangárvallasýsla 201 querns were reported in use, many of them likely locally made, and quernstone production was already accepted in Vestur-Skaftafellssýsla (Figure 4.15; Table 4.8).

The participation of all counties may not have been crucial for quernstone production to successfully take off in Iceland and become permanent, however. Looking at the quernstones known to have been imported and potentially in use in 1783, it can be considered what effect they could have had on critical mass within each county. In Table 4.8 the number of households within all the counties has been estimated (see also Figure 4.13) and how many needed to accept a quernstone to reach the 20% mark of no return. It is not known how the 600+ imported quernstones were divided between trading posts but there is little doubt that there would have been at least some effort to spread them as evenly as possible around the island. In Table 4.8 they have been tentatively split between counties based on the percentage of households in each. Commonly 7-9% of all households in each county could have had an imported quernstone in 1783 and this amount could very well have triggered long-term adoption (3-15%). Only Rangárvallasýsla had long passed the point of no return, with 40% of the households likely owning a quernstone. Even without counting the foreign quernstones, ~30% of the counties' households had acquired a quernstone, and this is without considering the fact that not all households would ever have used/owned a quern. If we only consider the tenant farms as potential owners of a quernstone, 9-13% of most households could have acquired one and Snæfellsnessýsla, Vestmanneyjasýsla and Rangárvallasýsla would all have passed the 20% mark, with Gullbringu- and Kjósarsýsla following closely behind them (16%).

So far, we have mainly been considering the quernstones that were imported, and it is not really known if all of them were indeed in use or who would have bought them. It is certain that not everyone could afford the foreign querns but there might also have been those that did not want to pay for a quernstone at the trading posts, even if they could. The seemingly easy acceptance of the people of Rangárvallasýsla may very well have been connected to earlier exploitation of lyme grass, e.g. in Þykkvibær (Anna Sigurðardóttir, 1985, pp. 140-142) and their neighbouring county Vestur-Skaftafellssýsla, and the fact that indigenous cultivation of cereals may have survived the longest in this part of the country. Great-great-grandfathers' quernstone may very well have been preserved (just in case) and come in handy at the time. It seems doubtful that quernstone production in Rangárvallasýsla would alone have triggered critical mass for the whole island, but the counties were well connected, and people travelled regularly in and out of the county, e.g. to Eyrarbakki and Reykjanes for the fishing seasons and into the county

Table 4.8. The potential distribution of known imported and Icelandic quernstones in the year 1783, prior to the Laki eruption.

Counties	Total households	Tenant farms	Crofts	10%	20%	Icelandic querns 1783	Imported querns by 1783*	Total querns	% Total	% Tenant farms
1. Gullbringu- and Kjósarsýsla	683	349	334	68	137	N.d.	56	56	8	16
2. Borgarfjarðarsýsla	310	214	96	31	62	N.d.	26	26	8	12
3. Mýrarsýsla	258	204	54	26	52	N.d.	19	19	7	9
4. Hnappadalssýsla	98	76	22	10	20	N.d.	7	7	7	9
5. Snæfellsnessýsla	653	222	431	65	131	+12	51	63	10	28
6. Dalasýsla	277	197	80	28	55	N.d.	26	26	9	13
7. Barðastrandarsýsla	423	305	118	42	85	N.d.	31	31	7	10
8. Ísafjarðarsýsla	631	442	189	63	126	N.d.	51	51	8	12
9. Strandasýsla	166	145	21	17	33	N.d.	13	13	8	9
10. Húnavatnssýsla	447	411	36	45	89	N.d.	38	38	9	9
11. Skagafjarðarsýsla	502	387	115	50	100	N.d.	38	38	8	10
12. Eyjafjarðarsýsla	508	483	25	51	102	N.d.	44	44	9	9
13. Þingeyjarsýsla	469	408	61	47	94	N.d.	38	38	8	9
14.-16. Múlasýsla	569	394	175	57	114	N.d.	44	44	8	11
17. A-Skaftafellssýsla	176	155	21	18	35	N.d.	13	13	7	8
18. V-Skaftafellssýsla	218	192	26	22	44	N.d.	-	0	0	0
19. Vestmannaeyjasýsla	51	35	16	5	10	N.d.	7	7	14	20
20. Rangárvallasýsla	623	430	193	62	125	201	51	252	40	59
21. Árnessýsla	737	437	300	74	147	N.d.	56	56	8	13
Total:	**7799**	**5486**	**2313**	**780**	**1560**	**213**	**609**	**822**	**-**	**-**

*This author's guestimate of potential distribution of imported querns (Figure 4.11) assuming the imported querns were fairly evenly distributed between counties in accordance with the number of populated farms. The 200 free quernstones and their distribution is not taken into account, just in case many of them are counted in the import statements. The Vestur-Skaftafellssýsla quernstones were distributed evenly between the other counties.

for the haymaking season, so there would have been no shortage of further information flow in and out regarding both quernstone use and production. We know that Icelanders made quernstones when rewards were promised, but there are also indications like in Rangárvallasýsla for example, that awards may not have been needed for local participation. Besides Rangárvallasýsla (8% of all households on the island, 30-40% participation) and Snæfellsnessýsla (also 8% of all households), there was potentially also active initial participation in the neighbouring county of Árnessýsla (9%), in Eyjafjarðarsýsla (7%), Barðastrandarsýsla (5%), Suður-Múlasýsla (3%) and Dalasýsla (4%). How quickly and to what extent they took up quernstone production is unclear but if those counties were as active as Rangárvallasýsla, at least 15-20% of all households in Iceland (Vestur-Skaftafellssýsla included) could have integrated the quernstone and imported grain into their daily lives, before the great increase in grain import between 1784 and 1787.

4.4. Conclusions

In this chapter the main aim was to retrace the Icelandic governmental planning process in the quernstone production revival through 18th century documentary sources in order to consider the main roles of the participating governmental agents and how their tactics may have influenced that process. The cereal cultivation experiments that were conducted in Iceland between 1750 and 1780 had a patchy successful rate and were largely ignored. In 1767, when it was becoming more and more clear that such cultivation was unviable and gained little support, treasurer Skúli Magnússon suggested the import of unground grain and the installation of hand querns and mills in Iceland. At this time import of unground grain commenced, albeit in very small quantities. It is unclear who may have been innovative enough to be the first to try it out, besides perhaps e.g. the treasurer himself and his close colleague sheriff Magnús Ketilsson in Dalasýsla. At least some of the unground grain was sold to the poor in Reykjavík sometime before 1770, but without free access to a quernstone if the descriptions of sheriff Guðmundur Runólfsson are to be believed. In 1770 these suggestions were deemed acceptable at Alþingi and The First Land Commission supported the venture. Among people who came forth with useful information were bishop Hannes Finnsson in Skálholt who suggested local malt querns that he thought might be helpful and sheriff Guðmundur Runólfsson provided quernstones made in Skaftafellssýsla (likely acquired through sheriff Lýður

Guðmundsson). After some deliberation both regional governors, Thodal and Ólafur Stefánsson, also gave the final green light to execute the idea in 1775 and suggested that the grinding of grain happen at home in small mills or hand querns, preferably produced locally.

That same year, indigenous querns and rock samples were sent to the Exchequer for evaluation with promising results. All the highest acting government officials; the treasurer, the governor and regional governor, were now in agreement with the foreign royal representatives within the Land Commission, and so in 1776 the Exchequer began import of unground grain and foreign hand querns to all the trading posts. New exchange rates were issued partly to encourage people to buy unground grain, and the foreign querns were to serve as models for indigenous production. Import of unground grain was gradually increased against a gradual decrease in meal import, so total import quantities changed very little until the early 19th century, and querns were to be distributed for free to the sheriffs and all those interested among the more prominent members of society to encourage the public to follow their example. By this time both bishops Finnur Jónsson at Skálholt and Gísli Magnússon at Hólar had contributed information to the project regarding useful quernstones and potentially useful raw materials. Only bishop Magnússon officially supported the project in writing as far as is known, but it can still be supposed that they were both supportive as bishop Jónsson had previously taken significant part in the evaluation stage with a detailed report to The First Land Commission. It seems that their approval may not have been a crucial part in the final decision, as Magnússon's vow of support came after the Exchequer made the official announcement. However, without a doubt their approval will have paved the way somewhat for the clergy to openly take active part in the project's execution, regardless of whether the bishops took part in making the final decision to import or not. The main change agents, the sheriffs and the merchants, were instrumental in initial project development and execution of quernstone and grain import, as well as in information distribution and innovation introduction. The fact that they were spread widely between all counties and often in direct contact with their clients and/or subordinates will have facilitated information distribution and created multiple hubs for information flow, and for the innovation to spread further afield within districts/parishes. However, they will have had little say in whether the farming community at large accepted the innovation permanently in their daily life.

It was estimated that for each district it would be sufficient to have six hand querns to serve the people in the beginning stages, or around 950-1000 quernstones in total. The first quernstones were imported in 1776 and 1777. In 1779 the Exchequer announced that only 200 of the imported foreign querns were to be free of charge and dictated their distribution around the island. In 1783 over 600 querns had been imported, but in 1784 import numbers drop considerably despite grain being imported in larger quantities than ever. Possibly further import of foreign quernstones will have been considered unnecessary and/or perhaps hindering to further progress in indigenous production which was evolving at varied rates. It is unlikely that 600 querns will have been enough to grind all the imported grain. In 1781 the trading posts were directed to accept indigenous querns for sale, rewards for indigenous production were set up and funded by The Royal Danish Agricultural Society and the Danish government. Progress reports to the Exchequer in 1783 indicated that quernstone production was developing fairly fast e.g. in Árnessýsla, Rangárvallasýsla, and possibly Snæfellsnessýsla and Vestmannaeyjasýsla as well, while in many others it was likely progressing more slowly. This varied rate of progress was likely in part due to existing local experience in quernstone production, mainly diffusing from the Southeast, varied participation of the sheriffs (very little official information was found in the written records e.g. regarding progress in Húnavatnssýsla, Ísafjarðarsýsla and Strandasýsla) and possibly varied accessibility to raw materials between counties (see further discussion in Chapter 7).

In 1783 the Laki eruption began. In the following three years the import of unground grain increased considerably and by 1787 the grain/meal ratio had reached 80/20. The large influx may have forced many to acquire or gain access to a quernstone in order to be able to process the grain sufficiently for consumption, although some may very well have simply fed the grain to their livestock in an attempt to keep it alive. The grain/meal ratio fell quickly back down again however, post-1788, to ~50/50 on average. Grain import remained in that range into the 1800s (total quantities oscillating between 800-1800 tons) but import of unground grain never ceased, and the grain/meal ratio slowly rose to ~90/10 in the early 19th century. In 1784 the Exchequer declared that trade in quernstones was to remain unregulated and the inhabitants free to acquire a quern any way they chose, no doubt in reaction to the extreme conditions in Iceland at the time, and this could very well have been a certain tipping point for local quernstone production. In the mid-1780s the records go relatively quiet regarding quernstones, but rewards for production continued until 1790. At the end of that period the Danish government had largely ceased involvement and expected the locals to carry on production on their own. All ideas, planning and applications for financial assistance in connection to the three innovation undertakings came mainly from Icelandic government officials and local demands for better quality meal. The Danish state expected self sufficiency. It threw a little money at the problem to appease the Icelandic government offficals and demanded progress reports in return but there is no indication in historical sources that the government had any expectations of export or large scale production of quernstones.

There are essentially five significant milestones spread over a ~60 year period; 1) the idea was pitched and accepted around 1770, 2) the gradual import of unground grain in place of meal and start-up querns started in 1776 and seemingly reached a peak in 1783, 3) the rewards were also initiated during this period in 1781, 4) between 1783-1785 the Laki eruption hit with a subsequent decrease in population, short-term influx of grain import and the freeing of quernstone trade in 1784, and finally 5) the gradual increase in cereal quantities beyond the long-standing norm largely in the form of grain, somewhere between 1820 and 1840. From the beginning the governmental aim was always that Iceland would become self-sufficient when it came to quernstone production, which will have pushed the public to participate and find solutions on their own that worked for their local communities in the long run. By 1783 the government incentives and steady import of unground grain may very well have spread the innovation widely enough and worked up sufficient momentum and social acceptance for quernstone production to take off on a permanent basis. However, where useful raw materials were not as easily available it is questionable whether import of unground grain could have continued successfully in the long run without more quernstone import and imported grain continued to be ~50% of the total import into the early 19th century. The cumulative adoption curve for quernstone acceptance may therefore very well have been two-stepped with a plateau forming between the late-1780s and early 19th century when the grain import quantities started increasing again (Figure 4.16) with improved shipping methods (higher number of ship arrivals and larger loads) and more open trade networks. Perhaps innovation diffusion will also have stalled in some areas where indigenous raw materials were scarcer, at the societal level that could not afford imported quernstones, although there would always have been a certain number of side-adopters having their grain ground with a neighbour. In contrast there may also have been farmers that actually did not buy much grain but set up a quernstone anyway, simply to be able to show and say that they had one, in the hope of being able to use it more in the future. Such quernstones would indeed have come in

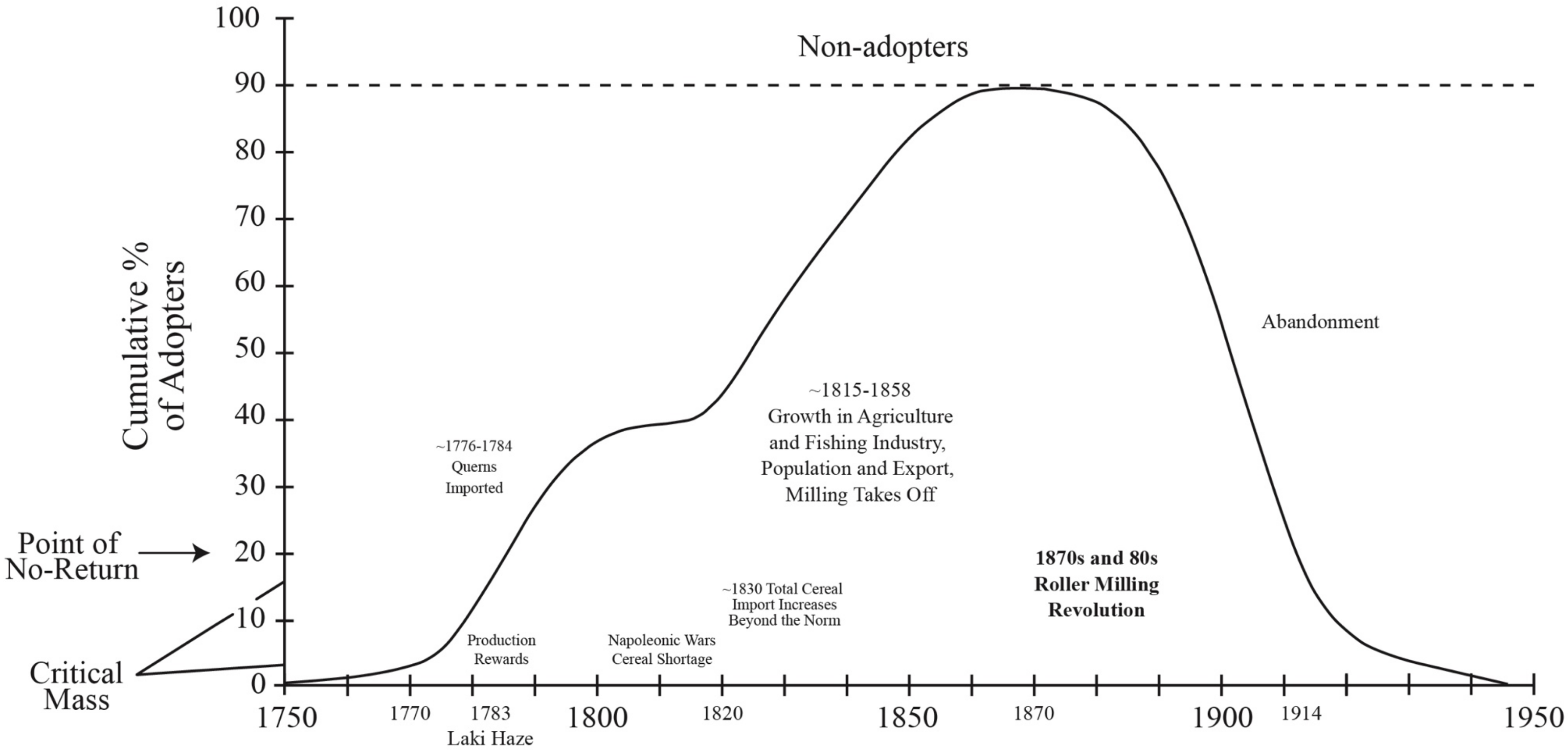


Figure 4.16 – A potential scenario of the developments in quernstone acceptance alongside unground grain import, adoption and abandonment rates in Iceland across 200 years approximated from the accumulated historical evidence above.

handy at least when grain import and consumption increased in the first half of the 19th century. In Rangárvallasýsla at least, more farms (~40%) had acquired quernstones than had been deemed necessary for each district by the government, which shows that the governmental aim and what the public later aspired to was not the same thing. Perhaps to begin with only the more affluent farms (value >21 hndr/~40% of all tenant farms), the farms that likely also horded the majority of the imported cereals, will have acquired a quern until total import quantities started increasing beyond the norm post-1820s (Figure 4.16). Potentially somewhere between 5000-20000 Icelandic quernstones may have been produced during the 150-year period og quernstone use (see further discussion in Chapter 8).

This historical narrative raises many more questions regarding raw material availability, the people participating in quernstone production and its further developments. The district officers, the priests and the craftsmen stood closer to the general public and had a much stronger connection and better opportunity to influence public opinion (*opinion leaders*) towards adoption or rejection. How effective these participants will have been in furthering innovation diffusion, however, will have depended on their reputation and connections within society and their final attitude towards the innovation. Merchants, priests, district officers, farming craftsmen, tenant farmers and farmhands received rewards for experimenting in mill and/or quernstone production, but it is unclear who within the community mainly took on production and adapted the quernstone to Icelandic conditions and needs further consideration. It was suggested above that good querns could have been imported from Denmark, Sweden and/or Norway but whether all of them came from there, or what they looked like, is unclear. Indigenous malt querns and lyme grass querns were already in use on the island in small quantities but what they looked like or what materials were used is also unclear. A significant amount of the foreign quernstones was imported to aid in the revival of indigenous production. The querns were widely distributed to multiple participants with varied talents and experiences, who must have affected the formerly established quernstone design in some distinct ways. The reports of various government officials show that the availability of useful raw materials was varied between counties and sometimes considered a hindrance to indigenous production, but to what extent this was actually a problem is unclear. What rock materials were being used exactly or where they mainly came from is also vague. All these questions will be addressed in following chapters, but in the next chapter the attention is turned towards the men that took on the production itself, the active modifiers; their status, their roles and their social and geographical reach within the community.

~ Chapter 5 ~

The Quern Masons and their Social and Geographical Reach

In 1783 Þorsteinn Magnússon sheriff of Rangárvallasýsla (Figure 5.1) requested reports from the districts in his county regarding any developments in quernstone production, and the number of known quern masons (*ÞÍ. Rtk. B10.6.33*, 1783). Responses came from 80% of the parishes often signed by both priests and district officers. According to their reports, participation in the production was variable. Some men had only made quernstones for themselves while others had made a number of them, and some had even taken a quern to the trading posts. Quernstones in Rangárvallasýsla had either been made from local materials or transported to the county from its two neighbouring counties, Árnessýsla and Vestur-Skaftafellssýsla. A few farmers had volunteered or agreed to become quern masons when asked while some were reported to have declined requests to make querns, citing e.g. lack of raw materials in their nearest environs or old age. More men were therefore considered to be able to make quernstones than actually did, at least on any larger scale than for themselves. However, it does not change the fact that increasing import of unground grain called for more quernstones and they were indeed being produced from local raw materials.

Although the initiative came from the authorities the revival of local production was also strongly dependent on the acceptance and participation of the general public, both to the idea of buying unground grain and to making quernstones. It is not known who received or bought the +600 foreign quernstones that had been imported by 1784. The historical narrative suggests that the 200 free querns at least were mainly distributed to the more affluent who were meant to lead by example, e.g. the sheriffs, merchants, priests and district officers within each county who will then not have needed to acquire a locally made quern. The production rewards of the 1780s were awarded e.g. to two priests, two merchants and five district officers, but the majority (35) however, were given to men described as (or estimated likely to be) tenant farmers, craftsmen (*smiður*) or both.

The aim of this chapter is to define the craftsman's position within Icelandic society in general, and the quern mason's in particular, and estimate their level of craft specialisation. Their social reach and connectivity within the Icelandic farming community, their potential as opinion leaders and the parts they may have played in the successful innovation diffusion will also be discussed. The chapter has been split into three sections. In the first section the social position of the Icelandic quern mason is analysed with the aid of 18th and very early 19th century census registries, before their geographical reach is estimated in section two. The quern masons were commonly average tenant farmers and farming craftsmen (isl. *smiðir*) without much specific craft specialisation, which suggests that the revival of quernstone production did not depend on specially trained master craftsmen. The masons worked mainly from their resident farms, but they were well socially connected to their neighbours and other fellow craftsmen. Their main activity area (both regarding customers and material procurement activity) was most commonly found within a geographical area roughly estimated to be around 20 km in radius from their residence, although their influence could certainly on occasion also be detected much further afield.

5.1. The Icelandic Quernstone Mason

5.1.1. The Icelandic Farming Craftsmen

After scouring through historical records in the early 1930s, Þorkell Jóhannesson (1933) and Guðbrandur Jónsson (1932-34) both noted that before the Reformation in the mid-16th century craftsmen mentioned in documentary sources were mostly men, although female craftsmen were not unheard of, and having the *nature of a craftsman* (isl. *smiðsnáttúra*) was considered hereditary. 'House builders' (isl. *húsasmiður*) were most often documented although it is rarely detailed whether they were stonemasons, carpenters or turf builders (isl. *vegglagsmaður*). The job description 'church builder' (isl. *kirkjusmiður*) was also commonly used. The general classifications of carpenter and blacksmith were also very common and often men were considered both. Iron was the most common medium but special metalworkers (e.g. goldsmiths and tinsmiths) were not unheard of, e.g working in the monasteries and the bishoprics of Skálholt and Hólar. Where a more detailed or specialized job description was mentioned it was often e.g. boat builders (isl. *skipasmiður/bátasmiður*) or men who made traditional food containers (isl. *askasmiður*), and bone- and woodcarving (isl. *útskurður/tréskurður*) were often considered separate professions (Guðbrandur Jónsson, 1932-34, pp. 287-290; Þorkell Jóhannesson, 1933, pp. 84-86).

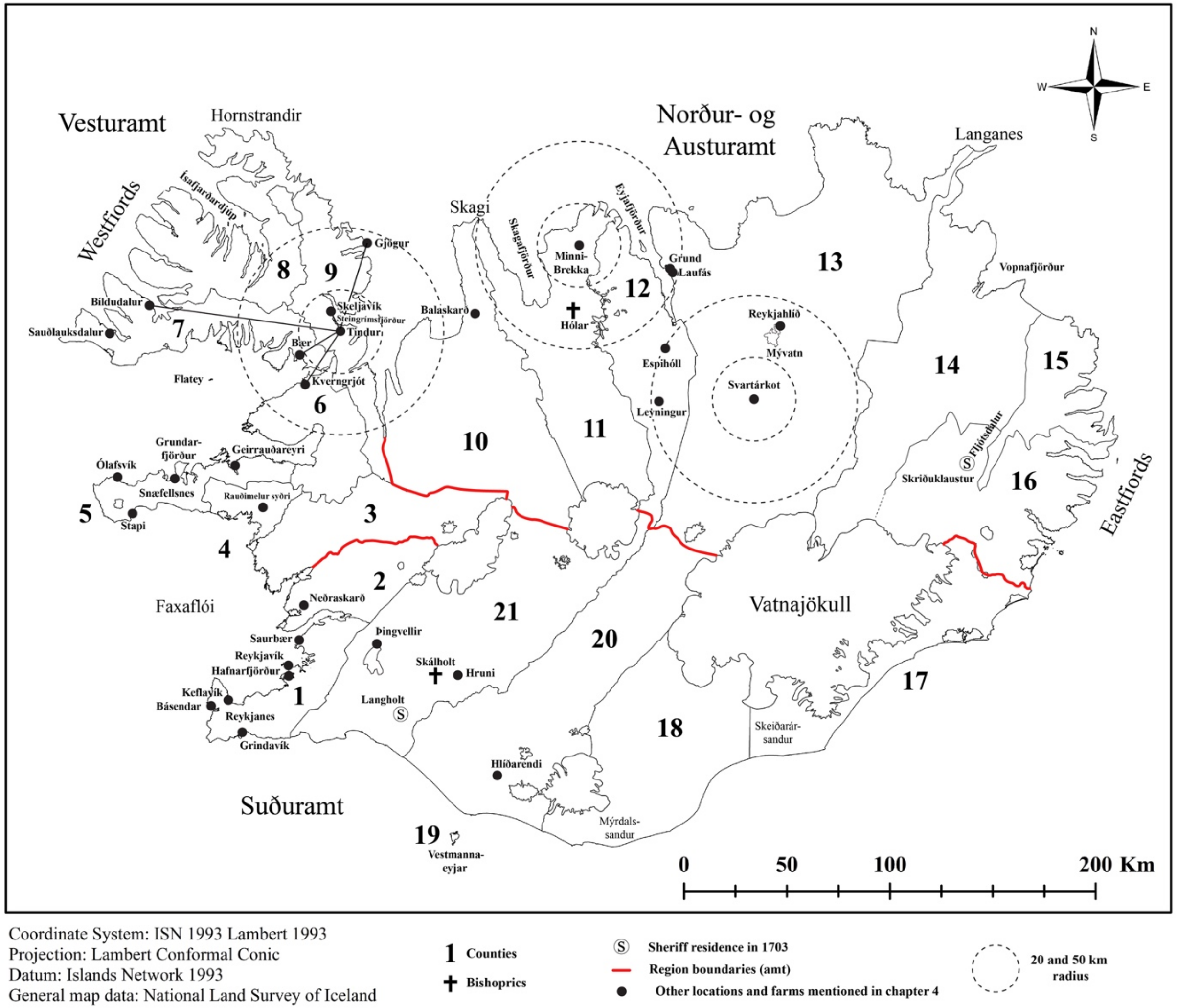


Figure 5.1. The main site locations and three examples of estimated main activity areas of the 19th century tenant farms Tindur (see also discussion of population mobility in section 3.6, Minni-Brekka and Svartárkot discussed in this chapter.

Classifications of craftsmen and their profession had not become more specific in the early 18th century. From the 1703 census ("NACD," 2017; 91 men) and Jarðabók Árna Magnússonar og Páls Vídalíns[24] (18 craftsmen; isl. *smiðir/smíðar*; *JÁM I*, pp. 145, 218-219, 224, 262 and 379; *JÁM II*, p. 32 and 41; *JÁM III*, pp. 174 and 188-189; *JÁM IV,* p. 249; *JÁM VIII,* p. 31 and 247; *JÁM V*, p. 325; *JÁM X*, pp. 49-50), information was gathered on 109 men in total (~0.2% of the whole population; 50.358 people) who applied their handicraft and/or were identified as craftsmen in the early 18th century (Table 5.1). The registration of craftsmen in the census was, however, only systematic in the county of Þingeyjarsýsla (13) in the Northeast (Figure 5.2). In this county about 7.3% (68 men, 72.2% of census total of craftsmen) of the male population (937 men, aged 15 or older) were registered as full or part time craftsmen. They were spread fairly evenly from Eyjafjörður in the west to Langanes in the east. Why the registration of craftsmen is only so detailed in Þingeyjarsýsla (not just in the 1703 census but also in the census taken in 1801 as well) is unclear, but it is considered very unlikely that the majority of Icelandic craftsmen lived only within this one county. From the detailed Þingeyjarsýsla registration in 1703 it can be extrapolated that at that time 5-10% (~800-1.600 men) of the entire Icelandic population of males 15 years or older (16.286 men in total, ~32% of the whole population) may have had some specialised or advanced knowledge and skill/training in handicraft, which they used to supplement their income alongside agricultural production, and possibly serve their local community to some degree.

Table 5.1. Number of craftsmen by county in the 1703 and 1801 censuses

County	1703	1801
Gullbringusýsla	0	22
Kjósarsýsla	1	0
Árnessýsla	4	4
Rangárvallasýsla	1	3
Skaftafellssýsla	0	11
Múlasýsla	1	1
Þingeyjarsýsla	**68**	**50**
Eyjafjarðarsýsla	1	13
Skagafjarðarsýsla	5	12
Húnavatnssýsla	1	9
Ísafjarðarsýsla	0	18
Barðastrandarsýsla	0	10
Dalasýsla	0	3
Snæfellsnessýsla	8	5
Mýrarsýsla	0	1
Borgarfjarðarsýsla	1	2
Total:	**91**	**164**

[24] Jarðabók Árna og Páls is an extensive early 18th century registration of all landholdings in Iceland (e.g. for valuations, rents, obligations, livestock and perquisites) compiled around the same time as the 1703 census (roughly between 1700 and 1720).

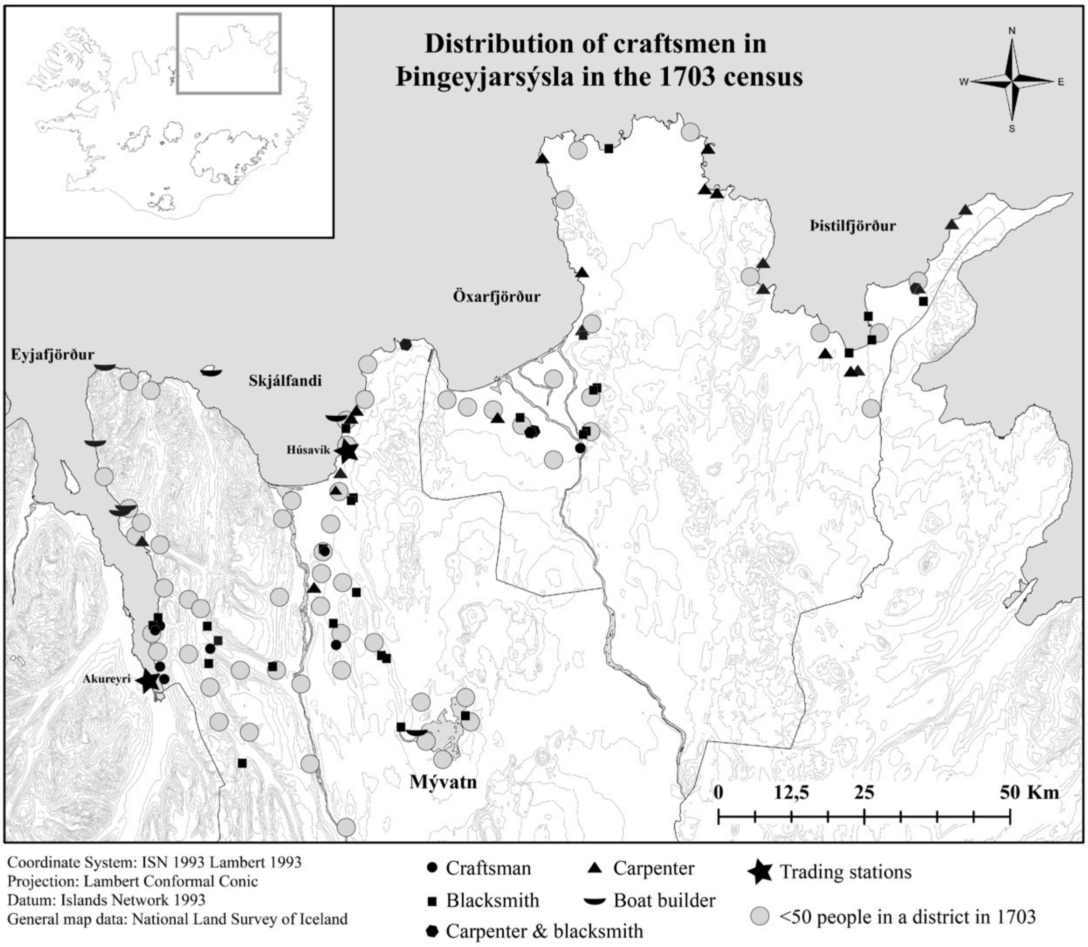


Figure 5.2. The geographical distribution of craftsmen registered in Þingeyjarsýsla in the 1703 census (see also Figure 3.3). According to the census no district in Þingeyjarsýsla had more than 50 inhabitants at the time.

In the early 18th century countrywide group (109 men) the craftsmen´s average age is 46 years (ranging from 24-81) and of those men, 16 (~15%) are also listed as district officers. In the group 76 craftsmen (~70%) are listed as tenant farmers (heads of a taxable farming household), 7 are crofters, 16 farm hands (isl. *vinnumaður, þjenari, lausamaður*), 9 hired hands and 1 foreman (isl. *forverksmaður/verkstjóri*). Of those whose craft is recorded beyond being a general craftsman (39 men), there are 35 blacksmiths (isl. *járnsmiður*), 28 carpenters (isl. *trésmiður/snikkari*), 9 boat builders (isl. *bátasmiður*), 3 metalworkers (gold, silver, copper and/or brass) and 2 men titled as both a blacksmith and a carpenter. There are six father and son pairs. Five of the pairs lived together on the same farm, while the seventh father and son pair lived on separate farms within the same county. In every instance the son is the oldest or the only son at home. The farm hands can be split into three sets, a) sons classified as farm hands on their father's farm who were in the age range 24-33 (n=5), b) fathers older than 70 living with their sons (n=3) and c) farm hands without clear relations to the family they are serving (n=8). In the last set there is possibly one man who could be a younger brother of the head of the household. The age range in the last set was between 31 and 63. Four of the farm hands were working on the farm of a district officer and one on the farm of a priest.

In the 1703 census only nine men may have been employed exclusively as craftsmen (classified as hired hands) in affluent households and only one of them was registered as a freelancer (isl. *lausamaður*) (Lýður Björnsson, 2006, pp. 62-63). The households (Figure 5.1) are all wealthy farms with formally educated and/or upper-class families in residence at 1) Saurbær in Kjalarnes, the residence of lawman Sigurður Björnsson (isl. *lögmaður*), 2) the episcopal see of Skálholt, 3) Langholt in Flói the residence of the sheriff of Árnessýsla, 4) Hlíðarendi, the residence of Guðríður Gísladóttir, widow of bishop Þórður Þorláksson and daughter of the late sheriff Vísi-Gísli Magnússon (Páll Ólason, 1948, pp. 277-278), 5) Skriðuklaustur, the residence of the sheriff of Suður-Múlasýsla, 6) the episcopal see of Hólar in Hjaltadalur (a blacksmith and a carpenter); 7) at Espihóll (Stóri-Hóll) in Eyjafjörður, the residence of rich landowner Magnús Björnsson, (father and mother both children of sheriffs respectively in Eyjafjarðarsýsla and Barðastrandarsýsla; Páll Ólason, 1948, pp. 242-243), and finally 8) at Rauðimelur syðri where widow Sigríður Hákonardóttir resided with her son, student Oddur Sigurðsson (in 1709 he had become a stand-in lawman, vísilögmaður; "IGD," 1997-2017; Páll Ólason, 1951, pp. 19-20). The single land steward registered was in charge of the farm Geirrauðareyri (also called Narfeyri) working for Guðmundur Þorleifsson 'the rich' (suffering from heart disease by that time) and his wife Helga Eggertsdóttir, daughter of Eggert Björnsson sheriff of Dalasýsla (Páll Ólason, 1949, p. 191).

For comparison the Icelandic census of 1801 (*Manntal 1801*, 1978-1980) was also studied and the results are slightly more detailed but fairly similar (Table 5.1). Again, few craftsmen are registered within most counties except Þingeyjarsýsla (50 men, 30.5% of all registered craftsmen), although their number is somewhat higher than in 1703 (161 men, 0.3% of the total population: 47.852 people) Average age is about 47 years (range 20-82) and 24 craftsmen (again ~15%) are also identified as district officers. This high average age could support the possibility that most craftsmen had to earn their reputation for many years before being specifically recognised as such. Unfortunately, the registration in Þingeyjarsýsla is not as detailed as in 1703. Men are generally only classified as craftsmen (isl. *smiðir*, 48 men) along with one copper smith and one blacksmith who also worked with copper. Outside of Þingeyjarsýsla however, there are 24 carpenters registered along with 16 blacksmiths, 9 boat builders, 11 metal workers (gold, silver, copper; one possibly a metal caster (isl. *steypusmiður*)), 11 men registered as both blacksmiths and carpenters and possibly 2 coopers (isl. *beykir*; 5 in total but at least 3, if not 4, of them are Danish). In addition, eight of the craftsmen (5 general craftsmen, 1 boat builder, a blacksmith and a carpenter) are also titled as weavers. It is therefore very likely that most of the 1801 craftsmen in Þingeyjarsýsla, and indeed the whole country, would also be generally classified as blacksmiths, carpenters or both, with a few boat builders and metalworkers thrown in. In the 1801 group there were four father and son craftsman pairs, a pair of brothers, one farmer and his son-in-law, one son-in-law living with his wife's family and seven sons living in their fathers' households, again either the oldest or only son living at home.

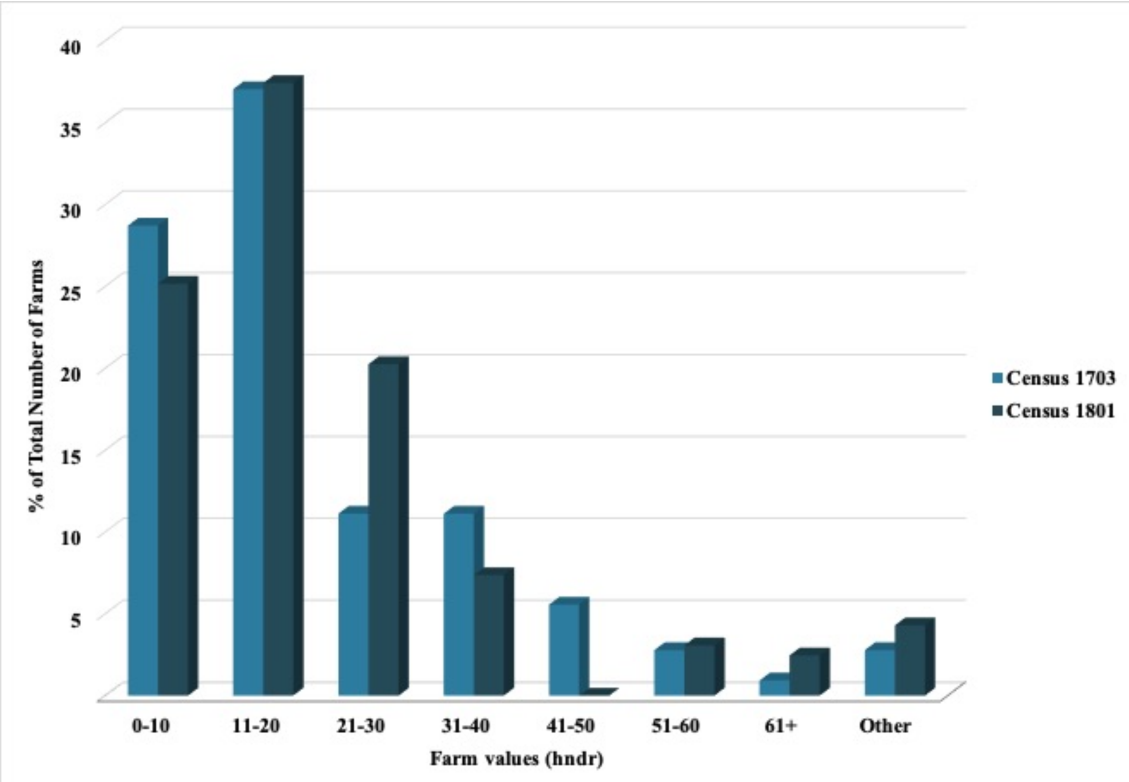


Figure 5.3. The distribution of registered craftsmen between farms, trading stations and Reykjavík (other) before and after The New Enterprises in the second half of the 18th century.

The higher number of craftsmen in the 1801 census can likely be connected to trading posts and urban developments in the Reykjavík area in Gullbringusýsla post-1750 (see the *Other* group in Figure 5.3) and slightly more detailed registration within the other counties. It is notable however that the most increase in the number of craftsmen (from 12 to 33 men) is connected with farms of above average value between 21-30 hundred. This could be an indication of increasing participation in handicraft from farmers of above average affluence who could afford to educate themselves or their sons and had more legroom to practice their craft.

5.1.2. Classifying the Quern Masons

Early on in the revival of quernstone production in the late 18th century men made quernstones of their own initiative, specifically volunteered to become fully fledged quern masons or were recruited at the behest of government officials. In all parts of the island craftsmen received rewards for quernstone production between 1781 and 1790 (Table 4.5). A search in 18th (78 men) and 19th/20th (25 men) century documentary sources (Figure 5.4; Table 5.2) revealed the names of 103 men that produced quernstones, whether it was only for themselves or in greater quantities. The information is often fragmented but the majority were tenant farmers or crofters. Within the group, 19 men were further referred to in various sources as general craftsmen (isl. *smiðir*), 15 men were district officers (~15%, all tenant farmers), along with 10 farmhands, 2 priests, 2 boat builders, a goldsmith, a copper smith and a merchant. Of the 46 quern masons that were likely active when the 1801 census is taken, only 5 were titled craftsmen and only 2 of them were found on both lists; Erlendur Einarsson coppersmith (s39) and Ólafur Jónsson goldsmith (s41). This would suggest that general farming craftsmen were indeed much more common than the census registries reveal. There seems little reason to doubt that men identified in government documents (see Chapter 4) as volunteers or recruits could and/or did indeed make quernstones during the quern production revival in the second half of the 18th century. It is of course also possible that even though some members of the elite received rewards for making quernstones, they did not perform the actual work themselves. With regards to the two priests this is unlikely however, as both served fairly small, poor and remote parishes (Brekkusókn in Mjóifjörður and Sandfellssókn in Öræfi; Figure 3.2), which will have forced them to find additional ways of supporting their families. One of them, reverend Jón Brynjólfsson was even called ‘the most miserable priest in Iceland’ by Bishop Hannes Finnsson (Páll Ólason, 1949, p. 282; 1950, pp. 81-82; Magnús Þórarinsson, 1964, p. 13).

The average age of the 103 quern masons at the time of their appearance in historical records was 42 years with a range between 24 and 72 years (the age of 76% could be confidently estimated). In the group there are 3 pairs of crafting brothers (s28 and s29 on the same farm, s54 and s55 in the same valley, s72 and s80 in the same fjord), 1 father and son pair on the same farm (s15 and s16), 1 pair of teacher (s60, priest) and student (s63) within the same county and a trio of a father-in-law (s91) and 2 brothers (s92 and s98) in the same valley. Only 3 men mentioned in 19th and 20th century sources seem to have made a living exclusively from making quernstones; Þórður in Hrauntún (s8) is said to have done little else and Arngrímur Guttormsson in Keflavík (s1) and Bergsteinn Pálsson in Óseyrarkot (s2) are specially registered as quern masons (isl. *kvarnarsmiðir*) in the censuses of 1835 and 1840 (Arngrímur and Bergsteinn were at that time both over 70 years of age; Table 5.2; *AÍ XVI*, 1986, p. 330; "NACD," 2017, censuses 1835, 1840 and 1890; *JJ*, 1847, p. 63 and 89; Pnr-Þorbjarnarstaðir, p. 8; "RÍL X," 1789, p. 318; "RÍL VII," 1786b, p. 275; *ÞÍ. Rtk. B22.5.22*, 1787).

A summary of the general information collected above on the registered 18th century craftsmen (270 men in total from the 1703 and 1801 censuses) and quern masons (103 men) can be seen in Table 5.3 and Figure 5.5. The two census groups were combined into one historical control group to represent the general population of Icelandic craftsmen (5-10% of the nation) of the time period in the analysis of the quern mason group. A randomly chosen sample group size of 270 people from a population of 45-50 thousand people in general statistical research would give a respectable ~6% margin of error of results at a confidence level of 95% (CheckMarket, 2002-2019; Edwards et al., 1997, pp. 61-65) so this historical collection of craftsmen should be a fairly good representation of Icelandic craftsmen in general in the 18th century. It must be stressed however, that what exactly controlled the census registrations of the Icelandic craftsmen (i.e. who was registered as a craftsman and who was not) is unclear and the original registrations were both likely unsystematic and incomplete.

Running Icelandic farms and crofts, always required general experience in handicraft, while potentially 5-10% of the male population took it to higher levels to generate extra revenue. District officers ran around 10-15% of all the farming households on the island and the percentage of recorded district officers in the groups of craftsmen and quern masons clearly reflects this (just under 15% for each group). The majority (~80%) of men in the quern mason group were not described in documentary sources as

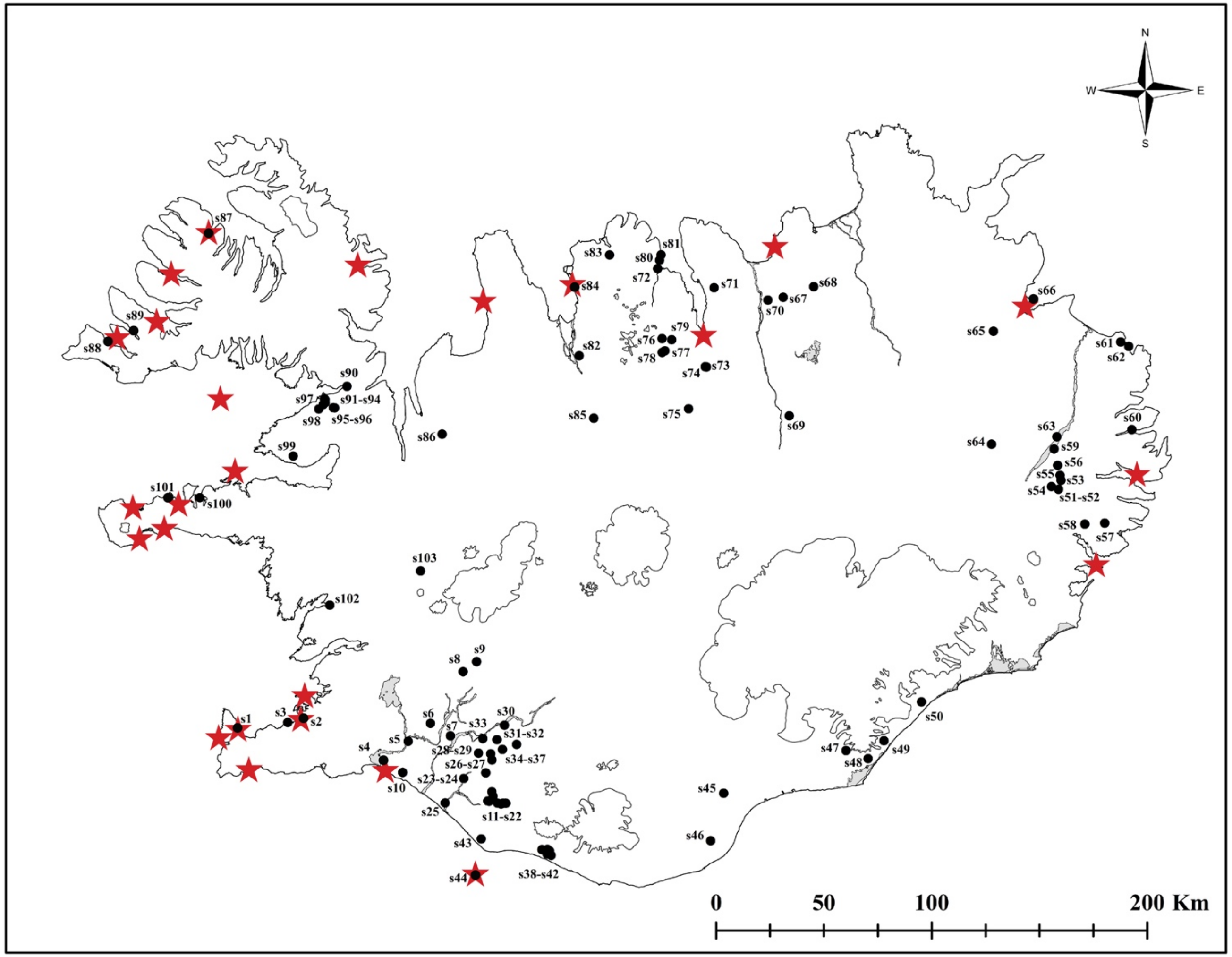


Figure 5.4. Geographical distribution of 18th and 19th century quern masons (Table 5.2). Red stars are 18th century trading stations.

Coordinate System: ISN 1993 Lambert 1993
Projection: Lambert Conformal Conic
Datum: Islands Network 1993
General map data: National Land Survey of Iceland

Table 5.2. Quernstone masons recorded in Icelandic historical sources (the masons were given an sX number to distinguish them from raw material site numbers eX, see Table 6.1 and Figure 6.2). The residence of each mason can be located in Figure 5.4 above.

No.	Name	Birth/ Death	Age Range	Social status	Residence	Value in 1847 (hundred)	Sources
s1	Arngrímur Guttormsson	1764-1839	25-70	lodger, quern mason	Keflavík, Útskálasókn, Gullbringusýsla	4 1/6	"IGD," 1997-2017; *JJ*, 1847, p. 89; "NACD" 2017, census 1835; *ÞÍ. Rtk. B22.5.22*, 1787. IGD: The Icelandic Genealogical Database.
s2	Bergsteinn Pálsson	1766-1846	25-80	fisherman, quern mason	Óseyrarkot, Garðasókn, G	small croft	"IGD," 1997-2017; "NACD," 2017, census 1840;
s3	Guðmundur Bergsteinsson	1866-1937	25-50	son of craftsman and farmer	Eyðikot, Hraun, G	small croft	"IGD," 1997-2017; "NACD," 2017, census 1890; Pnr-Þorbjarnarstaðir, p. 8.
s4	Einar Eiríksson	~1721-d. after 1804	60-80	farmer	Flóagafl, Breiðamýri, Árnessýsla	36 2/3	*AÍ XVI*, 1986, p. 330; "IGD," 1997-2017; *JJ*, 1847, p. 63; "RÍL VII," 1786b, p. 275.
s5	Páll Guðmundsson	~1747-1818	40-70	farmer	Ármótastekkar, east of Ölfusá, Á	small croft	*AÍ XVI*, 1986, p. 565; *JJ*, 1847, p. 56; "RÍL X," 1789, p. 318; "IGD", 1997-2017.
s6	Erlendur Ásbjörnsson	~1747-1832	35-85	farmer	Brjámsstaðir, Grímsnes, Á	13 2/3	*AÍ XVI*, 1986, p. 565; *JJ,* 1847, p. 63; "IGD", 1997-2017; "RÍL X," 1789, p. 318.
s7	Jón Jónsson	1857-1931	25-50	farmer, craftsman	Hlemmiskeið, Skeið, Á	30 1/3	Quernstone no. 57, Árnessýsla Heritage Museum (see quernstone catalogue); "IGD", 1997-2017; *JJ,* 1847, p. 63.
s8	Þórður Halldórsson	1840-1898	25-60	farmer, quern mason	Hrauntún, Biskupstungur, Á	small croft	Björn Sigurðsson, 2015, pers. comm.; *JJ*, 1847, p. 69; "IGD", 1997-2017.
s9	Guðmundur Magnússon	1818-1914	25-90	farmer, craftsman	Helludalur, Biskupstungur, Á	30 1/3	Quern no. 66, Árnessýsla Heritage Museum; *JJ*, 1847, p. 69; "IGD", 1997-2017.
s10	Ole Nielsen	N.d.	N.d.	tenant farmer from Jutland	Hlíðarendi, R og Brattholt, Flói, Á	25/15	*JJ*, 1847, p. 32 and 61; Gunnar Karlsson, 1964, pp. 61-62; Ólafur Olavius, 1965a, pp. 73-75.
s11	Sveinn Þorvarðarson	1741-1792	40-50	farmer, quern mason	Kollabær, Fljótshlíð, Rangárvallasýsla	40	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 33; "IGD", 1997-2017.
s12	Magnús Jónsson	N.d.	N.d.	quern mason, possibly a farmhand	Kollabær, Fljótshlíð, R	"	*ÞÍ. Rtk. B10.6.33*, 1783.
s13	Páll Brynjólfsson	1736-1785	35-50	farmer, quern mason	Torfastaðir, Fljótshlíð, R	20	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 33. "IGD", 1997-2017.
s14	Guðmundur Bjarnason	1743-1785	30-40	farmer, quern mason	Vallarhjáleiga, Fljótshlíð, R	10	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 35; "IGD", 1997-2017.
s15	Guðni Jónsson	b.~1725	50-60	district officer + quern mason, father of s16	Þórunúpur, Fljótshlíð, R	20	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 3; "IGD", 1997-2017.
s16	Andrés Guðnason	1754-after 1801	30-60?	farmer, quern mason, son of s15	Þórunúpur, Fljótshlíð, R	"	*ÞÍ. Rtk. B10.6.33*, 1783; "IGD", 1997-2017.
s17	Bjarnhéðinn Sæmundsson	1743-1811	55-80	district officer, farmer, craftsman	Langagerði, Fljótshlíð, R	20	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 34; "IGD", 1997-2017.

s18	Guttormur Bergsteinsson	~1726-1792	50-60	farmer, quern mason	Uppsalir, Fljótshlíð, R	10	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 35; "IGD", 1997-2017.
s19	Guðmundur Sigurðsson	~1748-1833	45-70	farmer, quern mason	Arngeirsstaðir, Fljótshlíð, R	20	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 33; "IGD", 1997-2017.
s20	Ásmundur Eyjólfsson	~1724-after 1800	55-80	quern mason, up and coming	Grjótá, Fljótshlíð, R	20	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 33; "IGD", 1997-2017.
s21	Sveinbjörn Þorleifsson	~1741-1824	30-80	farmer, quern mason, up and coming	Kirkjulækur, Fljótshlíð, R	32 1/2	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 33; "IGD", 1997-2017.
s22	Sæmundur Einarsson	~1752-1811	25-60	farmer, quern mason, up and coming	Lambalækur, Fljótshlíð, R	15	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 33; "IGD", 1997-2017.
s23	Björn Bjarnason	b. 1730	45-?	farmer, quern mason	Ægissíða við Ytri-Rangá, Oddasókn, R	40	*ÞÍ. Rtk. B10.6.33*, 1783; Valgeir Sigurðsson, 2010, p. 24; *JJ,* 1847, p. 43; "IGD", 1997-2017.
s24	Sigurður Ólafsson	~1740-1814	35-70	farmer, quern mason	Ægissíða by Ytri-Rangá, Oddasókn, R	"	*ÞÍ. Rtk. B10.6.33*, 1783; Valgeir Sigurðsson, 2010, pp. 25-26; "IGD", 1997-2017.
s25	Þórður Bjarnason	~1748-1830	35-80	farmer, quern mason	Unuhóll, Þykkvibær, R	3 1/4	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 39; "IGD", 1997-2017.
s26	Einar Jónsson	1713-1791	70-80	farmer, quern mason	Húsagarður, Landsveit, R	20	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ,* 1847, p. 45; "IGD", 1997-2017.
s27	Eiríkur Magnússon	~1712-1785	70-73	farmer, craftsman, quern mason	Húsagarður, Landsveit, R	"	*ÞÍ. Rtk. B10.6.33*, 1783; Valgeir Sigurðsson, 2003, pp. 387-388; "IGD", 1997-2017.
s28	Bjarni Tómasson	1752-1794	30-42	farmer, quern mason, brother to s29	Lunansholt, Landsveit, R	30 1/2	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 44; "IGD", 1997-2017.
s29	Jón Tómasson (blind)	~1760-1784	23-24	quern mason, brother to s28	Lunansholt, Landsveit, R	"	*ÞÍ. Rtk. B10.6.33*, 1783; "IGD", 1997-2017.
s30	Guðmundur Símonarson	~1750-before 1801	25-50	farmer, quern mason	Yrjar, Landsveit, R	10	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 43; "IGD", 1997-2017.
s31	Þorvaldur Jónsson	~1749-1832	25-80	farmer, district officer, sexton, accoucheur, quern mason	Klofi, Landsveit, R	24	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ,* 1847, p. 45; "IGD", 1997-2017.
s32	Þórður Vigfússon	~1739-1800	35-60	farmer, quern mason	Klofi, Landsveit, R	"	*ÞÍ. Rtk. B10.6.33*, 1783; "IGD", 1997-2017.
s33	Jón Bjarnason, junior	~1727-1787	55-60	farmer, district officer, quern mason	Vindás, Landsveit, R	27 1/3	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 44; "IGD", 1997-2017.
s34	Högni Jónsson	~1747-1816	35-70	farm hand, quern mason	Næfurholt, Rangárvellir, R	42	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 37; "IGD", 1997-2017.
s35	Teitur Jónsson	1722-1785	60-63	farmer, quern mason	Gunnarsholt, Rangárvellir, R	25	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 38; "IGD", 1997-2017.
s36	Loftur Bjarnason	~1725-1809	55-80	farmer, district officer, quern mason	Víkingslækur, Rangárvellir, R	20	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 37 (farm abandoned by 1803 due to erosion); "IGD", 1997-2017.
s37	Þorsteinn Jónsson	~1735-1812	45-75	farmer, quern mason	Svínhagi, Rangárvellir, R	20	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 37; "IGD", 1997-2017.
s38	Þorleifur Guðnason	~1723-1786	60-70	farmer, quern mason	Bakkakot syðra, Skógasókn, R	3 1/2	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 23; ÞÍ. Eyvindarhólar undir Eyjafjöllum – prestakall 0-084. BA/2-1.

s39	Erlendur Einarsson	~1748-1818	35-70	farmer, quern mason, copper smith in 1801	Hrútafell, Eyvindarhólasókn, R	40	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 23; "IGD", 1997-2017; ÞÍ. Eyvindarhólar undir Eyjafjöllum – prestakall 0-084 BC/2-1-1.
s40	Sverrir Jónsson	~1731- after 1801	50-80?	farmer, quern mason	Rauðafell, Eyvindarhólasókn, R	55	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 23; "IGD", 1997-2017; *Manntal 1801*, 1978, p. 255; ÞÍ. Eyvindarhólar undir Eyjafjöllum – prestakall 0-084 BC/2-1-1, Rauðafell 1784-1788.
s41	Ólafur Jónsson	~1742-1814	40-70	farmer, goldsmith, sexton, quern mason	Selkot, Eyvindarhólasókn, R	7 1/2	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 23; "IGD", 1997-2017; ÞÍ. Eyvindarhólar undir Eyjafjöllum – prestakall 0-084 BA/1-1-1, p. 239.
s42	Árni Ólafson	~1732-1791	50-60	district officer, quern mason	Núpakot, Steinasókn, R	12	*ÞÍ. Rtk. B10.6.33*, 1783; *JJ*, 1847, p. 24; "IGD", 1997-2017; ÞÍ. Eyvindarhólar undir Eyjafjöllum – prestakall 0-084 BC/2-1-1 Núpakot 1784, and BA/1-1-1, p. 208.
s43	Þórólfur Jónsson	~1732-1802	50-70	farmer, quern mason, up and coming	Bryggjur, Austur-Landeyjar, R	20	ÞÍ. Rtk. B10.6.33; JJ 1847, 29; "IGD", 1997-2017.
s44	Hallur Hróbjartsson	~1727-1808	55-80	farmer, quern mason	Búastaðir, Vestmannaeyjar	2.2, crown property	*AÍ XVI*, 1986, p. 565; "RÍL X," 1789, p. 318; *JJ*, 1847, p. 21; "IGD", 1997-2017.
s45	Sigurður Gunnsteinsson	~1751-d. after 1803	25-55?	farmer, quern mason	Hátún, Landbrot, Vestur-Skaftafellssýsla	24	*AÍ XVII*, 1990, p. 39; Björn Magnússon, 1972, p. 406; *JJ*, 1847, p. 9.
s46	Einar Ólafsson	1830-d. after 1890	25-60	farmer, craftsman	Slýjar, Meðalland, VSk	12	Quern no. 82, Skógar Museum; (Björn Magnússon, 1970, p. 218; *ÞÞ. 8075*); *JJ*, 1847, p. 10.
s47	Brynjólfur Ólafsson	1756-1816	25-60	priest, quern mason	Sandfell, Öræfi, Austur-Skaftafellssýsla	12	*AÍ XVI*, 1986, p. 565; *JJ*, 1847, p. 6; Páll Ólason, 1948, p. 282; "RÍL X," 1789, p. 318.
s48	Þorlákur Sigurðsson	~1742-1801	40-60	farmer, craftsman	Hnappavellir, Öræfi, ASk	12	*AÍ XVII*, 1990, p. 39; *JJ*, 1847, p. 5; "IGD", 1997-2017.
s49	Sigurður Ingimundarson	1829-1891	25-60	farmer	Kvísker, Öræfi, ASk	6	G. S. Árnason and Grímsson, 1998, p. 39; *JJ*, 1847, p. 5; *ÞÞ. 2162*; "IGD", 1997-2017.
s50	Þorsteinn Arason	1866-1924	25-60	farmer, craftsman, boat builder and foreman	Reynivellir, Suðursveit, ASk	30	*Byggðasaga A-Skaft. II*, 1972, p. 254); *ÞÞ. 2162*; *JJ*, 1847, p. 5; "IGD", 1997-2017.
s51	Árni Jónsson	~1740-1813	40-70	farmer	Haugar, Skriðdalur (Suðurdal), Suður-Múlasýsla	4	*AÍ XVII*, 1990, p. 73; *JJ*, 1847, p. 371; Einar Jónsson, 1955, p. 427; Hrólfur Kristbjörnsson and Jón Hrólfsson, 2013, pp. 88-89; "RÍL X," 1789, p. 318; "IGD", 1997-2017.
s52	Halldór Halldórsson	1869-1944	25-60	farmer	Haugar, Skriðdalur (Suðurdal), SM	"	Pnr-Haugar, p. 3; Hrólfur Kristbjörnsson and Jón Hrólfsson, 2013, pp. 89-90; *ÞÞ. 1967*).
s53	Jón Jónsson	1827-1860	25-33	farmer	Hallbjarnarstaðir, Skriðdalur (Suðurdal), SM	16	*ÞÞ. 1967*; Hrólfur Kristbjörnsson and Jón Hrólfsson, 2013, p. 77; *JJ*, 1847, p. 371; ÞÍ. Þingmúli í Skriðdal – prestakall 0-256 BC/3-1-1 and BC/4-1-1; ÞÍ. Eydalir í Breiðdal/Heydalir – prestakall 0-081 BA/3-1-1, p. 36; ÞÍ. Hallormsstaður í Skógum – prestakall 0-111 BA/2-1-1, p. 124

s54	Sigmundur Sigurðarson	~1762-d. after 1820	25-60?	farmer, district officer, sexton, brother to s55	Geitdalur, Skriðdalur (Norðurdal), SM	10	Einar Jónsson, 1953, p. 238); *AÍ XVII*, 1990, p. 73; "RÍL X," 1789, p. 318; "NACD" 2017, census 1816; Hrólfur Kristbjörnsson and Jón Hrólfsson, 2013, pp. 120-122; *JJ*, 1847, p. 371.
s55	Rustikus Sigurðarson	~1763-1803	25-40	farmer, brother to s54	Arnhólsstaðir, Skriðdalur, SM	20	*AÍ XVII*, 1990, p. 73; "RÍL X," 1789, p. 318; Einar Jónsson, 1953, p. 244; Hrólfur Kristbjörnsson and Jón Hrólfsson, 2013, pp. 61-62 and 71-72; *JJ*, 1847, p. 371; "IGD", 1997-2017.
s56	Jón Jónsson, (pamfill?)	~1718-1796 (?)	70-75	farmer, (active house builder?)	Geirólfsstaðir, Skriðdalur, SM	9	*AÍ XVII*, 1990, p. 73; *JJ*, 1847, p. 372; Einar Jónsson, 1955, p. 428; proviso, award given out in 1789, could also have been given to a 34 year old Jón Jónsson who lived at Geirólfsstaðir in 1787, ÞÍ. Hallormsstaður í Skógum – prestakall 0-111, BC/1-1-1 but he is not registered at Geirólfsstaðir after 1787 and is not associated with handicraft.
s57	Einar Eiríksson	~1749-1804	40-55	farmer	Ytri-Kleif, Breiðdalur, SM	9	*AÍ XVII*, 1990, p. 73; "RÍL X," 1789, p. 318; *JJ*, 1847, p. 378; ÞÍ. Eydalir í Breiðdal/Heydalir – prestakall 0-081 BC/3-1-1, year 1803, p. 1.
s58	Gunnlaugur Bjarnason	1799-1870	25-70	farmer	Flaga, Breiðdalur, SM	6	Quern no. 299, The National Museum of Iceland; *JJ*, 1847, p. 378; ÞÍ. Eydalir í Breiðdal/Heydalir – prestakall 0-081 BA/5-1-1, p. 252
s59	Guðmundur Sturluson	~1728-after 1785	50-65	farmer	Mjóanes, Vellir, SM	20	*AÍ XVII*, 1990, p. 73; "RÍL X," 1789, pp. 318-319; *JJ*, 1847, p. 371; "IGD", 1997-2017.
s60	Jón Brynjólfsson	~1735-1800	40-70	priest	Hesteyri, Mjóafjörður, SM	6	*ÞÍ. Rtk. B10.6.26*, 1783; *JJ*, 1847, p. 372; Einar Jónsson, 1953, pp. 315-316; Páll Ólason, 1950, pp. 81-82).
s61	Hávarður Guðmundsson	~1745-1789	30-45	farmer	Njarðvík, austan Héraðsflóa, Norður-Múlasýsla	40	Einar Jónsson, 1959, p. 741; "RÍL XII," 1791, p. 261; *AÍ XVII*, 1990, p. 74; *JJ,* 1847, p. 360; "IGD", 1997-2017.
s62	Gísli Halldórsson	1748-1825	25-70	farmer	Snotrunes, Borgarfjörður, NM	20	Einar Jónsson, 1965, pp. 117-118; *AÍ XVII*, 1990, p. 74; "RÍL XII," 1791, p. 261; *JJ*, 1847, p. 360; "IGD", 1997-2017.
s63	Einar Kortsson	~1762-1846	25-85	farmer, craftsman, lost his legs below knee in late 1791, studied with Jón Brynjólfsson (s60).	Ás, Fell, NM	14	Einar Jónsson, 1957, p. 542; Pétur Sveinsson, 1909, p. 183 and 203; *AÍ XVII*, 1990, p. 74; "RÍL XII," 1791, p. 261; ÞÍ. Valþjófsstaður í Fljótsdal – prestakall 0-249 BC/1-1-1, p. 65 and BC/4-1-1, 1845, Bessastaðir.
s64	Pétur Jökull Pétursson	1828-1892, died in Canada.	N.d.	farmer, district officer, craftsman	Hákonarstaðir, Jökuldalur, NM	N.d.	Jón B. Gíslason, 1956, pp. 102-105; Júníus H. Kristinsson, 1983, p. 58; "IGD", 1997-2017.
s65	Björn Gíslason	b. 1826. Died in Minnesota, USA.	N.d.	farmer	Haugsstaðir, Vopnafjörður, NM	4	Jón B. Gíslason, 1956, pp. 102-105; *JJ*, 1847, p. 351; "IGD", 1997-2017.
s66	Unnamed	N.d.	N.d.	farmer	Unclear, Vopnafjörður, NM	N.d.	*ÞÞ. 2349*
s67	Ingjaldur Andrésson	~1752-1824	25-70	farmer	Langavatn, Reykjahverfi, Suður-Þingeyjarsýsla	20	*AÍ XVII*, 1990, p. 74; "RÍL XII," 1791, p. 261; *JJ*, 1847, p. 326; "IGD", 1997-2017.
s68	Jón Kristjánsson	1841-1919	25-75	farmhand, quern mason	Þeistareykir, Reykjaheiði, SÞ	20 (in 1712)	Quern no. 35, Þingeyingar Folk Museum; *JÁM XI*, pp. 211-212; "IGD", 1997-2017.

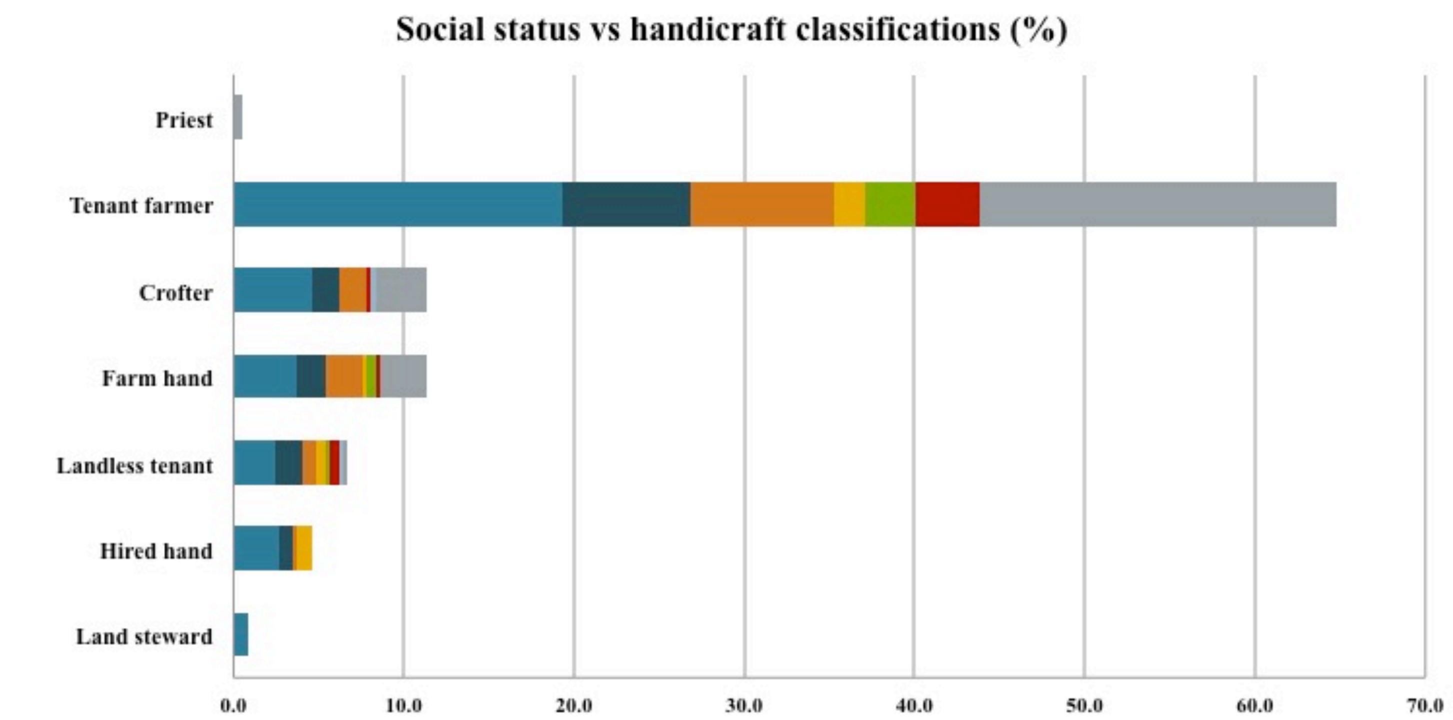
s69	Einar Friðriksson	1840-1929	25-80	farmer, craftsman	Svartárkot, Bárðardalur/Reykjahlíð við Mývatn, SÞ	small croft/20	Jón F. Einarsson, 1990-1993, p. 33; Indriði Indriðason and Brynjar Halldórsson, 2001, p. 281; *JJ*, 1847, p. 325; *ÞÞ. 1902*; *ÞÞ. 2073*.
s70	Jón Jónsson	~1733-d. after 1803	50-70	farmer, craftsman	Mýlaugsstaðir, Aðaldalur, SÞ	10	*AÍ XVI*, 1986, pp. 304-305; *JJ*, 1847, p. 328; Hsk-A. Þingeyingaskrá 19, p. 20; "RÍL VII," 1786a, p. 277; "RÍL VI," 1785, p. 267.
s71	Jóhann Bessason	1839-1912	25-70	farmer, master craftsman, possible quern mason	Skarð, Dalsmynni, SÞ	30	Quern no. 43, Laufás, Eyjafjörður; Þórhallur Bjarnason, 1907, p. 74; Indriði Indriðason and Brynjar Halldórsson, 1976, p. 114; *JJ*, 1847, p. 315; Jón Sigurðsson, 1954, p. 86; Jóhann Skaptason, 1991, pp. 162-182).
s72	Jón Sigurðarson	1736-1821	40-85	farmer, likely district officer and brother to Páll Sigurðarson s80	Böggvisstaðir, Eyjafjörður, Eyjafjarðarsýsla	23	Stefán Aðalsteinsson, 1978, pp. 73-74; Ólafur Olavius, 1965a, pp. 73-75; *JJ*, 1847, p. 289.
s73	Jón Þorláksson	~1732-1804	45-70	farmer	Sigtún, Eyjafjörður, E	20	*JJ*, 1847, p. 305; *Manntal 1801*, 1980, p. 258; "RÍL II," 1781a, p. 275; "IGD", 1997-2017; Stefán Aðalsteinsson, 2019b, pp. 1414 and 1525-1426.
s74	Hallgrímur Magnússon	~1736-1813	60-80	farmer, district officer	Grýta, Eyjafjörður, E	20	Ólafur Olavius, 1965a, pp. 73-75; *JJ*, 1847, p. 304; "IGD", 1997-2017.
s75	Þorvaldur Tómasson	~1707-1795	70-90	farmer	Kolgrímastaðir, Eyjafjörður, E	12	Ólafur Olavius, 1965a, pp. 73-75; *JJ*, 1847, p. 302; Stefán Aðalsteinsson, 2019a, p. 867); ÞÍ. Saurbær í Eyjafirði – prestakall 0-211 BA/2-1-1, p. 28.
s76	Jón Stefánsson senior	~1749-1820	25-70	farmer, district officer	Sörlatunga, Barkárdalur, E	20	Eiður Guðmundsson, 1982, p. 84; *JJ*, 1847, p. 294; "RÍL II," 1781a, p. 269 and 275; "RÍL II," 1781b, p. 277; "IGD", 1997-2017.
s77	Jón Magnússon	~1723-1788	50-65	farmer	Efstalandskot, Öxnadalur, E	8	"RÍL II," 1781a, p. 275; JJ, 1847, p. 296; "IGD", 1997-2017.
s78	Símon Sigurðarson Bech	1717-1785	55-60	farmer, craftsman, owned much land in Öxnadalur	Bakki, Öxnadalur, E	30	Eiður Guðmundsson, 1982, p. 91; "IGD," 1997-2017; *JJ*, 1847, p. 295; Ólafur Olavius, 1965a, pp. 73-75.
s79	Guðmundur Ólafsson	~1710-1784	65-70	farmer	Efri-Bægisá, Öxnadalur, E	N.d.	"RÍL III," 1782a, pp. 286-287; "IGD", 1997-2017.
s80	Páll Sigurðarson	1730-1799	45-70	farmer, craftsman, boat builder and quern mason	Karlsá, Ufsaströnd, E	20	Stefán Aðalsteinsson, 1978, pp. 395-396; *JJ*, 1847, p. 290; "RÍL II," 1781a, p. 269.
s81	Jón Jónsson	~1739-1810	40-70	farmer, fisherman, craftsman	Sauðanes, Ufsaströnd, E	20	Stefán Aðalsteinsson, 1976, pp. 63-64; *JJ*, 1847, p. 290; "RÍL II," 1781a, p. 269.
s82	Þorsteinn Hannesson	1852-1910	25-60	farmer, craftsman	Hjaltastaðir in Blönduhlíð and Hofdalir, Skagafjarðarsýsla	80	Quern no. 52, Skagafjörður Heritage Museum; *JJ*, 1847, p. 266; *Sk.Æ.* III, 1968, pp. 334-336.
s83	Jakob Jónsson, Myllu-Kobbi	1823-1900	25-75	farmhand, itinerant craftsman	Minni-Brekka, Fljótum, S	10	*JJ*, 1847, p. 274; Jón Jóhannesson, 1944a, 1944b; Hannes Pétursson, 1984, pp. 65-115.
s84	Ólafur Þorkelsson	~1792-1865	25-75	farmer, craftsman, quern mason	Háfagerði, Höfðaströnd, S	9	*JJ*, 1847, p. 269; *Sk.Æ.* VI, 1992, pp. 257-262.
s85	Eiríkur Guðmundsson	~1717-1805	55-85	farmer, district officer	Írafell, Svartárdal, S	15	*JJ*, 1847, p. 260; Jón Sigurðsson and Sigurður Ólafsson, 1952, pp. 78, 84 and 87; "RÍL III," 1782a, p. 287.

s86	Jón Arngrímsson	b. 1759?	25-?	farmer	Fitjar, Fitjárdal, Vestur-Húnavatnssýsla	16	*JJ*, 1847, p. 225; "RÍL IV," 1783, p. 311; "IGD", 1997-2017.
s87	Jens Lassen Busch	N.d.	N.d.	merchant	Ísafjörður, Í	N.a.	"RÍL II," 1781b, p. 282.
s88	Unnamed (initials HI)	N.d.	N.d.	fisherman/ farmhand?	Hafnarmúli, Patreksfirði (boat shelter), Vestur-Barðastrandarsýsla	N.a.	Quern no. 2, Hnjótur Museum.
s89	Níels Þórðarson	1843-1908	25-65?	farmhand	Innsta-Tunga, Tálknafirði, VB	7 1/2	Quern no. 1, Hnjótur Museum; NACD, 2015, census 1901; *JJ*, 1847, p. 184; "IGD", 1997-2017.
s90	Sveinn Sturlaugsson	~1728-1800	50-70	farmer	Kleifar, Gilsfirði, Dalasýsla	24	*AÍ XVII*, 1990, p. 27; Jón Guðnason, 1961, p. 514; *JJ*, 1847, p. 172.
s91	Gísli Sigurðarson	~1720-d. after 1801	50-80	farmer	Efri-Brunná, Saurbæ, D	20	*AÍ XVII*, 1990, p. 27; Jón Guðnason, 1961, p. 481-482; *JJ*, 1847, p. 171.
s92	Ólafur Gíslason (younger)	~1754-d. after 1804	25-50?	farmer, brother s98, son in law to s91	Efri-Brunná, Saurbæ, D	"	*AÍ XVII*, 1990, p. 27; Jón Guðnason, 1961, p. 482.
s93	Ingveldur Ólafsdóttir/ Jón Jónsson	I: b. 1729-d. after 1800 /J:~1722-d. before 1786	50-65	Jón was a farmer, district officer and craftsman	Neðri-Brunná, Saurbæ, D	20	*AÍ XVII*, 1990, p. 27; Jón Guðnason, 1961, p. 487; *JJ*, 1847, p.171.
s94	Jón Bjarnason	~1726-1804	45-80	farmer	Máskelda, Saurbæ, D	12	*AÍ XVII*, 1990, p. 27; Jón Guðnason, 1961, p. 478; *JJ*, 1847, p. 171.
s95	Ólafur Jónsson	~1750-1798	25-50?	farmer	Neðri-Brekka, Saurbæ, D	24	*AÍ XVII*, 1990, p. 27; Jón Guðnason, 1961, pp. 470 and 507; *JJ*, 1847, p. 171.
s96	Jón Þorleifsson	~1762-1847	25-85	farmer	Fremri-Brekka, Saurbæ, D	16	*AÍ XVII*, 1990, p. 27; Jón Guðnason, 1961, p. 464; *JJ*, 1847, p. 171.
s97	Guðmundur Bjarnason	~1745-1820	25-75	farmer	Bjarnastaðir (part of Kverngrjót main farm), Saurbæ, D	20	*AÍ XVII*, 1990, p. 27; Jón Guðnason, 1961, pp. 392, 401 and 412; *JJ*, 1847, p. 171.
s98	Ólafur Gíslason (older)	~1752-1791	25-40	farmer, brother of s92, son in law of s91	Stóri-Múli, Saurbæ, D	16	Jón Guðnason, 1955, p. 207; *AÍ XVII*, 1990, p. 27; Jón Guðnason, 1961, p. 436; *JJ*, 1847, p. 171.
s99	Guðbrandur Jónsson	1852-1931	25-80	farmer, craftsman	Hallsstaðir, Fellsströnd, D	24	*ÞÞ. 6190*; Jón Guðnason, 1961, p. 152; *JJ*, 1847, p. 168.
s100	Jón Ásmundsson	~1735-1812	40-75	farmer	Berserkseyri, Helgafellssveit, Snæfellsnesssýsla	24	"RÍL III," 1782b, p. 291; *ÞÍ. Rtk. B10.6.37*, 1783; *JJ*, 1847, p. 153; "IGD", 1997-2017.
s101	Guðmundur Jónsson	~1734-1820	40-85	farmer	Neðri Lág/Laug, Eyrarsveit, Sn	20	*ÞÍ. Rtk. B10.6.37*, 1783; *JJ*, 1847, p. 151; ÞÍ. Setberg í Eyrarsveit/Grundarfjörður - prestak. 0-215 BA/2-1, p. 264 and BC/1-1-1, pp. 4.
s102	Hallgrímur Jónsson	~1742-1814	35-70	farmer, district officer, quern mason	Innri-Skeljabrekka south of Andakílsá, Borgarfjörður, Borgarfjarðarsýsla	12	*AÍ XVI*, 1986, p. 330; Aðalsteinn Halldórsson et al., 1975, pp. 208-209; *JJ*, 1847, p. 113; "RÍL VII," 1786b, p. 275.
s103	Þorsteinn Jakobsson	1814-1868	25-55	farmer, district officer, craftsman	Húsafell, Hvítársíða, Mýra- og Hnappadalssýsla	N.d.	Katrín H. Bjarnadóttir, 2012, pp. 16-19; Sveinbjörg Guðmundsdóttir and Þuríður J. Kristjánsdóttir, 2003, pp. 350-351; Kristleifur Þorsteinsson, 1944, p. 30; *ÞÞ. 7345*.

Table 5.3. Comparison of social status and handicraft classifications between 18th century craftsmen and quern masons.

	Farming craftsmen		Quern masons	
Group size	270	-	103	-
Average age	46	-	42	-
Age range	20-82	-	24-72	-
Social status	**Number of men**	**%**	**Number of men**	**%**
District officer*	30	14.8	15	14.6
Crofter to farmer ratio+	~1/5.25		~1/7	
Tenant	163	60.4	78	75.7
Crofter	31	11.5	11	10.7
Farm hand	32	11.9	10	9.7
Hired hand	17	6.3	0	0.0
Landless tenant	24	8.9	1	1.0
Land steward	3	1.0	0	0.0
Priest	0	0.0	2	1.9
Merchant	0	0.0	1	1.0
Total:	270	100.0	103	100.0
Classification	**Number of men**	**%**	**Number of men**	**%**
Craftsman	125	46.3	19	18.4
Carpenter	48	17.8	0	0.0
Blacksmith	49	18.1	0	0.0
Bl.smith and carpenter	14	5.2	0	0.0
Boat builder	18	6.7	2	1.9
Metalworker	14	5.2	2	1.0
Cooper (*beykir*)	2	0.7	0	0.0
Undefined	0	0.0	80	78.6
Total:	**270**	**100.0**	**103**	**100.0**

* Mostly tenant farmers
+General crofter to farmer ratio was 1/4



	Land steward	Hired hand	Landless tenant	Farm hand	Crofter	Tenant farmer	Priest
Craftsman	0.8	2.7	2.4	3.8	4.6	19.4	0.0
Carpenter	0.0	0.8	1.6	1.6	1.6	7.5	0.0
Blacksmith	0.0	0.3	0.8	2.2	1.6	8.3	0.0
Metalworker	0.0	0.8	0.5	0.3	0.0	1.9	0.0
Blacksmith+carpenter	0.0	0.0	0.3	0.5	0.0	3.0	0.0
Boat builder	0.0	0.0	0.5	0.3	0.3	3.8	0.0
Cooper	0.0	0.0	0.3	0.0	0.3	0.0	0.0
Quern mason	0.0	0.0	0.3	2.7	3.0	21.0	0.5

Figure 5.5. Comparison of craftsmen's social status against their handicraft classifications (N=372 men).

any specific type of craftsman (e.g. carpenter, blacksmith, metalworker etc.). This does however not necessarily mean that at least some quernstone masons also worked with other materials, but verifying that is very problematic, so they are for our purposes simply classified here as quern masons. Estimating social status based on available historical information is much easier. The data indicates that just over 90% of the quern masons were either renting, or dependents (crafting farm hands, crofters, landless tenants and hired hands), on regular tenant farms. Most of those tenant farms were of more moderate value commonly between 11-30 hundred (farms worth +25 hundred were considered above average (Lýður Björnsson, 2006, pp. 37-38)). All the main social groups (mainly tenant farmers, crofters and farm hands) took part in quernstone production, although regular tenant farmers were about 15% more common in the quern mason group than in the control group. Within the control group landless tenants and hired hands are ~15%, while only one landless tenant (isl. *húsmaður*) was recorded in the quern mason group. The quern mason group also differs from the control group in that there are 2 priests (the merchant is ignored as he is Danish and very likely did not perform the actual masonry himself). However, the addition of priests onto the list as craftsmen only improves the social status classification range of Icelandic craftsmen in general, as a small percentage of priests are historically indeed known to have also taken part in handicraft (Jónas Jónasson, 1945, p. 379). In general, the crofter to tenant farmer ratio in 18th century Iceland was 1/4, but the ratio is slightly lower for the quern mason group or 1/7, so potentially fewer crofters took part in such production compared to the more affluent tenant farmers. When comparing the types of farms the dependents were directly subordinate to (Table 5.4), it becomes clear that, while craftsmen in the control group are distributed fairly evenly mainly between church farms/parsonages (33%) and tenant farms (36%), the quern mason dependents (farm and hired hands/crofters/landless tenants) are largely associated with tenant farms (73%). Of course, tenant farmers lived at different levels of affluence, but where the craftsman was the head of the household the tenant farm values in both groups showed essentially the same general distribution (Figure 5.6).

It is clear that the majority of the quern masons were either tenant farmers, or associated with tenant farms, of average affluence. About 80% of all the quern masons were not specifically named as craftsmen in documentary sources and 18% were only generally titled as such (isl. *smiður*). It cannot be ruled out that some of the undefined

Table 5.4. Classification of the assessed farms (%) where dependents (farm hands, crofters, landless tenants and hired hands) worked and/or lived.

	18th Century Craftsmen	Quern Masons
Dependents (% of total)	**38.5**	**22**
Church Farm/Parsonage	33	13
Tenant Farm*	36	73
Trading Post	15	9
District Officer Residence	10	5
Sheriff Residence	6	0
Total:	100	100

*Farms seemingly unconnected to government officials

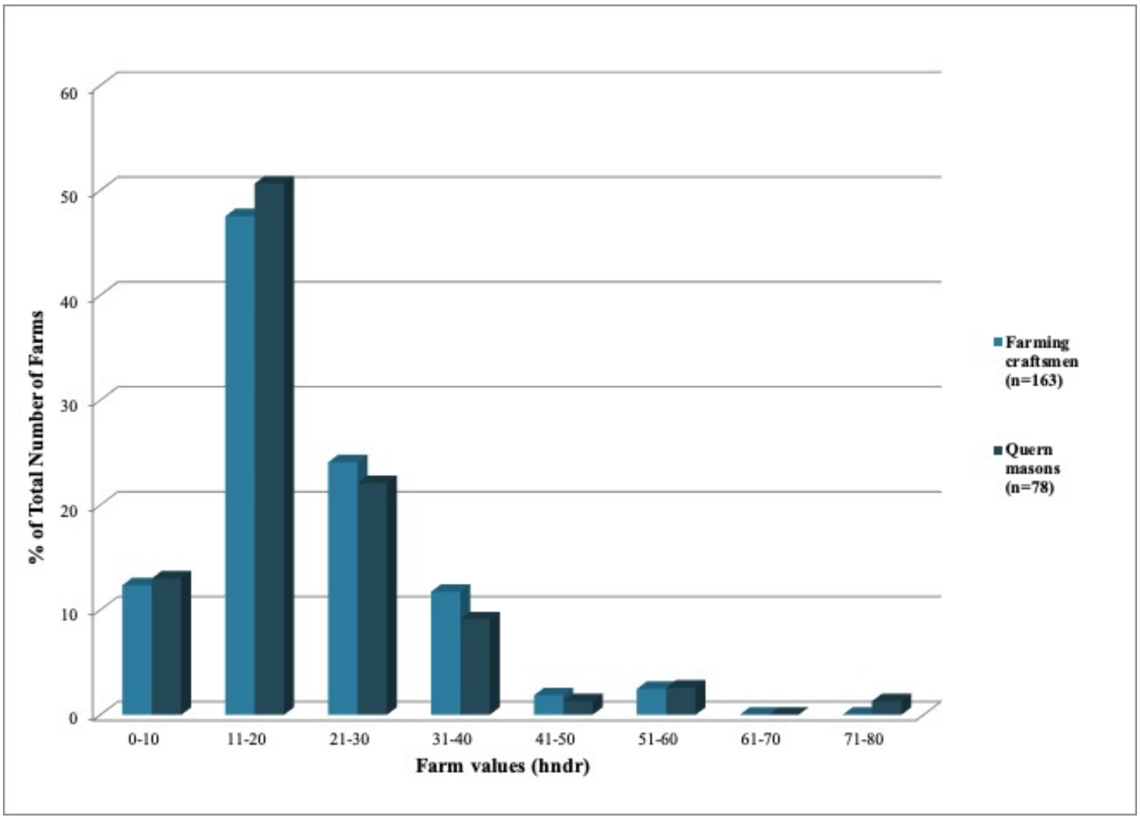


Figure 5.6. The distribution of the values (hundred) of all known tenant farms headed by 18th century farming craftsmen and quern masons.

farmers were also active craftsmen of some sort, but the data suggests that quernstone production was well within the skillset of the average Icelandic tenant farmer and did not require a more specialised class of craftsmen. About 15% of all recorded quern masons also served as district officers at some point, and all but 2 (i.e. 13 men) were connected with the 18th century quernstone production revival. Five of them were also titled as craftsmen and the control group of craftsmen contained the same ratio (~15%) of district officers as well. This shows that many of the government officials with the closest connection to the general public were well able to lead the way in the revival by personally taking part in the production. Very few of the quern masons were associated with church farms however, compared with the general group of craftsmen. This is perhaps not surprising, however, as during the revival many priests will likely have received an imported quernstone for free and been in a better position to buy one. They may therefore not have needed to spend their time, or their workers, on such production unless they were specifically interested in the project. They would, however, have been just as invaluable as information hubs and role models, or *opinion leaders*, in parish during the innovation introduction as the district officers and farming craftsmen, who in turn will also have had varied potential for influencing further spread of the innovation and its production in their district (see further discussion below).

5.2. Connecting the Circles: Farming Craftsmen and their Geographical Reach

5.2.1. A Tale of Two Quern Masons

Icelandic quern masons were most commonly average tenant farmers, crofters and farm hands. Within the group of known quern masons from the 18th and 19th centuries there are two men that could be tracked in more detail in documentary sources than the rest, Einar Friðriksson from Svartárkot in Bárðardalur and Jakob, *Myllu-Kobbi*, Jónsson from Minni-Brekka in Fljót (Figure 5.1). They represent two stereotypes almost at opposite ends of the wide range of craftsmen (from farm hands and freelancers to district officers and priests): the respectable crafting tenant farmer and the wandering freelancer. Their stories give a little more insight into the mobility and social reach of general craftsmen in one lifetime, which could extend at least 50 km from their main place of residence.

The ‘stationary’ farming craftsman: Einar Friðriksson from Svartárkot

Einar Friðriksson (Figure 5.7) lived at an early age at Hrappstaðasel, a very small croft (no known value) belonging to Hrappstaðir (12 hundred) in Bárðardalur (*JJ*, 1847, p. 323). His father Friðrik Þorgrímsson built the croft from scratch ("IGD," 1997-2017). Einar had four siblings, three sisters and one brother. As the eldest, Einar lived with his parents in Hrappstaðasel until he was 31 years old (1871) when they moved together to Svartárkot by Svartárvatn, about 25 km further inland but within the same district (Ljósavatnshreppur). Svartárkot was also a small croft (6 hundred) belonging to Stóra-Tunga in Bárðardalur (*JJ*, 1847, p. 323). In 1895 Einar (then aged 55) moved his growing family to Reykjahlíð (20 hundred) by Mývatn in Skútustaðahreppur (*JJ*, 1847, p. 325), where Einar still lived at his death at 89 in 1929 (Indriði Indriðason and Brynjar Halldórsson, 2001, p. 281; Pétur Jónsson, 1971). Einar and his wife Guðrún had nine children, five sons and four daughters. The family was very close and in 1920 there were four households in Reykjahlíð (31 people in total, most of them Einar’s progeny) headed by three of his sons; Jón Frímann (49), Illugi (47), Sigurður (36) and his daughter Guðrún (44). Einar was a farmer in Reykjahlíð until 1911 when he passed the reins to his son Sigurður.

Figure 5.7. Einar Friðriksson. The photo was taken before 1910 by Eiríkur Þorbergsson, photographer in Húsavík. The photo was donated by Gunnar Árnason and is preserved at the National Museum of Iceland (Mms-28430).

Einar had strong family contacts spread widely within the county. In 1920 his son Ingólfur (41) was a farmer at Kálfaströnd and Jónas (29) at Álftagerði, both also farms by Mývatn in Skútustaðahreppur ("NACD," 2017, census 1920; Indriði Indriðason and Brynjar Halldórsson, 2001, p. 281). Einar’s own siblings also moved around. In 1880 his brother Baldvin (aged 33) was a landless tenant (isl. *húsmaður*) at Engidalur east of Bárðardalur and between 1881 and 1895 he was a farmer on at least three farms Mjóidalur south of Bárðardalur, Sigurðarstaðir in Bárðardalur and Garðshorn in Kaldakinn ("NACD," 2017, census 1880; Indriði Indriðason and Brynjar Halldórsson, 2001, p. 311). In 1880 Einar’s sister María (aged 38) lived with her husband Jón Jónsson, born and raised, in Baldursheimur by Mývatn and in 1890 they had taken over farming at Sigurðarstaðir.

Einar's eldest son, Jón Frímann Einarsson (1871-1950), wrote a short autobiography (unpublished) where he describes his father's achievements. Einar was a very active man who made various types of wooden vessels (isl. *klápasmíði*) that he sold in the county, mainly to his neighbours in Bárðardalur and Mývatnssveit. He built water mills close to all three of his homesteads at Hrappsstaðasel, Svartárkot and Reykjahlíð. He was also a quern mason and when he lived at Svartárkot he would gather raw materials at Hrauntunga in Suðurárbotnar about 10 km inland. He also built mills around Mývatn e.g. at Baldursheimur (likely for his brother-in-law Jón), Haganes, Garður and Vogar (Figure 5.9), and even as far as Leyningur in Eyjafjörður over 50 km away (Jón F. Einarsson, 1990-1993, p. 33 and 38; "IGD," 1997-2017; "NACD," 2017, census 1840; *ÞÞ. 1902*; *ÞÞ. 2073*).

The itinerant worker: Jakob "Myllu-Kobbi" Jónsson

As a contrast Jakob, *Myllu Kobbi*, Jónsson (Figure 5.8) was an itinerant craftsman who spent his time wandering in the region of Skagafjörður working as a blacksmith and carpenter, building and maintaining mills and quernstones, making gravestones and even digging trenches (Figure 5.9). He was born in 1823 at Fremri-Svartárdalur in Svartárdalur in Skagafjörður. His parents died young, but Jakob had two brothers, Sveinn (1822) and Pétur (1829), and one sister Rannveig, *Kobba-Ranka*, Jónsdóttir (~1826-1890). The family lived at Fremri-Svartárdalur until 1833, excepting Pétur who was put into foster care at Hvammskot in Lýtingsstaðahreppur when he was a year old. In 1833 they moved to

Figure 5.8. Jakob 'Myllu-Kobbi' Jónsson. The photo is preserved at the National Museum of Iceland and donated by Gísli Sigurðsson (Mms-24495).

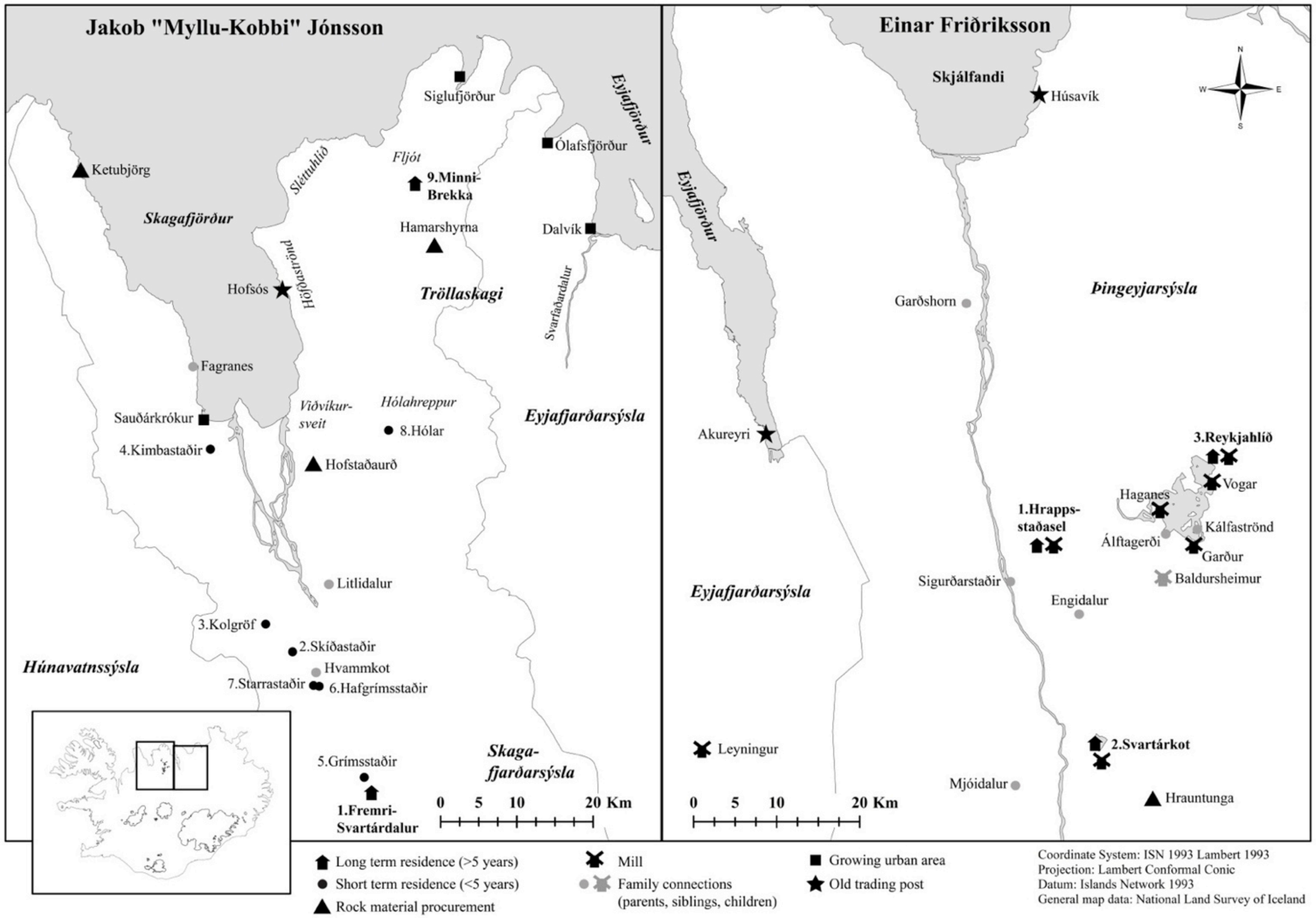


Figure 5.9. Graphic representation of habitation changes and family connections of Jakob “Myllu-Kobbi” Jónsson and Einar Friðriksson. The order of known habitation sites is numbered.

Skíðastaðir, also in Lýtingsstaðahreppur with Sveinn, Jakob and Rannveig. In 1835 Jakob is still at Skíðastaðir ("IGD," 1997-2017). He was confirmed in 1838 at age 15 and that same year he moved from Kolgröf in Efribyggð to Kimbastaðir in Borgarsveit in Skagafjörður. After his father's death around 1840 his mother moved to Fagranes at Reykjaströnd and his brother Sveinn to Litlidalur in Blönduhlíð. Whether they stayed in contact in any way is unclear. Jakob's wanderings after his parents' death are rather unclear but around the age of 18 he was still a farm hand at Kimbastaðir ("NACD," 2017, census 1840) and in 1843 he was at Grímsstaðir in Svartárdalur. Jakob studied blacksmithing with Baldvin Hinriksson Skagfjörð (1799-1853) at Hafgrímsstaðir between 1847 and 1849 and became both a blacksmith and a carpenter. In 1850 (aged 28) Jakob was a landless tenant (isl. *húsmaður*) and craftsman at Starrastaðir in Tungusveit ("NACD," 2017, census 1850, Jacob). Around 1853 when Baldvin Skagfjörð died, Jakob lived at Hólar in Hjaltadalur with reverend Benedikt Vigfússon where he was working as a blacksmith. Where he lived after that is unclear but in 1862 Jakob bought the farm Minni-Brekka in Fljót (10 hundred; *JJ*, 1847, p. 274; "NACD," 2017, censuses 1870 and 1880), which remained his official residence during wanderings until his death in 1900 (Hannes Pétursson, 1984, pp. 65-115; Jón Jóhannesson, 1944a, 1944b; Þormóður Sveinsson, 1948, pp. 74-75). Jakob mainly kept to Skagafjörður around Fljót, Sléttuhlíð, Höfðaströnd, Hólahreppur and Viðvíkursveit but it has been speculated that he may very likely also have travelled over Tröllaskagi to the east into Siglufjörður, Ólafsfjörður and Svarfaðardalur. He found raw materials for his gravestones and querns e.g. in Hamarshyrna in Fljót and in Hofstaðaurð in Hofstaðafjall (Elínborg Bessadóttir, 2015; "IGD," 1997-2017; Hannes Pétursson, 1984, pp. 65-115; Jón Jóhannesson, 1944a, 1944b). One account was also found regarding Jakob finding raw materials in Ketubjörg west of Skagafjörður (*ÞÞ. 2100*) but this could not be confirmed (see further discussion of raw material procurement in Chapter 7).

5.2.2. A Farming Craftsman's Main Area of Influence

Farming craftsmen were likely not much more mobile than the regular tenant farmer as most of them also had to have a permanent address and handicraft projects would more often than not be brought to the farm rather than the reverse. The general farming craftsman helped his neighbours and used available time for handicraft to sell and boost his farming income. Through the diaries of Halldór at Tindur we gleaned that in a typical farming household almost 60% of all trips undertaken during routine activities took place within a 10 km radius of the farm. If we conservatively apply the idea of a 10 km radius (20 km diameter) being the area of main influence and network connections of a single tenant farm to the registration of the craftsmen in Þingeyjarsýsla in 1703 (Figure 5.10) it becomes clear that they are fairly evenly spread both inland and along the coast. There is

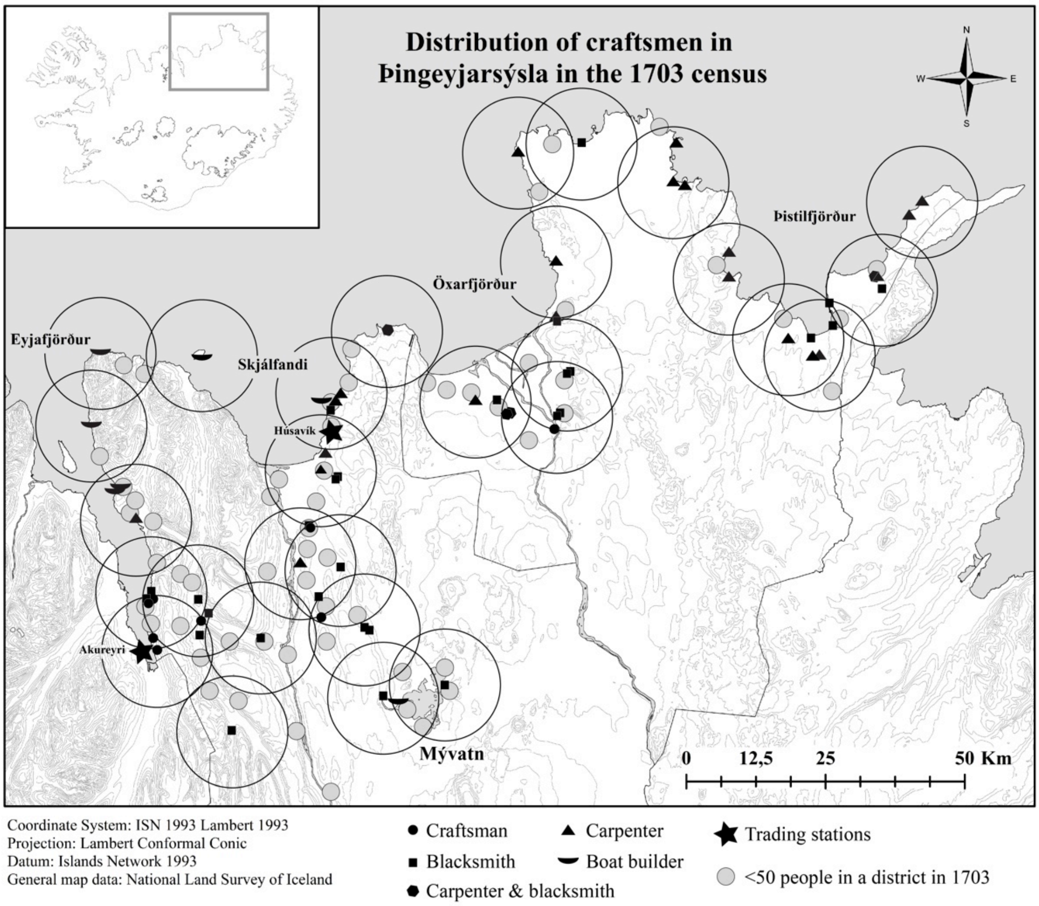


Figure 5.10. The distribution of farming craftsmen in Þingeyjarsýsla in the 1703 census encased in a circle 20 km in diameter. Only enough circles were put in to clearly show that registered craftsmen in 1703 were well within both geographical and social reach of each other in their daily lives and formed a connecting chain both inland and along the whole coastline.

rarely more than 5-15 km between them, and their areas generally overlap. This would mean roughly 1-3 hours of travel on foot for people to reach them depending on the terrain, and on horseback it would in most cases represent no obstacle at all. Therefore, if people needed a seasoned craftsman they rarely needed to travel far, and the farming craftsmen will have had no trouble in communicating and/or meeting each other to exchange news and opinions. At Tindur 85% of all interaction and travel during the farming year took place within a 20 km radius (40 km diameter) however, and it is likely that farming craftsmen would also generally be most active within an area of similar size, making the overlap of their potential activity areas and reach of influence even wider.

The craftsman may have had to travel further afield for larger projects (e.g. building construction and maintenance work) than the average farmer, although such projects were likely few and far between. When the movements of Einar Friðriksson and Jakob Jónsson were considered it was noted that through their lifetime they both stayed largely within the county of their birth but moved between districts to a varying degree. Their family connections changed, expanded and moved around just as they did, and as they moved between districts from farm to farm new friendships and connections will have formed, spreading knowledge of their skills and ideas and widening their area of influence (or infamy). Einar Friðriksson only lived in three places in his life and his achievements and known immediate family connections are mostly contained within an area roughly estimated to be around 40 km in diameter. However, the mill he built in Leyningur in Eyjafjörður in Eyjafjarðarsýsla shows that evidence of his work could be found outside his home county at least as far away as 50 km from Svartárkot as the crow flies (70 km if he lived in Reykjahlíð at the time). Jakob Jónsson moved around much more, and although little is known about the strength of his few family connections, his known wanderings covered an area somewhat larger than Friðriksson's furthest reach, or around 80 km in diameter. Again, it is likely that the brunt of the farming craftsman's operations and influence would be found within a 20 km radius of his residence, but his operations could well be considered to extent at least 50 km from his homestead and Friðriksson´s story suggests that craftsmen would travel across county lines to work for others.

5.3. Spreading Knowledge and Opinion Both Near and Far

5.3.1. Opinion Leaders and the Mobile Public Opinion

The Icelandic sheriffs only numbered around twenty, so they certainly could not reach many people single handed. The sheriffs sought help from their subordinates in each county and their initial and traditional first targets were mainly the priests, district officers and farming craftsmen. Lack of mass media may have meant a slower rate of information flow to the general population, but awareness of the innovation will have had no problem spreading through society e.g. at traditional public meetings (at assemblies and through church attendance). Such meetings were also likely good places to recruit/encourage/

inspire participants and diffuse information into all the districts where it would spread even further through frequent interpersonal communications between churches, farms and crofts, during the general day-to-day tasks. In a dispersed farming community with great distances between members of the same social class, i.e. parish priests, district officers and farming craftsmen who all usually also ran/formed part of a working farm, simply meant a stronger interconnection with their farming neighbours, making information flow and interpersonal communication across the few class-divides fairly easy and common (Rogers, 2003, pp. 309-309, *heterophilous network links*).

Successful innovation diffusion is that much more likely if early adopters/opinion leaders are influential, highly respected and central figures within their community or network. As there was very likely no conscious decision to specifically seek out such paragons as in modern innovation diffusion projects, the effectiveness of those who initially participated could have swung developments either way. Whatever their profession or social position initial participants were just as likely to be innovative as extremely traditional, whether priests, district officers, craftsmen or farmers. The free, but still very heavy, imported quernstones may have mainly been transported to chosen participants closest to the trading posts regardless of their social influence, although the nature of general Icelandic transport may not really have been considered an obstacle as goods had to be, and were, transported to their intended destination despite obstacles that today may seem daunting. In a society set in its ways it likely would have been less helpful to recruit only the ones that were willing and most innovative as more effective opinion leaders would also likely be traditional. Men who first volunteered, either out of interest or through incentive, could have been too innovative or too low in the social pecking order for the more traditional farmer to heed and those with more traditional values that were recruited or felt obligated to participate could have decided against adoption and thereby slowed down or hindered further diffusion to their followers.

We can of course never know exactly how many were innovative and how many were sceptical; who bought a quernstone and who made one, or when. The 19th and early 20th century data suggests that not all farms ever owned a quernstone. Some households always took their grain to a neighbour for grinding, especially after mills became common installations. It is reasonable to suppose that poorer farms and crofts would not have had much use for a quernstone (especially not an expensive one) as long as meal constituted only a small part of their diet. In the 1703 census, crofts made up about 25% of all Icelandic households and during the height of grain import in the mid-19th century potentially 10-20% of households were still non-adopters. If we tentatively assume that ~25% of Icelandic households were non-adopters, and split the remaining 75% between the adopter groups (Table 5.5) fashioned through past research of successful innovation

Table 5.5. Potential numbers of Icelandic households run by innovation adopters of varied boldness in successful innovation diffusion in the 18th and 19th centuries.

	%	Number of households
Innovators	1,5	110-125
Early adopters	10,5	780-860
Early majority	25,5	1885-2090
Late majority	25,5	1885-2090
Laggards	12	890-985
Non-adopters	25	1850-2050
Total:	**100**	**7400-8200**

diffusion (see Chapter 2), potential innovators and early adopters (preferably also opinion leaders) grinding imported grain and acquiring a quernstone would have had to have been heading at least ~900-1000 Icelandic households for an innovation to be introduced and take off successfully. This is a number intriguingly similar to the number of quernstones considered by the government to be sufficient in 1770 to introduce the innovation to the islanders and encourage further production, but then they would of course all have had to find their way to an owner sufficiently central and influential to be useful in furthering innovation diffusion.

If we consider the two central participating social classes in turn, the priests and the district officers, it becomes clear that they will have had slightly different parts to play, but both formed very important links in the innovation diffusion chain and will have been influential opinion leaders, as long as they viewed the innovation in a positive light (Table 4.7, Chapter 4). Parish priests were central in traditional and frequent social interactions. The priests had formal education and not only provided religious direction, but they were also teachers and moral guides (*polymorphic opinion leaders*). The data suggests that some priests likely received a free imported quernstone and experimented with mill building. Malt querns were also a known quantity, at least for some of the more affluent church farms where brewing took place. A few of the clergy were also known to be craftsmen and at least a couple may very well have experimented with indigenous quernstone production. However, the list of quern masons (Tables 5.2 to 5.4) indicates that not many were clearly associated with church farms. It is therefore likely that priests, similar to the sheriffs, will have mainly served as useful role models in leading by example through buying unground grain and using a quernstone (either imported or indigenous) within their household, in addition to providing experience and opinion of the innovation's general attributes and advantages, without getting their hands very dirty. Of course, priests had varied characters and relationships with their parishioners, were of different ages and influence and might have been just as likely to reject an innovation as support it (Figure 5.11). They could also have assigned their farm hand or hired a craftsman to make them a quernstone. Priests who were allocated quernstones may not have been the most innovative, but traditional priests would have been more likely to be good opinion leaders for a traditional society. They will have indeed had a negative effect on innovation diffusion if they decided against it, but will have been that much more effective in influencing further adoption if they viewed it positively (see e.g. Jóhanna Þ. Guðmundsdóttir, 2012 for examples of priestly influences on the acceptance/rejection of kitchen gardening in their parishes).

The district officers (15% of the population) were a more varied group, but no less important as opinion leaders. Like the priests they also filled a central social role in their farming community, but they were essentially more closely connected to it, being less educated farmers and/or farming craftsmen themselves, albeit usually slightly more affluent than the general public. They played a more active role by being able to both direct and participate in the actual indigenous quernstone production. Some may have been provided or given access to foreign quernstones to use as models, and all district officers participating will have been able to assess the possibilities of locating and exploiting available indigenous materials. The more active farming craftsmen that did receive or bought an imported quern to use and/or to copy, and viewed it favourably, would have made very effective opinion leaders able to distribute information to both their neighbours and other farming craftsmen within their network (Figure 5.10) and offer both advice and experience regarding usefulness and the production itself. The less educated and passive farming craftsmen and farmers who potentially only served their own family and/or nearest neighbour would have been less effective in distributing information further afield and more likely to be followers, or later adopters, rather than leaders (Table 4.7).

Active fishing farmers may have been more mobile than the average farmer, but they would likely have had less time to make quernstones during their busy schedule, unless they used the opportunity when weather prevented fishing to make one. Crofters and farm hands would be likeliest to be late adopters, laggards and non-adopters. By law, tenant farmers owned all profits from their farm hands' work, which will not have encouraged male farm hands to take part in quernstone production beyond perhaps making one for their employer, similar to full time craftsmen specially hired for their skill. Of course, as they were not the head of a household, they essentially had no personal need for a quernstone. However, where farm hands were essentially close family members, e.g. eldest sons, nephews or sons-in-law, they could perhaps have negotiated around such stipulations more easily and exploited at least some of the benefits of surplus handicraft production for themselves in the hope of being able to rent their own farm later. General farm hands would have made unlikely leaders in innovation but their often-extensive travels between fishing stations and hay fields would have been excellent pathways to transport innovation awareness between districts and counties, and many could have acquired or made themselves a quernstone later in life after experiencing their usefulness through an employer, if they ever had an opportunity to rent a farm themselves.

We can never know who the innovators were or who were the most influential opinion leaders in each county. It is very likely that in Iceland only a small group of men will have been considered role models for many things (*polymorphic*), while most were followers (Rogers, 2003, p. 312 and 314). We can classify the governors and the sheriffs, the foreign merchants and craftsmen (e.g. the merchant Busch in Ísafjörður, the sailor and former millers' apprentice Engelbret Larsen Hammer, and Ole Nielsen the immigrant farmer who taught quernstone masonry) as potential change agents and/or innovators because they were all partial outsiders and less bound by social constraints of the general social system (Rogers, 2003, p. 291). There is, however, of course nothing to say that they could not have functioned as opinion leaders in some way as well, but only the more influential change agents were in a position to bring/allow new knowledge into the system to be rejected or accepted in the first place (*gatekeepers*). The most effective opinion leaders would likely have been priests, district officers and/or farming craftsmen, but who was eventually chosen by his peers would have depended on individual personality and skill, family connections, wealth and active service and loyalty to their families and subordinates (Table 4.7).

5.3.2. The Initial Hubs of Information Distribution and Further Quernstone Production Developments

Those who bought unground grain and/or took on indigenous quernstone production, along-side actively serving as opinion leaders, will have formed central hubs for further information distribution within their district or parish. Where documentation of participation in the quern production revival is more detailed, there is clear evidence of intimate family connections and/or more than one man being rewarded and/or taking part in quernstone production on the same farm, and/or on closely set farms. Where information was available on quernstone masons clustered together, four examples have been chosen for further scrutiny. In all four clusters there is at least one district officer. Cluster 1) is in the Saurbær area and vicinity in Dalasýsla in the West and 2) the Skriðdalur valley in Suður-Múlasýsla in the East, recorded from the registration of craftsmen who received rewards for production. Cluster 3) is Landsveit in Rangárþing ytra and 4) is in Fljótshlíð in Rangárþing eystra. Information on these two latter areas was collected from late 18th century reports from government officials and priests regarding quernstone production in Rangárvallasýsla in the South (Figure 5.11; see also Figure 5.4 and Tables 4.5 and 5.2).

1) In the Saurbær area nine men were registered. Within that group there were the brothers Ólafur senior (s98) at Stóri-Múli and Ólafur junior (s92) at Efri-Brunná, both sons-in-law of Gísli Sigurðsson (s91), also living at Efri-Brunná. At Neðri-Brunná district officer Jón Jónsson (s93) likely received a reward after his death through the efforts of his widow Ingveldur Ólafsdóttir. Another pair of men at adjacent farms was Ólafur Jónsson (s95) at Neðri-Brekka and Jón Þorleifsson at Fremri-Brekka (s96). The last three were Guðmundur Bjarnason (s97) at Bjarnastaðir, Jón Bjarnason (s94) at Máskelda and Sveinn Sturlaugsson (s90) a little bit further away at Kleifar in Gilsfjörður. Whether Jón and Guðmundur were brothers is unknown.

2) In the Skriðdalur area there were four men who received rewards for production, Árni Jónsson (s51) at Haugar in Skriðdalur, district officer Sigmundur Sigurðson (s54) at Geitdalur and his brother Rustikus (s55) Sigurðsson at Arnhólsstaðir along with Jón Jónsson (s56) at Geirólfsstaðir. Whether there was any family connection between Árni and Jón is unknown. One man, Guðmundur Sturluson (s59) at Mjóanes in Vellir, was also registered for a reward. As his farm was at the mouth of Skriðdalur very close to the other farms he was included in the cluster selection. Einar Kortsson (s63) at Ás in Fell also

received a reward. However, as Ás is on the other side of the wide Lagarfljót river about 6 km NNE of Mjóanes he was not included in the cluster, although there may well have been communication across by boat.

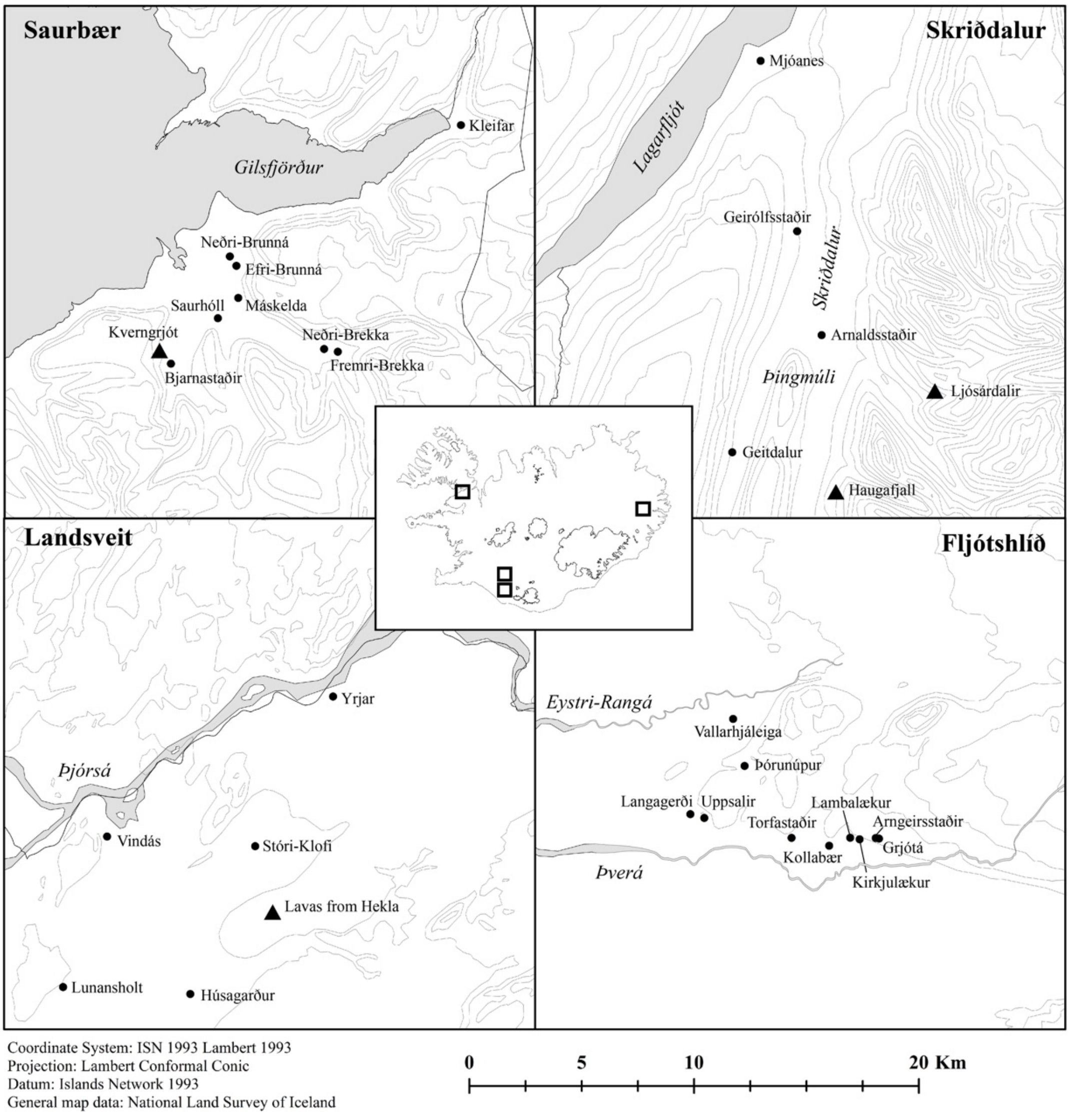


Figure 5.11. Four historical examples of intimate family connections within four clusters of quern masons who received rewards for, or likely took part in, the revival of quernstone production in the late 18th century. The triangles represent potential material procurement sites.

3) In the Landsveit area there were also eight men named. Two of them were district officers, Jón Bjarnason junior (s33) at Vindás and Þorvaldur Jónsson (s31) at Stóri-Klofi. Another man, Þórður Vigfússon (s32), was also registered at Klofi (possibly Litli-Klofi). Two pairs live on the same farm, Einar Jónsson and Eiríkur Magnússon (s26 and s27) at

Húsagarður and brothers Bjarni Tómasson and Jón Tómasson (blind)[25] at Lunansholt (s28 and s29). Only one man, Guðmundur Símonarson (s30) at Yrjar, does not seem to be connected to the others in any obvious way other than being their neighbour.

4) In Fljótshlíð ten men were registered. Two of them were district officers, Bjarnhéðinn Sæmundsson (s17) in Langagerði and Guðni Jónsson (s15) at Þórunúpur. Guðni was part of the only father and son team in the area with his son Andrés Guðnason (s16) who also lived at Þórunúpur. One other pair was recorded on the same farm, Sveinn Þorvarðarson and Magnús Jónsson (s11 and s12) at Kollabær. The rest of the men were Páll Brynjólfsson (s13) at Torfastaðir, Guðmundur Bjarnason (s14) in Vallarhjáleiga, Guttormur Bergsteinsson (s18) at Uppsalir and Guðmundur Sigurðsson (s19) at Arngeirsstaðir. In 1783 Ásmundur Eyjólfsson (s20) at Grjótá, Sveinbjörn Þorleifsson (s21) at Kirkjulækur and Sæmundur Einarsson (s22) at Lambalækur were also suggested to be the most likely up-and-coming quernstone masons in the area. These were all farming neighbours in Fljótshlíð.

Note that all these men are in clusters around 20 km in diameter (see discussion above), with the majority of other seemingly single participants more than 15 km away (see also other potential clusters e.g. from the mouth of Svarfaðardalur out to Ufsaströnd s72 and s80-81, Hörgárdalur/Öxnadalur s76-79, and under Eyjafjöll s38-42, each cluster including at least one district officer; Figure 5.4; Table 5.2). The formation of these initial clusters is more than likely strongly connected to relatively easy access to useful raw materials in larger quantities compared to the other areas where only one or two farmers and/or craftsmen are recorded, as they could support more quernstone masons (see further discussion of raw material procurement in Chapter 7). There are also hints that those who participated and received rewards were related and/or otherwise well connected, i.e. that they were people who supported/had special connections to their sheriff and/or district officers. The government officials seem to have used the opportunity to give themselves and their family members, and possibly their followers, a leg-up to earn the offered rewards before anyone else. The clusters also clearly demonstrate how information and influence initially spread between family members and neighbouring farms through local, daily communications (i.e. *the neighbourhood effect*). Some award winners were district

[25] Some readers may perhaps wonder how a blind man would be able to make a quernstone but this author sees no reasons why he could not if his brother took care of the material procurement. Sound and touch will have played a big part in working with stone, especially during the finishing stages. Everyone had to find a way to pull their load.

officers but alongside them were also general farming craftsmen (isl. *smiðir*) and farmers, as well as a few farm hands, that all likely took on quernstone production on a moderate local scale (see further details of quern production and raw material procurement in Chapters 6 and 7). The seemingly sparse participation of the more active and/or more specialised farming craftsmen (e.g. blacksmiths, carpenters and metalworkers) in quernstone production could potentially be due to the fact that they already had plenty of work to do in connection with their own area of expertise. Or perhaps they were simply not thought to need rewarding, they certainly would have been able to make their own quernstones.

Through time, new such hubs and clusters will have popped up all around the island where useful raw materials were found to be accessible. Where raw materials where scarce or quickly depleted, such hubs will have remained small or diminished and disappeared. Long-term traditions in quern masonry will have developed in areas where raw materials were found in enough quantities for long term exploitation. There may also have been initial clusters of quernstone use that formed around influential owners of foreign quernstones. Information and experiences will have continued to spread out from such hubs in a wavelike spread as Hägerstrand described (*neighbourhood patterns*) and form new ones through random jumps beyond, both geographically through population movement and through the spreading wave of neighbourly and/or familial communications.

At least some later quern masons will have taken up quernstone masonry as a partial source of income, likely taught by a close male relative. No clear changes can be detected in the social class or age distribution of quernstone masons known from the 19th century compared to the 18th. Only two men were found in the 1835 and 1840 censuses (Table 5.2; s1 and s2) recorded specifically as quern masons. Therefore, it could be suggested that taking on quernstone masonry as a full-time profession was likely never viable. One of the quern masons was indeed also recorded as a fisherman. The story of Einar Friðriksson (Table 5.2; s69) demonstrates however, that it could indeed make a fruitful extra addition to the household economy. Both census-recorded quern masons were born in the 1760s, which would have made them around 10 years old at the beginning of the quernstone revival. And both were living at Reykjanes close to slowly expanding trading posts and fishing stations in Keflavík, Hafnarfjörður and Reykjavík, where raw materials were easily accessible, and demand may perhaps have justified making it at least a partial profession. Further discussion of indigenous raw material procurement sites can be found in Chapter 7.

5.4. Conclusions

The main aim of this chapter was to define the Icelandic quern masons' social position and influence and estimate their level of craft specialisation and geographical reach. Running Icelandic farms and crofts always required basic experience in handicraft. Icelandic cottage industry was mainly practised during the winter, but essentially any and every opportunity was used for such work. Through varied farm work routines (which largely revolved around sheep herding), and general religious practices, most Icelandic farms were strongly socially connected both to their neighbours and to adjacent districts, despite primitive road systems and a rudimentary postal service. Regular long-distance travel of the workforce between fishing stations in the West and the main farming regions in the North and Southwest maintained constant connections between the regions. The regions east of Vatnajökull, i.e. Múlasýslur and Skaftafellssýslur, were more isolated from the rest of the island but yet likely fairly well connected internally. The public was allowed to produce anything they could to use as currency in trade and exchange to make their way in their daily life and on their travels, but only about 5-10% of the male population had an opportunity to be farming craftsmen and take handicraft to higher levels to generate extra revenue, serve their neighbours and thereby slowly bettering their position within society.

Icelandic men specially classified as craftsmen in historical sources, seem to have been from all walks of life, ranging from 20 up to 80 years of age. They are described as district officers, stewards, landless tenants, freelancers, hired hands and farm hands, crofters, and most commonly, as tenant farmers. Even priests were known to boost their income with handicraft. The craftsmen were for a long time only generally classified professionally based on the raw materials they mainly worked with (e.g. various types of metal or wood) rather than on specialised tasks, excepting perhaps church and boat builders, although they will no doubt haven taken on other handicraft work on the side. Few had the means to pay for or had access to apprenticeships abroad, so craftsmen were commonly either self-taught or handicraft education was provided by fathers and/or other close family members/benefactors.

Craftsmen could demand higher salary and work for shorter periods of time than regular farm hands. However, only the two bishoprics and the wealthiest church and tenant farms needed or could afford to have craftsmen in their service on a more permanent basis and therefore craftsmen could neither practise nor teach handicraft to any significant degree without finding work either at those richer farms, which were few and far between, or by heading a household on a farm large enough to support and/or employ enough offspring/labourers to take care of the time consuming farm work to sustain the family on their behalf. For this reason, most craftsmen were also the heads of tenant farms and men with talent, opportunity and drive to practice handicraft had better chance than others to make their way, and to a certain extent work their way up in society through their work. These farming craftsmen mainly worked from home but could cross county lines for their work and travelled occasionally, e.g. to local district and county assemblies and the official trading posts, and some even travelled to Alþingi at Þingvellir, for trading opportunities. Their working environment and area of influence was roughly estimated to have been mainly within a 20 km radius around their home-farm, although it was certainly not restricted to that area alone and may well have extended at least a further 50-100 km on occasion.

The 18th century quern masons were mainly farmers in charge of, or workers associated with, regular tenant farms of average affluence (11-30 hundred), and most of them seemingly lacked specific craft specialisation. A few were named as general craftsmen and ~15% of the quern mason group were district officers, but very few quernstone masons were clearly connected to church farms. This suggests that regular Icelandic tenant farmers and farming craftsmen had the required tools and skill to take on the quernstone production without much difficulty. Many church farms likely received a free imported quernstone during initial project execution and were more likely to be able to buy one, and therefore craftsmen associated with them may not have had to take active part in the production revival. Everyone; sheriffs and district officers, priests, farming craftsmen, tenant farmers, crofters and farmhands, had at least some active part to play in successful acceptance, whether it was information and/or product distribution, experimentation and production, or just general use.

However, the final decision to accept the innovation pair in the long run may have also depended on the innovation itself; its complexity, need and possibilities for continued reproduction, its price and its usefulness to the people who were introduced to it. To be able to reproduce the Icelandic quernstone locally, tools and raw materials were needed.

What remains now is to consider in more detail the make-up of the Icelandic quernstone assemblage and the logistics of quernstone production and its use in the home. The increase in quernstone use, both imported and indigenous, and the multiple crafting farmers producing querns for the first time in many separate counties around the island must have affected future quernstone typology and the pre-existing quernstone designs in some detectable ways.

~ Chapter 6 ~

The Icelandic Quernstone Assemblage: Updating an Island Branch of an Age-Old Appliance

In previous chapters it has been discussed how the revival of Icelandic quernstone production was started through governmental direction and public participation in the late 18th century, complementing the increased import of unground grain. According to historical sources foreign quernstones were imported to guide Icelandic craftsmen in their work during the initial stages of the production revival. Only one source, however, tells of a quernstone being exported. In the late 19th century, farmer Björn Gíslason from Haugsstaðir in Vopnafjörður moved his family to Minnesota in the United States, taking along with him his loom and his quernstone (Jón B. Gíslason, 1956, pp. 102-105). The quernstone proved very handy to Gíslason and his neighbours in the following years but whether it was foreign or Icelandic, decorated with pride or merely plain and functional, is unknown. This is a problem often encountered while reading historical descriptions of indigenous quernstone production; details of raw material sources and quernstone typology are either very vague or simply non-existent.

In this chapter the aim is to go back in time all the way to the late 9th century for an analysis of the whole Icelandic quernstone assemblage up to the early 20th century. Although the focus is mainly on the late 18th/early 19th century quernstone production revival it is important to consider the general extent and development of all Icelandic quernstone production and import of foreign quernstone types before and after 1750 to estimate the extent of quernstone preservation and identify late-18th century changes in raw material use and Icelandic quern typology after the revival (see Chapter 2 for methodology and the Icelandic Quernstone Catalogue at www.opinvisindi.is for basic information on the whole assemblage). The first section discusses the general nature of the quernstones' appearance in Iceland as it was formed with indigenous raw materials from the beginning of permanent settlement in the late 9th century and follow its trail in historical documents up to the mid-18th century. The second section gives an overview of the assemblages' raw material types and their quality. In the third section the typology is considered in more detail and in the two final sections the quernstones are classified by appearance and the various types arranged according to age, before the assemblage is finally split into two pre- and post-18th century groups and compared.

Icelandic rotary quern production can essentially be traced back to the beginning of permanent habitation in the late 9th century. In the Middle Ages imported quernstones mainly originated in Norway, at least between the 12th-15th centuries when trade connections were strong and indigenous cereal cultivation was still alive in the South and Southwest. After the mid-18th century quernstone revival however, they were also imported potentially from Sweden and continental Europe. Indigenous production methods were never totally lost due to the continuous exploitation of imported malt and wild lyme grass in Vestur-Skaftafellssýsla, but clear changes can still be detected in the Icelandic quernstone assemblage before and after the mid-18th century. The changes are mainly represented in 1) lowered grinding surface height, 2) increased variation in modern handle and rynd fittings, and 3) a clear shift in decoration motifs. It is likely that these changes are mainly connected to foreign design influences from imported raw quernstone models, and the participation of many colourful craftsmen with little previous experience in indigenous quernstone production. Emphasis shifted away from very small-scale manufacture of malt querns for a few of the most affluent farms; and the somewhat isolated lyme grass quern production in Vestur-Skaftafellssýsla expanded into island wide utilitarian manufacture of barley/rye querns for public use. It is unlikely however, that many of the first quernstones made or imported after 1770 have been preserved. The Icelandic assemblage demonstrates that there may well be at least a 50 year blank and the dating of the youngest quernstones is too general to support any detailed picture of speed of acceptance or patterns of geographical spread during this 150-year period of quernstone production. Therefore, the assemblage can only be used to support the quernstones long-term acceptance and ubiquity reported in 19th and 20th century historical sources.

6.1. The Pre-1750 History of Quernstones in Iceland

6.1.1. The Initial Diffusion of the Rotary Quernstone to Iceland

Mankind has been making use of Earth´s geological resources since the beginning of the Stone Age roughly 2,5 million years ago. *Saddle querns* appeared with the cultivation of wild cereals in the Near East and later spread into Europe and over to Britain in the Neolithic period. *Rotary querns* or *mills* (Figure 6.1) had appeared in Spain at least as early as the 6th and 5th centuries BC, in Britain by the 4th century BC, and in Scandinavia by the 2nd century AD (Peacock, 2013, p. 54; M. Watts, 2002, pp. 25-33). By the time

Iceland was settled in the late 9th and 10th centuries AD organized production of rotary quernstones had already been in place in Norway (mainly mica schist) at least since the beginning of the 8th century AD in Hyllestad (Grenne et al., 2008, p. 64, and figure 30) and in the Eifel Region in Germany (vesicular basalt) since the La Téne period (500-1 BC; Röder and Crawford, 1955, p. 68). Even though they were still using *metates* and *manos* in North America, a totally unrelated context to continental Europe, materials like vesicular basalt were also sought after for grinding stones for example in the Phoenix Basin in Arizona in the early 12th century AD, and people were willing to travel some distance to get it (20-35 km; Stone, 1994, p. 681 and 687). In the Viking Age (late 8th to the early 12th century) Scandinavians travelled enormous distances looking for new places to colonise, trade and raid for a hundred years before the settlement of Iceland. They sailed southeast to the Netherlands, Germany, France and Great Britain and even further afield east into the Baltic, to Russia and south to modern day Istanbul, (G. Jones, 1984, pp. 145-311; Sindbæk, 2010a). Mayen quernstones from the Eifel region in Germany have been found on manufacturing sites in many of the main emporia that prospered during the Viking Age; Hedeby (Schön, 1995), Dorestad (Kars, 1980; Parkhouse, 1976), London (Freshwater, 1996), Ipswich and York (Parkhouse, 1997, p. 102), as well as on a number of other smaller sites in North Western Europe, Denmark and South Western England (Parkhouse, 1997; Schön, 1995). Rotary querns could therefore well have been imported to Iceland with the settlers in the second half of the 9th century.

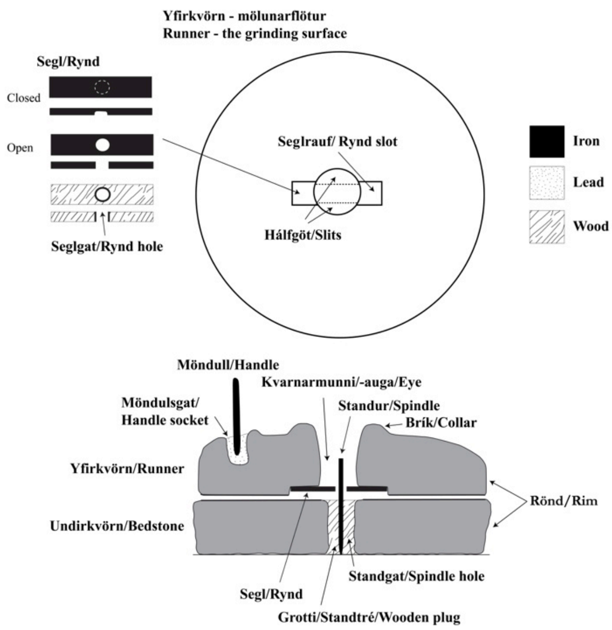


Figure 6.1. Diagram presenting the terminology used to describe a rotary quernstone and its basic components in Icelandic and English.

The settlement of Iceland has been debated extensively for a long time, but it is considered likely that initially after the first settlers arrived in Iceland their main goals were to strengthen their hold on land claimed and to increase their domestic livestock herds and agricultural production. The primary import in the first year, and later growing of grain on site (most likely largely barley although indications of rye and oat production have also been found in Iceland), would possibly have been one of the more important elements in the settlers' nutrition (Carelli and Kresten, 1997, p. 109; Gunnar Karlsson, 2009, pp. 155-167; Helgi S. Kjartansson, 1997, pp. 24-25; Orri Vésteinsson, 2006; Orri Vésteinsson et al, 2002, pp. 125-130). This suggests the potential need to import at least an initial '*settlers kit*'[26] of foreign rotary quernstones for a number of families/groups from the land of origin (e.g. Norway, Denmark and the British Isles). During the Settlement and Commonwealth periods (Table 6.1) Iceland's main trading connections

Table 6.1. Names for the main time periods used in the text, especially in connection with the quernstone classification.

Period	**Year AD**	**The main lines in Icelandic history**
Proto-settlement	Pre-870	Human presence but limited or no permanent settlement
Settlement	870-930	Iceland is settled permanently on a large scale
Commonwealth	930-1262	Iceland is a separate polity dominated by an oligarchy of chieftains, period of Christianisation
Middle Ages	1262-1550	Iceland becomes a Norwegian dependency, strong presence of English and German fishermen and traders before the early 17th c.
Early Modern	1550-1750	The Reformation and the age of humanism, renewed interest in Icelandic history and the nations origins. Danish Trade Monopoly from 1602.
Modern	Post-1750	From the birth of the New Enterprises and the start of the Enlightenment period up to the present day.

were with Norway before the arrival of English fishing vessels in the early 15th century (Gelsinger, 1981, pp. 149-180; Gunnar Karlsson, 2009, pp. 265-283), so Norwegian querns would be most likely to show up in Icelandic archaeological excavations. However, while Icelandic rotary querns have been unearthed from 9th-12th century contexts (both whole querns and fragments; Table 6.2) in Iceland on at least fifteen sites (Table 6.3 and further discussion below), no imported querns have yet been found from that period.

In her research into quernstone production at Hyllestad in Norway, Dr. Irene Baug (2015a, p. 148) pointed out a very tantalizing little titbit in the Icelandic *Landnámabók* (*Book of Settlements*; "ÍF I," 1986, pp. 116-117):

> "*Sigurðr svínhöfði var kappi mikill; hann bjó á <u>Kvernvágaströnd</u>. Herjólfr son hans var þá átta vetra,* […]

[26] See Forster's work (2004) on soapstone.

Herjólfr fór til Íslands í elli sinni ok nam land milli Búlandshöfða ok Kirkjufjarðar."[27]

In translation this micro-story tells of Sigurður pig head (or pig promontory), who lived in an area (or farm) called Kvarnarvogaströnd (Kvern/Quern - vogur/cove - strönd/shore) in Norway and had a son named Herjólfur. In his old age Herjólfur moved to Iceland, presumably in the late 9th/early 10th century, and is said to have claimed land between Búlandshöfði and Kirkjufjörður in northern Snæfellsnes. Landnámabók is thought to have been written originally in the early 12th century but only younger copies from the 13th and 14th centuries remain (Sverrir Tómasson and Guðrún Nordal, 1992, pp. 292-305). The reliability of the information the later versions provide is disputed, but according to Baug (2015a, p. 148) historians Finn Førsund and Ottar Rønneseth suggested that the place name Kvernvogaströnd could refer to the Hyllestad area and its quernstone production, opening up the possibility of a direct link between an area in Norway well known for quernstone production and the new settlement in the middle of the Atlantic. Norwegian quernstone production only became more standardized in the Viking Age and earlier quernstones in Norway were made from many varied rock materials manipulated for localised use (Baug, 2015a, pp. 13-14). The settlers of Iceland could therefore well have had potential, or even direct experience, in making their own querns, and the Icelandic quernstone assemblage suggests that they did. It is of course impossible to add any details to this historical hint, but the transport of the rotary quernstone across the Atlantic (whether it was physical and/or ideal), and its reproduction in Iceland, is a classic example of how material culture was sometimes diffused through human agency to a previously unpopulated area where it continued to change and evolve.

6.1.2. The Last Querns Standing after a Medieval Shift

Cereal cultivation (mainly barley) was practiced in Iceland from the time of settlement in the late 9th century but as the Middle Ages passed this cultivation slowly died out, and by the Early Modern Period malt querns and lyme grass querns were likely the last querns standing. Gunnar Karlsson (2009, pp. 155-166) has constructed a clear overview of the

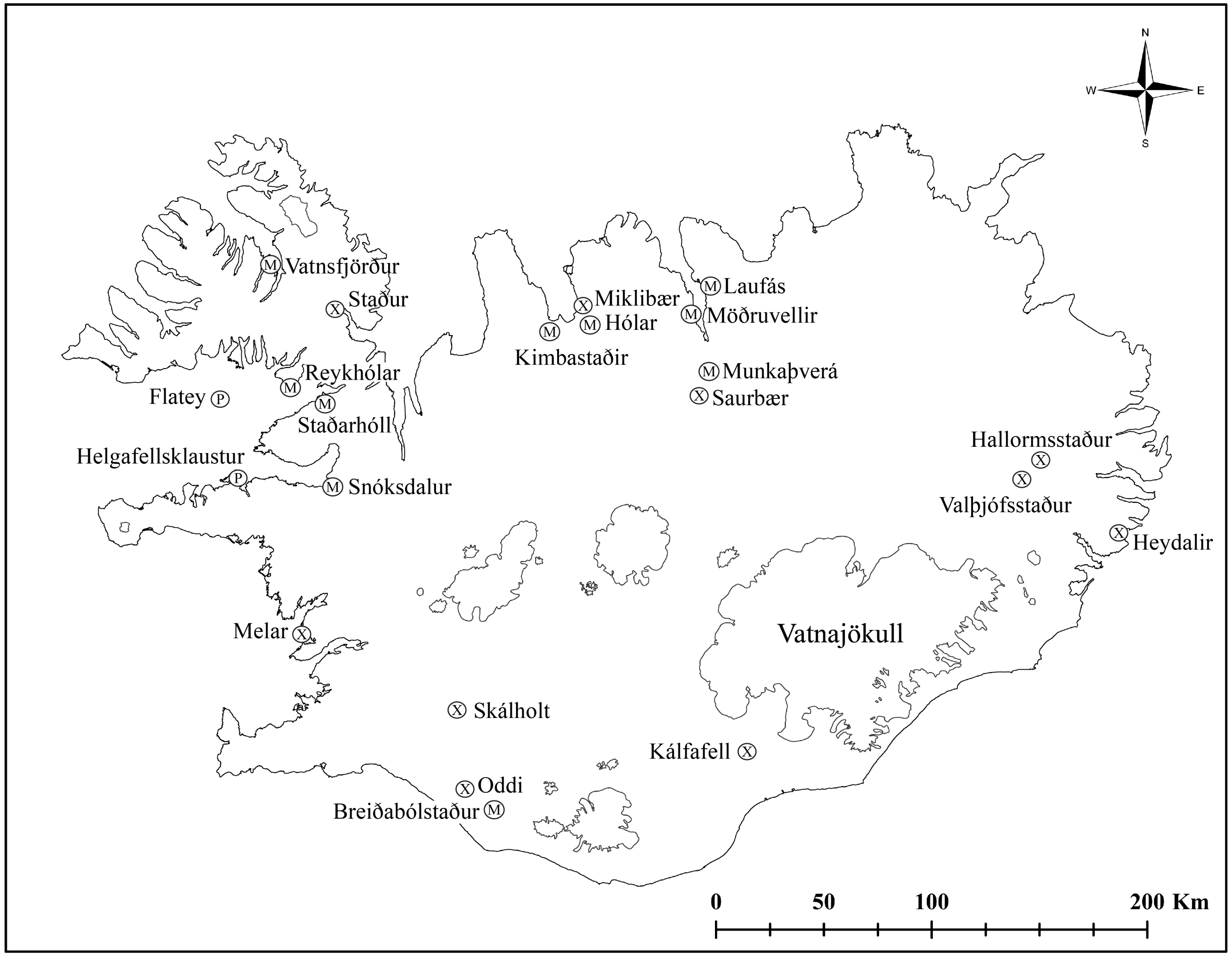
[27]The quote is recorded from Sturlubók (S80), one of five existent copies of Landnámabók. In Hauksbók and Melabók the place name is written Kven- (womanly) and Kvín- (whistle/moan), variants that are thought to be later distortions.

subject of Icelandic cereal cultivation from the Settlement Period to the late 16th century, based on historical, geological and archaeological research in Iceland. Following Karlsson's synthesis, indigenous cultivation was likely attempted for a time around the whole island from the 9th century but as the 10th century passed it seems cultivation largely died out in the North and the East fairly quickly. Cultivation continued in the Westfjords and all the way southeast into Skaftafellssýslur into medieval times, but it slowly became confined to the southern parts of the island, from Reykjanes in the southwest into Skaftafellssýslur. Early in the 14th century fish became a highly sought-after commodity and the presence of foreign trade contacts grew in the 14th and 15th centuries (mainly English and later German replacing trade with Norway). It is considered likely that a shift of labour from agriculture to fishing, and the increased availability of cheap imported meal, pulled the legs permanently from under any remaining indigenous grain cultivation. Not to mention the plague that also swept through the nation in the early 15th century (Gunnar Karlsson, 2009, pp. 155-166). As early as the mid-14th century, abbot Arngrímur Brandsson at Þingeyrar in the Northwest commented that only barley cultivation remained in a few places in the South (*Byskupasögur III*, 1953, p. VIII and 150; Sverrir Tómasson and Guðrún Nordal, 1992, p. 351). Historical documents and paleoecological research e.g. close to Reykholt in Reykholtsdalur in the West support this, as barley cultivation there seems to disappear in the 12th century (Egill Erlendsson and Edwards, 2010, pp. 41-44; Guðrún Sveinbjarnardóttir et al., 2007, pp. 202-203, and figure 8 p. 199). Two late 16th century accounts, the former written by Oddur Einarsson bishop of Skálholt in the South (Oddur Einarsson, 1971, pp. 9-11 and 126-127) and the later by Arngrímur Jónsson (1985, p. 20 and 140), scholar at Hólar in the North, suggest that cereal cultivation was alive 'in a few places' in the South of Iceland at the beginning of the Early Modern Period (Gunnar Karlsson, 2009, p. 164). However, the accounts are very vague and there is no mention of the cereal types supposedly cultivated. It is equally likely that the texts are referring to exploitation of wild, lyme grass in Vestur-Skaftafellssýsla, rather than cultivation of barley.

As cereal cultivation declined, quernstones in Iceland likely became less frequent. Documentary sources on import commonly mention meal (isl. *mjöl*), e.g. in the mid-13th century as a trade commodity from/through Orkney, and perhaps as early as the mid-11th century from Norway as famine aid (Gunnar Karlsson, 2009, pp. 240-241). Regulation of large scale milling by the ruling classes (both ecclesiastic and secular) was already well established in Southern Scandinavia, England and continental Europe by the 13th century

(Bennett and Elton, 1899; Jessen, 2017), and hand querns were even banned in places to safeguard mill owners' rights (Bennett and Elton, 1898, pp. 210-221). However, it did not suit the ruling classes in Norway to ban the use of hand querns in any way as quernstones and mill stones were a valuable commodity, both for indigenous use and export and there is no indication that their trade suffered through hand querns being banned elsewhere (Baug, 2015a; 2015b, pp. 34-35). Norwegian querns were specially produced for a long period of time between the 8th and early 20th centuries. The greatest output was in Hyllestad near Bergen from the 10th century, and in the Saltdal area in northern Norway from the 12th century (Saksenvik mainly 12th-14th, Setså 13th-14th), up until the mid-14th century when the plague struck Norway and all production decreased dramatically (Grenne et al., 2008). Therefore, while Icelandic indigenous cereal cultivation was still alive in the South and Southwest in the 12th-14th centuries, Norwegian quernstone production was also doing well. As any large scale export of cereals will have likely been under the control of the more affluent ruling classes who also owned/ran the larger grain mills, whether they were in Norway, Denmark or anywhere else, it is perhaps not surprising that import to Iceland was in the form of meal rather than unground cereal. As Icelandic cultivation declined in the 14th and 15th centuries imported meal became the norm and quernstones will have become largely obsolete, excepting the lyme grass querns in Vestur-Skaftafellssýsla in the Southeast. However, brewing and import of malted barley also continued (Gísli Guðmundsson, 1928, pp. 7-43; Guðbrandur Jónsson, 1943, pp. 94-109) and so the need for malt querns necessary to bruise the malt before use (Matthews and Lott, 2013 (1899)) remained as well.

The *Diplomatarium islandicum* (DI) contains preserved Icelandic documents and letters from the period 834-1590 AD. A list of all texts in the collection mentioning quernstones, malt and maltquerns can be seen in Table 6.2 and the geographical distribution of these in Figure 6.2. The earliest source mentioning a quernstone is an inventory of the monastery at Helgafell (isl. *Helgafellsklaustur*) dated to 1186, mentioning a '*kvern*' as part of its equipment. In *Vilchinsbók* the inventory of the church holdings in Flatey in Breiðafjörður from 1397 includes a '*kvern og lvdur*' [a quern and its foundations, *lúður*]. Another interesting source dating to 1476 contains a testimony regarding a supposed robbery of the church at Miklibær in Skagafjörður where almost everything was taken except the quernstone. In the 16th-18th centuries malt querns are



Coordinate System: ISN 1993 Lambert 1993
Projection: Lambert Conformal Conic
Datum: Islands Network 1993
General map data: National Land Survey of Iceland

Ⓟ Quernstones mentioned in 12th-14th century sources
Ⓧ Quernstones mentioned in 15th-16th century sources
Ⓜ Maltquerns mentioned in 15th-16th century sources

Figure 6.2. 12th-16th century documented querns.

Table 6.2. Collection of Icelandic texts in Diplomatarium islandicum mentioning quernstones and malt querns in the 12th-16th centuries.

Year	Document	Quote	Source	Comments
1186	Recorded holdings of Helgafellsklaustur [monastery]	"xxc. i busgagne oc husbuninge. oc þeim gæþom sem innan veggia ero. kvern oc selnet."	*DI I*, 1857-1876, p. 282	Whether quote refers to a quernstone is mildly questionable as it is mentioned side by side to a net for catching seals
1277	Records regarding king Magnús Lawmender and archbishop Jón the Red, Norway, in the old Skálholtsbók c. 1360	"Af viði ollum skal tiund greiðaz. af sallti oc kvernbergi."	*DI II*, 1893, p. 154	Here made clear that the word 'kvern' is definately used for quernstones (kvernberg/quern rock)
1397	Vilchinsbók, recorded holdings of Jónskirkja [church] in Flatey in Skálholtsstifti	"glodarkier. elldbera oc kiertistikur ij. kluckur ij oc biollur ij. bakstursjarn. kvern og lvdur."	*DI IV*, 1897, p. 152	A quernstone (kvern) on its foundations (lúður).
1420	Price setting of commodity in Vestmannaeyjar	"vj tunnur mallz firir hundrat."	*DI IV*, 1897, p. 276	6 barrels of malt for a hundred
1476	Testimonies regarding a robbery of Miklabæjarkirkja in Skagafjörður	"j kirkivnne ... kista læst. Önur olæst. avrk. net. kvern."; "var hier allt j brutv gripit ok tekit ur kirkivnne þetta sem adr er skrifat nema ein kvorn."	*DI V*, 1899-1902, pp. 813-814; *DI VI*, 1900-1904, p. 78	Quernstone left in the church robbery
1479	Recorded holdings of Gufudalskirkja	"sira jone æ stad psalltara. jolabok ok eina kuern."	*DI VI*, 1900-1904, p. 203	Possibly a quernstone
1503	Recorded holdings removed from Vatnsfjarðarkirkja	"Svo miced bvsgagn burt haft vr vazfirde sem hier seger malltkvern. mvstardzkvern. tvær pipars kvennar."	*DI VII*, 1903-1907, p. 638	The earliest mention of a malt quern
1508	Recorded holdings west of Þorskafjarðar-heiði, ownership of Björn Guðnason´s father	"xv alna tialld miog gamallt. roted og bætt. malltkuern og mustardzkuern. þetta alt fyrir ijc."	*DI VIII*, 1906-1913, p. 266	Malt quern
1520	Holdings of Hallormsstaðarkirkja in Skógar	"Ad avk var Brandreid : kuern : tialldtautur rifid"	*DI VIII*, 1906-1913, p. 769	Possibly a quernstone
1525	Sigurðarregistur, holdings of Hóladómkirkja	"J steikarahusi ... ij. katlar litler. ein eggiapanna. eitt mortel. iiij. katlar. ein maltkuern."	*DI IX*, 1909-1913, p. 299	Malt quern
1525	Sigurðarreg., holdings, Munkaþverárklaustur	"ein malltkuern j malunarkofa."	*DI IX*, 1909-1913, p. 307	Malt quern in a grinding shack
1525	Sigurðarreg., holdings of Möðruvallaklaustur	"mustardzknern. [svo] piparkuern. og maltkuern."	*DI IX*, 1909-1913, p. 318	Malt quern
1525	Sigurðarregistur, holdings of Saurbæjarkirkja	"Þetta innan gátta .ij. ... kuern. ... piparkuernur."	*DI IX*, 1909-1913, p. 329	Possibly a quernstone
1540	Records of bishop Gissur Einarsson regarding holdings at Skálholt see	"iiij tiorutunnur. vi biktunnur. ij jarnfot. kuern. lxx eikibord. x grenibord. ij mioltunnur."	*DI X*, 1911-1921, p. 526	Possibly a quernstone, 2 barrels of meal

1541	Letters of bishop Gissur Einarsson at Skálholt see	"Jtem j vestari tradaskemmu ij smiortunnur og lijtid lausasmior. Jtem v tunnur miaulz med iij eingielskum. ... Jtem handkuern. ... Jtem sueifarjarn fra kuirn."	*DI X*, 1911-1921, p. 630	5 barrels of meal, 3 of them English, handquern and one turning iron from a quern
1548	Recorded holdings of Skálholt cathedral and its distribution after Gissur dies	"Jtem kuern."; "Jtem j gullskemmu. ... ij tunnur miols þyskar. og adrar ij Engelskar. ... Jtem kvern." On p. 652, 1 stone hammer (steinklappa) and grinding stone (hverfusteinn)	*DI XI*, 1915-1925, pp. 620, 652, 656-657	1 quern, 2 barrels German meal, 2 barrels English meal.
1547	Holdings of Staðarhólskirkja in Saurbær	"en maltkuern."	*DI XI*, 1915-1925, p. 548	Malt quern
1550	Recorded holdings of Hólar cathedral after bishop Jón Arason was executed	"Jtem i fatabure ... fimm tunn(u)r miols. tuær tunn(u)r mallz. j. tioru tunna. ... ij. malltkuorn ... mustardskuern"	*DI XI*, 1915-1925, p. 853	5 barrels of meal, two barrels of malt, 2 malt querns
1553	Recorded holdings of Breiðabólstaðarkirkja in Fljótshlíð	"Jtem innann stocks ... ein malltkuern. ... huerfisteinn. ... ij klabrýni."	*DI XII*, 1923-1932, p. 651	Malt quern
1554	Breiðabólstaðarkirkja, recorded holdings	"Jtem i Ambodum. ... Jtem ein kuern."	*DI XII*, 1923-1932, p. 784	Likely same malt quern
1553	Holdings of Oddakirkja at Rangárvellir	"Jtem innann stoks ... kuern."	*DI XII*, 1923-1932, pp. 652-653	Possibly a quernstone
1556	Recorded holdings of Reynisstaðir monastery	"mioltunna so nær. ... Piparkuörn ... vijsad til malltkuarnar a Kimbastöðum."	*DI XIII*, 1933-1939, p. 141	Malt quern at Kimbastaðir
1557	Holdings of Kálfafellskirkja in Fljótshverfi	"kuern."	*DI XIII*, 1933-1939, p. 264	Possibly a quernstone
1559	Holdings of Laufáskirkja in Eyjafjörður	"piparkvörn lasin. ... malltkvörn."	*DI XIII*, 1933-1939, p. 407	Malt quern
1560	Recorded holdings of Valþjófstaðakirkja	"Jtem innan stoks. ... jc kuern.	*DI XIII*, 1933-1939, p. 558	Possibly a quernstone
1562	Recorded holdings of Heydalakirkja	"kuern og huerfusteinn ad auk."	*DI XIV*, 1944-1949, p. 30	Likely a quernstone
1563	Recorded holdings of Melakirkja	"eirn hverfusteinn, ein kvern."	*DI XIV*, 1944-1949, p. 97	Likely a quernstone
1564	Recorded holdings of Snóksdalskirkja	"j Sueinaskemmu ... Jtem ij malltkuarner."	*DI XIV*, 1944-1949, p. 225	2 malt querns
1568	Holdings of Staður in Steingrímsfjörður	"ein kuern gomul og klofrifinn j gegnum."	*DI XV*, 1947-1950, p. 108	An old, broken quernstone
1569	Recorded holdings of Hólar cathedral	"malltkuern"	*DI XV*, 1947-1950, p. 217	Malt quern
~1570	Gíslamáldagar, holdings of Vatnsfjarðarkirkja	"ein malltkuern og mustardzkuern."	*DI XV*, 1947-1950, p. 566	Malt quern
~1570	Gíslamáldagar, holdings of Reykhólakirkja	"Jtem ... eirn jarnkall og mallttkuern."	*DI XV*, 1947-1950, p. 590	Malt quern
~1570	Gíslamáldagar, holdings of Staðarhólskirkja	"malltkuern."	*DI XV*, 1947-1950, p. 592	Malt quern
~1570	Gíslamáldagar, holdings of Hrunakirkja	"Jtem malltkuern gømul."	*DI XV*, 1947-1950, p. 650	Malt quern

named in a few high-status locations in connection with brewing. Sites include the governors' residence at Bessastaðir at Álftanes (*JÁM III*, pp. 192-219) and the bishops' residences at Skálholt (Table 6.2; Bergsteinn Jónsson, 1958, p. 86) and Hólar, the monasteries at Munkaþverá and Möðruvellir, and vicarages at Vatnsfjörður in Ísafjörður, Staðarhóll in Saurbær, Breiðabólstaður in Fljótshlíð, Laufás in Eyjafjörður, at Snóksdalur in Miðdalir, Reykhólar in Reykhólasveit and Hruni in Hrunamannahreppur. The sources mentioning Bessastaðir are early 18th century accounts recording tenant obligation for various farms in Gullbringusýsla to grind malt at Bessastaðir. The accounts only indicate the presence of a malt quern at Bessastaðir indirectly but there is no reason to suppose Bessastaðir did not have one (see further discussion below).

According to Þórðar saga kakala in Sturlunga, as Þórður takes over the holdings of Snorri Sturluson on his return to Iceland from Norway in 1247, he removes a large amount of malt from Bessastaðir and takes it with him to Reykholt (*Sturlunga Saga*, 1946a, p. 84). This is the oldest contemporary Icelandic source identified indicating the presence of malt on the island (late 13th to 14th century; Sverrir Tómasson and Guðrún Nordal, 1992, p. 309). Only the 1556 inventory for the monastery (isl. *klaustur*) at Staður in Reynisnes in Skagafjörður mentions a malt quern at a neighbouring low status tenant farm called Kimbastaðir. It is possible that the malt quern from the monastery ended up there when the monasteries were abolished during the Reformation around 1550 and all their assets scattered far and wide. Or perhaps the farm's purpose was partly to grind the malt and/or brew alcohol for the monastery, as some form of a monastic grange perhaps. The quernstones said to belong to Skálholt (Table 6.2) are not specifically named as malt querns, but as they are clearly recorded alongside multiple barrels of imported German and English meal (isl. *miol*/*mjöl*) it seems likely that they were used to bruise malt rather than grind barley or rye to meal. In the late 16th century bishop Oddur Einarsson (1971, p. 126) at Skálholt (1559-1630) mentions indigenous ale made from thrashed barley (isl. *hýtt bygg*) boiled in Icelandic springwater. As we look back to Chapter 4 bishop Finnur Jónsson in Skálholt revealed the presence of a malt quern in his bishopric made from indigenous materials, supporting their presence at or near Skálholt in the late 18th century. This could suggest that the thrashed barley bishop Oddur mentions, might just have been processed in an Icelandic malt quern.

None of the 16th century sources (Table 6.2) name a quernstone (isl. *kvern*) and a malt quern (isl. *malltkuern/maltkvörn*) side by side, but they do mention non-specific querns (isl. '*kvern/kuern*') at Staður in Steingrímsfjörður, Oddakirkja (vicarage, isl.

kirkja; en. *church*) at Rangárvellir, Valþjófsstaðakirkja and Hallormsstaðakirkja in Skógar both in Fljótsdalur, Saurbæjarkirkja, Kálfafellskirkja in Fljótshverfi, Heydalakirkja and Melakirkja. These querns are more likely to be malt querns as well, although it cannot be discounted that the querns at e.g. Oddi and Kálfafell could be querns for grinding barley, as grain cultivation is thought to have survived longest in the southern parts of the island.

Unfortunately, while all these documentary sources indicate the presence of either quernstones or malt querns, again it is unclear which materials they were made of and whether they were foreign or indigenous. Icelandic materials were likely used from the beginning of permanent settlement, so import of Norwegian quernstones would not really have been necessary. Foreign querns still do make an appearance in the quernstone assemblage in the South (see further discussion below), while indigenous cultivation was still alive. It could be suggested that Norwegian querns were mainly imported to Iceland in the Commonwealth and early Medieval Periods between the early 12th and 14th centuries (Figure 6.3), beginning when Norwegian mercantile, religious and political

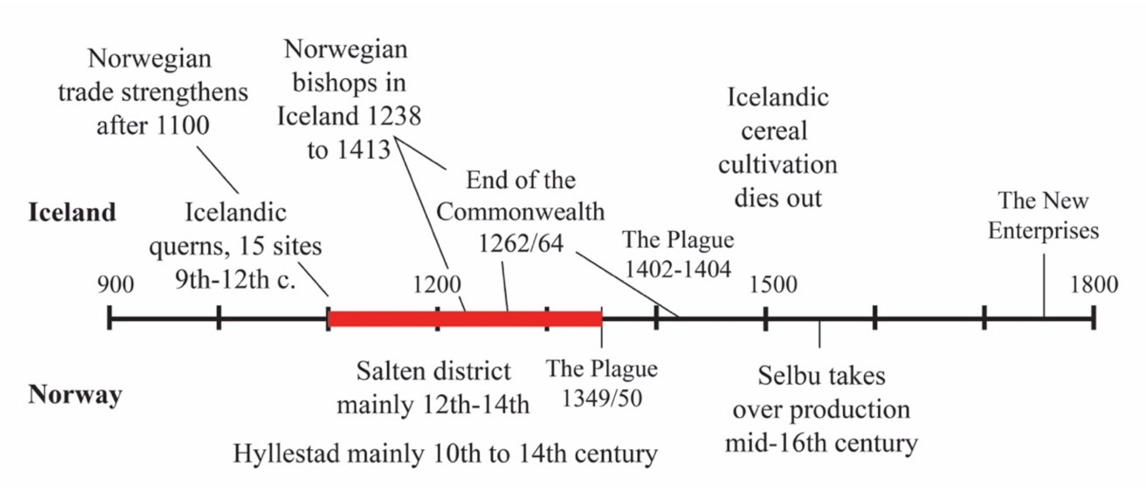


Figure 6.3. Icelandic and Norwegian historical developments compared with regards to import of Norwegian quernstones that are most likely to be found in Icelandic archaeological contexts between the 12th and 14th centuries.

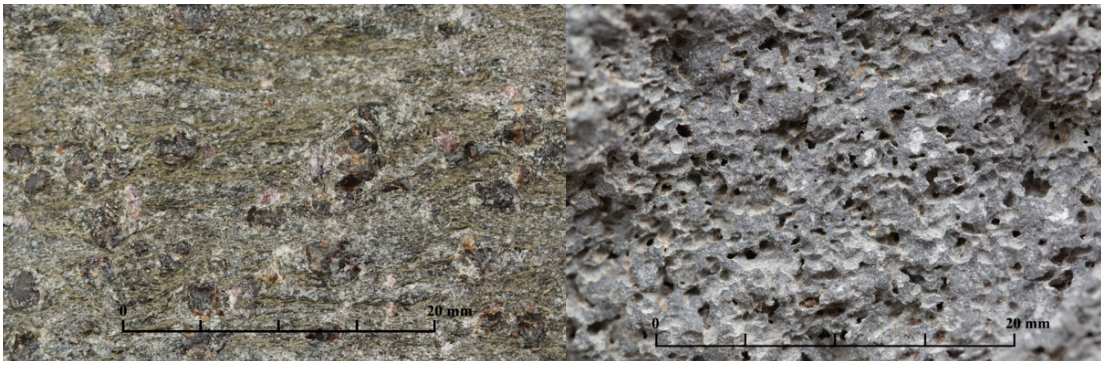
influences became stronger in Iceland (Gunnar Karlsson, 2000, pp. 79-99; Helgi Þorláksson, 2017, pp. 41-48); ending as the plague struck Norway and its quernstone production took a serious hit, and the English slowly took over Icelandic trade. The Norwegian production was very slow in getting back on its feet and never really reached its former glory until the mid-16th century when the Selbu production took off (Grenne et al., 2008). Meanwhile imported meal became the norm in Iceland between the 12th and

15th centuries, until the late 18th century (see Chapter 4). Only malt querns as aid in brewing (which could have been either imported or indigenous), and indigenous lyme grass querns in Vestur-Skaftafellssýsla in the Southeast, likely remained in use in Iceland past the 16th century.

6.2. The Serviceable Icelandic Grinding Stone Materials and their Quality

In general, suitable material for grinding stones like querns needs to be hard enough to resist disintegration, and preferably retain sufficient surface roughness during friction or grinding over a period of time. Greater resistance to disintegration means more durability of the grinding stone and less contamination of the ground product. The ability to retain surface roughness for long periods also means less need for manual redressing or pecking of the surface and therefore even less loss of rock material (Delgado-Raack et al., 2009, p. 1824; Parkhouse, 1997, p. 97; Schneider, 2002, pp. 390-392; Searcy, 2011, pp. 82-83; Stone, 1994, p. 682). In 2009 Delgado-Raack et al. published the results of an analysis on the material characteristics (e.g. mineral composition, density, porosity, hardness, cohesion, texture and particle orientation) and mechanical behaviour of the most common materials used in *grinding stones* (including quernstones). These materials included *sandstone, vesicular basalt, garnet mica schist, gneiss, gabbro, hornfels* and *conglomerate*. The materials were subjected to tests involving friction on solid and lubricated steel surfaces containing a corundum abrasive and the researchers also evaluated the degree and potential to develop or maintain surface roughness, in essence to try and determine "*the abrasive capacity of the rocks*" (Delgado-Raack et al., 2009, p. 1827). They concluded that the two materials endowed with the highest resistance to friction as well as the ability to maintain a good surface roughness were *vesicular basalt* and *garnet mica schist* (Delgado-Raack et al., 2009, pp. 1828-1830; Figures 7.4 and 7.5). *Vesicular basalt* was deemed marginally better than the *mica schist* when both qualities were considered together, but while the basalt developed much higher values of surface roughness, the mica schist had the advantage in resisting friction (least volume (cm^3) lost) albeit only marginally (Delgado-Raack et al., 2009, p. 1829 and figure 4). Vesicular basalt stones constantly sharpened themselves and therefore seldom needed dressing (furrows/pecking; Bergsteinn Jónsson, 1958, p. 40; Searcy, 2011, pp. 82-83).

Few of these suitable types of grinding stone materials are found in Iceland (Delgado-Raack et al., 2009, pp. 1825-1826; Kristján Sæmundsson and Einar Gunnlaugsson, 2002; Schneider, 2002, pp. 385-389). Some conglomerates, ignimbrites



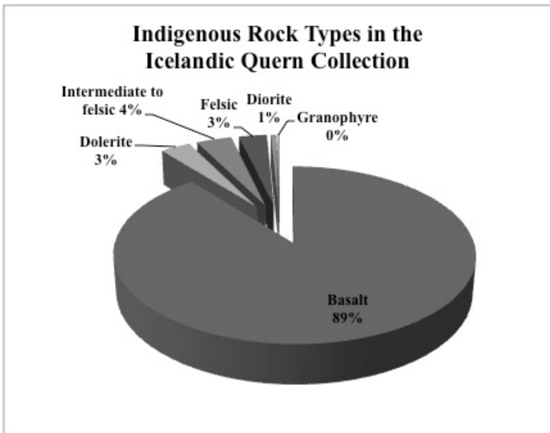
Figures 6.4. and 6.5. Imported staurolite biotite schist (left) from Selbu in Norway, quern from Stuðlar in Reyðarfjörður, Suður-Múlasýsla (courtesy of Baldvin Baldvinsson, Reyðarfjörður). Finely vesicular basalt (right), quern from Botnar in Meðalland (courtesy of Kjartan Ólafsson, Botnar), Vestur-Skaftafellssýsla. Photographs by Sólveig G. Beck.

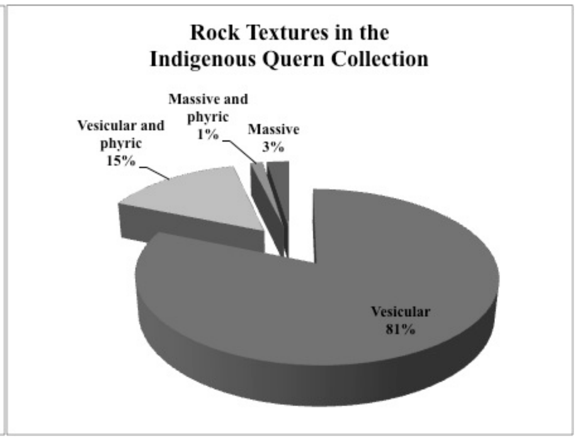
and red inter-basaltic sediments and rocks can be found on the island and large quantities of tuff (i.e. lithified tephra), but most of these rock types are likely too soft and/or too inaccessible to have been useful for quern production (see further discussion of raw material availability in Chapter 7). The softer materials would break apart easily and contaminate the meal too much, which leaves only the igneous lava rock types. The Icelandic quernstone assemblage is comprised of 490 whole querns and fragments. About 75% (n=375) of those querns are likely made of indigenous materials, while the rest of the assemblage is foreign import. The foreign group is comprised of 71% mica schist finds from Norway[28], mainly from the Middle Ages up to the early 20th century, along with 16% sandstone querns (most likely from Sweden) and a few querns of foreign vesicular, volcanic rock (13%, likely from mainland Europe, e.g. Germany) that are likely modern imports (see further discussion below).

When we look at the indigenous quernstone *raw material types* in more detail (Figure 6.6) it becomes clear that they can be grouped into basic rocks (mainly basalts and dolerite 92%), possible intermediate and/or acid rocks (undiagnostic rock types of lighter colours and diorite, 4.5%), and acid rocks (potentially rhyolite and/or trachyte and granophyre, 3.5%). It is very likely that some quernstones made of intermediate rock types (e.g. dacite,

[28] From the Selbu area southwest of Trondheim in Mid-Norway (52 modern querns), Hyllestad north of Bergen in West Norway (4 querns and 27 fragmented finds) and the Saltdal area in Northern Norway (6 finds; Gurli B. Meyer, NGU, personal communication, 2015 and 2019).

hawaiite or islandite) have been generally classified as basalt as no chemical analyses have been done, but the acid rocks are easily identified due to their lighter colours (yellow, red and/or green). The acid rocks are also lighter and softer than the more metal





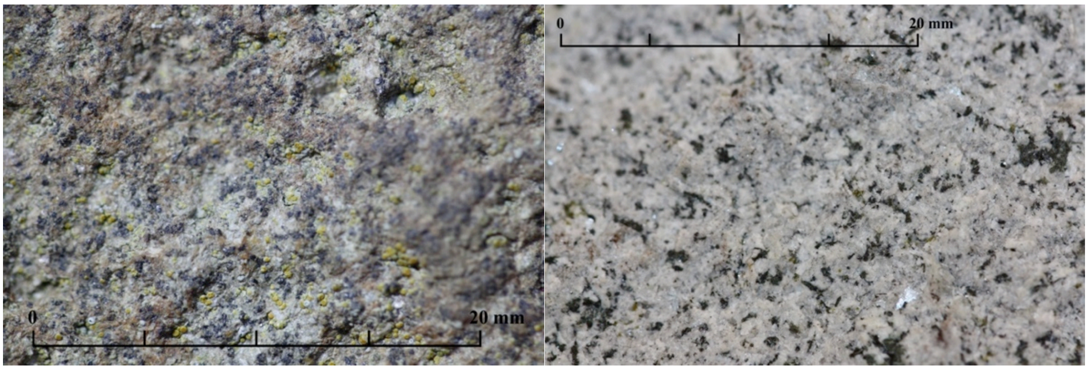
Figures 6.6 and 6.7. The Icelandic quernstones and their rock types and textures.

rich basalts. Over 95% of all the Icelandic querns are also vesicular[29] (Figures 6.4 and 6.6). Vesicular rock forms when lava solidifies without the gasses in the lava being able to escape, thus forming gas bubbles or vesicles in differing quantities in the matrix (Þorleifur Einarsson, 1968, pp. 63-90). When the *textures* in the indigenous rock assemblage are considered in more detail, over 80% of the quernstones are vesicular, fine to very fine-grained volcanic rock and 15% are vesicular and phyric volcanic rock, largely likely basalt. The vesicles in the quernstones are commonly <5-10 mm in diameter and roughly estimated between 20-40% of the matrix, often closely set and of similar size range. Where clear size graduation could be detected within the used rock, the finer vesicles were always at the grinding surface. The phyric querns rarely had more than 2% macrocrysts (mainly olivine and/or feldspar) in the matrix. Only 4% of the assemblage is massive rock types and within that group are four, coarse-grained querns made of plutonic or intrusive rocks, i.e. granophyre, dolerite[30] and two querns possibly made of diorite (Figures 6.8 and 6.9). *Vesicular basalt* was the most commonly used indigenous quernstone material in Iceland and, as the research of Delgado-Raack et al. (2009) showed, it was one of the best materials to use in grinding stones. As foreign mica schist stones were also most common of those imported it seems that Icelanders had the two

[29] Querns of volcanic rock were defined as *massive* when rock groundmass was mainly fine to very fine grained rock, *vesicular* when vesicles in the groundmass were larger than 1 mm and >5% of the matrix, and *phyric* when the fine to very fine rock matrix contained >2% macrocrysts (commonly olivine and/or feldspar) larger than 1 mm in a much finer matrix and easily visible to the naked eye.
[30] Both fragments were analysed at the Icelandic Institute of Natural History.

best materials for grinding grain at their disposal. Where good raw material could be found for one quernstone pair, and the stones were well cared for, each quern could last for 70-80 years or more (Delgado-Raack et al., 2009, p. 1830; Sæmundur Magnússon Hólm, 1958 (1781-1782), p. 134). Therefore, Icelandic farmers will not have needed more than 1-2 good pairs in a lifetime.

Vesicular igneous rock has been used in quernstones for centuries. German Mayen lava quernstones from the Eifel region were quarried and distributed over Northwestern Europe, Denmark and England[31], from the Halstatt Period (800-500 BC) up to the 20th century (Major, 1982, p. 195; Parkhouse, 1997, p. 103; Pohl, 2011; Röder and Crawford, 1955, p. 70; Schön, 1995, pp. 96-107). Even Icelanders knew of their fame in the 18th and 19th centuries as they compared them to Icelandic rocks from Vestur-Skaftafellssýsla and Norður-Múlasýsla, although they did not seem to find the indigenous materials to be inferior quality (*SHÍB 1839-1874*, 2000, p. 42; E. Ólafsson and Pálsson, 1943, p. 155).



Figures 6.8 and 6.9. Coarse grained, massive rock, from Sleðbrjótssel in Jökulsárhlíð, Norður-Múlasýsla (courtesy of Guðmundur Ármannsson, Vað, Skriðdalur), possibly diorite (left) and granophyre (right) from Hlíð in Lón, Austur-Skaftafellssýsla (courtesy of the Icelandic Institute of Natural History). Photographs by Sólveig G. Beck.

Such querns have therefore been mass-produced and widely distributed since long before Iceland was settled (~AD 870) and to this day vesicular basalt is a preferred material in grinding stones such as metates among the Maya in Central-America (Searcy, 2011, pp. 55-57). One substantial source has been found in Iceland so far with information on the practicalities of making an Icelandic quernstone. In 1780 scholar Sæmundur Magnússon Hólm from Vestur-Skaftafellsýsla described how to make a quernstone from scratch, where he stated that the rock needed to have 'many small eyes':

[31] All the modern, foreign basalt querns found in Iceland could possibly be from this area, but this has not been confirmed.

‘*The quern is made of two lava flagstones, which can be found mainly at lava skerrys* [in lava plains]*, where rock is flat <u>with many eyes</u>* [vesicles] *but is not bluestone* [isl. blágrýti, very fine grained and hard, dark coloured basalt lava]. *The rocks or flagstones are best, which have never frozen, and is that much more enduring/tough* [seigara] *than the other. In those flagstones, found in the earth there are often cracks/flaws, but in the others there are not. If the quern is to be good, the whole flagstone should have <u>small eyes all over</u>* [vesicular]*, about 1½ alin*[32] *width and length or littler more than a* kvartil *or most 1½*[33] *in thickness, while it has not been hewn. Two of those flagstones are needed for the lower and upper quern.* […] *For the upper quern a finer rock is used. Then he* [the craftsman] *starts by hewing the rims, and checks whether there are any secret flaws, which he feels through the hammer and from how hewn flakes scatter from under the hammerhead. When there is a flaw, he should make the rims round, but do nothing else, and when that is ready, he makes an iron band and tightens it around it, as much as he can. With this method it is possible to take two lava flagstones and fit them together, when wide enough rock is unavailable.* […] *When the quern dulls, she should be sharpened with care, so as not to chip away the surface too roughly. For this men have a small hammerhead or a piece of flint, and preferably the rock should be struck into the remaining furrows* [í glyttið].’ (Sæmundur Magnússon Hólm, 1958 (1781-1782), pp. 132-134)[34].

However, Sæmundur Magnússon Hólm also warns the Icelandic masons to beware of any flaws in the rock, and suggesting that vesicular basalt was one of the best grinding materials is only part of the story, or as Rutter and Philip (2008, p. 353) have clearly stated: “*even chemically similar basaltic rocks show a great deal of variability in behaviour, due almost exclusively to physical variations in the rock*”. Searcy (2011) explains that when metateros in Modern Central-America look for vesicular basalts for metates, 1) vesicle density, amount and size, 2) phenocryst inclusions and 3) other flaws or fractures within the rock, are the most important parameters they have to consider in order to get a good product from their work. Stones with more vesicles are considered easier to work but stones with a moderate amount last longer, so a balance has to be reached. Stones with large phenocrysts are avoided as they could cause the stone to fracture during production or use, or later contaminate the food. Hidden fractures could be detected by testing the stones’ resonance by tapping it with another stone (Searcy, 2011, pp. 55-57). The textures observed in the Icelandic quernstone assemblage do

[32] 1 alin about 63 cm, 1½ alin about 94 cm.
[33] 1 alin is 4 kvartil or 24 þumlungar, 1 kvartil about 16 cm, 1½ kvartil about 24 cm.
[34] Translated from Icelandic by this author.

suggest that raw materials with large phenocrysts[35] or vesicles[36] and those affected by hydrothermal alterations were indeed avoided. Searcy also describes how inclusions (likely e.g. phenocrysts or amygdales) could cause the stone to fracture in the wrong way during the rough-out or finishing stages and this could, at least partly, be what Sæmundur Magnússon Hólm means when he discussed how the craftsman should monitor the stones' flaking tendencies (Sæmundur Magnússon Hólm, 1958 (1781-1782), p. 132; Searcy, 2011, p. 56). Raw materials used in Iceland were often scattered rocks that had been weathered and exposed to the elements for a long time (see further discussion of material procurement in Chapter 7) so it is likely that inner flaws could not always be avoided. Sæmundur Magnússon Hólm stated that the flagstones were to be transported home '*with care'* and described how rocks with flaws could be bound together with iron girdles, and Þorsteinsson (1944, pp. 16-17) stated that the quernstones produced from materials originating in Geitland were put in '*irons*'. It is likely that "*to put them in irons*" simply meant to fit them with a handle and a rynd, both often made of iron in modern times, but the iron mentioned could also have referred to thin iron girdles[37] like those Sæmundur Magnússon Hólm described, strapped around the quern's outer rim to keep it together. This was likely uncommon however, as only fourteen quernstones preserved whole in the Icelandic assemblage were fitted with iron bands. Six of them had at some point broken in 2-3 pieces, while the rest were fractured around the rim, often close to the handle. Whether these stones were strapped before or after breakage is unclear, but it would not have been necessary to do so too often when working with Icelandic igneous rock materials.

6.3. Describing the Quernstone Assemblage

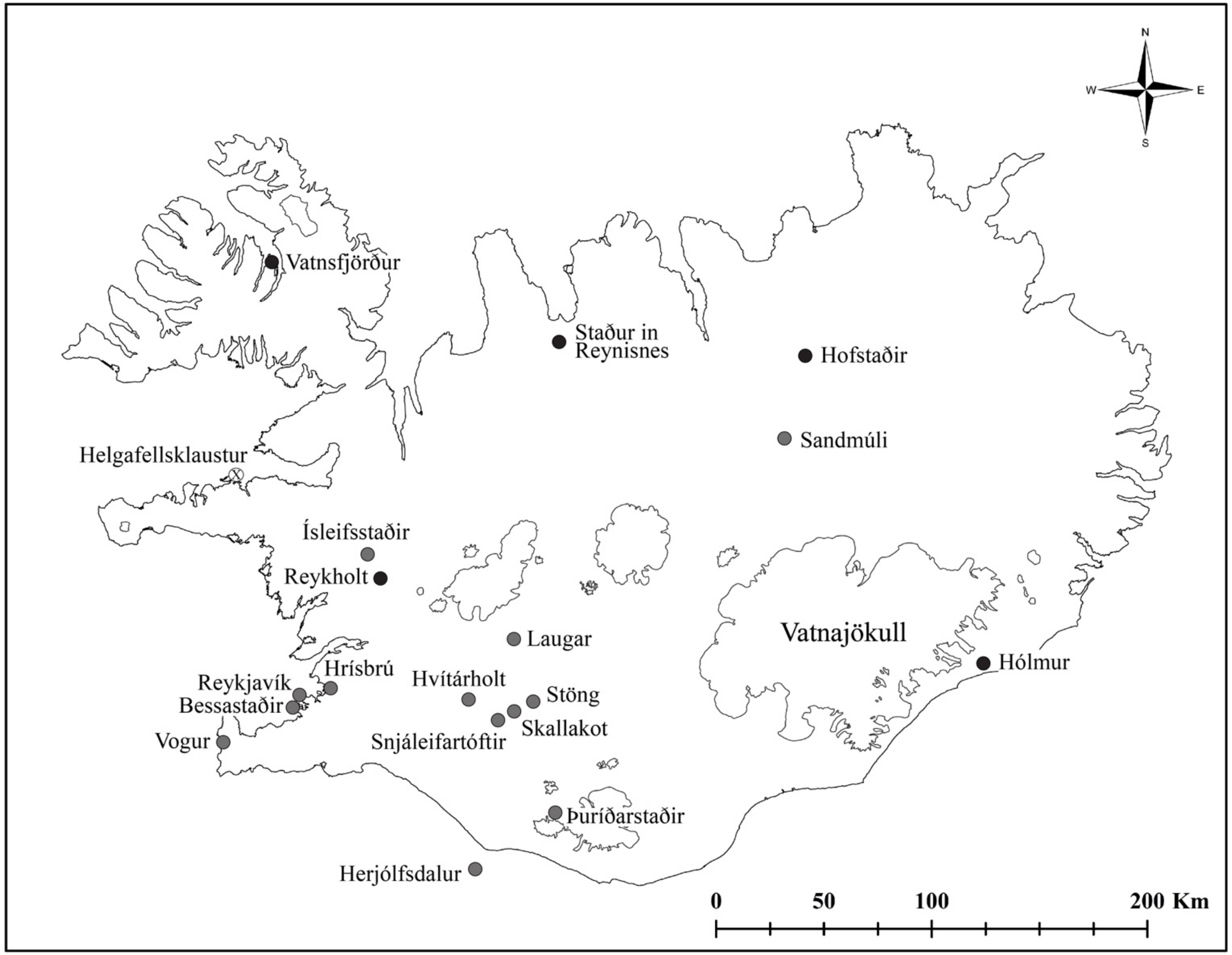
6.3.1. The Earliest Quernstones

About 40% of the quernstone assemblage (n=192) could be confidently connected with both a place of origin and a time period (Tables 6.3-6.5). Within that group of the assemblage foreign querns are ~30% and indigenous ~70%, very close to the local/foreign ratio of the whole assemblage (25%/75%). Thirty quernstone fragments made of Icelandic phyric and/or vesicular basalt, have been found on 15 sites in early Icelandic

[35] Very rarely >2-5% or larger than 2 mm, where they were found at all.
[36] Commonly <5-10 mm with fairly homogenous distribution, 20-40% of the matrix.
[37] Modern querns, girdle 2-3 mm thick, 1-2.5 cm wide, held together with 1-3 rivets.

contexts (Table 6.3; Figures 6.10 and 6.12) dating from the late 9th to the 12th century (or the Settlement and Commonwealth Periods), in places like Bessastaðir in Álftanes, Suðurgata 3-5 (Nordahl, 1988, pp. 113-114 and 139-148) and Lækjargata 10-12 (Lísabet Guðmundsdóttir, 2016-17, pers. comm.) in Reykjavík, Hrísbrú in Mosfellsdalur (Byock, Walker, and Zori, 2008, pp. 13-14 and 89), Hvítárholt in Hrunamannahreppur (Þór Magnússon, 1972), Herjólfsdalur in Vestmannaeyjar (Margrét Hermanns-Auðardóttir, 1982) and Vogur in Hafnir (Bjarni F. Einarsson, 2009, pp. 18-22, and figures 16 and 17). Their presence clearly suggests that within 100 years from arriving in Iceland the settlers were making use of indigenous materials to make rotary quernstones. It is also interesting to note that the majority of quernstones classified as massive and/or phyric come from this early period of manufacture, potentially suggesting that the early masons tried to transfer their pre-existing knowledge of rock textures, of e.g. massive mica schist rock with porphyroblasts, over onto the volcanic rock. This could indicate some level of initial trial and error in raw material use, as these materials would have been less durable than the fine-grained vesicular rock. One datable quernstone has also been found from this time period in the North at Sandmúli in Krókdalur from Icelandic rock (Figure 6.10, quern no. 410), which suggests that early querns were also made from local materials at some point in the North. One other very similar bedstone (403) has also been unearthed at Fremsta-Fell, along with another likely found close to Eyrarbakki (59) very similar to the Vogur quern (242; Figure 6.11; Table 6.5) but does not have a clear context and cannot be dated with any confidence.

This distribution of the earliest quernstone finds mainly mirrors research activity, which through the years has largely been concentrated in the Southwest. However, unground barley has also been found (albeit on a small scale) in 9th-early 11th century archaeological contexts but without quernstone finds, e.g. at Vatnsfjörður (Milek, 2011, p. 169) in the Westfjords, Skagafjörður (Trigg et al., 2009) and Hofstaðir (Lucas, 2009, p. 334) in the North, Reykholt in Reykholtsdalur in the West (Guðrún Sveinbjarnardóttir, 2012, pp. 52, 55 and table 6 p. 49) and Hólmur (Bjarni F. Einarsson, 2015, pp. 223-225) in the Southeast. As rotary querns have indeed been found in the earliest contexts in the Southwest, along with the single bedstone in the North, there is good reason to think rotary querns were also used in the West and East at this early stage. When settlement was abandoned, querns would likely be a household item that moved with the family (although smaller crofts were perhaps less likely to have one), and quernstone fragments have frequently been found reused in walls, paving and floors, which could account for



Coordinate System: ISN 1993 Lambert 1993
Projection: Lambert Conformal Conic
Datum: Islands Network 1993
General map data: National Land Survey of Iceland

● Icelandic quernstones from 9th-12th century contexts
● Barley from 9th-11th century archaeological contexts sans quernstones
⊗ Quernstone mentioned in a 13th century source

Figure 6.10. The geographical distribution of all known Icelandic quernstones from 9th-12th century archaeological contexts, and a few locations where charred barley has been unearthed in pre-11th century contexts without quernstones being found along with it (Table 6.3).

Table 6.3. The fifteen sites where the earliest Icelandic lava quernstones have been found and their contexts (see quernstone catalogue for more details on each quern).

Quern Catalogue Number	Site	Time of excavation/ publication	Context	Time Period	Material
296	**Bessastaðir, Álftanes**	1996	Floor at SW end of hall, peat ash layer	9th-10th century	Massive dolerite, very degraded
142	**Suðurgata 3-5, Reykjavík**	1988	Found on wood chip layer under a wall outside the oldest smithy and the hall	Early 10th century	Massive phyric basalt
144	**Suðurgata 3-5, Reykjavík**	1988	Wood chip layer close to the smithy and the hall	9th-11th century (?)	Vesicular basalt, decorated
146	**Suðurgata 3-5, Reykjavík**	1988	Courtyard, layer immediately under turf containing the Landnám tephra 871 $^{+}/-$ 2	9th-11th century	Vesicular basalt
242	**Vogur, Hafnir**	2009	Floor of hall, pavement area I	9th-10th century	Vesicular basalt
381	**Herjólfsdalur, Vestmannaeyjar**	1982	Hall II, broken roughout	9th-11th century	Vesicular basalt
382	**Herjólfsdalur, Vestmannaeyjar**	1982	Unclear, broken roughout	9th-11th century	Vesicular basalt
383	**Herjólfsdalur, Vestmannaeyjar**	1982	Unclear	9th-11th century	Phyric and vesicular basalt
384	**Herjólfsdalur, Vestmannaeyjar**	1982	Unclear, broken roughout of a runner	9th-11th century	Phyric and vesicular basalt
385	**Herjólfsdalur, Vestmannaeyjar**	1982	Unclear, broken roughout	9th-11th century	Phyric and vesicular basalt
386	**Herjólfsdalur, Vestmannaeyjar**	1982	Unclear	9th-11th century	Phyric and vesicular basalt
387	**Herjólfsdalur, Vestmannaeyjar**	1982	Unclear, broken roughout	9th-11th century	Phyric and vesicular basalt
389	**Hvítárholt, Hrunamannahreppur**	1972	In pavement in eastern end of long hall III	10th century	Vesicular basalt
390	**Hvítárholt, Hrunamannahreppur**	1972	Found in hall IX towards the north end	10th century	Vesicular basalt
392	**Hvítárholt, Hrunamannahreppur**	1972	Found in a test trench between halls III and IX	10th century	Vesicular basalt

393	**Hvítárholt, Hrunamannahreppur**	1972	Found in hall IX	10th century	Vesicular basalt
115	**Hrísbrú, Mosfellsdalur**	2008	East corner of central hall on top of the northern bench	10th-11th century	Vesicular basalt
116	**Lækjargata 10-12, Reykjavík**	2016	Ashy floor in the main hall, barley found in floor	10th-11th century	Vesicular basalt
134	**Lækjargata 10-12, Reykjavík**	2016	In the wall of hall, a disturbed context	Likely 10th-11th c.	Phyric and vesicular basalt
410	**Sandmúli, Krókdalur**	Found 1910, excavation 2005	Eroded farm stead at the mouth of Sandmúladalur, surface find	Likely 10th-11th c.	Phyric and vesicular basalt
366	**Stöng, Þjórsárdalur**	1943	Hall II by the door into IV	11th-12th century	Vesicular basalt
367	**Stöng, Þjórsárdalur**	1943	Floor of hall	11th-12th century	Vesicular basalt
379	**Skallakot, Þjórsárdalur**	1943	Two fragments found apart, one in southern part of main hall, other in house IV	10th-12th century	Phyric and vesicular basalt
394	**Þuríðarstaðir, Þórsmörk**	1983	Eroded farmstead, surface find	10th-12th century	Phyric and vesicular basalt
380	**Snjáleifartóftir, Þjórsárdalur**	1943	Eastern end of hearth in hall	11th-12th century	Vesicular basalt
314	**Ísleifsstaðir**	1943	Found in center of hall	9th-10th century?	Find lost, likely vesicular basalt
343	**Laugar, Hrunamannaafréttur**	1943	Badly eroded farmstead, surface find in 1945	11th-13th century	Vesicular basalt
357	**Alþingisreitur, Reykjavík**	2012	Wood charcoal layer, exact position unclear	Pre-1226 AD	Vesicular basalt
358	**Alþingisreitur, Reykjavík**	2012	By a hearth, exact position unclear	Pre-1226 AD	Phyric and vesicular basalt
359	**Alþingisreitur, Reykjavík**	2012	Unclear	Pre-1226 AD	Vesicular basalt

their absence in midden deposits. According to Baug (2015a, pp. 14-15) water mills with a vertical wheel had likely been introduced to Scandinavia as early as the late Viking Period (793-1066 AD). It is therefore not impossible that remnants of water mills could be found on 10th and 11th century settlement sites of higher status in Iceland. This could mean that grain was ground, and querns were kept in mills off the main settlement site closer to local creeks and rivers, although during high winter the mills would be useless, and querns would still have to be kept inside the farmhouse to prevent frost damage. Because of this millstones and hand querns (<50-60 cm in diameter) cannot be separated to any degree, as millstones often also had to have handles if anything should happen in the mill or if they needed to be used inside for parts of the year. If Norwegian quernstones were indeed not imported to the island to any degree until the mid to late Commonwealth Period (as per discussion above) it is unlikely that such querns will be found in the North or East, excepting malt querns, as by that time local cereal cultivation had already been largely abandoned and meal the common import. It is clear that mainly Icelandic quernstones have been unearthed in Icelandic 9th-12th century contexts, although there may potentially also be a few undated foreign fragments from this period that were unearthed at Bergþórshvoll in South-Iceland, which will be discussed in the next chapter.

6.3.2. Medieval and Early Modern Querns: Mixture of the Foreign and Indigenous

As previously discussed, about 75% of the whole quernstone assemblage is made of indigenous rock, while only 25% are foreign. Foreign quern fragments have been unearthed at eleven sites in pre-18th century archaeological contexts, all of them mostly well-worn fragments of materials from Hyllestad and Saltdal in Norway (~40% of all the mica schist stones; Table 6.4; Figures 6.11-6.12). Metamorphic and sedimentary rock materials used in quernstones are easily identified as foreign, as such rock types cannot be found in Iceland, but Norwegian querns have never been found in situ in Icelandic archaeological excavations. Icelandic and Norwegian quernstone materials (Tables 6.4-6.5; Figure 6.11) have only been found side by side at four of the sites, at Stóraborg and Bergþórshvoll, and possibly at Bessastaðir and Torfastaðir as well, although those querns could also have been used in the Modern Period. Of the six finds likely originating in the Saltdal area, two are from Kambur in Flói and Torfastaðir in Fljótshlíð where age and

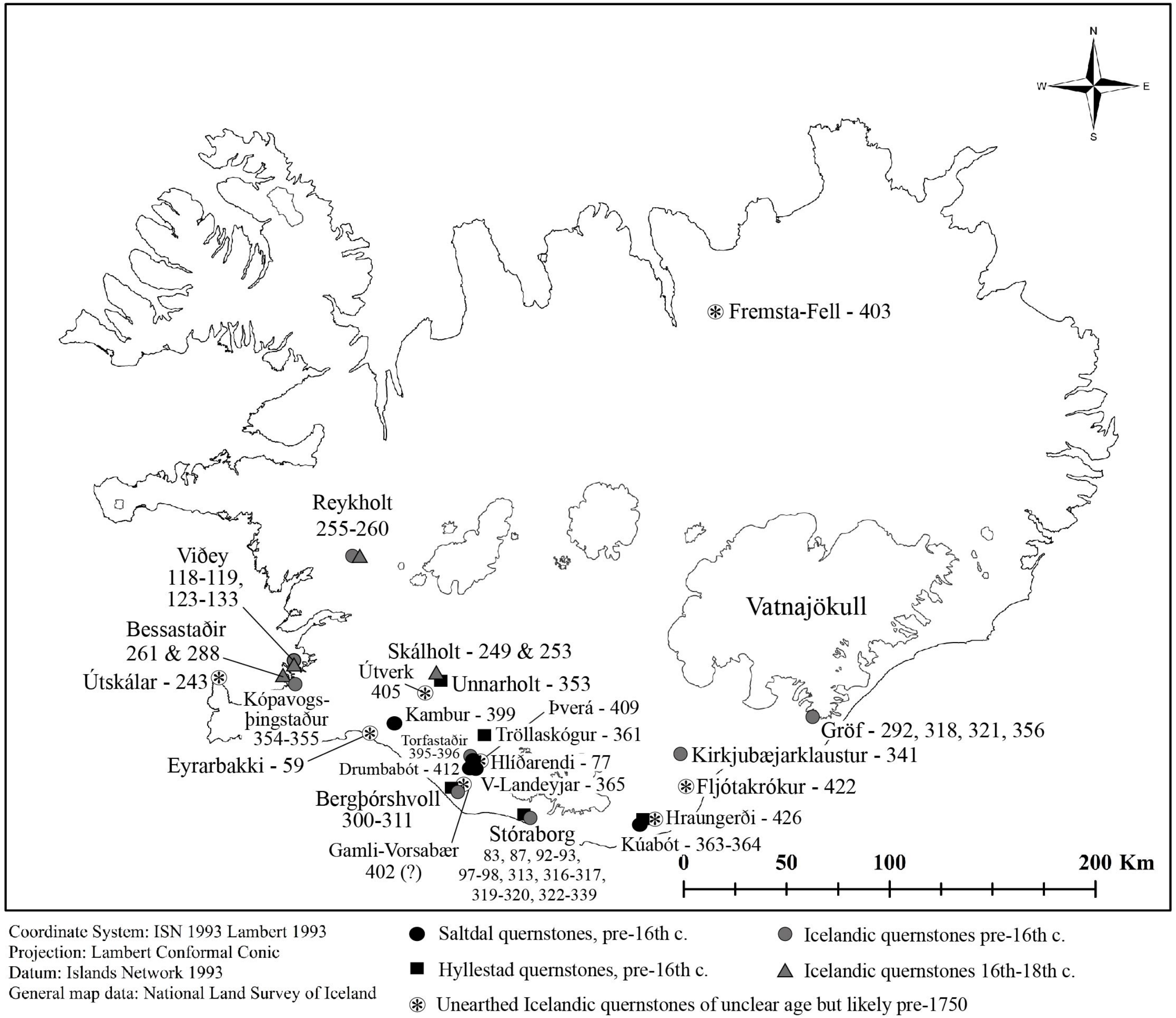


Figure 6.11. Geographical distribution of foreign and indigenous quernstones likely from the 13th to the 18th centuries. Foreign and indigenous quern fragments were only found side by side at Torfastaðir, Bergþórshvoll and Stóraborg. Quernstone fragments marked likely to be pre-1750 have an unclear context.

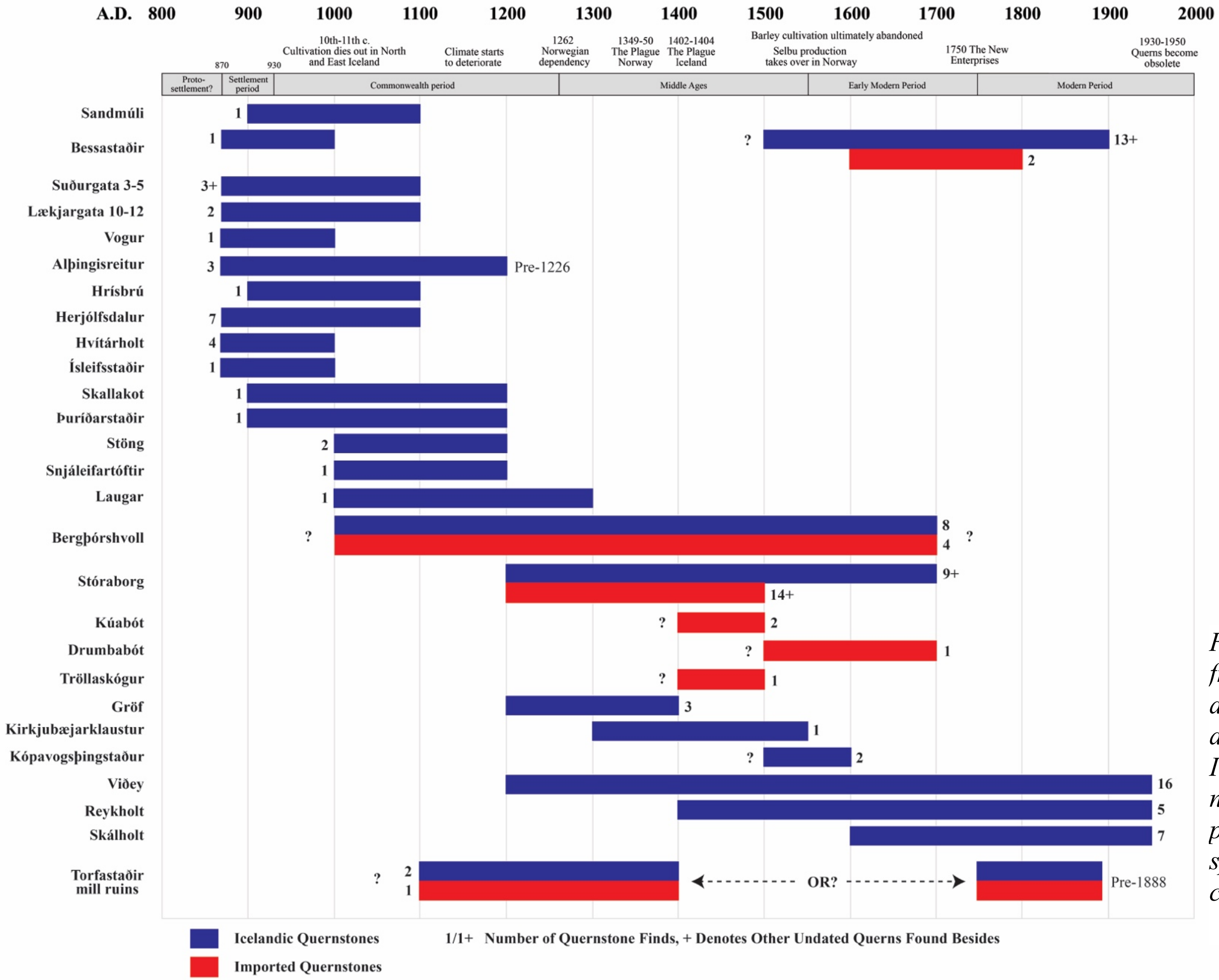


Figure 6.12. Quernstone fragments of indigenous (blue) and foreign (red) origin from archaeological sites in Iceland. Fragments have nowhere been allocated a potential time period of origin spanning less than 1-2 centuries.

Table 6.4. Norwegian quernstones and fragments found in Icelandic pre-18th century contexts (chemically analysed/? unconfirmed).*

Quern Catalogue Number	Site	Excavation/ publication	Context	Find type	Time Period of Context	Source
97	**Stóraborg**	-	Surface find at the eroded farm mound	Whole quern	Unclear, likely pre-16th c.	Hyllestad
98	**Stóraborg**	1978	Pit in an eroded area N of the cemetery	Whole quern	Unclear, likely pre-16th c.	Hyllestad
377	**Unknown**	Unclear	Unclear	Whole quern	Unclear	Hyllestad
307	**Bergþórshvoll**	1927-1931	Unclear	Fragment	Unclear, likely medieval or older	Hyllestad
309	**Bergþórshvoll**	1927-1931	Unclear	Small fragment	Unclear, likely medieval or older	Hyllestad
310	**Bergþórshvoll**	1927-1931	Floor of hall	Disk	Unclear, likely medieval or older	Hyllestad
311	**Bergþórshvoll**	1927-1931	Unclear	Fragment	Unclear, likely medieval or older	Hyllestad
313	**Stóraborg**	1964	Unclear	Two fragments	Unclear, likely medieval or older	Hyllestad
317	**Stóraborg**	1979	Surface find	Fragment	Unclear, likely medieval or older	Hyllestad
319	**Stóraborg**	-	Surface finds	33 fragments	Unclear, likely medieval or older	Hyllestad
320	**Stóraborg**	1981	Area south of the farm houses	Fragment	Unclear, likely older than 1500	Hyllestad
322	**Stóraborg**	-	Surface find at the eroded farm mound	Fragment	Unclear, likely medieval or older	Hyllestad
329	**Stóraborg**	1985	House 33	Fragment	Possibly 13th or 14th century	Hyllestad
331	**Stóraborg**	-	Surface find at the eroded farm mound	Fragment	Unclear, likely medieval or older	Hyllestad
332	**Stóraborg**	1988	Underneath wall in house 42	Disk	Possibly 14th-15th century	Hyllestad
334	**Stóraborg**	1989	House 18, low in the floor	Fragment	Likely 13th or 14th century	Hyllestad
335	**Stóraborg**	1990	Found west of house 53	Fragment	Possibly 14th or 15th century	Hyllestad
336	**Stóraborg**	1990	Found west of house 53	Small fragment	Possibly 14th or 15th century	Hyllestad
337	**Stóraborg**	1990	Found north of house 18	Small fragment	Possibly 13th or 14th century	Hyllestad
338	**Stóraborg**	1990	Found north of house 18	Fragment	Possibly 13th or 14th century	Hyllestad
339	**Stóraborg**	1990	House 54	Small fragment	Possibly 13th or 14th century	Hyllestad
353	**Unnarholt**	-	Found during construction	Fragment	Unclear	Hyllestad
361	**Tröllaskógur**	-	Surface find at abandoned farm mound	Fragment	Unclear, likely 15th c. or older	Hyllestad
77	**Hlíðarendi**	-	Unclear, likely found during construction	Fragment	Unclear, likely 16th c. or older	Saltdal
363	**Kúabót**	1972-1976	South bench in hall B	Fragment	Late 15th century or older	Saksenvik, Saltdal*
364	**Kúabót**	1977	Surface find	Small fragment	Late 15th century or older	Hyllestad
365	**V-Landeyjar**	-	Surface find at eroded farm mound	2 fragments	Unclear, likely 16th c. or older	Setså, Saltdal*
396	**Torfastaðir**	1888	Forgotten mill uncovered in 1888 along with Icelandic querns 395 and 397	Whole quern	Unclear, could be pre-16th c.	Saltdal area
399	**Kambur**	-	Unclear, likely found during construction	Fragment	Unclear, likely pre-16th c.	Saltdal area
412	**Drumbabót**	-	Surface finds at eroded archaeological site	8 fragments	Likely 16th-17th century or older	Saltdal area

Table 6.5. Likely 13th-17th century Icelandic quernstone finds.

Quern Catalogue Number	Site	Excavation/ publication	Context	Time Period (TAQ)	Material
118	**Viðey, Reykjavík**	1987/1991	Monastery/farmstead, two fragments found separately in hall M10 and in room M40.	14th-16th century	Vesicular basalt
119	**Viðey, Reykjavík**	1991	Monastery/farmstead, room M38/hall and corridor	14th-16th century	Vesicular basalt
121	**Viðey, Reykjavík**	1987	Monastery/farmstead, hall M10	14th-16th century	Vesicular basalt
122	**Viðey, Reykjavík**	1987	Structure M15	Post-1550	Dolerite
123	**Viðey, Reykjavík**	1988	Monastery/farmstead, floor of hearth room M35 (ónstofa)	13th-16th century	Vesicular basalt
124	**Viðey, Reykjavík**	1991	Monastery/farmstead, room M38	Late middle ages	Vesicular basalt
125	**Viðey, Reykjavík**	1987	Lower floor of structure M2	15th-16th century (?)	Phyric and vesicular basalt
126	**Viðey, Reykjavík**	1987	Monastery/farmstead, infilling of pit house M9	14th-16th century	Vesicular basalt
127	**Viðey, Reykjavík**	1987	Monastery/farmstead, by south wall of hall M10	Late middle ages	Vesicular basalt
128	**Viðey, Reykjavík**	1991	Monastery/farmstead, collapsed wall in room M38	Late middle ages	Vesicular basalt
129	**Viðey, Reykjavík**	1992	Corridor in room M38	16th-18th century	Vesicular basalt
130	**Viðey, Reykjavík**	1989	Monastery/farmstead, sleeping hall M36	14th-16th century (?)	Vesicular basalt
131	**Viðey, Reykjavík**	1989	Monastery/farmstead, room M38	16th-18th century	Vesicular basalt
132	**Viðey, Reykjavík**	1990	Monastery/farmstead, room M38, stray find	17th-18th century	Vesicular basalt
133	**Viðey, Reykjavík**	1990	Monastery/farmstead, platform in sleeping hall M36	14th-16th century	Vesicular basalt
143	**Suðurgata 3-5**	1988	Unclear	10th-16th century	Vesicular basalt
243	**Útskálar, Garðar**	2013	Farm mound, floor	13th-18th century	Vesicular basalt
249	**Skálholt**	2004/2007	2 fragments, floor of meat store/vestib. and corridor VII	Pre-1670-1690	Vesicular basalt
253	**Skálholt**	2007	Floor of meat store, XVII	Pre-1670-1690	Vesicular basalt
255	**Reykholt**	1988-1999	4 fragments from multiple contexts	15th-16th century	Vesicular basalt
260	**Reykholt**	2005	In stone floor of church	15th-16th century	Vesicular basalt
259	**Reykholt**	2004	Floor layer of first Lutheran church in Reykholt	16th-late 18th century	Vesicular basalt
256	**Reykholt**	2001	Reused in pavement	17th-19th century	Vesicular basalt
257	**Reykholt**	2001	Reused in pavement	17th-19th century	Vesicular basalt
261	**Bessastaðir, Álftanes**	1987	From paved floor of servants' quarters of the royal residence (Kóngsgarður)	Likely pre-1700	Phyric and vesicular basalt
288	**Bessastaðir, Álftanes**	1992	Unclear	Possibly 16th-19th c.	Phyric and vesicular basalt
300	**Bergþórshvoll**	1927-1931	Found in loose soil close to the surface	Medieval or older	Vesicular basalt
301	**Bergþórshvoll**	1927-1931	Surface find, context vague	Medieval or older (?)	Phyric and vesicular basalt
302	**Bergþórshvoll**	1927-1931	Unclear	Medieval or older	Vesicular basalt

303	**Bergþórshvoll**	1927-1931	Floor layer 38	Medieval or older	Vesicular basalt
304	**Bergþórshvoll**	1927-1931	Surface find, context vague	Medieval or older (?)	Phyric and vesicular basalt
305	**Bergþórshvoll**	1927-1931	Surface find, context vague	Medieval or older (?)	Vesicular basalt
306	**Bergþórshvoll**	1927-1931	Unclear	Medieval or older (?)	Vesicular basalt
308	**Bergþórshvoll**	1927-1931	Surface find northwest of center of excavation area	Medieval or older (?)	Vesicular basalt
318	**Gröf, Öræfi**	1959	Room II of hall	13th-14th century	Phyric and vesicular basalt
321	**Gröf, Öræfi**	1959	Pantry VII, on platform by western wall	13th-14th century	Unclear, likely Icelandic
356	**Gröf, Öræfi**	1959	Farmstead, room II of hall.	13th-14th century	Unclear, likely Icelandic
316	**Stóraborg**	1978	Found in a hole north of church yard with quern 59, eroded area	Likely pre-1700	Vesicular basalt
323	**Stóraborg**	1983	Under western wall of house 25	14th/15th century	Phyric and vesicular basalt
324	**Stóraborg**	1984	Lower rock paving in floor of house 31-2	15th-16th century	Phyric and vesicular basalt
325	**Stóraborg**	1984	Pavement south of house 31-2	15th-16th century	Vesicular basalt
326	**Stóraborg**	1985	Channel south of house 31-2	15th-16th century	Phyric and vesicular basalt
327	**Stóraborg**	1985	Found in layer over house 33	13th-14th century	Vesicular basalt
328	**Stóraborg**	1985	Structure 34	17th century	Vesicular basalt
330	**Stóraborg**	1987	Found in house 16	18th century or older	Vesicular basalt
333	**Stóraborg**	1989	Surface find, cleaning	Unclear	Vesicular basalt
341	**Kirkjubæjarklaustur**	2007	Convent, structure M3	14th-16th century	Phyric and vesicular basalt
354	**Kópavogsþingstaður**	1976	Two fragments from different contexts	16th century or older	Vesicular basalt
355	**Kópavogsþingstaður**	1976	Two fragments from different contexts	16th century or older	Vesicular basalt
395	**Torfastaðir, Fljótshlíð**	1888	Found in the ruins of an old watermill uncovered in 1888 with querns 396 and 397	12th-19th century?	Vesicular basalt
397	**Torfastaðir, Fljótshlíð**	1888	Found in the ruins of an old watermill uncovered in 1888 with querns 395 and 396	12th-19th century?	Vesicular basalt
59	**Eyrarbakki and vicinity**	Donated	Origin unclear but quern very similar to quern 242 (Table 7.3).	Unclear, likely pre -1750	
402	**Gamli-Vorsabær**	1951	Donated, context unclear	Unclear, likely pre-1750	Phyric and vesicular basalt
403	**Fremsta-Fell, Ljósavatnshreppur**	-	Found at 2 m depth S of old farm during construction, see quern 410 (Table 7.3).	10th-18th century, type could suggest medieval or older	Vesicular basalt
405	**Útverk, Skeiðar**	Found 1931	Found deep in the ground, area now a cabbage patch	Unclear, likely pre-1750	Phyric and vesicular basalt
409	**Efri-Þverá, Fljótshlíð**	-	Found by Þverá, just east of Ámundarkot	Unclear, likely pre-1750	Phyric and vesicular basalt
422	**Fljótakrókur**	-	Field leveling at old farm site abandoned pre-1900	Unclear, potentially pre-1750	Vesicular basalt
426	**Hraungerði**	Found 1964	Found in barn foundation in burned building remains	Unclear, potentially pre-1750	Vesicular basalt

context are unknown. One fragment from Kúabót is possibly from Saksenvik in Saltdal. Two large fragments from the same runner found in Vestur-Landeyjar are most likely from *Setså* also in the Saltdal[38] area, but their age and context are unclear beyond very likely being Early Modern or older. The largest assemblage of mica schist stones came from the Hyllestad area or around 24 finds, and although they are mostly fragments (collections of fragments found in one place were counted as one find) the group also includes three whole quernstones (although frustratingly none of them are datable) and two smaller discs made from fragments of extremely worn querns (see also Baug and Jansen, 2014). Sites include Tröllaskógur, Kúabót, Bergþórshvoll (1 disc) and Unnarholt, which are all likely 16th century contexts or older. The largest group of Hyllestad stones, however, was unearthed at Stóraborg and included two whole quernstones, 46 small fragments (33 of those are counted together as one find) along with five larger fragments and one disc. Where time period could be estimated at Stóraborg the fragments came from 13th to 15th century contexts, side by side with many Icelandic quern fragments.

As the imported finds are mostly found in unclear and/or likely post-12th century contexts it could be suggested that few querns were transported with the settlers (see historical discussion above), perhaps because indigenous materials were known to be perfectly serviceable. Six combs have been typologically analysed from the Bergþórshvoll excavations, the two earliest types dating to the 11th-12th centuries (Guðrún A. Gísladóttir and Mjöll Snæsdóttir, personal communication 2018), so Hyllestad quernstone fragments (307-311) found there could potentially have belonged to contexts from at least as early as the 11th century. However, as the main excavation took place very early in the 20th century and most of the data has not been analysed in any detail (Kristján Eldjárn and Gísli Gestsson, 1952) they have no clear context and could also very well be later imports, as the youngest comb type was likely made sometime in the 16th-18th centuries.

The Torfastaðir millstone is the only whole foreign quern that was potentially found in situ. It was found in 1888 in the ruins of a forgotten mill uncovered during a rainstorm along with fragments of two other Icelandic querns (395 and 397; Table 6.5). As Saltdal quernstone production had diminished considerably when Selbu production took over in the 16th century this mill could potentially be from the Middle Ages when the Saltdal

[38] The Kúabót and Vestur-Landeyjar fragments were chemically analysed by Gurli B. Meyer at the Geological Survey of Norway (NGU).

district was most active. Equally however it could also be interpreted as a potentially failed milling experiment using an old quern (potentially a malt quern) following the publication of the first mill building instructions in 1781 (Bjarni Einarsson, 1781), over 100 years prior to the mill ruins being exposed.

Thirteen sites have revealed Icelandic quernstone finds of igneous rock, potentially Early Modern or older (Table 6.5; Figures 6.11-6.12), three of which are also high-status sites recorded in documentary sources to have had malt querns; Bessastaðir, Reykholt and Skálholt. One fragmented quernstone runner was found at Kirkjubæjarklaustur, three quern fragments at Gröf in Öræfi and two fragments at Kópavogsþingstaður, all likely medieval, and five fragments were found in Reykholt dated to the 15th-19th centuries. The Bessastaðir assemblage (261-291, 293-298) is largest, and contains 32 finds of Icelandic fragments. Although it also has two likely Norwegian mica schist querns (262-263, a large broken millstone likely from Selbu and a whole hand quern bedstone with a flat grinding surface), they were found in contexts dated to 1650-1750 AD, a time frame that is too close to the beginnings of the quernstone revival in the Modern Period to be able to safely say that those querns were not imported in connection with that event. At least 13 of the Bessastaðir finds are very likely querns and/or malt querns from Early Modern and Modern Period contexts (16th-19th c.), but as post-excavation analyses are not finished for the site, most of them have an unclear context and/or time period. As Bessastaðir was one of the few centres where cereal production experiments took place in the Modern Period it is also possible that experiments in Icelandic quernstone production took place there as well. The multiple Icelandic quern fragments from Viðey (Figure 6.13) and Skálholt (Figure 6.14) have much clearer contexts ranging from the Middle Ages into Modern times (14th-19th century). However, Skálholt is the only excavated site so far that has quernstone fragments bridging the 1750s divide, connecting the Early Modern and Modern Periods across the quernstone revival through clearly defined contexts (see further discussion of Modern querns and typology below).

At this point in time very few medieval and early modern sites (i.e. other than high status sites like Reykholt, Viðey, Skálholt and Bessastaðir) have been systematically excavated so it is too early to draw any firm conclusions regarding the overall distribution of indigenous vs foreign quernstones in Iceland before 1750. Only one quernstone clearly dated pre-1750 has been recorded in the North and none in either the West or East of Iceland. This can only be put down to limited research activity in those areas to date, as there is no reason to believe that quernstones were not used there, to grind barley in the

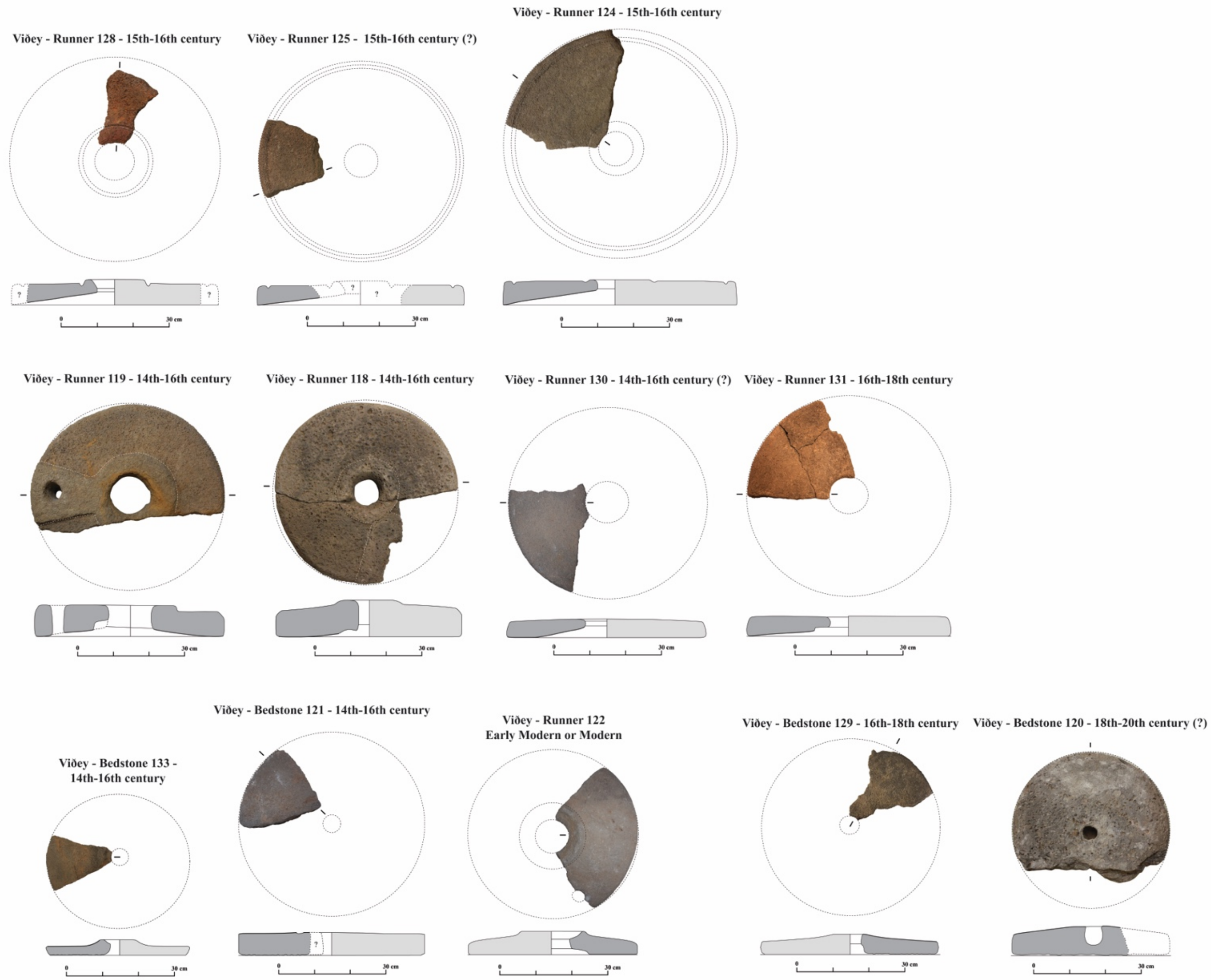


Figure 6.13. The largest Viðey quernstone fragments dated mostly to the Medieval and Early Modern Periods.

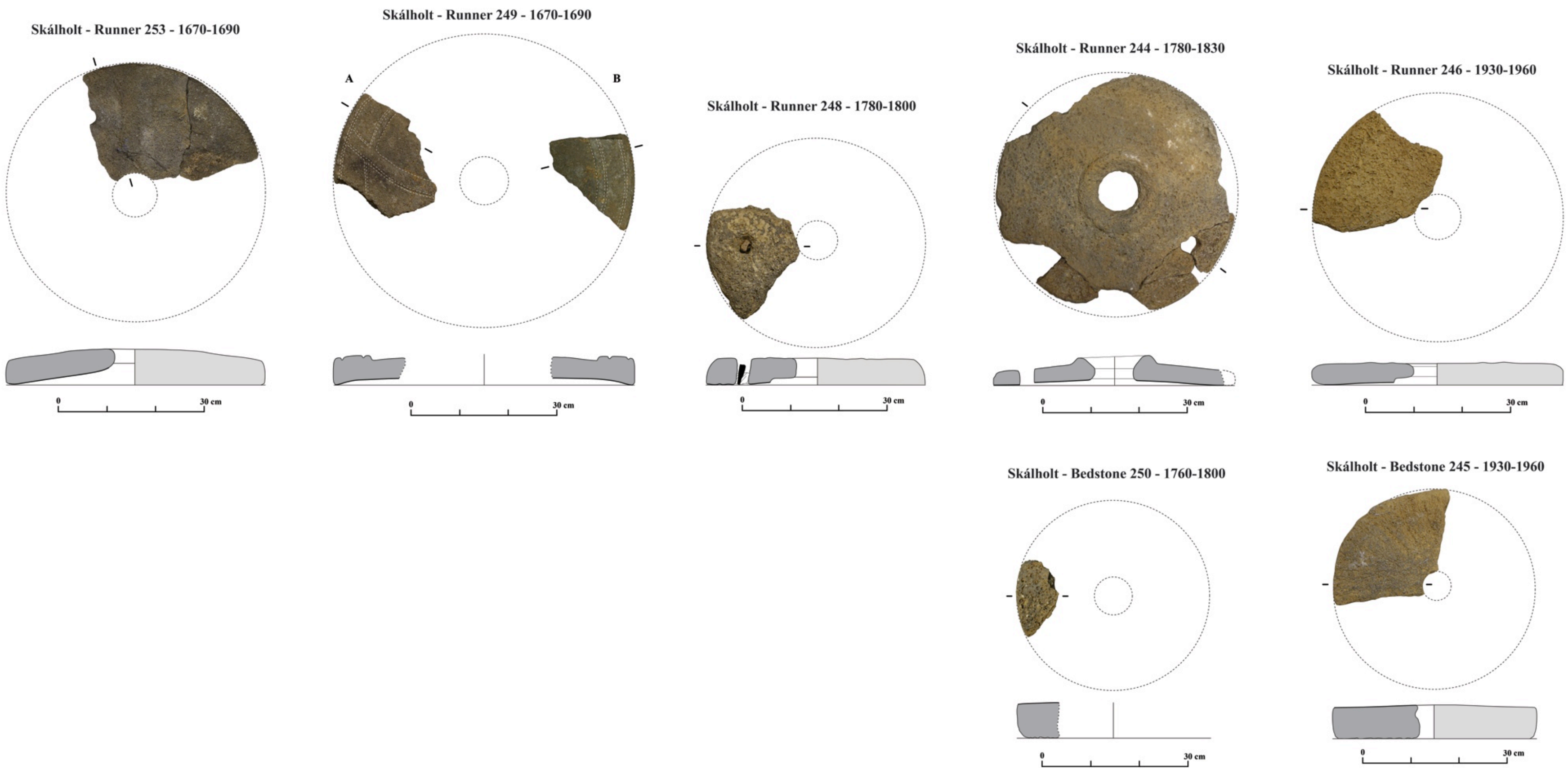


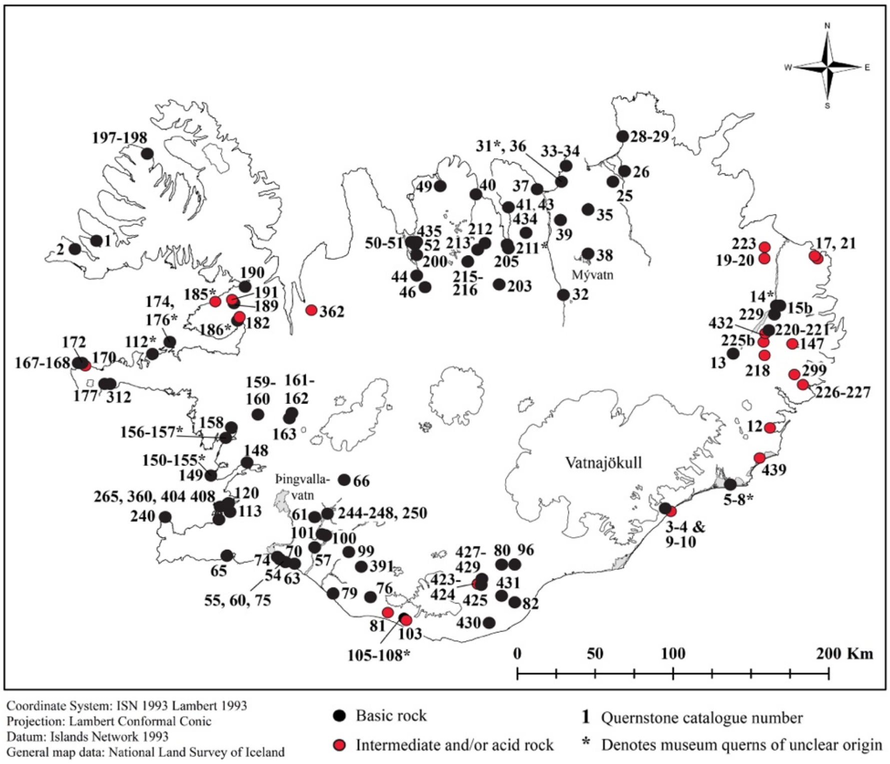
Figure 6.14. The Skálholt quernstones mainly dated from late Early Modern and Modern Periods.

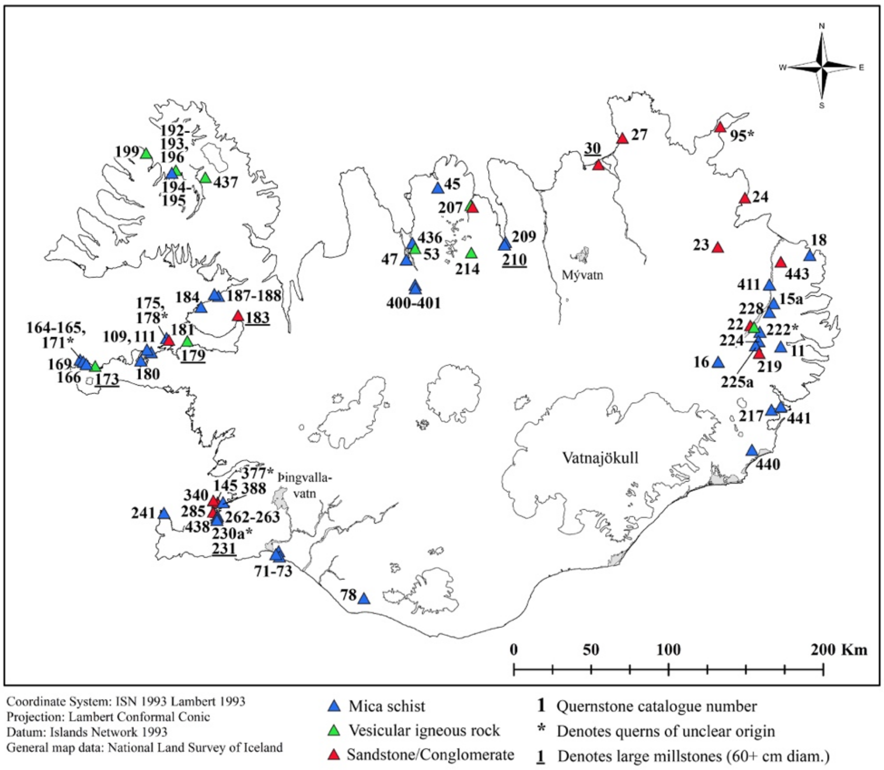
9th and 10th centuries and later malt in general, at least at more high-status sites. It is clear however, that rotary querns (whether for grinding malt, barley or lyme grass) have likely been produced continuously in South-Iceland from indigenous rock (albeit probably on an ever-smaller scale as cereal cultivation slowly died out) from the Settlement Period up to the revival of Icelandic quernstone production at the beginning of the Modern Period.

6.3.3. The Modern Quernstone Group

The quernstones, which likely and/or definitely post-date 1750, are the largest part of the assemblage, or a little over 75%. Their geographical distribution can be seen in Figures 6.15 and 6.16. They are largely preserved property along with some surface finds, again of both foreign imports (25%) and indigenous (75%) products, mainly used in the 19th and early 20th centuries. They are either querns that were donated to/collected by museums or remained with families/on farms after becoming obsolete. As precise production dates are unknown for the majority of this group there is no way to form any clear picture of production rates through time or geographical patterns of spread, either regional or local. The indigenous quernstones are very varied in size and shape and dominantly made from vesicular, igneous rock, while the foreign querns are made of metamorphic rock (mica schists, 61%), sedimentary rocks (sandstones and conglomerates, 22%) and volcanic rock (17%). Quernstones are never specifically mentioned in post-1800 import statements that have been published. Grinding stones (isl. *hverfisteinar*, used to sharpen metal tools) start to appear in import statements in 1864 (*Landshagir IV*, 1870, p. 59) and in 1910 grinding stones and whetstones are imported from Denmark, Britain, Norway, Sweden and Germany (Indriði Einarsson, 1912, pp. XXIV-XXV). As grinding stones are commonly mentioned while quernstones are not, querns were likely not imported in any large quantities. They could well have been imported from the same places however, and the quernstone assemblage indeed supports this, as the quernstones and millstones are likely mostly from Norway, Sweden and Germany.

Most of the mica schist querns are likely from Norway (Meyer, 2015, personal communication; Stanley-Blackwell, 2015, pp. 171-173). As mentioned above the oldest dated foreign mica schist querns grouped in this final period are likely from late 17th-18th century contexts in Bessastaðir, one handquern (262) and one large millstone runner (263) both likely from Selbu in Norway. All but one (quern 218 in the catalogue) of the





Figures 6.15 and 6.16. Geographical distribution of all registered modern quernstones with a known place of origin, both indigenous and foreign. For further information on each numbered quern in the catalogue at www.opinvisindi.is/Icelandic QuernstoneCatalogue.pdf. Indigenous quernstones with vague origins in museums in Reykjavík (117, 135-141, 369-373, 375, 415, 417, 420 and 421), Hafnarfjörður (230b, 232-239) and Eyrarbakki (56, 58-59, 64 and 68-69) are not shown.

Figures 6.17 and 6.18. On the left is an unworked Norwegian mica schist stone (likely a Modern quern from Selbu) dug out of the old harbour at Eyrarbakki in Árnessýsla. The stone is preserved at the Mariners' Museum in Eyrarbakki. On the right a pair of imported, millstones of lava rock from the mill in Brokey in Hvammsfjörður. The stones are preserved in Húsið, the folk museum in Stykkishólmur. Scale bars 20 cm. Photos by Sólveig Guðmundsdóttir Beck.

registered millstones larger than 65 cm in diameter were imported. Two other such large millstones from Selbu have also been preserved in Hafnarfjörður (231) and in Akureyri (210, shipped to Iceland after 1901 (Baug and Jansen, 2014, p. 249; Størseth and Einarson Rø, 2014, pers. comm.) but likely not used for very long). Most of the other foreign querns are smaller (mainly 40-50 cm in diameter) and show signs of use, excepting one quern dredged from the sea at Eyrarbakki (72) that seems unused (Figure 6.17). Only one whole post-1700 quernstone runner (171) is likely to be from Hyllestad. It was found on the seashore at Hellisandur in Snæfellsnes. This quern could potentially have been produced in the 18th or 19th centuries after Hyllestad production increased again for a short while (Grenne et al., 2008, p. 50 and 64).

Nineteen quernstones are made of sedimentary rock (sandstone or conglomerate) and most are whole quernstones, likely mass-produced and modern imports. Only two finds in this group are small fragments. Fragment 285 is from an unclear context at Bessastaðir, which could possibly be made from Jotnian sandstone from eastern Sweden (potentially from Gävle or Dalarna in the Malung district; Belmont, 2006c; Hockensmith, 2009a, p. 193; Lundmark and Lamminen, 2016; Ogenhall, 2011; 2017, pp. 13, 17-18 and 21-22, see figures 8 and 9). Fragment 340 was found in Nes by Seltjörn and is very likely conglomerate from Höör in Skåne, Sweden (Belmont, 2006a; Hockensmith, 2009a; Pienkowski, 2002). One other whole quernstone is also likely from Höör (22a) along with a pair of unused millstones preserved in Stykkishólmur (181), possibly from Vittseröd, which is also in the Höör area (Friberg and Sundner, 1996, pp. 100-102; Nilsson et al., 2017). Production in these areas continued until the late 19th century. All the other sandstone querns are possibly made from Jotnian sandstone, two of them large millstone pairs (30 and 183), although there is also the possibility of them coming from the British Isles. Lastly, fifteen of the foreign quernstones are volcanic rocks. They are mostly small in diameter but often very thick (Figure 6.18), homogenous in design and clearly mass-produced, which makes them most likely to originate from Germany. (Belmont, 2006b, 2006d; Gluhak and Hofmeister, 2011; Hockensmith, 2009a, pp. 140-151). Only one large millstone (173) was registered from foreign volcanic rock in Ólafsvík at Snæfellsnes used in the early 20th century in the town mill.

6.4. The Quernstone Typology

A graphic representation of the basic Icelandic sandwich rotary quernstone (Figure 6.1) shows its general components and accessories and the terminology connected to them, both in Icelandic and English. The Icelandic terminology was collected from three 18th century sources written by provost Einar Bjarnason in 1705 (Jón Þorkelsson, 1918-1920, pp. 391-395), treasurer Skúli Magnússon in 1769 (Skúli Magnússon, 1914, p. 77) and artist and scholar Sæmundur Magnússon Hólm (1958 (1781-1782), pp. 131-134) in 1781. The English terminology is derived from various sources covering general quernstone history and typology (see e.g. Bennett and Elton, 1898; Curwen, 1937, 1941; Hauken and Anderson, 2015b; Peacock, 2013; M. Watts, 2002). According to the earliest Icelandic sources the handquern was placed on a timber frame with animal skins placed on top during use and these foundations were called '*lúður*' and '*lúðurskinn*'. Most modern Icelandic quernstones however were kept in a simple, square timber box called '*kvarnarstokkur*', either sitting on a table or standing on four timber legs, whether it was inside the dwelling or in the mill. The box was swept e.g. with a bird's wing or a fish tail.

The Icelandic querns are all subtly different in their appearance and sophistication but on the whole the assemblage has fairly uniform characteristics. The quernstones are almost all circular, sandwich rotary querns. The most worn quernstones are no more than 2-4 cm thick, while the least used ones are ~10-15 cm thick. Only one large quernstone was classified as a pot quern (46) but it is likely that it was difficult to use as the slits at the edges are very small and it will have been heavy to lift the runner to clean the quern after grinding. The quernstones commonly range between 40 and 55 cm in diameter

(Figure 6.19). They were sometimes used both as a hand quern and as a millstone where water mills did not work in the wintertime. As previously mentioned, millstones also often had handles in case something happened in the mill that required turning the querns by hand so it is commonly not possible to distinguish between the two, unless there is e.g. clear evidence placing a quern in a specific mill or when there is no handle socket present on a complete, but clearly used, quern. Eleven querns were recorded with a diameter >65 cm and, as was mentioned above, ten of them are imported millstones. The single Icelandic stone that measured ~68 cm was from Haugar in Skriðdalur and made from local acid rock. It was meant to be a millstone and made to order but was never collected from the mason. Similar millstones were used at the watermill in Haugar. In the 60-64.9 cm range there were 24 querns. Two whole pairs of known millstones made from local

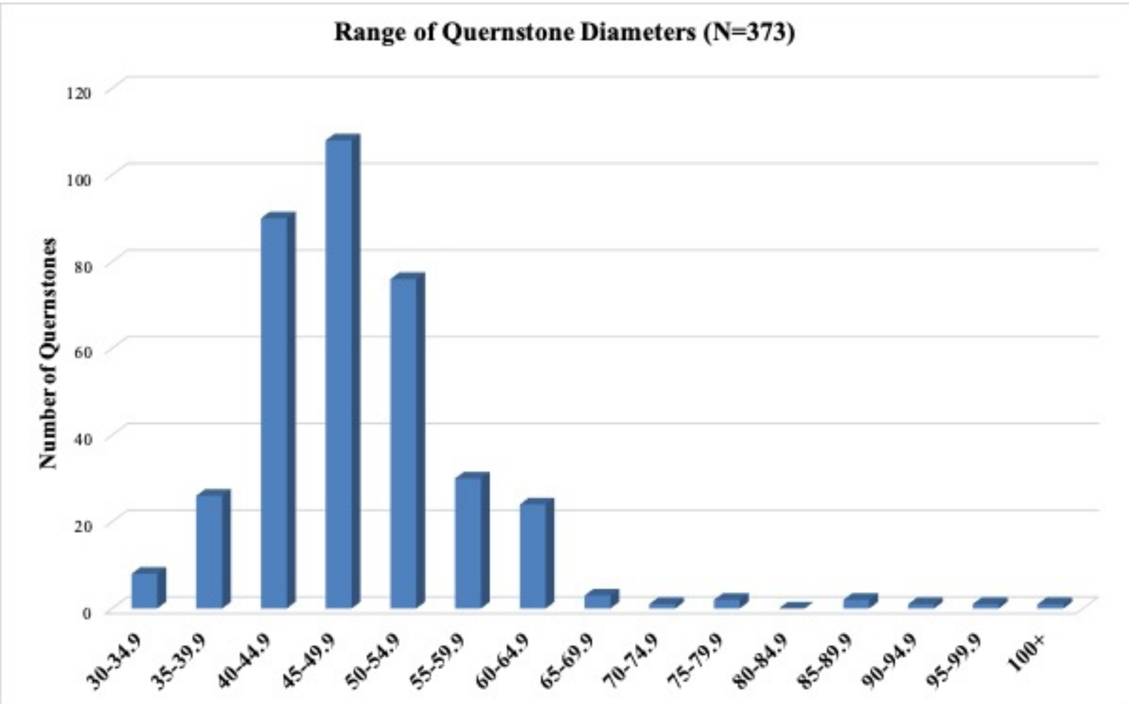


Figure 6.19. Range of quernstone diameter in the Icelandic assemblage.

lava rock were registered at Urriðafoss by Þjórsá in Árnessýsla (62-64 cm) and in Ólafsdalur in Gilsfjörður in Dalasýsla (62-63 cm) along with the single pot quern bedstone that measured 58-60.5 cm in diameter at Litli-Dalur in Skagafjarðarsýsla (thought to have been made by Jakob, Myllu-Kobbi, Jónsson, see Chapter 5). All the other quernstones registered in this group are small lava rock fragments from various time periods measured with the aid of a diameter chart which makes their diameter uncertain, as the sides of Icelandic quernstones were rarely so regularly circular in circumference that chart measurements of a small rim fragment can be considered totally reliable. The smallest known millstones measured 46-47 cm in diameter. When querns are less than 45 cm diameter it is unlikely that they would have been used as anything but hand querns, as fitting such a small quern in a mill would greatly limit its efficiency.

The classification of the Icelandic sandwich querns (Figure 6.20) is founded on the work of Hauken and Anderson (2015a, 2015b), King (1986) and Peacock (2013, pp. 54-76). The main parameters used to group the runners were the shape of their upper surface (1-4), the height of the grinding surface (I-III), and the presence or absence of a collar (A and B in classifications) around the eye. The collars could be considered as decoration as quernstones functioned perfectly well without them. As they can only be found on some quernstones however, both foreign and indigenous, but are still present from the Settlement Period up to Modern times they were included in the classification. It is noteworthy that while just over 60% of the foreign runners have a collar (B), only around 30% of the Icelandic querns have one. No registered quernstone had an actual hopper (classified here as a trough formed around the eye with a clear base) above/around their eye. The rynd slot (Figure 6.1) has been present in the Icelandic querns since the Settlement Period and always (where it was preserved) hewn into the runner's grinding surface so it was not considered as a helpful identifying element in the classification.

For the bedstones it was the spindle apparatus (A for hole or B for socket), the shape of the base (1-3) and the height of the grinding surface (I-III) that were considered the most important parameters. A closed pivot hole largely rules out the possibility of the quernstone having been a millstone. The rims of the querns were generally uncharacteristic whether they were runners or bedstones, i.e. vertical, faintly curved outwards or mildly tilted. Furrows are present on the grinding surfaces of querns in Bessastaðir at Reykjanes and Skálholt in Biskupstungur as early as the Early Modern Period (17th to early 18th c.) and in Reykholt in Borgarfjarðarsýsla as early as the Late Middle Ages or Early Modern Periods (possibly 15th/16th to the 17th century). As furrows generally wear away during use and older fragments are often worn the furrows are an unreliable characteristic and were therefore not used in the classification. The t% index[39] was very rarely higher than 25 for both the bedstones and the runners as the querns are largely made of thin lava slabs so it was not considered in the classification. The three

[39] (Max thickness/max diameter)*100 (see Hauken and Anderson, 2015a, p. 66).

largest quernstones catalogued were relatively unused and they had a t% of 29-35.3. Only one quern had a t% index higher than 40, which is very unusual. This quern was given a group of its own (6.I.), although it is simply a very coarse runner made from a thick boulder (quern no.13). Based on the chosen parameters the Icelandic runners could be split into 22 separate groups, which shows how varied they are in look, both in time and space (Figures 6.20 and 6.21). The distribution of foreign and Icelandic quernstones between groups and subgroups pre- and post-1770 can be seen in Figures 6.22 and 6.23. The most common querns are runners in group 1.I.A. and bedstones in group A.I.1. (40% of the total assemblage), all with a flat top or base and a grinding surface height <1 cm. Most of the runners fit neatly into four main groups of flat, convex, hemispherical and conical quernstones, but five Icelandic runners were also allocated a group of their own (5.I.) as they have a handle lug protruding from the main body (Figures 6.24 and 6.25). The five querns were likely made by the same mason living in the Eyjafjörður area (Figure 6.26) and all came from locations within 35 km of each other. They also all show indications of unworked, natural weathering surfaces, which suggests they could be water worn boulders collected at the seashore or from a riverbed in that area, possibly the river Hörgá in Hörgárdalur or along the shoreline of Eyjafjörður.

When these general parameters are all considered together there are no two querns so alike within the groups that they can be said without much doubt to be made by the same mason, besides perhaps the 5.I. handle lug querns. Three examples of modern runners (19 and 20) from Surtsstaðir in Jökulsárhlíð (Figure 6.27), the Reynivellir querns in Suðursveit (9 and 10) and the Stóri-Ás querns (161-162) also come close to it, along with quern fragments like e.g. 118-119 and 124-125 from Viðey (Figure 6.13), Reykholt querns 256 and 259, Bessastaðir quernstones 278, 294 and 295 and the Herjólfsdalur fragments (381-387), but they are still not similar enough to remove all doubt. However, even though most of the quernstones are still very varied in appearance and style, the typological analysis reveals interesting pre- and post-1770 changes in three respects; 1) the grinding surface heights, 2) the handle and rynd fittings and 3) the decorations.

6.5. Changes in Time and Space

6.5.1. The Grinding Surface Heights

The feature that showed the clearest change in time was the height of the grinding surface, i.e. the extent of the runners' concavity and the bedstones' convexity. The runners were

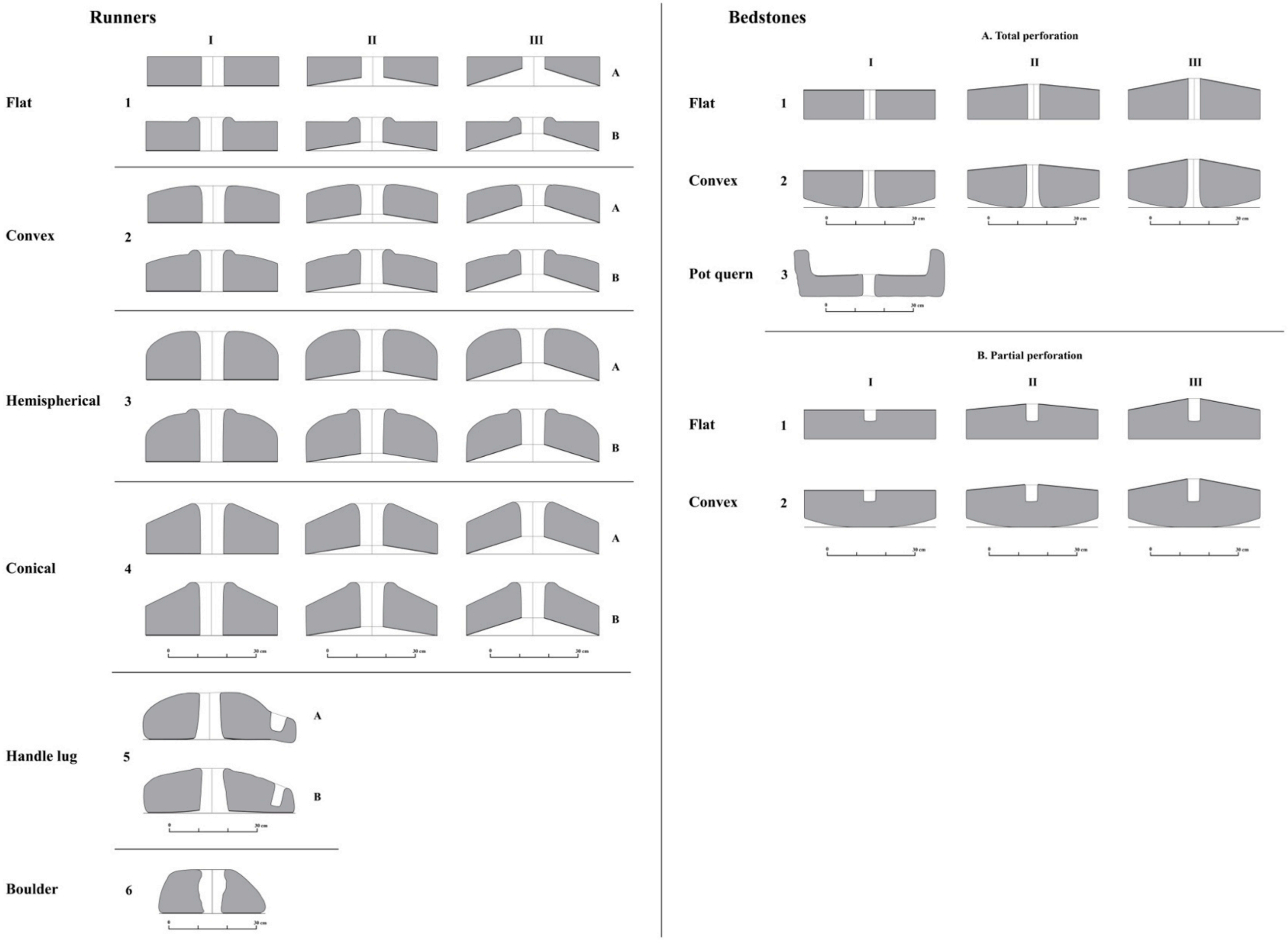


Figure 6.20. Typological classification of Icelandic quernstones

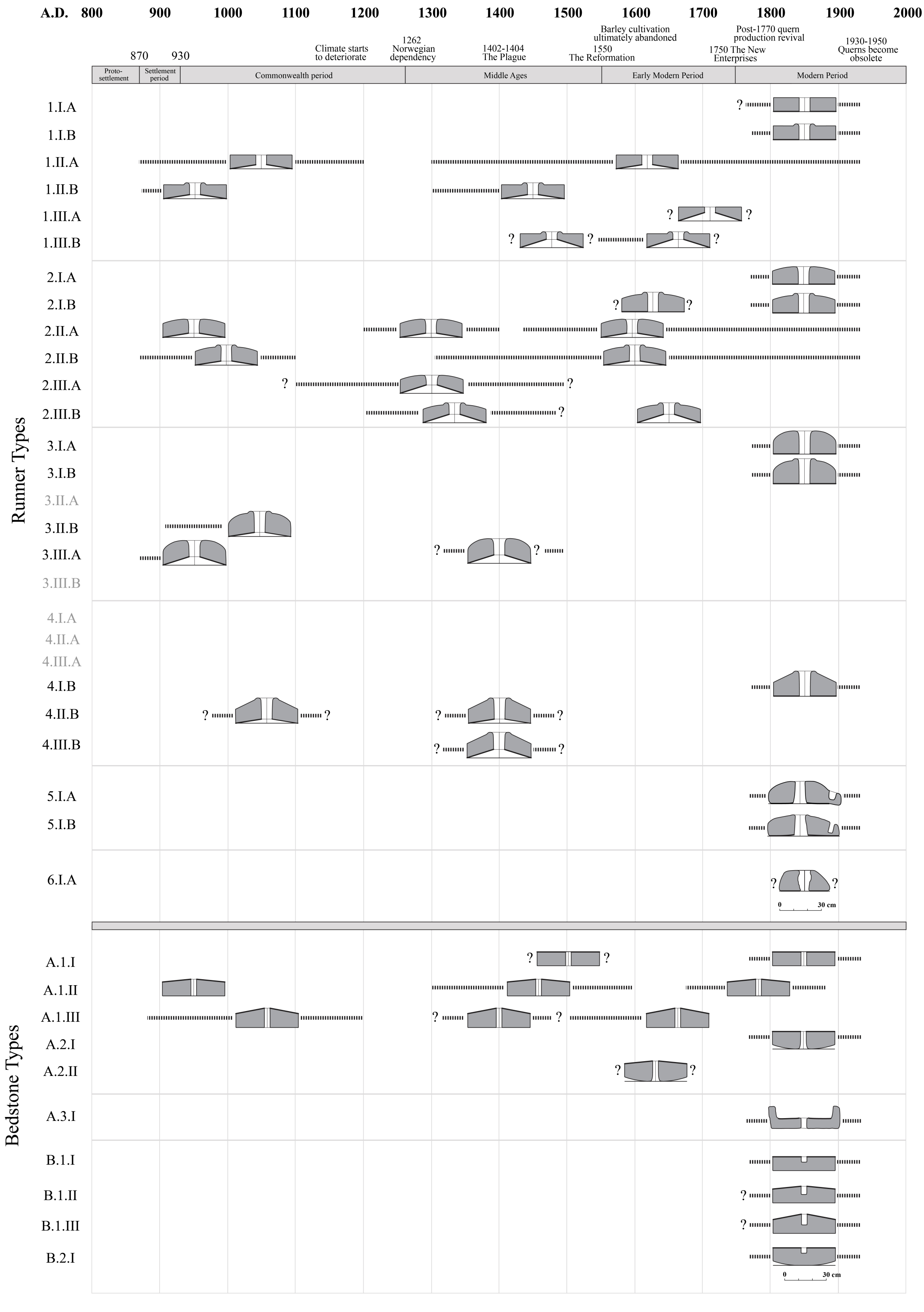


Figure 6.21. Change in Icelandic quernstone typology through time (setup founded on Hauken and Anderson, 2015a).

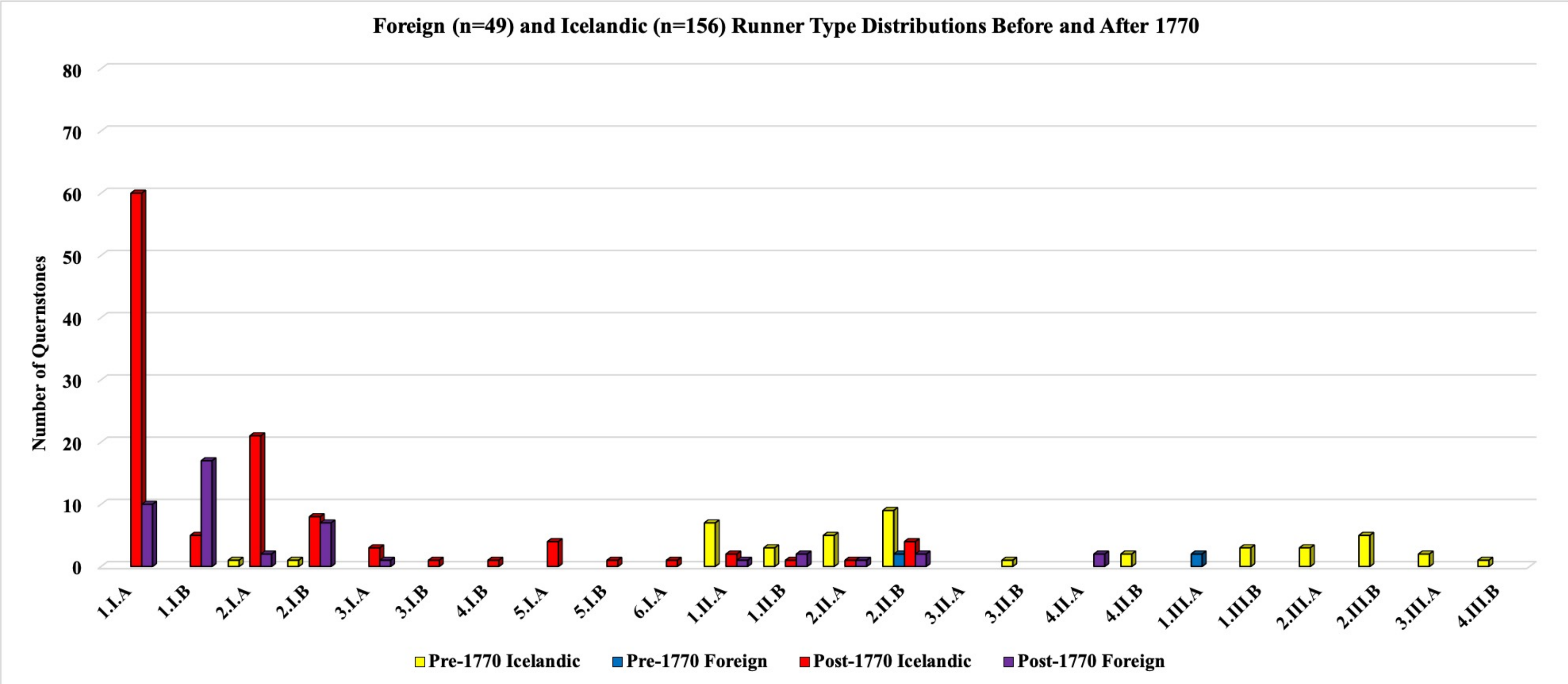


Figure 6.22. The distribution of identifiable Icelandic and foreign runners between classification groups before and after 1770. To the left are runner type groups with a grinding surface <1 cm (I) while to the left there are groups with grinding surfaces >1 cm (II-III). Note how the majority of the pre-1770 querns have a grinding surface >1 cm. Very few pre-1770 foreign runner fragments could be allocated a type group. The before and after assemblage's merge in the middle (II) with regards to grinding surfaces, but no type III querns (far right) were found in the Modern assemblage.

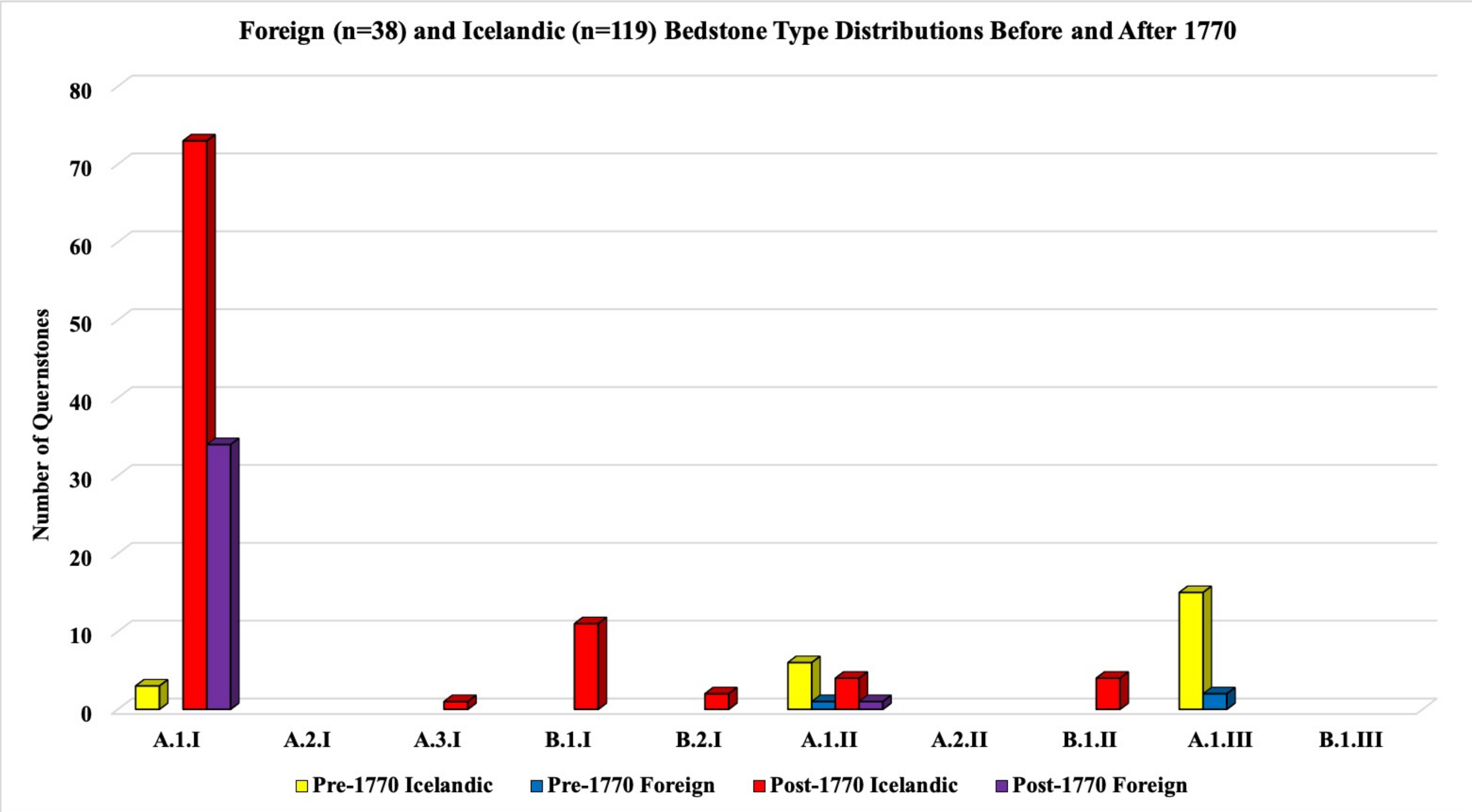


Figure 6.23. The distribution of identifiable Icelandic and foreign bedstones between classification groups before and after 1770. Again, most of the bedstones with grinding surfaces <1 are found in the Modern assemblage and few preserved foreign bedstones pre-1770 could be allocated to a type group. Bedstones with a socket for the spindle (B) have also only been found in the Modern assemblage.

Figures 6.22 and 6.23. Handle lug runners (5.I.) from Langahlíð in Hörgárdalur (left, scale bar ~20 cm) and Akureyri in Eyjafjörður (right, scale bar 20 cm), see also figure 6.26. Photographs by Sólveig Guðmundsdóttir Beck.

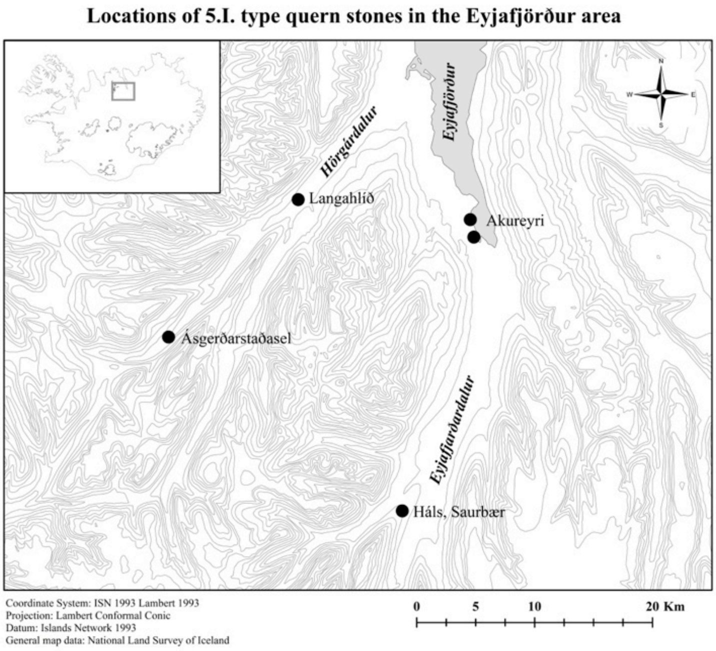


Figure 6.24. Locations of 5.I. type quernstones in the Eyjafjörður area, likely all made by the same mason and all located within 35 km of each other.

Figure 6.25. Two runners from Surtsstaðir in Jökulsárhlíð, East Iceland, made from acid volcanic rock. Photograph by Sólveig Guðmundsdóttir Beck.

split into three groups; stones with grinding surface height <1 cm (I), between 1 and 3 cm (II) and + 3 cm (III; Figures 6.20 and 6.28). The bedstones' grinding surface needed to be at least 0.5-1 cm lower than the grinding surface of the runner on top closest to the eye, so the grain had room to move from the eye of the quern towards the rim. The bedstones were therefore split into groups with grinding surface height <1 cm (I), 1-2 cm (II) and +2 cm (III). Recorded bedstones that had a grinding surface height >2 cm, were rarely more than 3-3.5 cm. Only two bedstones have measurements from 0.5-3.5 cm up to 6-6.5 cm within the same bedstone. These bedstones are both very roughly hewn and are dated to the 10th-12th centuries, from Þuríðarstaðir in Þórsmörk (394) and Suðurgata 3-5 (142) in Reykjavík. These two bedstones clearly show that when smaller fragments are measured, they cannot be said to represent the whole quernstone with 100% confidence, although more often than not the grinding surface height is still regular within each stone (rarely >0.5 cm variance). The grinding surfaces are worn unevenly and the bedstones have often formed a thick lip around the spindle hole underneath the eye where it is unworn. Where bedstones had clearly formed such a lip the grinding surface height was only measured from the rim to the lower edge of the lip.

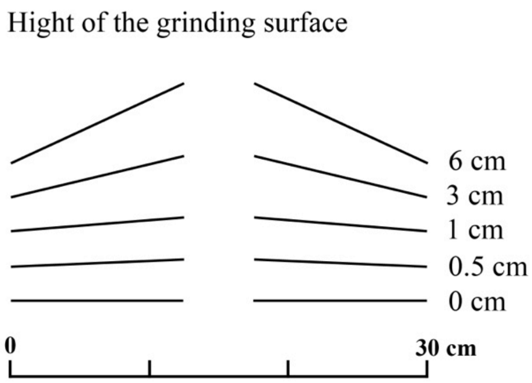


Figure 6.26. Examples of height ranges of quernstone grinding surfaces, the height difference measured between the outer rim and the center.

On the whole the most common type of Icelandic quernstones catalogued were runners 1.I.A and bedstones A.1.I, querns with a flat top/base and a grinding surface from 0-1 cm (Figures 6.21-6.23). Around 60% of the assemblage had a grinding surface <1 cm in height (I). The majority of those stones are runners, bedstones or whole pairs that are most likely from the Modern Period. Icelandic querns have been specially hewn with a convex/concave surface from centre to rim since the Settlement Period. The grinding surface height range is commonly between 1-6 cm up to the late Early Modern Period, when quernstones with a flat grinding surface (0-0.5 cm) become much more common (Figures 6.21-6.23). A broken roughout of a runner (384) was found in Herjólfsdalur in 9th-10th century ruins where a concave grinding surface is clearly only partially hewn out, and a whole bedstone (115) with a convex grinding surface of 2.5-3 cm was found at Hrísbrú in Mosfellsdalur dated to the 10^{th}-early 11^{th} centuries. Only three quern fragments (121-122 and 133) have been unearthed in archaeological excavations with a clear grinding surface height of <0.5 cm that have been allocated to the late Medieval and Early Modern Periods. They all come from the monastery site in Viðey in the Reykjavík area (Figure 6.13) and suggest that quernstones with a flat grinding surface may have occurred before the Modern Period. However, of the 15 quernstone fragments unearthed in Viðey, nine have an estimated grinding surface height between 1.5-4 cm, while three of them could not be classified (one of which (127) is potentially a fragment of 133), which shows that +1 cm grinding surfaces were much more common on this site. While the estimated age range of quernstone fragments unearthed in archaeological excavations is often rather wide or unclear it can be confidently stated that Icelandic quernstones with a flat grinding surface (<1 cm, often ~0-0.5), a grinding surface not specially hewn to be concave/convex, do not become the norm until the Modern Period (likely post-1770).

This change can likely be explained with a combination of two main factors acting post-1770: 1) quernstones to grind rye and barley simply became much more common than malt querns, and 2) imported quernstones with flat grinding surfaces served as models for new quern masons and their quernstones (Figures 6.22 and 6.23, types 1.-3.I.A-B. and A.1-3.I/B.1-2.I). In 1705 provost Einar Bjarnason described how lyme grass (*Elymus arenarius*) was harvested and processed in Vestur-Skaftafellssýsla in Southeast Iceland and casually mentioned the quernstones used to grind it: "*Then the* [dried lyme grass] *kernels are ground with a quern; it is similar to a malt quern, except it is flatter,*" (Jón Þorkelsson, 1918-1920, p. 392). It is unclear which surface Bjarnason is referring to, but it seems very likely that he meant a difference in the querns grinding surface heights. In late summer 1775 governor L. A. Thodal sent the Danish Exchequer lava rock querns for evaluation, one from Skaftafellssýsla and one which had been used successfully to grind malt in Iceland (*ÞÍ. Rtk. B7.1.17*, 1774-1776). No mention was made of grinding surface height in Thodals' report but the malt quern was deemed unsuitable for grinding rye. This could have had more to do with the rock material textures rather than the height of the grinding surface, but it could potentially also have been due to the grinding surface being unsuitable. Malt was to be crushed or bruised but never ground too finely (Fenton, 1997, pp. 392-393; Matthews and Lott, 2013 (1899), pp. 514-516) the way barley and rye had to be ground for bread. Perhaps when a grinding surface was too steep, rye/barley/lyme grass grains moved too quickly through the quernstone for satisfactory grinding and the grains would have to be fed through the quern more often. Either way, the grinding surface of rye/barley quernstones was likely more level than in the malt querns, explaining why a lower grinding surface becomes more common. This development is potentially hinted at in the Skálholt quernstone series (Figure 6.14) where the 17th century runners 249 and 253 are clearly hollowed out (gr.s. 1.5+ up to 3 cm), i.e. potential malt querns judging by known documentary sources, while the later 19th-early 20th century ones are more flat (gr.s. 0-1 cm), or potential rye/barley querns connected with the Skálholt farm.

Imported quernstones may also have played some part in the clear change in Icelandic quern typology during the Modern Period. In August 1775 governor L.A. Thodal and deputy governor Ólafur Stephensen suggested to the Danish Exchequer that Selbu quernstones, or other good ones, be imported to Iceland from Trondheim and around 1780 the Royal Trading company imported 200 quernstones for free distribution in Iceland to serve as models for indigenous production (*ÞÍ. Rtk. B7.1.17*, 1774-1776). In the beginning the first imported quernstones therefore likely came mostly from Norway (*ÞÍ. Rtk. B10.4.19*, 1780). It is also likely that most of them came from Selbu which was the most active quernstone production area in Norway after 1650 (Grenne et al., 2008, pp. 64-65), but wherever they came from they seem to have been fairly raw when they came to Iceland as 18th century sources suggest. In 1781 merchant Jens Larsen Busch in Ísafjörður was awarded a silver medal for improving accessories for imported quernstones to suit Icelandic conditions ("RÍL II," 1781b, p. 282), and in October 1783 the sheriff of Suður-Múlasýsla in East-Iceland complained that all querns imported to his county were unsharpened or unworked (dan. *ubiilede*), but sold at the price of ready-made querns according the official royal exchange rate (*ÞÍ. Rtk. B10.6.26*, 1783). One mica schist quernstone dug out of the old harbour at the Eyrarbakki trading station (Figure 6.17) seems to support this. The quern is an unused, flat mica schist disk (likely meant to be a bedstone) without furrows, pecking or any accessories or features other than a large spindle hole. In fact, the majority of all recorded imported querns in the Icelandic assemblage (whether mica schist, sandstone or volcanic rock) that are estimated to be from the Modern Period have a grinding surface height mostly between 0-0.5 cm, and never more than 1.5 cm (Figures 6.22 and 6.23). This suggests that the general flattening out of the grinding surface in the Icelandic quernstones can also partly be traced to the renewed import of foreign querns as models for new quern masons unfamiliar with older traditions of partly shaping/hollowing out the querns.

6.5.2. The Handle and Rynd Fittings

According to historical sources many imported querns seem to have been unfinished when they came to Iceland so it should be less likely that the development of sockets and slots for handles and rynds in the Icelandic quernstones could be explained by the influence of imported traditions. However, the Icelandic handle fittings still seem similar to fittings found in Norway (Hauken and Anderson, 2015b, p. 13), i.e. sockets and radial slots (Figure 6.29). In the Westfjords quernstones typology was influenced e.g. by the Danish foreign merchant that refitted them for Icelandic conditions, and querns in the South partly by the settler Ole Nielsen who is said to have made querns from scratch (see Chapters 3 and 4). Foreign influence was therefore not entirely missing. More often than not runner fragments found in archaeological excavations in Iceland are missing the handle fittings but through the assemblage recorded so far it seems that simple, circular and square handle sockets (Figures 6.29a and 6.30-6.31; for either a straight, wooden or iron handle) close to the outer rim are dominant until the Modern Period when radial slots and slot/socket combinations for angled, iron handles appear as well (Figures 6.29b and c, 6.32-6.36). All types can be found around the island, although the older and larger circular socket (likely for a wooden handles) seem most common in Skaftafellssýsla in the Southeast. Only one Modern Icelandic quernstone (421) has an abandoned, horizontal handle hole hewn into the rim but the quern's origins are unclear (plus it also has a functioning iron handle on top fused with tin). In addition, only one quern (67) has a fitted handle loop for a handle pole (Figure 6.37), although this does not necessarily mean they were uncommon, as they may simply not have been preserved. Rynd slots were always two indentations reaching out from either side of the eye like wings to accommodate the rynd across the eye (Figures 6.30-6.34), except when an old

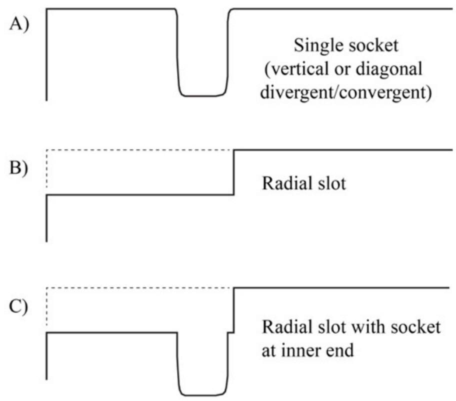


Figure 6.27. The three main types of quernstone handle fittings at a runners' outer rim in the Icelandic assemblage, the single socket is either circular or square.

rynd slot had become too shallow due to wear. Then there were two (and in a very few cases even 3 or 4) crossed rynd slots of different depths on one runner (see e.g. querns 1, 22, 37, 50, 148, 167 and 171). The only basic development in the rynd slot discernible is that it became slightly larger and moved from being coarsely U-ended, to being commonly more regularly rectangular and oblong. According to late 18th century descriptions of Icelandic quernstone production in Vestur-Skaftafellssýsla (Sæmundur Magnússon Hólm, 1958 (1781-1782), pp. 132-134) the handle, the rynd and the spindle hole plug were made of wood (Figures 6.33 and 6.38) while the spindle was made of iron. However, in most preserved querns from the Modern Period where the rynd and/or handles are preserved (Figures 6.32-6.37) they are made of iron and welded into sockets and/or slots with tin (Elínborg Lárusdóttir, 1941, pp. 9-10), while the spindle is still mainly wedged in place with a wooden plug (Figure 6.35). Covering the iron handle there was often a hollowed out wooden cylinder or a halved animal bone shank (Figure 6.39). History and the quernstone assemblage fittings suggest therefore that prior to the Modern Period simple handle sockets, smaller rynd slots and wood were likely more common in quernstone accessories. As production was revived handle fittings became more varied, rynd slots became larger and more rectangular, and the use of metals (iron and tin) became more common, all around the island.

6.5.3. The Decorations: Excavated Fragments vs the Curated Querns

Most of the Icelandic quernstones are simple disks with plain, flat or convex surfaces. Around 10% of the querns have partially or wholly natural, upper or lower surfaces, while another 10% of them sport personal flare in varied decorations (Figures 6.40 and 6.41). None of the Viking Age runners have decorations beyond simple collars around the eye and/or handle hole. Quernstones from excavated contexts likely dating from the Middle Ages up to the Early Modern Period are about 60% of all the decorated quernstone runners in total and they were all found on only seven sites, in Suðurgata 3-5, Kaupavogsþingstaður, Kirkjubæjarklaustur, Bessastaðir, Viðey, Skálholt and Reykholt (Figure 6.42). One decorated quernstone from Suðurgata (144) was considered a 9th-11th century find, but as the fragment was only associated with a general, open area in the excavation, and all the other similarly decorated querns are likely late medieval or younger, its dating may be considered dubious. Only ~5% of all the Modern quernstones were decorated (40% of the decorated total) and they are scattered between farms around

Figure 6.28. Viðey (118), a handle socket and small U-ended rynd slot, no indications of metal remnants.

Figure 6.29. Vogur in Hafnir (242), a small, roughly U-ended rynd slot and a simple handle socket, no indication of metal remnants.

Figure 6.30. Tjarnargata 14 in Reykjavík (360), straight iron handle in a simple handle socket and an iron rynd fused with tin.

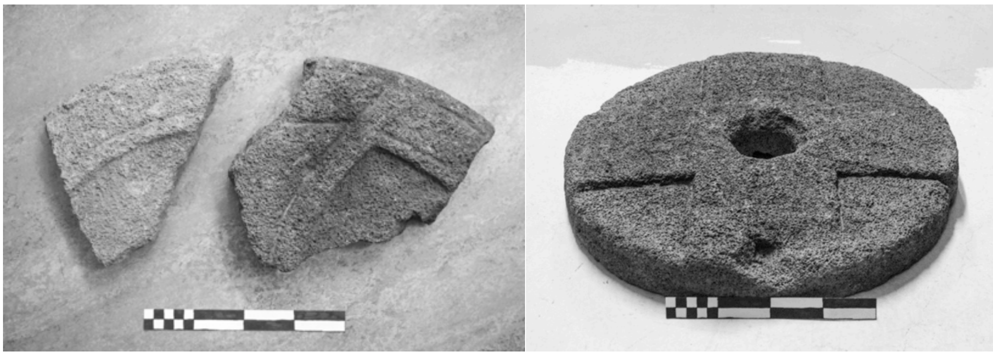
Figure 6.31. Laugarnes in Reykjavík (388), a wooden rynd wedged in the middle of the eye as the quern is too thin for a rynd slot, a straight iron handle in a simple socket fused with tin and one empty used handle socket.

Figure 6.32. Stóra-Sandfell in Skriðdalur (221), larger and rectangular oblong rynd slot and an angled iron handle in socket fused with tin (or lead).

Figure 6.33. Kollaleira in Reyðarfjörður (147), two radial slots for an angled iron handle with socket at inner end, preserved handle fused with tin, the bedstone spindle is wedged in a wooden plug with the aid of small iron nails.


Figures 6.34 and 6.35. Left, Eintúnaháls at Síða, (96), bent iron handle in a socket fused with iron and likely tin. Right, Geldingaholt, Skagafjörður (47), a loop for a handle pole fused with tin in a radial slot.


Figures 6.36 and 6.37. Left, Reynivellir in Suðursveit (3), wooden handle in a simple, circular socket. Right, Torfustaðir at Akranes (149), a bone shank over a straight iron handle, also in a simple, circular socket and fused with tin.



Figures 6.38 and 6.39. A decoration of both an embossed ridge along the edge and striations on excavated Early Modern quernstone fragments from Skálholt in Biskupstungur (left) and a Greek-cross relief on a preserved Modern quern from Lundar in Stafholtstungur (right).

the island (Figure 6.43). This concentration of specially decorated runners mainly at high status sites like Kirkjubæjarklaustur, Skálholt, Reykholt and Bessastaðir represents their capability to afford the time and effort needed to produce such embellishments, but as no quernstones have been excavated from Medieval or Early Modern sites of lower status for comparison it tells us little else. As decorations are unrelated to a quern's function and are often dependent on the mason's talent and context of production they were not considered in the general classification. When considered all together however, they still reveal a considerable difference between the pre- and post-1750 century quernstone assemblages, in essence representing a clear break between earlier status manufacturing and later utilitarian manufacturing (Helms, 1993, p. 14).

In Figures 6.42 and 6.43 quernstone runners with decorations revealed in excavations have been grouped together against preserved, decorated Modern runners, and their differences are more than clear. The pre-1750 runner decorations can be grouped into two types; 1) thick, embossed triangles around handle sockets and/or raised narrow ridges along the rim, and 2) engraved, narrow striations forming circles and lines. The two types can also be found intertwined as on runner 143 from Suðurgata 3-5. The Modern curated quernstones are decorated very differently. Their decorations can be split into five types; 1) an embossed Greek cross motif, 2) inscriptions of initials and/or production year, 3) coarse, random embossing, 4) stepped or bevelled edges at the rim and/or eye, and 5) figure engravings. The most common decorations were the Greek-cross relief mainly found in the western parts of the island, with thick arms of equal length spanning the

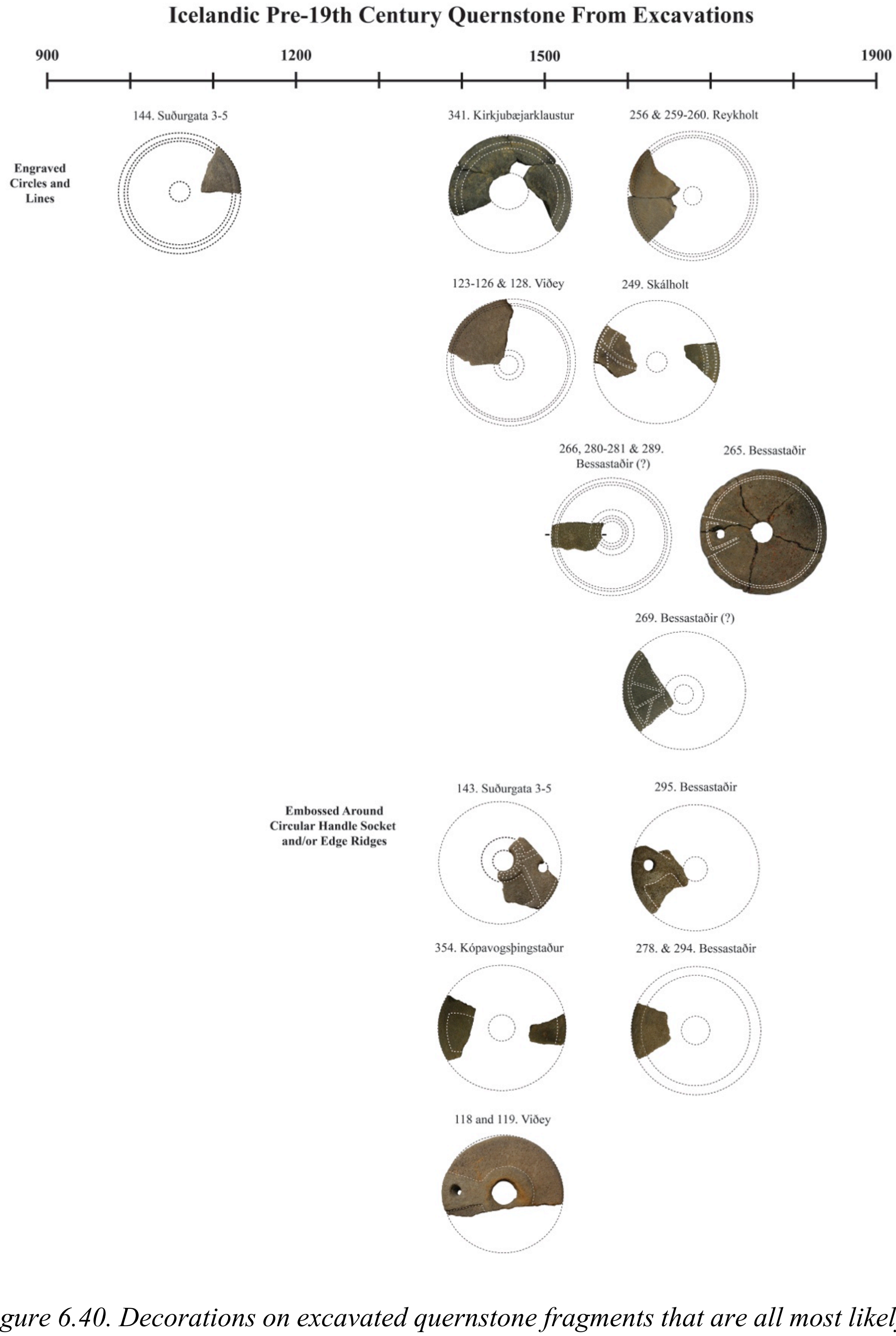


Figure 6.40. Decorations on excavated quernstone fragments that are all most likely 18th century or older. Some of the Bessastaðir quernstones (266-269) have an unclear context but comparing the undated ones with those that are, e.g. in Bessastaðir (280-281, 289), Skálholt and Reykholt, would suggest they are likely pre-18th century.

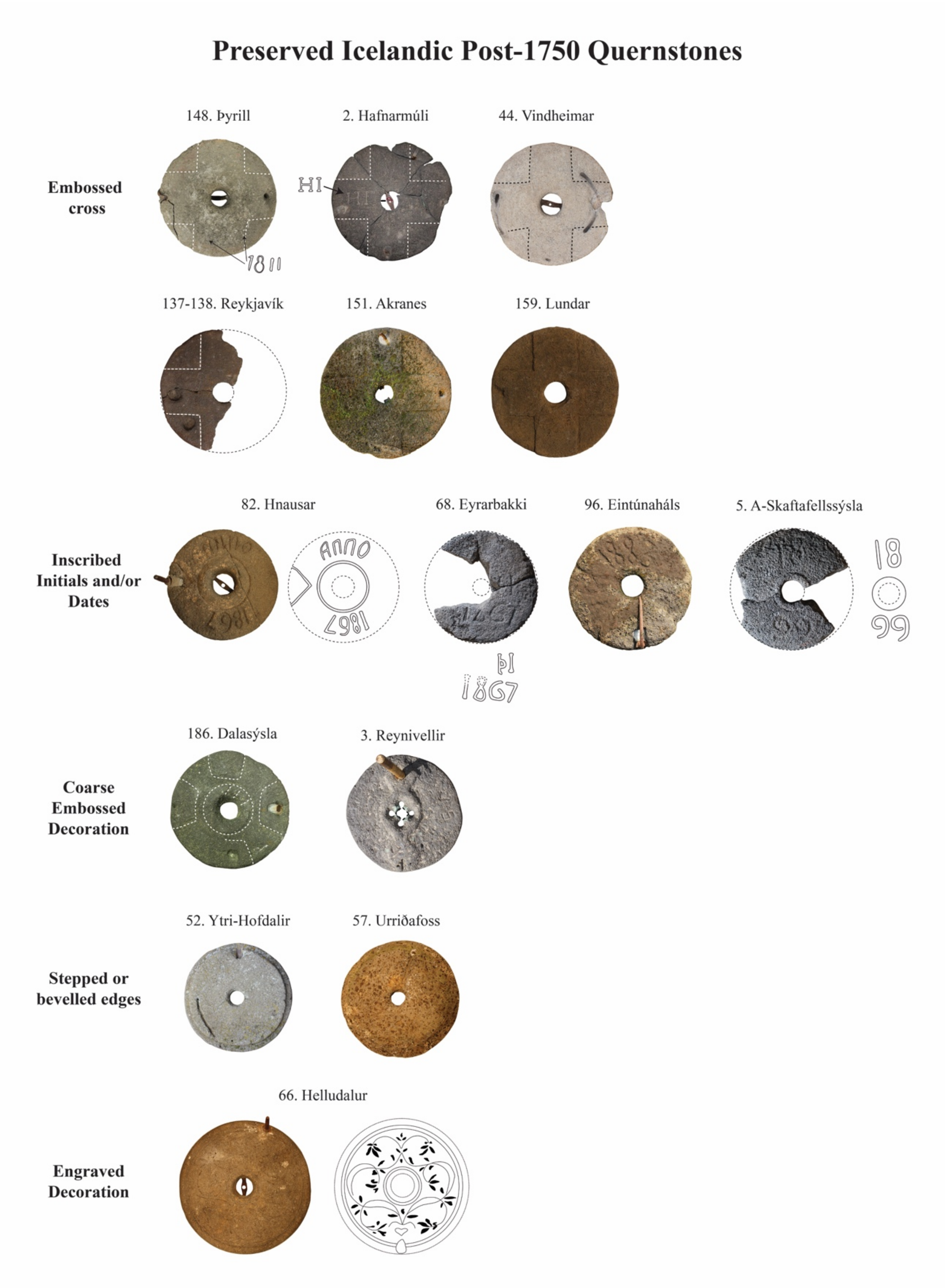


Figure 6.41. Decorations on quernstones found at various Icelandic farms and mostly classified as preserved property, likely Modern Period productions.

diameter of the runner; the production year inscriptions (1811(?)-1899), which were mainly found in the South, and bevelled edges around the outer rim of the runner. The types can also overlap as with quern 148, which sported both a cross and a date. Very little clear connection or continuity can be gleaned between these two pre- and post-1750 groups, excepting perhaps the coarsely embossed wide ridges around the handle socket in quern 3 from Reynivellir, similar to the Bessastaðir (295) and Suðurgata (143) querns, and the striation ring around the collar in quern 82 from Hnausar similar e.g. to the Viðey querns (123-126 and 128). This is more likely to be a coincidence however, rather than any diffusion of older decorative ideas, although it is interesting that the only two querns that show any resemblance are originated in Skaftafellssýsla where quernstone production was potentially continuous across the Medieval, Early Modern and Modern Periods.

None of the registered imported foreign quernstones were decorated, excepting perhaps for a collar around the eye. Whether Norwegian querns were ever decorated in any way beyond a collar is unclear. As e.g. Selbu millstone 210 is inscribed with a production number and quarry name (albeit very indistinct), and many of the mica schist stones are furrowed, there is reason to suggest that at least some mica schist stones could very well have been decorated. It is very unlikely however, that they would be among those imported to Iceland in the late 18th century and therefore will not have had much influence on indigenous decorations, although production inscriptions could certainly have inspired Icelandic masons to mark their stone with a production year and their initials. The cross motif is not surprising considering the strong Christian religious influence present in Iceland, although it could also be connected to the design of the Icelandic flag at the end of the 19th century. However, the fact that it is expressed in a very similar way on all of them is intriguing, especially considering that they are (at least as yet known) only located in the westerly regions on the island (from Reykjavík in the Southwest, through Hvalfjörður and Borgarfjörður, into the Westfjords and over to Skagafjörður in the Northwest), which during the time of quernstone production were strongly connected through workforce exchange during the fishing and haymaking seasons (Figure 3.6). It could potentially denote the diffusion of a single decorative idea between areas through population mobility.

The clear change in decoration styles in the assemblage is not surprising if we consider that the use of quernstones moved beyond the more affluent farms and their brewing, to more ordinary farms and general consumption of cereals, not to mention the potential increase in the number of untried, farming craftsmen in the late 18th century who all had to 'reinvent' quernstones for themselves without preconceived ideas of designs beyond the functional. Modern quernstone 66 (Figure 6.44) clearly demonstrates that there is every reason to think that at least some Icelandic farmers could have developed a special talent for stone masonry. It is also more than likely that many Icelandic farmers could master the necessary basic skill to cope, while few likely became experts in this type of stone working. It would not have been practical to spend too much time honing a

Figure 6.42. A quernstone designed by Guðmundur Magnússon in Helludalur in Biskupstungur (1818-1914). The quern is preserved at Byggðasafn Árnesinga in Eyrarbakki.

skill that was needed as rarely (see further discussion of potential yearly demands in Chapter 8) as quernstone making or to add flourish beyond what was strictly necessary to keep the cost down. The Modern Icelandic examples certainly seem to suggest that utilitarian principles generally came far ahead of aesthetics. In the end it is most likely that Modern Icelandic quernstone production in general never called for any great sophistication or produced many specialists due to a combination of a high number of self-sufficient, farming craftsmen, widely spread between farms all around the island, and a low, and generally utilitarian public demand (see further discussion in Chapter 8).

6.5.4. A Lack of Detailed Temporal and Spatial Range in the Assemblage

In Chapter 4 we caught a glimpse of the first late 18th century quernstone masons participating in the quernstone revival around the country. Award handouts for quernstone production jumped from Eyjafjarðarsýsla, Skagafjarðarsýsla and

Húnavatnssýsla in the North and Northwest, and Snæfellsnessýsla in the West between 1781-1784, over to Borgarfjarðarsýsla in the Southwest in ‘87 and Þingeyjarsýsla in the Northeast in ‘86 and ‘90, Árnessýsla in the South in ‘87 and ‘89, and over to Múla- and Skaftafellssýslur in the East and Southeast, Vestmannaeyjar in the South and Dalasýsla in the West between ‘89 and ‘90. From them and other documentary sources we indeed have hints of the locations of some of the initial centres of information spread and production, but we likely don´t see any clear remnants of the masons first attempts at quernstones in the assemblage. The oldest Modern quernstone confidently marked with a production date is from 1867. There is one other possibly marked 1811 but this date is very badly carved and may just as well be a very squished 1888 or 1899. It could well be that most of the earliest post-1770 querns have not been preserved as they will likely have been discarded or repurposed once they became too worn to grind grain. Good Icelandic quernstones were estimated by Sæmundur M. Hólm to be able to function for decades (up to +70-80 years) so there is likely a significant dearth of querns produced in the first 50-100 years in the post-1770 assemblage due to simple wear and tear. Very little information is also available regarding the at least 2-3 generations of quernstone masons working between 1780 and 1900. In the quernstone assemblage we therefore likely mostly have the remnants of the late 19th century peak in quernstone use and production in the Modern quernstone assemblage but very few of the preserved querns are traceable back to their makers or a specific production year. It is therefore impossible to reconstruct any sort of picture of realistic geographical diffusion patterns from the available data.

In Figures 6.45-6.49 all quernstones types likely to belong in the Modern assemblage (both foreign vs Icelandic) have been split into nine groups and ordered into four regions roughly following Iceland´s cardinal directions, with between 60 and 80 recorded quernstones within each region. The groups are <u>Reykjanes</u> (Gullbringu- and Kjósarsýslur, county no. 1, see figure 3.2) and the <u>South</u> (Árnes-, Rangárvalla- and Vestmannaeyjasýslur, counties no. 19-21); the <u>Southwest</u> (Borgarfjarðar- and Mýrarsýslur, no. 2-3), <u>West</u> (Snæfellsness-, Hnappadals- and Dalasýslur, no. 4-6) and <u>Westfiords</u> (Barðarstrandar- and Ísafjarðarsýslur no. 7-8, no querns recorded in Strandasýsla); the <u>Northwest</u> (Húnvatns-, Skagafjarðar- and Eyjafjarðarsýslur, no. 10-12) and <u>Northeast</u> (Þingeyjarsýsla, no. 13), and finally the <u>East</u> (Múlasýslur, no. 14-16) and the <u>Southeast</u> (Skaftafellssýslur, no. 17-18). This arrangement does not give much insights or epiphanies in connection with general typological distributions beyond what

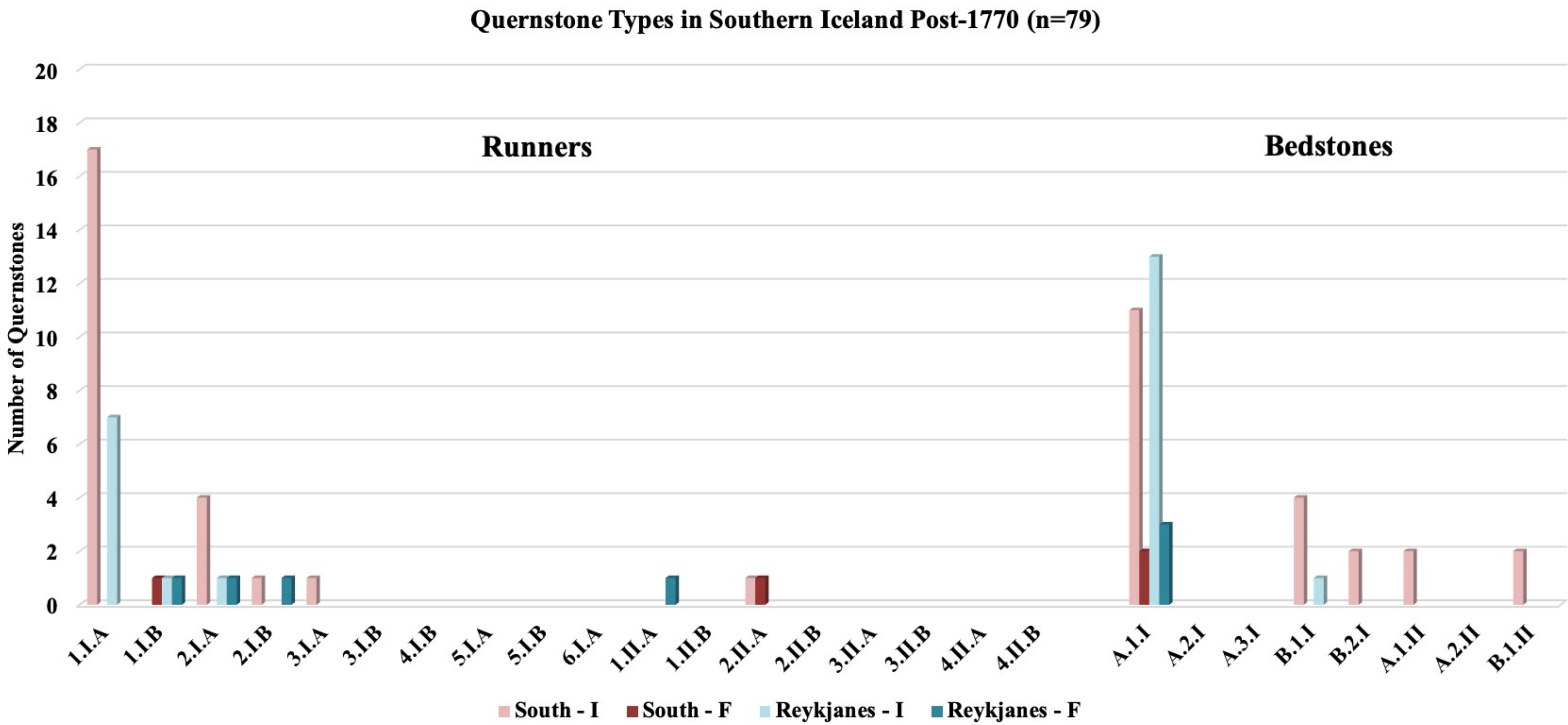


Figure 6.45. The distribution of classifiable post-1770 quernstones (I - Icelandic/F - Foreign) between areas in Southern Iceland. Few foreign quernstones are found in the region, either runners or bedstones, and only recorded in Árnessýsla. Few quernstones have grinding surfaces >1 cm (II, no querns from group III).

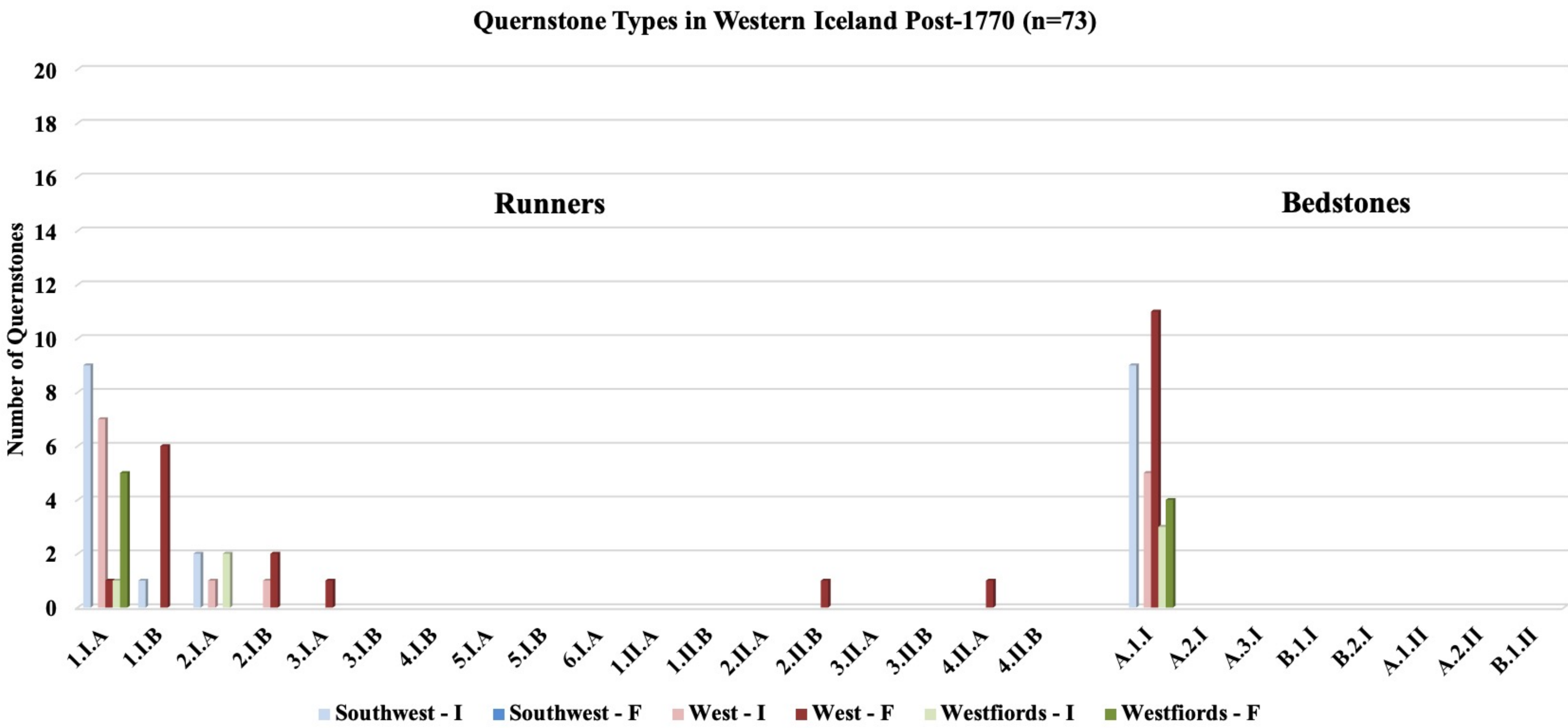


Figure 6.46. The distribution of classifiable post-1770 quernstones (I – Icelandic/F – Foreign) between areas in Western Iceland. Foreign quernstones are much more common and the typological range is narrow. Very few querns with a grinding surface >1 cm (II, none from III). No examples of bedstones with sockets (B) are found in this region. Note the complete lack of foreign querns in the Southwest against their much higher numbers in the West and the Westfiords.

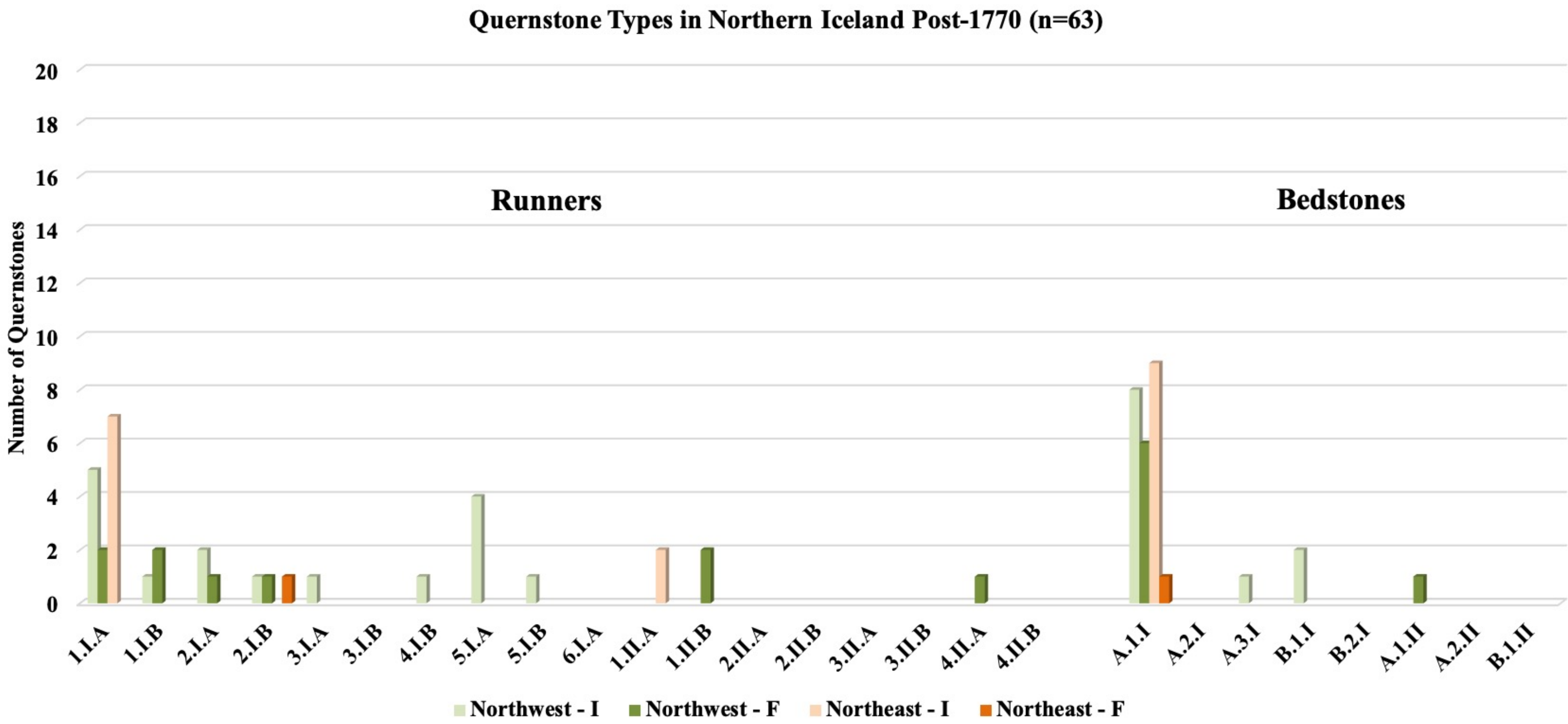


Figure 6.47. The distribution of classifiable post-1770 quernstones (I – Icelandic/F – Foreign) between areas in Northern Iceland. A fairly even distribution of foreign querns vs Icelandic ones in the Northwest, while Icelandic ones are much more common in the Northeast. The typological range of runners is fairly wide in the Northwest but narrow in the Northeast. Most querns, both foreign and Icelandic, have a grinding surface <1 cm (I).

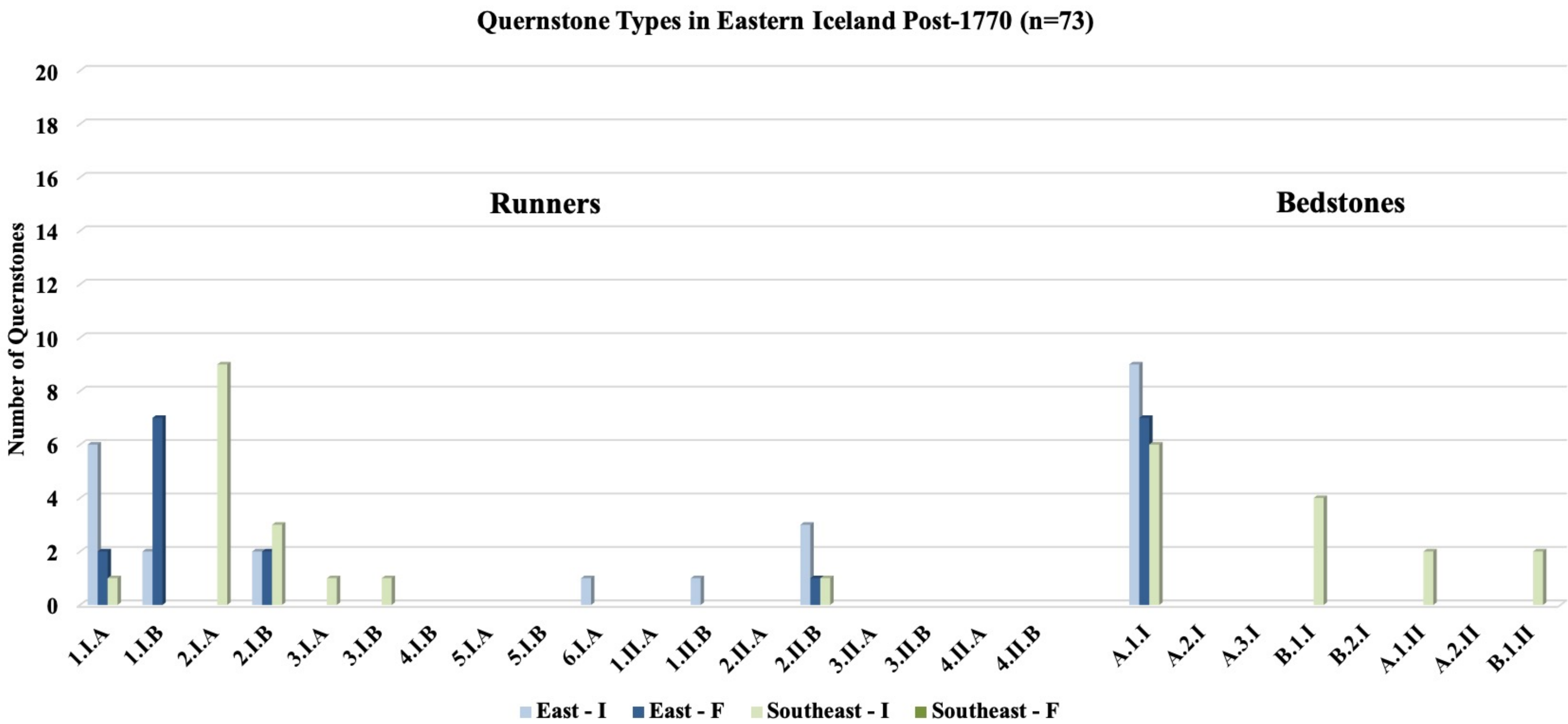


Figure 6.48. The distribution of classifiable post-1770 quernstones (I – Icelandic/F – Foreign) between areas in Eastern Iceland. In the East there is a fairly even distribution between foreign and Icelandic quernstones, and foreign runners commonly have collars (B). Note the complete lack of preserved foreign quernstones in the Southeast.

has already been tackled above. The most common quernstone types between all the groups, whether they be Icelandic or foreign, are runner types 1.I.A-B. and 2.I.A-B and bedstone type A.1.I, with a few querns scattered variously between the other less common typological groups on the side. Bedstones with spindle sockets (B) are found in all regions in Iceland, except the Western ones (Southwest, West and Westfiords). Whether this is because socket bedstones were never made in the region or just have not been preserved is unclear. However, it is possible to identify some interesting clues to the general trends regarding Icelandic raw material exploitation between the regions. In Southern Iceland there are few foreign querns preserved (Reykjanes I%/F% ratio 75/25 and South 90/10), either runners or bedstones. No foreign querns are recorded in the Southwest but when moving into the West (40/60) and the Westfiords (40/60) the foreign quernstones become much more common. In the Northwest Icelandic querns are only slightly more common than the foreign querns (60/40) but in the Northeast the Icelandic ones are much more common (90/10). Finally, in the East there is again a fairly even distribution between foreign and Icelandic quernstones (55/45) against a complete lack of them again in the Southeast in Skaftafellssýslur. But are these distributions due to variations in Icelandic raw material availabilities or something else? This question is addressed in the next chapter.

6.6. Conclusions

With the aid of documentary sources and the quernstone assemblage side by side it has been possible to form at least a rough picture of quernstone production developments and typology in Iceland from the late 9th to the early 20th century as a whole. While trade connections and organisation were still developing after Settlement in the late 9th century, cereals were likely cultivated all around the island and rotary quernstones were produced mainly from Icelandic materials. As early at the 10th century cereal production was being abandoned however, at least in the North, and it is thought likely that it slowly became concentrated mainly in the Southwest towards the Southeast to Skaftafellssýsla. As trade connections and Norwegian political influence grew in Iceland in the 11th and 12th centuries, import of ground cereals, or meal, and Norwegian quernstones from Hyllestad and Saltdal, likely became more common alongside indigenous production, at least in the South. Post-12th century, cereal production in Iceland became more and more difficult due to deteriorating climate conditions and continued import of meal, which may have mostly finished it off and likely brought the import of Norwegian quernstones largely to a halt. In the late 15th/early 16th centuries indigenous cereal production had all but died out, but local quernstone production hung on in the South. Beyond that point in time, rotary quernstones were likely mainly used to bruise malt at high-status sites and grind wild, lyme grass in Skaftafellssýsla, until the import of unground grain was increased, and indigenous quernstone production was rebooted in the second half of the 18th century.

That being said, at this point in time the quernstone assemblage is somewhat skewed. Viking Age archaeological research has mostly been directed in the South, Southwest and Northeast, which means that finds of that time period, from e.g. the West, the Westfjords and the East, are strongly under-represented and early quernstone examples from those areas simply non-existent. Many of the medieval quernstone fragments found so far, are surface finds or from older excavations where contexts are unclear or unknown so they can only tentatively be allocated to the late Commonwealth and Medieval Periods. Very few middle-class sites belonging to the Medieval and Early Modern Periods have been excavated in the Southwest and South so the indigenous quernstones from these time periods, found at high status sites like Skálholt, Reykholt and Bessastaðir, lack contemporary comparison. The assemblage is also top-heavy when it comes to the preserved curated Modern quernstones. Too often their origins and exact age are vague or simply unknown and likely many of the first quernstones produced are lost through wear and tear. I.e. a good example of the classical problem of the oldest remnants of the changes that archaeologists are trying to map simply not existing anymore, in this instance despite the relatively short amount of archaeological time that has passed since it occurred. However, there are still clear differences that can be gleaned by comparing the typologies and raw material use in these pre- and post-1770 assemblages.

From the time of settlement and into modern times, Icelandic quernstones were mainly produced from vesicular, basic igneous rock; a very serviceable, raw material for grinding stones that was also exploited for a long time in quernstones both in Europe (rotary) and the Americas (metates and manos), and likely no less serviceable than the Norwegian mica schists. The earliest Icelandic quernstones are fairly simple and utilitarian and often rather rough and ready, while pre-18th century quernstones decorated beyond a simple collar, have mainly been found in Medieval and Early Modern contexts at high status sites like Bessastaðir, Skálholt, Viðey and Reykholt. In the Modern period imported quernstones become more varied. They move from being coarsely hewn medieval Norwegian querns from Hyllestad and Saltdal over to being mass produced, undecorated and strait-laced, and imported not only from Selbu, a different production area in Norway, but also e.g. possibly from Sweden and Germany. Modern Icelandic quernstones however, continue to be made mainly from vesicular, basic rock. They are relatively simple and utilitarian, but the runners show a wide range of nuances in their appearance, likely as they were mainly produced intermittently, both by and for many self-sufficient tenant farmers and farming craftsmen. A few Icelandic Modern querns also continue to sport decorations but of significantly different motifs. Along with this apparent shift in motifs, the clearest indications of renewed expansion of quernstone production for grinding pearl barley and/or rye all around the island in the mid-18th century, are that quernstones much more commonly have a lower grinding surface (<1 cm), and handle and rynd fittings show more variation, at least partially through the possible influence of the imported mass produced foreign manufacturing traditions and quernstones serving as models.

As the Modern assemblage is poorly defined in time and we are likely missing many of the first post-1770 quernstones, it can only be generally considered as a whole at a regional level and there is no way to glean any more detailed temporal developments in typology or Hägerstrand's geographical patterns of spread that may have formed during their diffusion in the late 18th and early 19th century, at any level. Few quernstones can be traced confidently to specific craftsmen, and where possible, it is only one or two quernstones at most for each one; querns that are usually found or recorded to belong to the same farm and thereby not even able to give a clue to their makers' potential areas of influence as represented in Chapter 5. The only exceptions are the handle lug (5.I.A-B) querns in Eyjafjarðarsýsla. In their case, however, the problem is reversed. Their unique look could suggest that they were made by the same craftsman with a certain area of influence in Hörgárdalur and along the western coast of Eyjafjörður, but his identity or place of residence is unknown. Despite this limited temporal range of the assemblage, however, the Modern quernstones' presence and preservation leave no doubt about their general ubiquity within the Icelandic farming community in the 19th and early 20th centuries. They are the well-preserved remnants of an innovation that became obsolete in a matter of decades due to outside technological breakthroughs in milling and shipping not long after, or just as it was about to, reach its maximum spread within Icelandic society.

However, in order to become so ubiquitous, Icelandic farmers and craftsmen had to be able to make and/or buy a quernstone, and for production they had to have good access to relatively cheap indigenous raw materials (rock, wood, iron). In this chapter we have also established that the main Icelandic raw quernstone materials were vesicular, basic and intermediate igneous rocks with a few silicic rock types thrown in. There are also some interesting trends in quernstone distribution that indicate that Icelandic quernstones were more commonly produced and used in some regions more than others. In the next chapter we will consider the general methods used in Icelandic quernstone production as they are revealed in historical sources and more depth is given the general availability and geographical spread of serviceable rock materials found around the island, before we can move on to further estimate any potential reasons for innovation acceptance or rejection in Chapter 8, i.e. production costs, the level of need and any repercussions (good/bad) of long-term quernstone reproduction and the many pros and cons of the actual quernstone usage.

~ Chapter 7 ~

Scavenging Rocks for Icelandic Quernstone Production

In 1783 Magnús Ketilsson sheriff of Dalasýsla discussed the possibility of useable basalt pillars as raw material for quernstones near his home. He described the pillars as 30-80 cm thick, which had to be split if they were to be useful, but expressed concern that knowledge on how to cleave them and appropriate tools were lacking in Iceland (*ÞÍ. Rtk. B10.6.38*, 1783). Whether the rock material he mentions was indeed suitable, how far it had to be transported or if it was ever used for quern making is unclear. Contrary to the opinion of sheriffs in other counties, Ketilsson felt that more technological knowledge and effort was needed to produce quernstones in Iceland. Most likely he was simply thinking big and imagined mass production of querns similar to Norway and Germany, as there is no indication that Icelanders lacked the skill and knowledge of how to make adequate querns, or that new types of tools were needed. According to the descriptions of itinerant craftsman Myllu-Kobbi and the farmers exploiting materials in Geitland (Hannes Pétursson, 1984, pp. 82-87; Kristleifur Þorsteinsson, 1944, pp. 16-17), hammers and chisels were the main tools required for the production. Sources only mention one specific type of hammer (isl. *kvarnarklappa*; Sigurður Vigfússon, 1888-1892, pp. 50-51) and one example has been preserved at the Skógar Museum (Þórður Tómasson, pers. comm., 2013) in the south of Iceland (Figure 7.1). This hammer was likely home-made and possibly used e.g. to shape the querns during the last stages of production and sharpen grinding surfaces of used querns by making/refreshing furrows and/or pecks. Obsidian was also used for such work in the late 18th century (Sæmundur Magnússon Hólm, 1958 (1781-1782), p. 134).

Figure 7.1. Kvarnarklappa, preserved at the Skógar Museum, South Iceland.

From documentary sources it can also be surmised that masons looked for rocks that had already been broken up naturally into flagstones of suitable thickness, whether it was in the late 18th or the early 20th century. That way no time or tools were needed to specially cleave the raw material. However, finding such flagstones was not always possible. In

1783 farmers in Hólasókn in Rangárvallasýsla complained that serviceable rock types in the area were hard to work, as they had to be hewn on all sides. This was considered feasible only if a farmer or craftsman meant to make a quern for himself, not if querns were to be produced in larger numbers for distribution (*ÞÍ. Rtk. B10.6.33*, 1783). The descriptions of scholar and artist Sæmundur Magnússon Hólm in 1780 (see further details in the previous Chapter 6) suggest that craftsmen in Vestur-Skaftafellssýsla also usually looked for flagstones of suitable thickness and rarely considered rocks that had to be cleaved. More effort would have been needed to work the querns to acceptable thickness where farmers did not have naturally weathered flagstones at their disposal, although many natural flagstones may not have required much less work as they also sometimes had to be trimmed (Kristleifur Þorsteinsson, 1944, p. 16).[40]

Very few historical accounts describe Icelandic raw material procurement sites in any detail, beyond a place name and/or general location, and very little is known about the nature or number of such sites in Iceland. If Icelandic farmers and craftsmen had not had access to all the necessary raw materials to make a quernstones, the rock materials in particular, the revival would have been doomed to fail. In late 18th century historical sources there were indeed some murmurs and worries that raw materials were too scarce in places to make enough quernstones. To add more detail and get a clearer idea of general availability of useful Icelandic raw materials across the island an overview was put together of the Icelandic geological context in section 7.1 and in section 7.2 the general geological and geographical information available regarding all material procurement sites found in documentary sources from the 18th up to the early 20th centuries are detailed. A few sample sites were then selected for examination in the field and they are described in section 7.3. The geographical distribution and geological composition of the recorded quernstone assemblage were then examined against this backdrop in section 7.4 in order to form a clearer picture of the nature and extent of raw material exploitation in quernstone production around the island.

Serviceable Icelandic rocks were available and exploited for small-scale quernstone production in many and varied locations scattered all around the island, and raw material availability was therefore likely not a great hinderance in the revival of quernstone production in the late 18th century in most regions. Raw materials commonly had to be

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[40]Quoted above where Kristleifur Þorsteinsson mentions flagstones in Geitland were slightly too thick for quernstones.

located by scavenging the landscape e.g. in riverbeds, screes and/or along the coastlines. Finding and gaining access to more concentrated amounts of serviceable materials was much easier however, in the active volcanic zones where vast uneroded lava fields are more common. In the geologically older regions towards the island margins, i.e. in the Westfjords, the Northwest and the East, supply of raw material was scarcer and more scattered and could have hindered production. Modern imported quernstones do seem slightly more common in those areas but indigenous stones are never completely absent in any region. It is likely that craftsmen rarely sought raw materials, or sold many quernstones, beyond their main sphere of activity (<20 km radius), except perhaps when raw material availability and product demand came together and made manufacture on a larger scale more viable. Production mainly took place in the quern masons' own home and no historical narratives or archaeological evidence was found indicating the presence of abandoned production installations or campsites on raw material procurement sites. Any potential effects that Icelandic production methods and raw material availability, or lack thereof, could have had on local quernstone production for good or bad will be discussed further in Chapter 8.

7.1. The Geological Context of Material Procurement in Iceland

The location and composition of lithic materials exploited by humans is governed by the nature of the geological and tectonic history of the country of origin (Rockman, 2003, pp. 7 and 18-19). Iceland is a geologically recent and volcanically active, oceanic island (Figure 7.2), with the oldest geological formations above sea level belonging to the Neogene (~2,6-23 Ma; formerly known in Iceland as the Tertiary or Upper-Tertiary; see e.g. Björn S. Harðarson et al., 2008). Volcanic activity in Iceland is caused by the combined influence of two diverging tectonic plates at the Mid-Atlantic Ridge (The North-America plate and the Eurasia plate) that move apart by ~2 cm each year, and a large hotspot in the mantle beneath the earth's crust, resulting in constant formation of new crust and tectonic rumblings (see e.g. Freysteinn Sigmundsson, 2006). About 85-90% of the island's volume above sea level is igneous rock as the island is built up of layers upon layers of tholeiitic, transitional alkalic and alkalic magma series exposed at the surface as lava flows, intrusions (i.e. dykes, sills and plutons) and tephra formations. Through chemical analyses it has been estimated that Icelandic rock formations consist of 75% basalts (e.g. tholeiite and alkali basalts), 14% intermediate rock (e.g. islandite and andesite) and 11% acid rocks (e.g. rhyolite and trachyte). Of those formations the extrusive rocks dominate as <0.5% outcroppings at the surface are made of intrusive and plutonic rocks (e.g. dolerite and diorite, granophyre and gabbro; Sveinn P. Jakobsson, Jónasson, and Sigurðsson, 2008).

Areas that are no longer volcanically active are the Western parts of Iceland north of Snæfellsnes, the Westfjords and the Northwest all the way east to Skjálfandi, along with the Eastfjords from Langanes in the north to eastern Vatnajökull in the south. They are largely made up of Neogene rock formations (Figure 7.2) that have been heavily affected by tectonic forces (e.g. shearing and pressure) and low temperature metamorphism (e.g. amygdale formations). Glaciers covered the land during the last Ice Age, carving deep valleys and fiords from the central highlands to the coast, exposing vast sections of older, largely basic, lava flows and acid rock formations of extinct central volcanoes (Figure 7.2) scattered within the extensive lava formations (e.g. Friðgeir Grímsson and Leifur A. Símonarson, 2008, p. 304; Hreggviður Norðdal et al., 2008). The mountain ranges along fiords and valleys are often high and rather steep (commonly 500-1200 m), especially in the East- and Westfjords. Rockslides, slumps, screes and glacial moraines formed during and after glacial erosion in the Ice Age are common, where younger lava formations higher up in the lava stacks have crumbled and/or been transported from the mountains down to the lowlands. Larger rivers are also known to transport boulders from the mountains down to the lowlands, especially during spring thaw and heavy, autumn rains, and in many areas along the coast the North Atlantic slowly but surely breaks up the bedrock into smaller, more manageable pieces.

The areas most affected by post-glacial volcanic activity (Figure 7.2, the geological background map used in this chapter was made by Anette Theresie Meier at the Icelandic Institute of Natural History) at the plate boundaries stretch from the Reykjanes peninsula in the southwest inland towards the northeast up to Langjökull, the whole of South Iceland from Hengill east to Vatnajökull and from there up to the northeast coast, around Öxarfjörður and to the north-eastern tip of Melrakkaslétta (Thorvaldur Thordarson and Höskuldsson, 2008). Snæfellsnes in the west has also been affected but the peninsula's main volcanoes (e.g. Snæfellsjökull and Ljósufjöll) have long lain dormant. It has been estimated that when combined, post-glacial lava flows cover just over 10% of the island's surface (Sigmundsson et al., 2013, p. 57). Large expanses of them are relatively undisturbed, excepting natural weathering, vegetation colonisation and sediment burial.

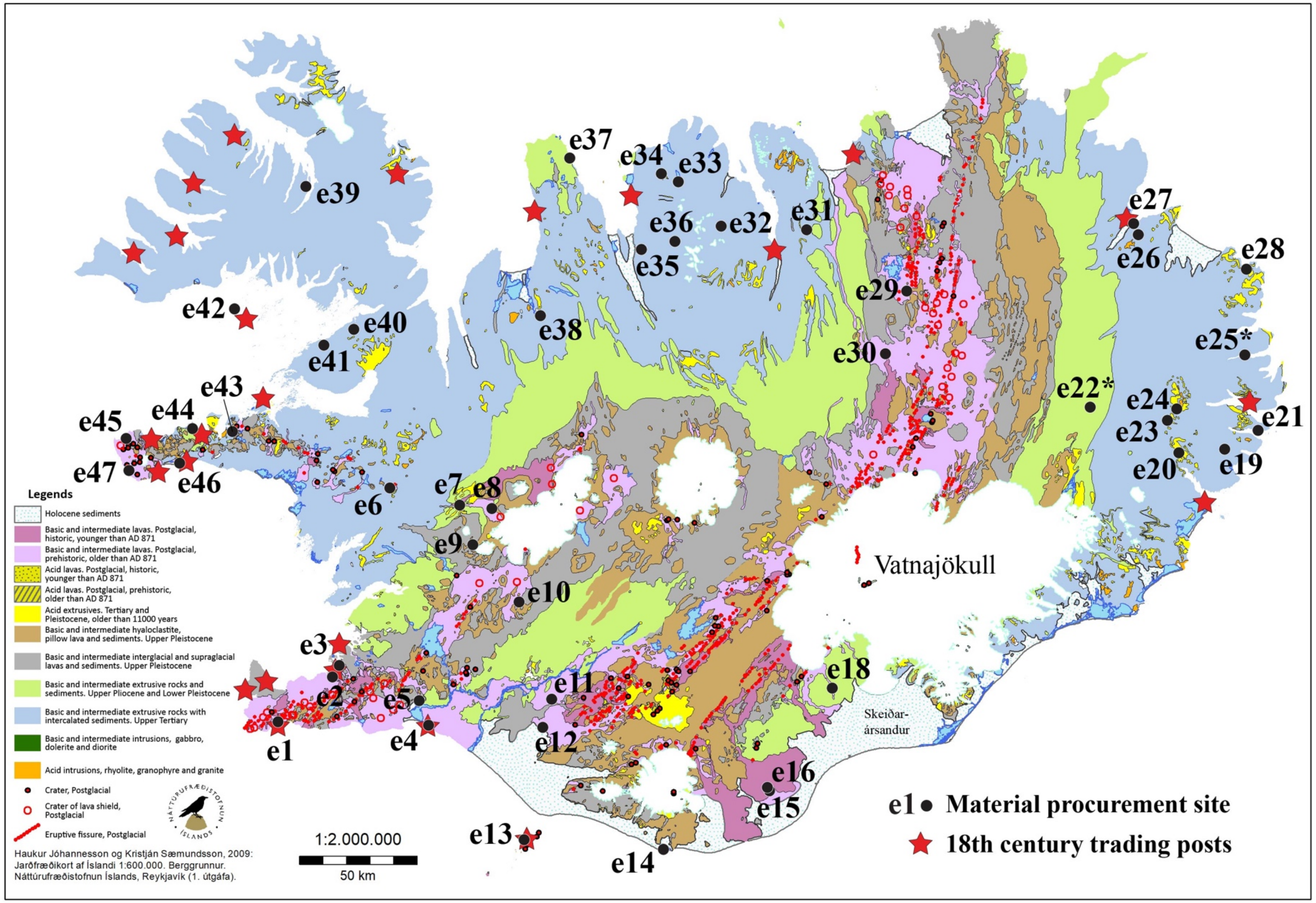


Figure 7.2. Geological map of Iceland (see Haukur Jóhannesson and Kristján Sæmundsson, 2009; this version was provided by Anette T. Meier courtesy of the Icelandic Institute of Natural History, see also Figures 7.40-7.41) with geographical locations of material procurement sites recorded in Icelandic historical sources superimposed (see Table 7.1). The Tertiary is now formally named the Neogene (~2,6-23 Ma).

Table 7.1. Quernstone raw material procurement sites mentioned in historical sources.

No.	Material procurement area/quarry	Area	Site type	Sources
e1	**Grindavík**	Grindavíkurhreppur, Reykjanes	Coastal area, inhabited, post-glacial lava flows.	*ÞÞ. 7636*
e2	**Brenna, in Kapelluhraun***	Hafnarfjörður, Reykjanes	Relatively flat plain, inhabited area 3-4 km away, post-glacial lava flow, olivine tholeiite basalt, 12th century formation, lava damaged due to urban development in Hafnarfjörður.	Sigmundur Einarsson et al., 1991, pp. 61, 65 and 71; Haukur Jóhannesson and Sigmundur Einarsson, 1998, p. 173 and 175; Kristján Sæmundsson and Magnús Á. Sigurgeirsson, 2013, p. 383 and 392; Pnr-Þorbjarnarstaðir, p. 8; *ÞÞ. 15024*.
e3	**Kaplakriki**	Hafnarfjörður, Reykjanes	Relatively flat plain, inhabited area <1 km away, lava flow formations, likely post-glacial lava flows, now disappeared due to urban development.	Þór Magnússon, 2016, pers. comm.
e4	**Eyrarbakki**	Eyrarbakkahreppur	Coastal area, inhabited, likely a post-glacial lava flow.	*ÞÞ. 15004-b*
e5	**Ölfus, unnamed location near Eyrarbakki**	Eyrarbakkahreppur	Coastal area, inhabited, likely a post-glacial lava flow.	*ÞÍ. Rtk. B10.6.34*, 1783
e6	**Brekkuhraun/ Grábrókarhraun**	Norðurárdalur in Borgarfjörður	Large inland valley, inhabited, 60 m above sea level, post-glacial lava flow.	*ÞÍ. Rtk. B10.6.35*, 1783
e7	**Gilsbakkahraun/ Gráhraun**	Hvítársíða in Borgarfjörður	Narrow valley inland, inhabited, 60-200 m a.s.l., part of Hallmundarhraun, post-glacial lava flow, younger than AD 871.	*ÞÍ. Rtk. B10.6.35*, 1783
e8	**Geitlandshraun***	Geitland, Hvítársíðuhreppur	Expansive sandy plain, uninhabited, habitation 12-13 km away, 4-600 m a.s.l., post-glacial lava flow, about 9000 years old, olivine tholeiite, weathered and covered with gravel and sand, little vegetation.	Pnr-Geitland, pp. 2-3; Ari T. Guðmundsson, 2003, p. 256, see also figure p. 250; Sveinn Jakobsson, 2013, p. 359, figure 4.11.1 and p. 362; Sinton et al., 2005, p. 14, table 3 p. 10 and figure 6 p. 11; Kristleifur Þorsteinsson, 1944, pp. 16-17; Þorsteinn Þorsteinsson, 1988, p. 36, 2015, pers. comm.
e9	**Kaldidalur**	Between Langjökull and Ok, Borgarfjarðarsý.	Mountain valley, no clear source description, uninhabited, habitation 12-13 km away, 600 m a.s.l., likely lava flow formations, younger than 0.8 m.y.	*ÞÞ. 7397*, could be same as e8
e10	**Kvernháls and Svínahraun***	Úthlíð, Biskupstungum	Wide valley inland, uninhabited, habitation ~4 km away, 300 m a.s.l., post-glacial lava flow, area part of Lambahraun, over 4000 years old, olivine tholeiite. Kvernháls was a ridge likely crossed on an old route taken from Biskupstungur to fetch raw materials in Svínahraun.	Pnr-Úthlíð, pp. 7-8; Óbyggðanefnd, 2002; Sigurður Pálsson, 1884, p. 1; B. Sigurðsson, 2015, pers. comm.; Sinton et al., 2005, p. 15, figure 3 p. 5 and table 3 p. 10; see also Eason and Sinton, 2009, p. 337; Sveinn Jakobsson, 2013, pp. 359, 360 and 362
e11	**General area**	Landmannhreppur	Relatively flat plains inland, inhabited area, 100 m a.s.l., likely post-glacial lava flows from Hekla.	*ÞÍ. Rtk. B10.6.33,* 1783
e12	**General area**	Rangárvellir	Relatively flat plains inland, inhabited area, 100-140 m a.s.l., likely post-glacial lava flows from Hekla.	*ÞÍ. Rtk. B10.6.33,* 1783
e13	**Lava south of Herjólfsdalur and other unnamed locations**	Heimaey, Vestmannaeyjar	Small oceanic island, inhabited, post-glacial lava flows. Quernstones and rough outs from vesicular basalt have been found on an old farm site in Herjólfsdalur dated to the Settlement Period (~AD 870-930, possibly slightly older).	Quern no. 409, National Museum of Iceland; Matthías Þórðarson, 1926, pp. 19-20; see also *ÞÍ. Rtk. B10.1.25*, 1782.
e14	**Dyrhólaey/Portland**	Mýrdalshreppur	The coast, bedrock beaten by the sea, inhabited area 2-3 km away, likely lava flow formations, younger than 0.8 m.y.	*ÞÍ. Rtk. B10.6.29*, 1783

e15	**Króklækjarmelar***	Botnar, Leiðvallahreppur	Flat gravelly plains, 20-40 m a.s.l., uninhabited, habitation 2-3 km away, post-glacial lava flow, Botnahraun, 6-7000 years old, much weathered and covered with gravel and sand.	Pnr-Botnar, p. 3; Magnús T. Guðmundsson et al, 2013, p. 236 (see figure 4.4.2) and 250; Jón Jónsson, 1979, pp. 218, 227-228 and 230; Guðrún Larsen, 2010, p. 44; Sæmundur Magnússon Hólm, 1958 (1781-1782), p. 132; Stanton et al., 2011, see table 3 p. 6, quoted Jónsson 1979 in table; Leiðvallahreppur also named in *ÞÍ. Rtk. B10.6.29*, 1783.
e16	**Hellisskersmelar***	Hnausar in Meðalland, Leiðvallahreppur	Flat gravelly plains, 20-40 m a.s.l., uninhabited, habitation 2-3 km away, post-glacial lava flow, Botnahraun, 6-7000 years old, much weathered and covered with gravel and sand.	Pnr-Hnausar, p. 2; Magnús T. Guðmundsson et al., 2013, p. 236 (see figure 4.4.2) and 250; Jón Jónsson, 1979, pp. 218, 227-228 and 230; Guðrún Larsen, 2010, p. 44; Sæmundur Magnússon Hólm, 1958 (1781-1782), p. 132; Stanton et al., 2011 see table 3 p. 6, quoted Jónsson 1979 in table.
e17	**Kararvíkurgrjót**	Location unclear, Vestur-Skaftafellssýsla	Unknown but more than likely an area with post-glacial lava flow formations, place name lost possibly due to lava formation in the Laki eruption AD 1783-1784.	Sæmundur Magnússon Hólm, 1958 (1781-1782), p. 132
e18	**Kvarnarhlíðarhraun**	Kálfafell in Kálfafellssókn, Hörglandshreppur	Narrow valley inland, uninhabited, 200 m a.s.l., habitation 6-7 km away, likely part of Núpahraun/ Fossahraun, a post-glacial lava flow, older than AD 871.	Pnr-Kálfafell, p. 2; *SHÍB 1839-1873*, 1997, p. 162
e19	**Gunnarstindur**	Breiðdalur, Breiðdalshreppur	Mountain peak north of Breiðdalur, 1025 m high, no clear source description, habitation 4-5 km away at its roots, Neogene (2,6-23 Ma) basic and intermediate extrusive rock formations.	*ÞÞ. 14446*
e20	**Breiðdalseldstöðin**	Breiðdalur, Breiðdalshreppur	Deep inland valley, inhabited area 1-2 km away, mountain side, 100-1100 m above sea level, extinct central volcano, silicic rock formations older than 11 th.y.	Quernstone no. 299, The National Museum of Iceland; see also Pnr-Ánastaðir, p. 19.
e21	**General area, Reyðarfjarðareldstöð?**	Kolfreyjustaðasókn, Fáskrúðsfjörður	Precise location unclear, inhabited fjord in E-Iceland, Neogene lava form., mountains N and S of the fjord (5-900 m) also contain extensive remnants of an extinct central volcano, silicic, extrusive rock, older than 11 th.y. Quernstones made from silicic and possibly intermediate rock from Kollaleira in Reyðarfjörður were registered in 2016, very likely from these formations.	*SHÍB 1839-1874*, 2000, p. 426.
e22	**Fljótsdalsheiði**	Fljótsdalshreppur	Precise location unclear, extensive heathland, 5-700 m above sea level, uninhabited, habitation 10-15 km away.	*ÞÍ. Rtk. B10.6.26*, 1783
e23	**Kvarnarhraun, Haugafjalli***	Skriðdalshreppur	A large rockslide or remnants of a rock glacier in an inland valley, 370 m a.s.l., mountain side, inhabited area 1-2 km away, very likely tholeiitic rhyolite rock from an extinct central volcano, Þingmúlaeldstöð, active in the Neogene period about 4-6 m.y. ago. One millstone registered in 2015 at Haugar farm made from the same material.	Quern no. 218; Carmichael, 1964, p. 437 and 442 and figure 1; Charreteur et al., 2013, figures 1, 2e and 10a; Pnr-Haugar, p. 3; Ágúst Guðmundsson, 1995; *ÞÞ. 10613*; Ólafur Jónsson, 1976, pp. 125-130.
e24	**"Skriðdalsfjall"**	Skriðdalshreppur	Mountain, precise location unknown, inland valley, inhabited area 1-5 km away, both Neogene basic and intermediate extrusive formations and silicic rocks from an extinct central volcano in the mountains of Skriðdalur, Þingmúlaeldstöð. The river Jóka has been known to transport large pillows of vesicular, silicic lava down to the lowlands, quernstones from very similar material were registered at the farms Vað and Mýrar in Skriðdalur in 2014.	*ÞÍ. Rtk. B10.6.26*, 1783
e25	**Mjóifjörður**	Mjóafjarðarhreppur	Narrow fjord, precise location unknown, inhabited in the lowlands along the coast, mountainous area around the fjord, 700-1100 m, Neogene basic and intermediate extrusive rock formations.	*ÞÍ. Rtk. B10.6.26*, 1783

e26	**Skjaldþingsstaðafjall (Krossavíkurfjöll)**	Vopnafjörður	Mountains beside a fjord, 600-1100 m high, precise location unknown, inhabited areas 1-5 km away in the lowlands along the coast, Neogene basic and intermediate extrusive rock formations. Rock in the mountain is called quernstone rock and likened to "*from what a Danish man has said, rock from the Rhine valley* [rínsku grjóti]." in Germany, likely Mayen area.	*SHÍB 1839-1874*, 2000, p. 42.
e27	**Krossavíkurfjara**	Vopnafjörður	The coast, precise location unknown, Neogene basic and intermediate extrusive rocks, habitation <1 km away.	*ÞÞ. 2349*
e28	**General area/s**	Borgarfjörður eystri, Norður-Múlasýsla	Fjord, precise location unknown, inhabited in the lowlands along the coast, mountainous area around the fjord, 400-850 m, Neogene basic and intermediate extrusive rock formations along with silicic formations from an extinct central volcano, >11 th. y.	*ÞÞ. 2081*
e29	**Grænavatnsmelar, Grænavatnsbruni**	Grænavatn, Skútustaðahreppur	Flat lava plain inland, post-glacial lava flow, 300-350 m a.s.l., inhabited areas around Mývatn 5-6 km away.	*ÞÍ. Rtk. B10.6.23*, 1783
e30	**'Kvarnarsteinakambur', Hrauntunga***	Suðurárbotnar, Bárðdælahreppur	Flat lava plains far inland, 450-500 m a.s.l., uninhabited area, habitation 10-15 km away, post-glacial lava flow, Útbrunahraun, 10.300 years old, where raw material was taken the rock is heavily broken up into large but thin, vesicular plates forming an extensive crest, block lava, lava very sandy in places.	Jón. F. Einarsson, 1990-1993, p. 38; Árni Hjartarson, 2004, p. 157; *ÞÞ. 1902*; Ólafur Jónsson, 1945, pp. 181 and 183-184.
e31	**Selgilsbotn, Kinnarfjöll***	Fornastaðir, Ljósavatnshreppur	Wide, inland valley, habitation 2-3 km away, scree on a mountain slope, 7-800 m a.s.l., basic and intermediate extrusive rock formations, 3.3-8.5 Ma old. Where material was taken high in the mountains age is likely closer to 3.3 m.y.	Haukur Jóhannesson, 2014; Haukur Jóhannesson and Kristján Sæmundsson, 2009; Pnr-Fornhólar, pp. 2-3.
e32	**Kvarnárhraun, Kvarnárdalur upp af Skíðadal**	Klængshóll, Svarfaðardals-hreppur	Inland valley, uninhabited, habitation 4-5 km away, raw materials at the base of Kvarnárdalur valley, possibly 300 m a.s.l., Neogene basic and intermediate extrusive rock formations, rock considered very good for that area.	Pnr-Klængshóll, p. 4.
e33	**Hamarshyrna**	Fljót, Tröllaskaga	Steep mountain slopes, mountain 883 m high, wide inland valley, inhabited in the lowlands 1- 2 km away, precise location unclear, Neogene basic and intermediate extrusive rock formations.	Hannes Pétursson, 1984, p. 84.
e34	**Krakavellir, above the farm**	Flókadalur, Tröllaskagi	Mountain slopes, mountains 6-900 m high on either side of the farm, narrow inland valley, inhabited in the lowlands, precise location unclear, Neogene basic and intermediate extrusive rock formations.	Frímann Arngrímsson, 1919, p. 10.
e35	**Hofsstaðaurð and Urðarhólar***	Hofsstaðir, Skagafjörður	Extensive rockslide or remnants of a rock glacier in the western slopes of Hofsstaðafjall (~800 m), wide inland valley, habitation 1-2 km away, basic and intermediate extrusive formations, 3.3-8.5 Ma old.	Ágúst Guðmundsson, 1995; Ólafur Jónsson 1976, pp. 16-17 and 95; Pétursson, 1984, p. 87
e36	**Hólabyrða, Hjaltadalur**	Hjaltadalur	Mountain slopes, Hólabyrða (1244 m), wide inland valley, inhabited in the lowlands 1-2 km away, precise location unclear, Neogene basic and intermediate extrusive rock formations.	Querns no. 51 and 52, Skagafjörður Heritage Museum.
e37	**Ketubjörg at Skagi (?)***	Keta, Skarðshreppur, Skagafjörður	The coast, bedrock beaten by the sea, precise location unclear, habitation 2-3 km away, basic or intermediate extrusive rock formations in the area, 0.8-3.3 Ma. old.	*ÞÞ. 2100*
e38	**Gedda/Gedduhryggur, Vatnsdalsfjall**	Hvammur, Vatnsdalur, Húnavatnssýsla	Mountain, rock cliff above Hvammur farm 1-2 km away, likely 3-400 m a.s.l., in Vatnsdalsfjall, inland valley, inhabited in lowland areas, description mentions sandstone, but it is more likely to have been intrusive rock, possibly dolerite or diorite.	Pnr-Hvammur, p. 8; *LFI*, 1854, pp. 463-464; Ólafur Olavius, 1965b, pp. 205-206
e39	**Reykjarfjörður**	Vatnsfjarðarsveit	Very narrow fjord, mountains 150-350 m high, thin strip of lowland area along the coast, was barely inhabited, precise location unclear, Neogene basic and intermediate extrusive rock form.	Ólafur Lárusson, 1952, p. 140

e40	**Kverngrjótshólar, place name***	Saurbær, Dalasýslu	Low, grassy hillocks in a wide valley, inhabited <0.5 km away, silicic extrusive rock older than 11 th. y., unclear whether there was much raw material taken in this place, one very coarse, possible rough out was found in the area but no functioning quernstones from that material were registered.	*SHÍB 1839-1855*, 2003, p. 167 and 178; Pnr-Kverngrjót, p. 1; *Sturlunga Saga*, 1946b, p. 86
e41	**Bárðardalur og nágr.**	Skarðsströnd, Dalasýslu	Vague reference to possible quernstone production in the area, precise location unknown, coastal area with narrow inland valleys, mountainous, Neogene basic and intermediate extrusive rock formations.	*ÞÍ. Rtk. B10.6.38*, 1783
e42	**Breiðafjarðareyjar, t.d. Skjaldmeyjarey**	Islands in Breiðafjörður	Very small oceanic islands in Breiðafjörður, each barely more than a few hillocks, precise locations unknown, Neogene basic and intermediate extrusive rock formations.	*ÞÍ. Rtk. B10.6.42*, 1783
e43	**Berserkjahraun***	Helgafellssveit, Snæfellsnesi	Coastal area and inland valley, inhabited 1-2 km away, large and very coarse lava, post-glacial lava flow, ~4000 years old, overgrown with moss, sea beats at it on the coast on two fronts.	Haukur Jóhannesson, 1982, p. 164; 2013, p. 376; Björn Jónsson, 1979, p. 34; *ÞÍ. Rtk. B10.6.37, 1783*
e44	**Lárfjall (Brimlárhöfði?)**	Eyrarsveit, Snæfellsnesi	A low mountain on the coast (268 m), precise location unknown, basic and intermediate extrusive formations from the Neogene low in the mountains, and 0.8-3.3 m.y. old similar rock formations higher towards the top, on both sides of Lárvaðall cove.	*ÞÍ. Rtk. B10.6.37*, 1783
e45	**Kvarnarhraun***	Prestahraun, Hellisandi	Coastal area, now uninhabited, habitation was 1-2 km away, post-glacial lava flow on the flat lava plains northwest of Snæfellsjökull volcano, 2-4000 years old, material taken in a large area where the pahoehoe lava is broken up into large but thin, vesicular plates, blocky lava.	Pnr-Gufuskálar, pp. 3-4; Ari T. Guðmundsson, 2003, p. 281; Haukur Jóhannesson, 1982, pp. 170-171, 2013, pp. 367-377; Sigurður Steinþórsson, 1968, pp. 236-237; Kristborg Þórsdóttir, 2014, pp. 29-30.
e46	**Búðahraun***	Breiðuvík, Snæfellsnesi	Coastal area, flat plains, inhabited as close as 1-2 km, along the coast and along the Snæfellsnes mountains north of the extensive post-glacial lava flow, areas within the flow where the lava is broken up into large but thin, vesicular plates, block lava, quernstone was registered from Miðhús farm (courtesy of Guðmundur Alfreðsson, Syðri Knarrartunga) made from vesicular basalt, likely from this lava flow.	*ÞÍ. Rtk. B10.6.37*, 1783
e47	**Beruvíkurhraun**	Suðvestan undir Snæfellsjökli	Coastal area, 40-80 m a.s.l., now uninhabited, habitation was 5-6 km away, post-glacial lava flow southwest of Snæfellsjökull volcano.	*ÞÍ. Rtk. B10.6.37*, 1783

Lava flows that are situated close to inhabited areas with potential for raw material procurement are e.g. in 1) Gullbringussýsla (large areas of the Reykjanes peninsula), Mýrarsýsla (e.g. Geitlandshraun and Hallmundarhraun west of Langjökull and Grábrókarhraun in Norðurárdalur) and Snæfellsnessýsla (e.g. around Snæfellsjökull, Eldborgarhraun in Kolbeinsstaðahreppur and Berserkjahraun in Helgafellssveit) in Southwest and West Iceland, 2) Árnessýsla (e.g. Elborgarhraun in Ölfus and Úthlíðarhraun in Biskupstungur), Rangárvallasýsla (e.g. extensive lava flows west and southwest of Hekla in Landsveit and at Rangárvellir) and Vestur-Skaftafellssýsla (e.g. Eldhraun, Eldgjárhraun and Botnahraun in Álftaver, Meðalland, Landbrot and east of Síða) in the South, and 3) Norður-Þingeyjarsýsla and north-eastern Suður-Þingeyjarsýsla (e.g. Grænavatnsbruni and Búrfellshraun in Mývatnssveit and Kerlingarhraun in Núpasveit) in the Northeast (Haukur Jóhannesson, 2014)[41].

7.2. Icelandic Raw Material Procurement Sites

After scanning historical records and quernstone registration fieldwork, 47 potential raw material procurements sites were identified in all parts of the island (Figure 7.2) where raw materials were or may have been collected for Icelandic quernstones. Place names were recorded in the 20th century for most farms in Iceland, often in great detail. Such names very often indicate or pinpoint locations and/or old histories of varied land use on each farm, such as animal pens and outhouses, rubbish heaps, mills, field systems, animal traps and rock mines, to name just a few examples. In table 7.1, information has been assembled for each recorded procurement site and its location for a general overview of known site types. While these recorded areas are very likely only a fraction of all the places utilised for material procurement in Iceland (see e.g. Sæmundur Magnússon Hólm, 1958 (1781-1782), pp. 132-133; Ólafur Olavius, 1965b, p. 206; *ÞÍ. Rtk. B10.6.22*, 1783; H. Þórðarson et al., 1985, pp. 18-19 for vague hints and indications of other potential sites) they suggest what kind of natural formations and rock types were being exploited and how far craftsmen were ready to travel for materials. In 1783 sheriff Jón Jakobsson in Eyjafjarðarsýsla wrote:

[41] An interactive geological map of Iceland has also been made by ÍSOR and can be found at http://jardfraedikort.is.

> *"Rock types for quernstones, can be found at various places, but nowhere in any quantity, by my knowledge in cliffs or mountains; some have also sought rock types by the sea and from them made good hand querns, the most useful here in the county."*[42] (ÞÍ. Rtk. B10.6.22, 1783).

Exploiting varied rock types for quernstones, found in small quantities in many different places was more than likely the case, not just around Eyjafjörður, but all over Iceland. Documentary sources indicate that quernstone material was indeed sought far and wide, but specific locations of mines or outcrops are rarely described. Sources often mention place names of general areas such as valleys, rural districts or fiords. Where locations are more specific, they mention lava fields, gravel beds, cliffs, heaths, landslides, mountainsides, coastlines and even small islands. However, even when the descriptions are more specific, the areas they pinpoint can still be geographically extensive. Sources tell how craftsmen travelled to material procurement sites where they gathered suitable flagstones and pared them roughly down to size on site before transporting them back home where the majority of the work would take place during the wintertime. Materials were transported home on horses, on sleds, skis and even on the craftsman's back (Jón F. Einarsson, 1990-1993, p. 38; Sæmundur Magnússon Hólm, 1958 (1781-1782), pp. 132-133; Hannes Pétursson, 1984, pp. 82-87 and 92; G. Sigurðsson et al., p. 8; *ÞÍ. Rtk. B10.6.37*, 1783; Kristleifur Þorsteinsson, 1944, pp. 16-17). Sæmundur Magnússon Hólm[43] (1749-1821), who grew up in Vestur-Skaftafellssýsla, wrote a description of quernstone masonry practiced within the district:

> '*The quern is made of two lava slabs, which can be found mainly at lava skerrys* [within sandy lava planes], […] *Each stone on the sand is checked for its rock type, and then he* [the farmer/craftsman] <u>*digs them up and collects them wherever he can find them*</u>. […] *Two of those flagstones are needed for the upper and lower quern. Then they are transported with care to the quern mason's home.*' (Sæmundur Magnússon Hólm, 1958 (1781-1782), pp. 132-133)[44]

None of the sources analysed give any indication of special encampments or installations where rock was prefabricated or produced on site. Since all the sources suggest that very little work took place at the procurement sites it is very unlikely to find any structures or

[42] Translated from Danish by this author.
[43] later a priest at Snæfellsnes.
[44] The underlined text is this author's emphasisl. The wording was kept as close as possible to the original text.

accumulated production debris such as rough-outs, broken quernstones, centre plugs or other rock chippings or human refuse on site. Very often the sources speak of seeking flagstones or rock slabs of good size, preferably needing only paring for transport so it would be more likely to find scattered rock fragments and flakes formed when rocks and flagstones have been pared, and perhaps split, so as not to transport unnecessary weight back home. Þór Magnússon, then director of The National Museum of Iceland, once received information regarding possible quernstone fragments within the lava field in Kaplakriki in Hafnarfjörður (e3; Table 7.1; Figure 7.2). Þór Magnússon (2016, pers. comm.) later walked around the area for a long time but never found anything demonstrating how finding even clear quernstone debris in a named area in the Icelandic landscape is bit like finding a needle in a haystack.

7.3. Surveying the Sites

Out of the 47 sites, fifteen sample sites in ten different areas were selected for closer inspection, mainly to acquire more detailed information on the landscapes being exploited and to confirm that finding physical evidence of raw material procurement on site in Iceland is unlikely. Areas for closer inspection were selected based on 1) their historical significance, 2) formation locations and 3) rock types being exploited. Lack of access to chosen formations affected the decision process during fieldwork only to a small degree. All the chosen areas are named in documentary sources except Ljósárdalur and Ljósárgil in the Skriðdalur mountains (e24; Table 7.1; Figure 7.2). This area was chosen because during fieldwork in Skriðdalur, two very distinct quernstones were registered made of pale yellow, vesicular rhyolite (acid rock) that very likely has its source in that mountain area. The chosen areas were surveyed in July and August in 2015 (Sólveig G. Beck, 2015). One day (10-15 working hours) was spent on each site interviewing local informants and walking as much surface area on site as possible to get a good general overview of available materials. The surveyed areas can be split into two categories:

Lava flow fields: Mainly made up of basic and intermediate rocks.

Erosion formations: Mountain screes, riverbeds and rocky shorelines, a range from basic to acid rocks (a range also called basaltic/silicic, or mafic/felsic rock series).

7.3.1. Lava Flow Fields

<u>*Lowland areas*</u>

Three lowland areas close to the coast were selected where sources mention utilisation of lava flow fields: a) Brenna (e2) in the upper parts of the Kapelluhraun lava flow field on Reykjanes (Pnr-Þorbjarnarstaðir, p. 8), utilised e.g. by craftsman Guðmundur Bergsteinsson (s3; Table 5.2); and two fields on the north coast of Snæfellsnes, b) Kvarnarhraun (e45) in Prestahraun within the boundaries of the abandoned farm of Gufuskálar (Kristjánsson and Magnúsdóttir, p. 4), and c) Berserkjahraun (e43) in Helgafellssveit (*ÞÍ. Rtk. B10.6.37*, 1783) utilised e.g. by craftsman Jón Ásmundsson (s100; Table 5.2). All these lava flow fields were exploited for their occasional flagstones and/or richer flagstone patches where the smooth crust of pahoehoe lava has been disrupted and broken into pieces during the lava flows formation (Þorvaldur Þórðarson, 2013, p. 116; see also e.g. Keszthelyi et al., 2004, pp. 14-21).

The Brenna lava flow was formed in a volcanic episode called Krísuvíkureldar that took place in the 12th century and originated in the Krísuvík volcanic system in the Trölladyngja area. The lava is classified as olivine tholeiite basalt (Sigmundur Einarsson et al., 1991, pp. 61, 65 and 71; Haukur Jóhannesson and Sigmundur Einarsson, 1998, p. 173 and 175; Kristján Sæmundsson and Magnús Á. Sigurgeirsson, 2013, p. 383 and 392). In the area east of Kapelluhraun there are three older lava flow fields that could also have provided useable raw materials, Older and Younger Hellnahraun originating in Brennisteinsfjöll, lava flow fields that did not form later than 3-4000 years ago and late in the 10th century A.D. respectively, and Óbrynnishólahraun thought to have formed early in the 2nd century B.C. (Sigmundur Einarsson et al., 1991, pp. 72-74; Haukur Jóhannesson and Sigmundur Einarsson, 1998, p. 173 and 175; Jón Jónsson, 1974, pp. 117-118). It is likely that other craftsmen would also have found materials in the multiple other lava flow fields that have formed on Reykjanes through the ages, as was indeed the case e.g. in Grindavík (e1) and Keflavík (craftsman s1; Table 5.2).

The lava flow field of Berserkjahraun, or Mjóasundahraun (Björn Jónsson, 1979, p. 34), is in fact three lava flows southeast of the mountain Bjarnarhafnarfjall that originated in the so-called Ljósufjöll volcanic system, reaching down to the sea in two places in Hraunsfjörður and Hraunsvík. The procurement area mentioned in documentary sources refers to the youngest part of the lava (~6 km^2) that flowed from a crater called Smáhraunakúla to the southwest into the sea in Hraunsfjörður where it almost closed off the fiord. All the lava flows are around 4000 years old (Haukur Jóhannesson, 1982, p. 164; 2013, p. 376). One quernstone (no. 112 in the quernstone catalogue) was registered in the Bjarnarhöfn Museum made of vesicular, volcanic rock that could well have originated in Berserkjahraun.

Kvarnarhraun (or Bekkjahraun as it is generally called) is thought to have originated in a large crater called Rauðhólar about 2-4000 years ago. Rauðhólar are located in the lowlands northwest of Snæfellsjökull volcano and are a part of the Snæfellsjökull volcanic system. The village of Hellissandur is partly built on this lava flow (Ari T. Guðmundsson, 2003, p. 281; Haukur Jóhannesson, 1982, pp. 170-171; 2013, pp. 367-377; Sigurður Steinþórsson, 1968, pp. 236-237).

Brenna and Berserkjahraun are both fairly thin flows (at least 2-5 m) but with coarse sides that are hard to climb. Both lava flow fields are typified by coarse grained rubbly surfaces and are covered with blankets of moss (Figure 7.3). The moss makes it easier to travel across the coarse lava and the place name record mentioning Brenna tells of how the craftsman used that moss as a lining between his back and the lava flagstones as he carried them home. However, when carrying a heavy flagstone, the trip would have been dangerous. It seems more likely the craftsmen would search for flagstones closer to the sides of such lava flows rather than venture far into the fields. Both Brenna and Berserkjahraun have been damaged by road works and construction projects. Where they have been disturbed the lavas seem to have broken up into gravel and coarse blocks unsuitable for quernstones, so such lavas would in general likely not provide much useable raw material except the flagstones in scattered locations on their surface. In both locations no specific raw material procurement sites are known. A small surface area within each lava flow was surveyed and a few potentially useful, relatively flat flagstones (>0.5x0.5 m) of vesicular rock were found in scattered locations in both lava fields, measuring 10-30 cm thick (Figures 7.4 and 7.5). It seems therefore likely that craftsmen would have had to hunt for flagstones within the lava fields. All the flagstones found were covered with scoria. The likelihood of finding debris from raw material procurement in such lava flows is miniscule.

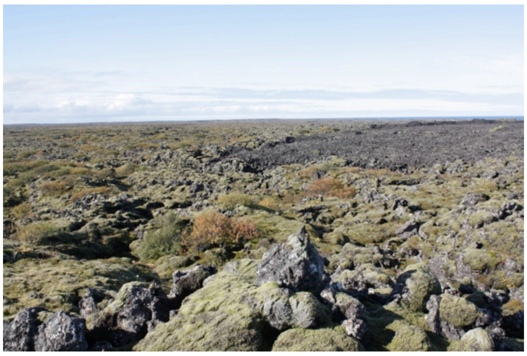


Figure 7.3. Brenna in Kapelluhraun, to the left the coarse lava has been damaged due to construction (view to the NW).

Figures 7.4 and 7.5. Vesicular, lava flagstones (thickness ~15-20 cm) in Brennan in the Kapelluhraun lava flow field that could potentially be used for quernstones.

Kvarnarhraun is part of the Prestahraun lava flow field (Kvarnarhraun and Bekkjahraun are also considered parts of Prestahraun). From the sources it was unclear where the actual raw material was acquired other than it being found in Kvarnarhraun somewhere within Bekkjahraun. During a walk through the lava field it became clear however, that raw material was acquired in the lowlands in an extensive area ~1.8 km SSV of the Gufuskálar farm and ~800 m SW of a clear, lonely hillock in the landscape called Hríshóll. The surface of the lava in this area is also covered in grass and moss but it is no thicker or higher in the surrounding landscape and heavily broken up into scores of large flagstones (Figure 7.6) sticking out of the vegetation at all angles. Flagstones can also be found around this area closer to Hríshóll and towards the sea but not in such large numbers. In Kvarnarhraun the flagstones are of all sizes and shapes, from being barely 2 cm to 30-40 cm thick (Figures 7.7 and 7.8). No indications of potential material procurement debris were detected in the area surveyed. As the lava fields Brenna and Berserkjahraun could not be traversed in their entirety it cannot be excluded that perhaps similar formations of flagstone patches could be also found within them. One other such flagstone patch has also been located within Búðahraun (e46), another lava flow field in Breiðavík in the South of Snæfellsnes (see also Kvarnasteinakambur in Hraunbotnar (e30) below).

Figure 7.6. Kvarnarhraun in the land of Gufuskálar at Snæfellsnes. A vast flagstone patch, view to the SW.

Figures 7.7 and 7.8. One of the biggest flagstones found in Kvarnarhraun in the land of Gufuskálar at Snæfellsnes (the walking stick is 1.2 m long).

Inland Areas

Two inland areas at higher altitudes were surveyed where lava fields were utilised: a) Svínahraun (e10) lava field (in connection with the place name Kvernháls (quernstone ridge)), an area utilised by craftsman Þóður Halldórsson from Hrauntún (s8; Table 5.2), and b) Kvarnarsteinakambur (e30) at Hrauntunga in Suðurábotnar (Jón F. Einarsson, 1990-1993, p. 38 tells of the place name Hrauntunga; *ÞÞ. 1902*, mentiones a quernstone "lava ridge" in northern Ódáðahraun)[45] utilised by craftsman Einar Friðriksson from Svartárkot (s69; Table 5.2).

Svínahraun is a vast tongue of lava flow that is still only a small part of the great Lambahraun lava flow field in the Western volcanic zone that extends from Geitafell to the northeast of Langjökull. Lambahraun is a vast lava field (>145 km^2/~7 m^3) that is thought to have flowed from Eldborgir north of Kálfstindur around 2200 B.C. (4100 +/- 500 years BP). The most common rock type in the lava field is olivine tholeiite basalt (Eason and Sinton, 2009, p. 337; Sveinn Jakobsson, 2013, pp. 359, 360 and 362; Sinton et al., 2005, p. 15, see also figure 3 p. 5 and table 3 p. 10). The Svínahraun lava flow field is flat and largely overgrown with heathland vegetation (Figure 7.9). Out

Figure 7.9. View NW towards Hellisskarð west of Lambahraun, over the relatively flat and well grown Svínahraun at the roots of Bjarnarfell mountain.

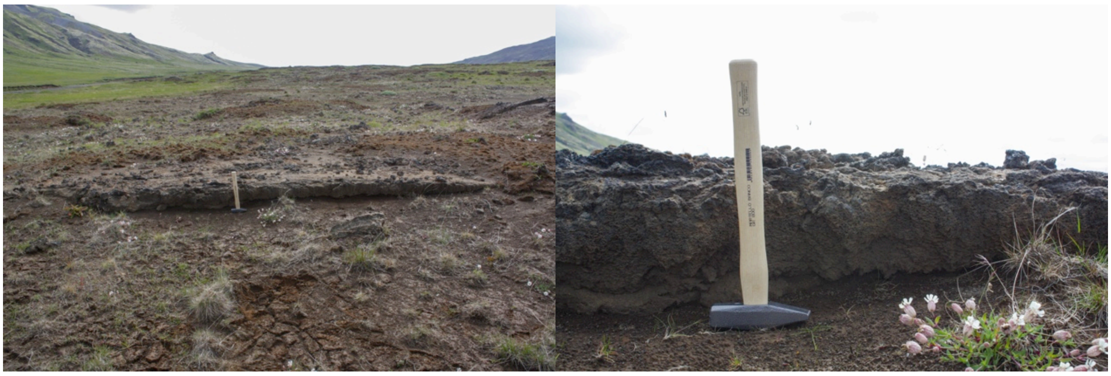
[45] The latter source tells of a "so called 'kvarnarsteina kambur'" that does not seem to have been used generally as a place name but *Kvarnarsteinakambur* has been taken up here as a name to demarcate the extensive flagstone ridge in the Hrauntunga area.

of the vegetation, lava domes protrude here and there with cracks in their smooth tops. In those cracks the lava is much too thick and curved to be of any use, so the majority of the lava field has likely been unsuitable for quernstones.

According to farmer Björn Sigurðsson (2015) in Úthlíð, flagstones found in an area called Kvernháls (quernstone ridge) were used for quernstones. Based on Björn's directions Kvernháls was located at the eastern edge of Svínahraun lava field on the planes northwest of Bjarnarfell mountain. Kvernháls is indeed mentioned in the Úthlíð place name registry (Sigurður Jónsson, pp. 7-8) in connection with an old road system that crossed the Svínahraun lava flow and continued over Kvernháls to the east. However, there is no mention of quernstone raw material procurement, and the descriptions suggest that Kvernháls was much higher in the landscape than Svínahraun. A more detailed description of the ridge's location was found in documentary sources from the 19th century describing an old road system called Kjalvegur (Sigurður Pálsson, 1884, p. 1), where Kvernháls was said to be a ridge above the lava field north of Bjarnarfell, a ridge that the road crossed to the east down into the lowlands of the Biskupstungur area. This perhaps suggests two potential material procurement sites in the area.

The area where raw material procurement took place according to Björn Sigurðsson is indeed along the eastern edge of the Svínahraun lava flow, on the flat, sandy banks of a dried-up river that flowed along the mountainside down into the lowlands in the south. The area is about 2 x 0.5 km and is aligned NNE-SSW. Here the lava seems to have flowed towards and into the riverbed and solidified in thin sheets of rock on top of older river sediments, sheets that later could have broken up into smaller sections through weathering. Examples of vesicular flagstones of good thickness (30-50 cm) were present in the area but very little could be found of larger flagstones potentially useful for quernstones. In one place in the northern part of the area however, there is still an extensive, unbroken sheet of thin lava (15-30 cm thick) that could possibly be of use in quernstone production (Figures 7.10 and 7.11). It is likely that most of the larger flagstones have been removed but no clear indications of raw material procurement debris could be detected in the area, which no doubt has suffered extensive wind erosion through the years.

There is therefore little doubt that raw material for quernstones could be found at the edge of Svínahraun but it is more likely that the place name Kvernháls came about in a slightly different way. The aforementioned Kjalvegur road system crossed the lava fields over the Kvernháls ridge between the mountains Bjarnarfell and Sandfell and continued



Figures 7.10 and 7.11. To the left, the large, thin lava sheet at the outskirts of Svínahraun, view SSW. To the right, the edge of the sheet close up, the hammer is about 35 cm long.

to the east down into Haukadalur valley in Biskupstungur, just north of the farm Helludalur about 4 km ESE of Svínahraun's eastern edge. It seems more likely that the ridge got its name from the time when the farmers of Haukadalur, like e.g. Guðmundur Magnússon master craftsman from Helludalur farm (s9; Table 5.2, and quernstone 66 the catalogue), perhaps travelled over the ridge to Svínahraun to look for raw material for their quernstones. However, the possibility that good flagstones could also have been found on the gravel fields on Kvernháls ridge cannot be entirely ruled out.

Hrauntunga (lava tongue) is an area at the source of the river Suðurá in Suðurárbotnar, about 9,5 km from Svartárkot by Svartárvatn in Bárðardalur. A clear path lies from Svartárkot by Svartárvatn on Útbrunahraun inland to the ESE along the northern bank of Suðurá into Suðurárbotnar. While walking along the river many large flagstones and fractured lava rocks can be seen along the path where the surface of the flat Útbrunahraun has broken up. To reach Hrauntunga it was necessary to take a detour around the source of the river and travel along the edge of Fjallsendahraun (also known as Frambruni), past the river Bæjarlækur, which flows out from beneath the edge of the Suðurárhraun lava flow in the Bárðardalshraun lava flow field. Útbrunahraun is fairly flat while Fjallsendahraun and Suðurárhraun are both thick and coarse, basic and rubbly pahoehoe lavas rising menacingly above the sandy flatlands in Hrauntunga. The three lavas are all originated in the Northern volcanic zone and more specifically within the Dyngjufjöll area. Fjallsendahraun likely originated in Trölladyngja in a volcanic eruption in the 12th or 13th century AD but no documentary sources clearly connected to that eruption have been found. The other two are both more than 7000 years old (Árni Hjartarson, 2004, pp. 156-160; ÍSOR, 2019; Ólafur Jónsson, 1945, pp. 181-184).

The Hrauntunga area itself is a sandy plain demarcated by Suðurá in the north, Fjallsendahraun in the east and Suðurárhraun in the south and west (Figure 7.12). The area is about 2x1 km NW-SE along Suðurá. The sandy plains cover a ~9500-year-old lava field called Kinnarhraun (ÍSOR, 2019), and they are slowly being colonised by lyme grass. In Hrauntunga there are plenty of good, vesicular lava flagstones floating here and there in the sand and two cairns are built from flagstones close to the western banks of Bæjarlækur. On the walk west, the flagstones slowly make way for larger sand dunes, finally leading to a huge, lava ridge (Figure 7.13) in the middle of Hrauntunga where the northwestern edge of Kinnarhraun has been crumpled into huge flagstones, rocks and boulders, again slabby pahoehoe lava (isl. *klumpahraun*; Þorvaldur Þórðarson, 2013, p. 116). In this area there are huge piles of large and small flagstones from 5 to >30 cm in thickness among other clasts of the lava rubble (Figures 7.14 and 7.15), which together


Figures 7.12 and 7.13. On the left is the view NW into Hrauntunga, over Bæjarlækur and the sandy Kinnarhraun. At the left edge of the photo is the thick, dark edge of Suðurárhraun. On the right is Kvarnarsteinakambur between Suðurárhraun and Suðurá, viewed towards the NNW. Photo is taken from the upper edge of Suðurárhraun.


Figures 7.14 and 7.15. To the left are flagstones and other lava rocks found in the sands at Hrauntunga (hammer ~35 cm long). To the right is a close up of the largest flagstone.

form a ~1 km long and 0.5 km wide lava ridge NNW-SSE from the edge of Suðurárhraun north to Suðurá. This is very likely the area that one source referred to as the "so called 'kvarnasteina kambur'" (see above) and has on those grounds been allocated the name Kvarnarsteinakambur. No clear indications of raw material procurement debris were found in the area.

7.3.2. Erosion Formations

Five areas with ten recorded potential material procurement sites were selected to look into locations where erosion formations were utilised for quernstone material procurement: 1) Botnahraun (e15-e17) and the Geitland *area* (e8-e9) to represent sandy gravel plains (isl. *melar*) partly or wholly covering old lava flow fields, and 2) Skriðdalur (e23-e24), Skagafjörður (e35 and e37) and Selgilsbotn (e31) representing mountain screes, riverbeds or rocky shorelines.

Gravel plains

It is interesting that the two areas with the greatest historical presence are both old lava flow fields, Botnahraun and Geitlandshraun, which have more or less turned into vast sandy gravel plains. The two areas slightly resemble the sandy plain in Hrauntunga, covering the Kinnarhraun lava field discussed above. However, Hrauntunga was grouped as a lava field because the main material procurement area was likely the extensive ridge of slabby pahoehoe lava, relatively unaffected by the sandy blanket around it. It can't be ruled out however, that flagstones were also gathered on the sandy plains and other fragmented areas within the lava fields surrounding the area, so Hrauntunga and Kvarnarsteinakambur could in essence belong to both groups.

The oldest documentary sources mentioning raw material procurement for quernstones are from the late 18th century. In 1780 Sæmundur Magnússon Hólm (1958 (1781-1782), p. 132) mentions three known material procurement sites in the district of Leiðvallarhreppur in Vestur-Skaftafellssýsla: Kararvíkurgrjót, Hellisskersmelar and Króklækjarmelar (*melar* = sandy gravel planes) south of Trjágróf (e15-e17). The place names Hellisskerssmelar and Trjágróf were found in the place name records of two farms, Hnausar (E. Eyjólfsson, p. 2) and Botnar (E. Eyjólfsson, p. 2) in an area called Meðalland (see also quernstones 82 and 431 in the quernstone catalogue). In the place name record for Botnar there is also mention of Krókmelar and Krókvatn but no Króklækjarmelar (E.

Eyjólfsson, p. 3). After scanning all place name records for Vestur-Skaftafellssýsla and speaking with Kjartan Ólafsson farmer in Botnar (K. Ólafsson, 2015) and the late Vilhjálmur Eyjólfsson from Hnausar (V. Eyjólfsson, 2015), it became clear that the place name Kararvíkurgrjót is likely lost. Vilhjálmur from Hnausar[46] did not recognise the place name Króklækjarmelar but suggested that the area in question could be south of Króklækir, the three water streams that flow onto the sandy gravel plains from underneath the Eldgjá lava in Botnakrókur about 3 km south of the farm at Botnar. According to Kjartan in Botnar, Hellisskersmelar are about 3 km southeast of Botnar and about 1.5 km southeast of Krókvatn (Figure 7.16). Between Krókvatn and Hellisskersmelar there are Krókmelar (possibly an abbreviation of Króklækjarmelar) but the borders between these two areas are very unclear.

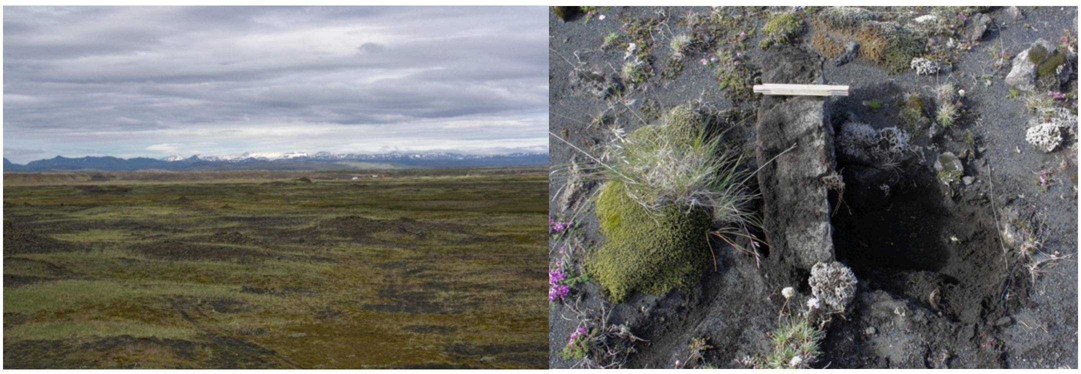
Figure 7.16. Hellisskersmelar in Botnahraun, view to the south. Kjartan Ólafsson strolling in the distance.

The farm in Botnar stands at the outskirts of the Laki lava flow field that flowed from the Laki fissure within the Grímsvötn volcanic system between 1783-1784. During this volcanic episode the old farm in Botnar disappeared under the lava flow and was later moved to the west where it now stands (2019), enveloped by the lava field on almost all sides. (Thorvaldur Thordarson et al., 2003, pp. 11-13 and 45; Thorvaldur Thordarson and Self, 1993). The old farm stood on Eldgjárhraun, which is thought to have originated in Eldgjá circa 934-39 A.D. within the Katla volcanic sytem (Thorvaldur Thordarson et al., 2001, pp. 34-35). Both lava flow fields flowed thick and voluminous down onto the gravel planes towards the southwest in succession, one on top of the other. Protruding from underneath these two extensive lava flows is the third lava flow field called Botnahraun southwest of Botnar farm. It is considered likely that this lava originated in the Rauðhóls-Bunuhóla-Hálsa crater system, part of the Þórðarhyrna volcanic system. Botnahraun is ~6-7000 years old and classified as olivine basalt (Jón Jónsson, 1979, pp. 218, 227-228 and 230; Guðrún Larsen, 2010, p. 44; Stanton et al., 2011, see table 3 p. 6). The sandy

[46]The quernstone Vilhjálmur had to turn for a while when he was young, grinding rye, is preserved at Skógar Museum (Figure 1, quernstone 82 in the quernstone catalogue).

gravel planes covering Botnahraun reach from Krókvatn close to the Botnar farm, all the way south to the farm Feðgar south of Eldvatn. West of Krókvatn the area extends east to the edge of the Laki lava flow field, and from there, all the way south to Langholtsrás. In total this area is about 4-5x4 km in size.

According to the descriptions of Sæmundur Magnússon Hólm in 1780 the farmers sought their materials to the south out on the gravel planes covering Botnahraun before the Laki lava flow was formed three years later, even though the much less disturbed Eldgjárhraun was also accessible. Kjartan in Botnar pointed out that there are very few usable flagstones in this lava field, which most likely explains why Botnahraun was chosen. The materials from the older Botnahraun are also much more broken up. In the Laki lava flow field the available rock is rubbly and slabby pahoehoe similar to the Brenna and Berserkjahraun lava flow fields (see above). According to Kjartan, flagstones are more common there, but somewhat vitreous and fragile (see also e.g. Keszthelyi et al., 2004, pp. 19-21). Perhaps the farmers in the area could have made use of flagstones from the new lava sometime after it formed. It is also possible that Kararvíkurgrjót (the lost place name) may have disappeared under this new lava field as the description is written 3 years before it formed. Kjartan did not remember ever seeing any remnants of broken quernstones or rough outs, but during our outing on the planes he could point out a few places where good flagstones could be found, e.g. on Hellisskersmelar (Figures 7.17 and 7.18). Plenty of small vesicular flagstones of suitable thickness can be found floating on the surface of the plains, but flagstones large enough for quernstones are rare.



Figures 7.17 and 7.18. To the left, the view from Sauðasker at Hellisskersmelar over Krókmelar NNW towards the Botnar farm in the far distance. On the right, a typical flagstone found floating in the sand at Hellisskersmelar, of suitable thickness but otherwise too small.

The second account of material procurement is from the late 20th century (Kristleifur Þorsteinsson, 1944, pp. 16-17 and 30) and describes an area inland west of Langjökull called Geitland, where the farming craftsmen of Húsafell farm (see e.g. s103, Table 5.2) procured raw material for quernstone production from the Geitlandshraun lava flow field (e8) south of Svartá at the roots of Hafrafell mountain. The Húsafell masons made querns for the whole of Borgarfjörður and possibly beyond. According to the descriptions, flagstones were scattered far and wide in varied sizes, not too thick for quernstones. Usually two men with 5-6 packhorses collected raw materials in the area once a year during the summer. The flagstones were pared with hammer and chisel down to a size suitable for the horses to carry and transported for a distance of around 12 km along a road called Kvarnarvegur, to Húsafell where the main work took place. The area was utilised until the end of the 19th century (Pnr-Húsafell, p. 3; Kristleifur Þorsteinsson, 1944, pp. 16-17; Pnr-Húsafell, p. 2; Þorsteinn Þorsteinsson 1988, p. 36). In one of the place name records for Geitland (A. Gíslason, p. 3) a later procurement area is mentioned within Geitland by a mountain called Hádegisfell which Þorsteinn Þorsteinsson from Húsafell recognised (Þ. Þorsteinsson, 2015) as likely being higher up in the Geitland area by Geitá, just north of Nyrðra-Hádegisfell at the mouth of Kaldidalur (Figure 7.19). Þorsteinn believes that the packhorse trips to Geitland likely only took one day, although he does not rule out the possibility that farmers took shorter trips to trim and gather flagstones together in one place before transporting them home. Kaldidalur (e9) is also mentioned as a raw material procurement site in answers to one of The National Museum questionnaires (*ÞÞ. 7397*) but it is unclear whether this account applies to the area under Nyrðra-Hádegisfell already mentioned, or if there is a third potential raw material procurement site at lower altitudes within the long valley beyond the Geitland area.

Figure 7.19. Flagstones floating on the sands north of Nyrðra-Hádegisfell and Geitá, view N.

The Geitlandshraun lava field originated in Geitlandsgígar (craters) about 9000 years ago (about 7000 BC/8900 cal yrs BP; C^{14} dating of charcoal underneath the lava). The lava covers about 62 km^2 from Geitlandsgígar and Geitá high in the landscape in the south, north into the lowlands to Hvítá. Geitlandsgígur is part of the Geitland volcanic system west of Langjökull, a fissure swarm reaching from Hallmundarhaun lava field in the north, through the western edge of Langjökull and Geitland south to Þingvellir. The most common volcanic rock is olivine tholeiite basalt (Sinton et al., 2005, p. 14, see also table 3 p. 3 and figure 6, p. 11; Þorsteinn Þorsteinsson, 1988, p. 36). Kvarnarvegur has largely disappeared and it has long been forgotten where exactly flagstones were mainly collected as the documentary descriptions are vague. Þorsteinn Þorsteinsson from Húsafell pointed out two possible sites in the Geitland area following the descriptions (some actually written by him). In these locations the Geitland area and the Geitlandshraun lava field are largely a barren, sandy gravel plain but with lower altitudes towards the north, away from the glacier, vegetation cover becomes more extensive. When the areas were surveyed no large flagstones were found near Langalaut, south of Svartá at the roots of Hafrafell, although smaller, vesicular flagstones were observed scattered on the gravel plains here and there. This is perhaps not surprising since usable material was removed in large quantities. Under Nyrðra-Hádegisfell however, there are plenty of 10-20 cm thick flagstones floating in the sand (Figures 7.19, 7.20 and 7.21), although they are on the small side for quern production. Perhaps the farmers had to move raw material procurement higher up towards Geitá and Nyrðra-Hádegisfell when larger flagstones became depleted south of Hafrafell.

Figures 7.20 and 7.21. To the left a flagstone on the sand north of Nyrðra-Hádegisfell at the southern end of Geitland just north of Geitá river (slide rule ~20 cm long). To the right a clear example of vesicular rock, but the surface is highly worn likely through wind erosion. The flagstone is about 13 cm thick.

It is interesting to note that Sæmundur Magnússon Hólm mentions in his description that those seeking quernstone materials in Meðalland (see e15-e17) also needed to dig for stones, likely as the lava formations exploited there are to this day largely covered in sand and gravel. This seems also to have been the case in Landmannahreppur in 1783:

> *'Here everywhere there is enough of lava rock but only a small portion of it is suitable for good quernstones; possible usable materials can with much difficulty be located and dug up from the earth.'* (*ÞÍ. Rtk. B10.6.33*, 1783).

No clear indications of specific material procurement areas or debris could be found in Geitland or Meðalland. If any small and/or large holes or ditches were dug down onto the lava fields in these areas, they are likely long since filled up as the plains have no doubt been smoothed out by weathering. This likely applies to the sands at Hrauntunga discussed above as well.

Mountain screes, riverbeds and rocky coastlines

In 1783 Jón Sveinsson, the sheriff of Suður-Múlasýsla in East Iceland, exchanged letters with the Danish Exchequer regarding possible raw material procurement sites in the county. In his writings he suggested that potential outcrops could perhaps be found in *Skriðdalsfjöll* (e24), i.e. the mountains of Skriðdalur (*ÞÍ. Rtk. B10.6.26*, 1783). However, exactly which mountain/s in Skriðdalur he is referring to is unclear. During fieldwork four quernstones (218, 224b, 225b and 432 in the quern catalogue) were registered made of two types of light-coloured silicic rock (likely rhyolite), one type with a massive silvery grey matrix, the other three clearly vesicular and light brown to pale yellow in colour (Figures 7.22-7.24). The rock types are likely originated in the extinct Þingmúli central volcano, but found in two separate areas in Skriðdalur. The vesicular rock is very likely originated in a side-valley off of Skriðdalur called Ljósárdalur. The valley has been eroding into the Þingmúli central volcano for a long time and its core of silicic lava formations (Carmichael, 1964, p. 437 and 442, see also his figure 1) from the southeast side by glaciers and running water. In the m ountains in and around the central volcano all the main rock formations of the tholeiitic rock series can be found (Carmichael, 1964, p. 35; Charreteur et al., 2013, pp. 471-475; Sveinn Jakobsson, 1985, p. 77). The valley is named after the river Innri-Ljósá flowing through it. The river is in turn likely named for the light colours of the rock formations it erodes and transports into the river Jóka towards the river Grímsá down in the lowlands of Skriðdalur. Large pillows of vesicular, silicic rock can be found from time to time both in Innri-Ljósá and Jóka (Ármannsson, 2015, pers. comm.) that could have been used for quernstones (Figures 7.23 and 7.24).

Figure 7.22. Two quernstones 224b and 432 made of vesicular, silicic rocks at Vað in Skriðdalur (folding rule about 20 cm long).

Figures 7.23 and 7.24. To the left the mouth of Ljósárdalur and Innri-Ljósá, view ENE. To the right a big vesicular boulder of silicic rock (~1x0.5 cm) found lying in Innri-Ljósá.

Two other quernstones made from very similar vesicular silicic rock (19 and 20 in the quernstone catalogue; Figure 7.27) were also recorded at the Austurland Heritage Museum from the farm Surtsstaðir in Jökulsárhlíð, but this rock has more likely originated in the mountains of Fagridalur by Héraðsflói (Haukur Jóhannesson, 2014).

Of course the craftsmen could also have travelled straight to potential outcrops in the mountains, as was the case with Kvarnarhraun[47] in Haugafjall (e23) in Skriðdalur where farmer Halldór Halldórsson at Haugar (Pnr-Haugar, p. 3; Hugrún Sveinsdóttir, 2015, pers. comm.; Hrólfur Kristbjörnsson and Jón Hrólfsson, 2013, pp. 88-89), attained the second silicic rock type (massive, silvery grey matrix) for his many quernstones. Kvarnarhraun is located high (~370 m a.sl.) in the northern shoulder of Haugahólar in Haugafjall (Figure 7.25), about 1.25 km above and ESE of the farm in Haugar situated on the lowlands east of Múlaá. This is the only one of the raw material procurement locations where the exact spot is known. Haugahólar are a massive, hillocky rock slump formed about 4000 years ago (Árni Hjartarson, 1990, p. 86; Ólafur Jónsson, 1976, pp. 125-130). Kvarnarhraun is a small rocky outcrop of silvery grey silicic rock, partly covered by heather and moss. The larger rock fragments (mainly two large rock stacks 3-4 m high) are slowly splitting into 2-20 cm thick flagstones of varied sizes, thin sheets and flakes (Figures 7.25 and 7.26). It is clear from the varied angles of the splitting flagstone layers between the larger rocks and boulders that they are not in their original position. According to Carmichael (1964, p. 437 and 442, see also his figure 1) there is a thick, silicic volcanic formation in the top of Hallbjarnarstaðatindur, the mountain north of Haugafjall. It is very likely that this volcanic rock can also be found in the top of Haugafjall and a part of it has broken

[47]The word '*hraun*' is often used in the Eastfjords for rocky gravel hillocks and screes in the mountains (Pnr-Hafranes, p. 1).

Figures 7.25 and 7.26. To the left, Kvarnarhraun, a rocky outcrop at the top of Haugahólar, view to the ESE. To the right, a large rock sticking vertically out of the ground in Kvarnar- hraun, splitting into flagstones and flakes of different sizes, (hammer is about 35 cm long).

Figures 7.27, 7.28, 7.29 and 7.30. Top left a big flagstone in Kvarnarhraun (hammer about 35 cm long), top right a close up of the light coloured silicic rock in the flagstones, figures 32 and 33 below are of one of the millstones (68 cm in diameter) that Halldór in Haugar made in his lifetime, but this one has likely never been used.

up and tumbled down to form a part of Haugahólar. This is a tholeiitic rhyolite lava flow (see Charreteur et al., 2013, especially figures 1, 2e and 10a) originated in the Þingmúli central volcano active in the Neogene about 4-6 million years ago. The rocky shoulder is covered in smaller chips and flakes of the light grey silicic rock of varied sizes and shapes, but no clear indications of raw material procurement or debris could be detected.

In Selgilsbotn (e31) raw material for millstones was also likely acquired from a small scree in the mountains above the farm of Fornhólar in Ljósavatnsskarð (Pnr-Fornhólar, p. 3; Sigrún Sigurðardóttir, 2015, pers. comm.). Selgilsbotn is about 2 km northeast of the farm high in the brow of Fornastaðafjall (~850 m a.s.l.). The mountain forms the southern end of a mountain range called Kinnarfjöll. Lava flows in Kinnarfjöll are roughly classified as basic and intermediate rocks formed between ~3.3 and 8.5 million years ago (Haukur Jóhannesson and Kristján Sæmundsson, 2009). One quernstone was recorded at the Fornhólar farm (quernstone 434 in the catalogue) made from vesicular basalt. Since the material procurement site is said to be close to the top of the mountain it seems likely that the formations in questions could potentially be closer to the younger end of that age range. At the top of Selgil (shieling gully, -*botn* meaning the inner end, or top end of the gully in this instance) there is a perennial snow patch called Hempa (cassock, see red arrow in Figure 7.31). It is therefore not very likely that raw material was taken directly at the top of the gully, as there is always snow cover there. The actual Selgilsbotn is more likely green slopes over the highest ridge from Selhnúkur to Hempan (yellow arrow; Figure 7.31). On the highest ridge, on either side of the gully, there are scattered fragments of vesicular rock in the mountain screes but

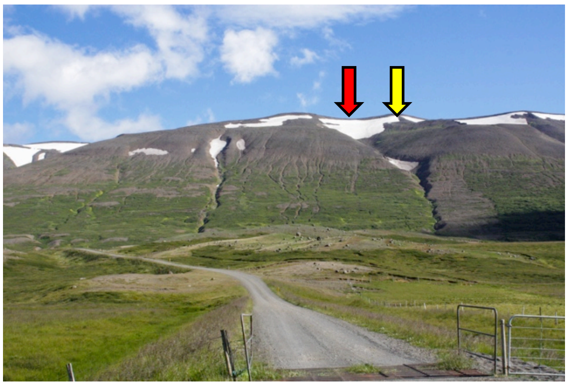


Figure 7.32. Fornastaðafjall and Selgil to the far right (red arrow). Hempa is the snowdrift at the top of the gully. View to the NE.

Figure 7.31. A rocky scree above Grenishnúkur below the mountain's edge. To the right just below the snowdrift Guðmundur M.H. Beck serves as a scale walking in the scree in his bright blue jacket.

no large flagstones. Along the highest edge of the mountain there is stony ground that slowly makes way for sandy gravel plains closer to the centre. On the plains there are small vesicular flagstones of good thickness scattered around, but none so big as to be useable as a quernstone. If any good material was found in these areas it is not easily detected or has been removed.

Above and northeast of Selgilsbotn and Selhnúkur (shealing peak) is Grenishnúkur. Above Grenishnúkur there is a large hollow below a large snowdrift covering the mountainside. Below the snowdrift in the hollow there is a little puddle called Tjörnin (the pond). To the side of the drift there is a small, rocky scree in a slope where rock has tumbled down the mountainside into the hollow (Figure 7.32). Climbing down from the top into the hollow it became clear that in the cliff face there are thin flows of vesicular lava that could well be suitable for quernstones, but they are difficult to approach. In the scree below the cliff face however a few larger flagstones (Figures 7.33 and 7.34) were found but no clear indications of material procurement activity or debris.

Figures 7.33 and 7.34. To the left a large example of a vesicular basalt flagstone in the scree above Grenishnúkur. About 60 cm in diameter and 12-15 cm thick.

The two final areas chosen for further survey, Hofstaðaurð (e35) and Ketubjörg (e37) in Skagafjörður, are both said to have been scoured for raw materials by the notorious drifter and craftsman Jakob, *Myllu-Kobbi*, Jónsson (1823-1900, see Chapter 5), alongside the mountain slopes of Hamarshyrna (e33) in Fljót close to his home at Minni-Brekka (Bessadóttir, 2015, pers. comm.; Jón Jóhannesson, 1944a, 1944b; Hannes Pétursson, 1984; *ÞÞ. 2100*). There are three recorded quernstones (no. 49, 200 and 435 in the quernstone catalogue) that he likely made. Quernstone 49 (Figure 7.35) is e.g. from his home in Minni-Brekka and quernstone 435 was preserved at Hofstaðir, the farm directly below Hofstaðaurð.

Figure 7.35. Quernstone 49 from Minni-Brekka in Fljót made by Myllu-Kobbi.

Hofsstaðaurð (Figure 7.36) is a vast, rocky gravel scree in Hofstaðafjall in eastern Skagafjörður, similar to Haugahólar in Skriðdalur. The volcanic rock series in Hofstaðafjall formed sometime between 3.3 and 8.5 million years ago (Haukur Jóhannesson and Kristján Sæmundsson, 2009). The age of the Hofsstaðaurð scree itself is unclear, but it is likely formed 2-3000 years ago (Ólafur Jónsson, 1976, pp. 16-17 and 95). In the lower slopes of the scree there are undulating gravel beds and hillocks partly grown with moss and heather. Coarser rocks and boulders stick out of the gravel in places but no good flagstones. Higher up, the scree gradually becomes much coarser and in its central top edge it is not possible to walk as the rocks and boulders are too large and tightly packed. Large vesicular rocks and boulders of all shapes and sizes can be found scattered in the scree around the coarsest parts along the top edge, as well as higher in the mountain above the main scree, but few good flagstones were found (Figures 7.37 and 7.38), and none vesicular. No clear indications of material procurement debris were detected.

Figure 7.36. Hofstaðaurð. A rocky gravel scree in Hofstaðafjall in Skagafjörður. View ESE.

Figures 7.37 and 7.38. One of the few flagstones found in Hofstaðaurð in Skagafjörður.

The last place and only one representing coastal areas was Ketubjörg in Skagafjörður. It quickly became clear however that the area said to be below Ketubjörg (*ÞÞ. 2100*) could not be easily approached except by boat so it was not surveyed up close. The rock formations were supposedly utilised by Myllu-Kobbi (see Chapter 5) but the farmers at Keta had never heard of him coming this far northwest in Skagafjörður for materials (Gunnsteinsdóttir, 2015, pers. comm.). This casts some doubt on the documented account as does the distance Myllu-Kobbi would have had to travel from his home (45 km over Skagafjörður by boat) to acquire the materials, when other sources were much closer. It must be noted however, that inland northwest of the farm, there are indeed fragmented young lava formations (0.8- 3.3 million years old), as well as along the shoreline at Keta, where they are breaking up into flagstones due to sea erosion (Figure 7.39), so it is not unlikely that serviceable quernstone material could be found along the shoreline at low tide. These lavas are part of the Skagafjörður volcanic zone and remnants of a volcano are present in Ketubjörg (Árni Hjartarson, 2013, p. 313; Haukur Jóhannesson, 2014).

Figure 7.39. Lava stacks flaking at Keta on the western coast of Skagafjörður.

7.4. Raw Material Availability and Accessibility

7.4.1. Regional Trends

According to Rockman (2003, pp. 4-5) acquiring locational information of raw materials (landscape learning), is thought to be the easiest form of knowledge to acquire and would have happened relatively fast in a colonising context (see also Kitchel, 2018), i.e. in a matter of days or perhaps a few weeks at most. Assuming the seekers knew what they were looking for it would have taken them only a few days at most to locate any accessible sources. The Icelandic quernstone assemblage suggests that Modern, indigenous quernstones were produced at/for various Icelandic farms all around the island (Figure 7.40), and as was discussed in the previous chapter the indigenous quernstone materials can been grouped into basic rocks (basalts and dolerite 92%), possible intermediate and/or acid rocks (undiagnostic rock types of lighter colours and diorite, 4.5%), and acid rocks

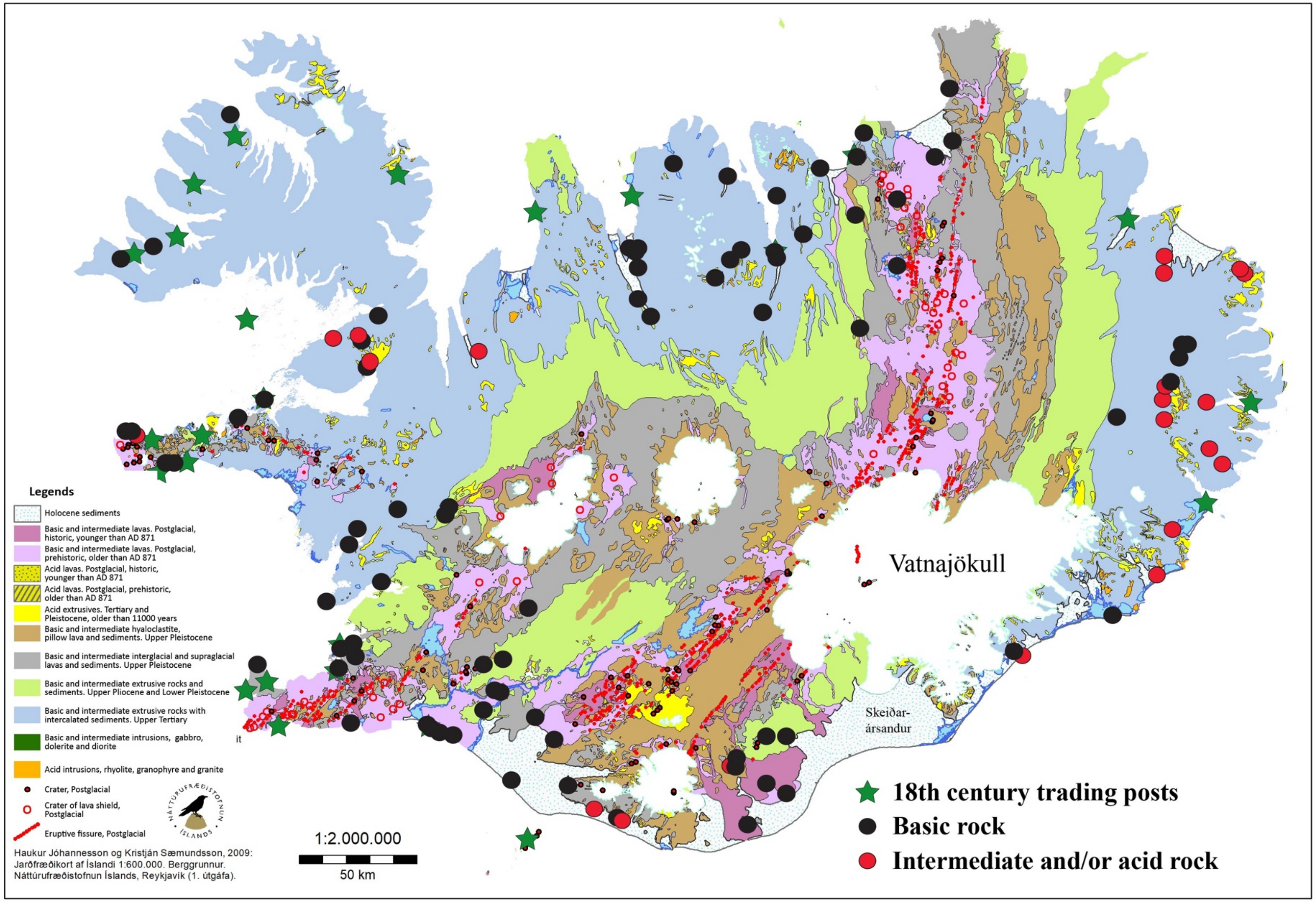


Figure 7.40. Distribution of indigenous modern quernstones around Iceland (see quernstone numbers in Figure 6.15, see also Figure 7.2).

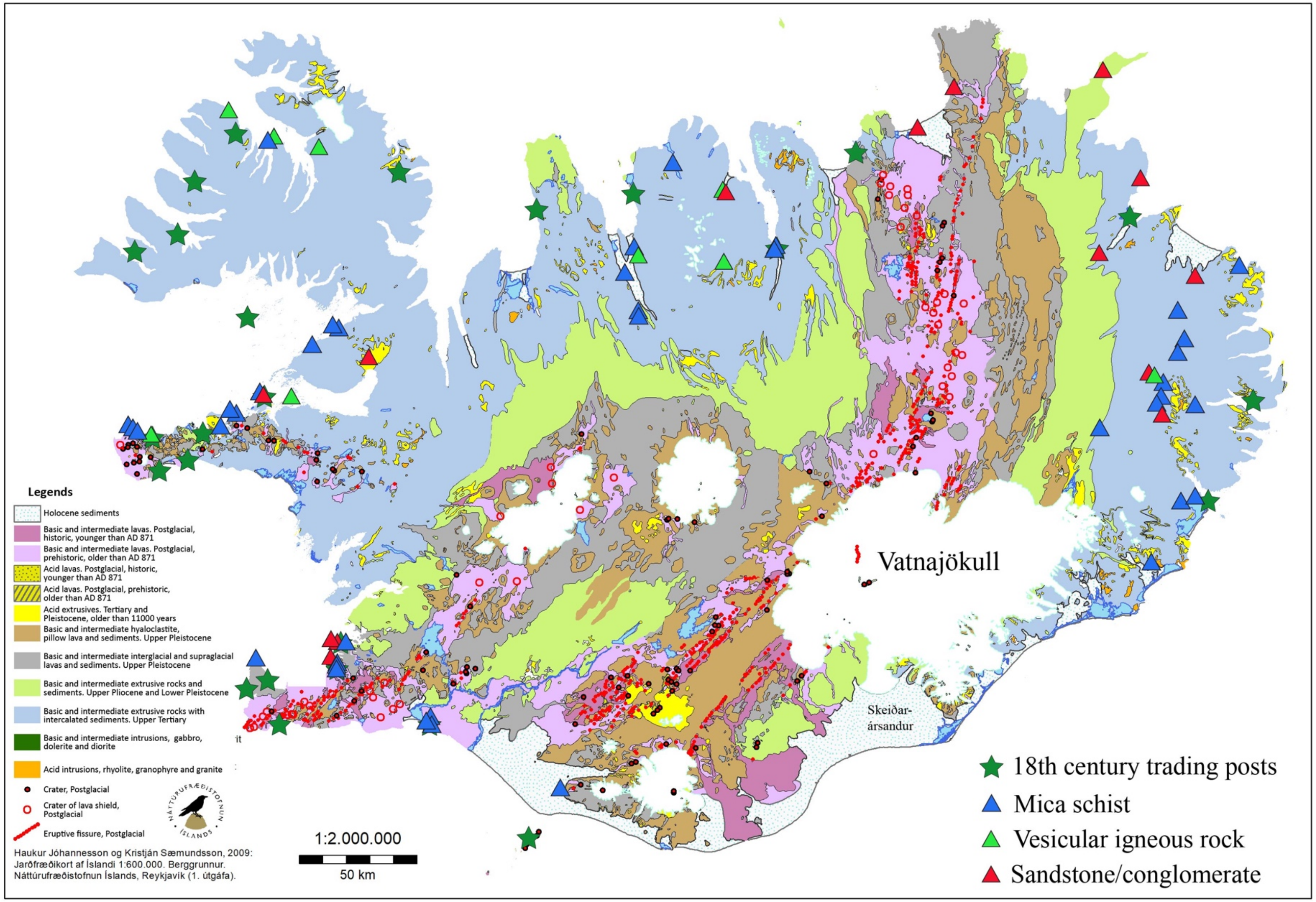


Figure 7.41. Distribution of foreign modern quernstones around Iceland (see quernstone numbers in Figure 6.16; see also Figure 7.2)

(potentially rhyolite and/or trachyte and granophyre, 3.5%). The known procurement sites discussed above suggest that raw materials were often limited and scattered, so material procurement was commonly more in the form of scavenging over larger areas rather than any form of mining. The lack of concentration of raw materials likely didn't inspire production on a larger scale. Many, if not most, of the earliest recorded procurement sites (*ÞÍ. Rtk. B10.6.23*, 1783; *ÞÍ. Rtk. B10.6.33*, 1783; *ÞÍ. Rtk. B10.6.34*, 1783; *ÞÍ. Rtk. B10.6.42*, 1783) likely had limited amounts of utilisable material and would have been quickly depleted, calling for further search. As discussed in Chapter 4, as knowledge of available and suitable raw materials was accumulated over time, material procurement strategies likely became more efficient and locations more demarcated, at least in areas where materials could be found in larger quantities. This seems to have been the case e.g. with areas within vast and relatively fresh post-glacial lava fields in the active volcanic zones running diagonally through the middle of the island, which were naturally broken up into thin flagstones in places during their formation or through weathering. e.g. in Geitland (e8; Kristleifur Þorsteinsson, 1944, pp. 16-17)), in Meðalland (e15-e16), Hrauntunga (e30), Kvarnarhraun (e45) and possibly Búðahraun (e46). At these sites the supply was more extensive and could likely be utilised for longer periods.

Outside the volcanically active zones, in the Westfjords, the Northwest and East Iceland (blue colour in Figure 7.40), the rock formations are much older (3.3-16 Ma) than in the northeast, on Snæfellsnes, Reykjanes and in the South. In these areas, where expansive post-glacial surface flows are non-existent, searching for raw materials will have been more difficult and procurement sites were likely short lived and much more scattered. The tendency seems to have been to look for formations connected to or within extinct central volcanoes (Figure 7.40) exposed through erosion, where rock types such as vesicular silicic rock (e.g. rhyolite, trachyte and dacite) and massive, coarse-grained rocks (e.g. diorite, dolerite, gabbro and granophyre) can be found. So far this especially seems to apply to Dalasýsla in the West and Múlasýslur in the East, where materials were exploited from e.g. the Breiðafjörður (e20), Þingmúli (e24) and Reyðarfjörður (e21) central volcanoes. Material procurement sites are also cited rather high up in the mountains, e.g. in Gunnarstindur (e19), on Fljótsdalsheiði (e22), in Selgilsbotn (e31) and Kvarnárdalur (e32), and above Krakavellir (e34). This is not surprising as at higher altitudes the rock formations would be without thick vegetation cover and soils, and perhaps less affected by tectonic forces and low temperature hydrothermal alterations that would have made them poor raw material for shaping and grinding. Searching higher in the mountains would also have been necessary where there were no useful screes or fragmented materials naturally transported some way down into the lowlands, as in Haugahólar (e23) and Hofsstaðaurð (e35), or indeed rocky shorelines to scour like at Ketubjörg (e37) and Krossavíkurfjara (e27). However, in the East- and Westfiords for example the high altitudes and often precariously steep mountain slopes may have made many potential areas inaccessible and search would have been more limited to screes in lowland areas and along the coastlines than e.g. in the Northwest were mountains are lower, slopes more gentle and mountaintops are more accessible.

No clear trends can be detected in the distribution of different imported, modern quernstone types (Figure 7.41), although sandstone querns do seem a little more common in the Northeast and East, while the imported igneous rock querns are mainly in Snæfellsnes and the Westfjords. The only regions where no imported modern querns were registered were in the Southwest (Borgarfjarðar- and Mýrarsýlur) where e.g. the Húsafell-Geitland production was very active, and in the Southeast in Skaftafellssýsla where there was an unbroken tradition of exploiting indigenous materials for quernstone production. Raw material availability was clearly no hinderance in those areas. In these areas where production was local and constant there does not seem to have been much incentive to acquire foreign quernstones. When the ratios of all the registered foreign and indigenous querns are compared between regions (Figure 7.42), foreign querns are more common in the East and Northeast, the Northwest, Westfjords and West. This difference is likely mostly connected to the more limited availability of indigenous raw materials within the geologically older Neogene eastern and western margins of the island. As very few modern quernstones (only about ~3% for three large counties, see figure 7.42, majority found on the island Vigur) were registered during fieldwork in the Westfjords, and from only five, widely scattered locations, the trends visible there are somewhat less reliable. It has to be considered very likely however that, similar to the East, foreign querns would be more commonly distributed there as well. Perhaps even more common, as access to exposed central volcanoes are much rarer in the Westfiords than in the East (Figure 7.40). The majority of foreign quernstones registered in the South and Southeast regions are likely Early Modern or older (see previous discussions in Chapter 6) but recorded alongside many indigenous quernstones (both pre-Modern and Modern) as well. Their presence in older contexts can therefore not be explained away by a simple lack of useful indigenous materials and make it more likely for them to be acquired more for status and/or convenience, rather than just pure necessity. In essence the Icelandic geological landscape is rich in potential quernstone materials but access to it was always a question of constant and vigorous searching, especially outside the active volcanic zones. Because of the uncertainty and variety of other potential access points to raw materials (e.g. thousands of screes, creeks and rivers and hundreds of kilometres of shoreline) providing further examples of potential raw material procurement sites beyond those already offered above would be pure guesswork without extensive landscape surveys and are therefore outside the scope of this thesis.

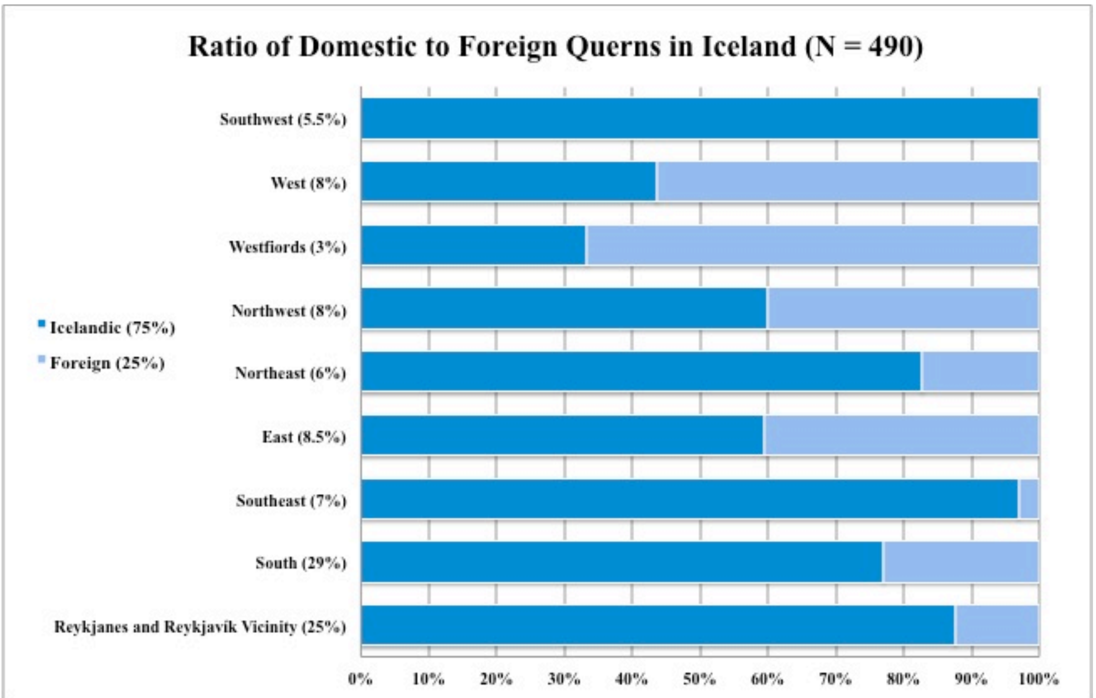


Figure 7.42. Comparison of ratios of all recorded Icelandic and foreign quernstones between Iceland's main geographical areas; Southwest (Borgarfjarðar- and Mýrarsýsla no. 2-3), West (Snæfellsnes-, Hnappadals- and Dalasýsla 4-6), Westfjords (Barðarstrandar- and Ísafjarðarsýsla 7-8). Northwest (Húnavatns-, Skagafjarðar- and Eyjafjarðarsýsla 10-12), Northeast (Þingeyjarsýsla 13), East (Múlasýslur 14-16), Southeast (Skaftafellssýslur 17-18), South (Árnessýsla, Rangárvallasýsla and Vestmannaeyjasýsla 19-21) and the Reykjanes and Reykjavík vicinities (Gullbringu- og Kjósarsýsla 1; see also figures 3.2 and 6.45-6.48 in Chapters 3 and 6).

7.4.2. The Distances Travelled for Raw Materials

Quernstones would rarely have been transported far during the production process, perhaps between districts or between adjacent counties at most. Only one source from 1783 suggests that raw materials or finished querns moved between counties. Sources in Stórólfshvolfssókn in Rangárvallasýsla tell of eight hand querns made from rock originated in Landmannahreppur within the county (likely exposed lava formations originating from Hekla volcano), along with querns from the counties adjacent to Rangárvallasýsla on either side, Árnessýsla and Vestur-Skaftafellssýsla. Querns in Stóradalskirkjusókn, also in Rangárvallasýsla, were in that same year said to originate from other counties due to lack of local raw materials. Farmers in Hólasókn in Eyjafjallasveit claimed to be ready to make querns if they could acquire rock over in Árnessýsla. They had made querns for themselves from local stone but felt it was too much effort to mass-produce querns from that raw material (*ÞÍ. Rtk. B10.6.33*, 1783). It seems likely that generally, farming craftsmen would have wanted to keep raw materials within their own county or locality for themselves, especially if materials were scattered and scarce. Kristleifur Þorsteinsson claimed that raw materials from Geitland were used in querns for the Borgarfjörður area and beyond (Kristleifur Þorsteinsson, 1944, p. 16) but any more detail of how far they were distributed is unknown. Likely it was no further beyond Borgarfjarðarsýsla than into Mýrarsýsla to the north and perhaps Gullbringu- and Kjósarsýsla to the southwest.

Known material procurement sites in Iceland were rarely more than 2-5 km away from the nearest contemporary farm or area of habitation (Table 7.3), except Geitland (12-13 km) and Hrauntunga (10-15 km). As both those sites likely provided large amounts of available raw materials the longer traveling time was worth the effort (see further discussion in Chapter 8). The extra distance did not call for trips lasting more than a day or two at most, at least from where the quernstones were produced at Húsafell and Svartárkot respectively. Six of the seven known quern masons, historically connected with a specific material procurement site, lived 3-15 km away. Only the wandering Myllu-Kobbi is known to have travelled to procurement sites 40-80 km away from his home but he was also known to make quernstones on, or close to, such distant sites rather than at his home.

When quernstones made of distinctive raw materials, like granophyre, diorite and vesicular, acid rocks, are considered they are also very rarely found more than 20 km from their likeliest source. These querns are found within areas where good raw materials were perhaps more difficult to acquire so they might not be good representatives for other areas where materials were likely more common, e.g. in the Southwest and Northeast. In this context it is also interesting to point out the five handle lug querns (type 5I; see section 6.2), which were all very likely made by the same quern mason and are all

Table 7.2. Distance between raw material procurements sites and the closest inhabited areas and/or the home of the quern mason.

Procurement Site	Distance from craftsman (km)	Distance to nearest farm (km)
Brenna in Kapelluhraun	4	3-4
Kaplakriki	-	<1
Geitlandshraun	12-13	12-13
Kaldidalur	12-13	12-13
Kvernháls and Svínahraun	4-7	4
Dyrhólaey/Portland	-	2-3
Króklækjarmelar	-	2-3
Hellisskersmelar	-	2-3
Kvarnarhlíðarhraun		6-7
Gunnarstindur	-	4-5
Breiðdalseldstöðin	-	1-2
Fljótsdalsheiði	-	10-15
Kvarnarhraun, Haugafjall		1-2
Skriðdalsfjall	-	1-5
Skjaldþingsstaðafjall (Krossavíkurfjöll)	-	1-5
Krossavíkurfjara	-	<1
Grænavatnsmelar	-	5-6
Kvarnarsteinakambur, Hrauntunga	10-15	10-15
Selgilsbotn	-	2-3
Kvarnárhraun	-	4-5
Hamarshyrna	7-8	1-2
Hofstaðaurð and Urðarhólar	40-60	1-2
Hólabyrða		1-2
Ketubjörg á Skaga (?)	40-50*	2-3
Gedda/Gedduhryggur, Vatnsdalsfjall	-	1-2
Kverngrjótshólar, place name	-	<0,5
Berserkjahraun	3-5	1-2
Kvarnarhraun	-	1-2
Búðahraun	-	1-2
Beruvíkurhraun	-	5-6

*over Skagafjörður by boat, around fiord ~80 km

found clustered within 35 km of each other in western Eyjafjörður. Together these quernstones could support the idea that serviceable raw materials for quernstone production were rarely sought over distances much beyond a farmers/craftsman's main geographical sphere of activity (<40-60 km diameter around their residence; see previous discussion in Chapter 5). The travels of Myllu-Kobbi also suggest that even where craftsmen were more mobile and travelled further afield, they may have looked for raw materials close to a customer's geographical location and made them on site, rather than transporting the heavy materials/ready-made querns for long distances. Reluctance to travel greater distances for materials could, at least partly, also explain why foreign querns are more common in areas where materials were scarcer. Like other raw materials used for quernstones the distances travelled for work, raw materials and/or subsequent product transport certainly also had fixed value estimates, and all those components will in some way have affected the general price of a single quernstone. These aspects will be discussed further in the following chapter.

7.5. Conclusions

Judging by documentary descriptions there were no significant changes in quern production traditions between the late 18th and early 20th centuries. Production from indigenous raw materials was spread all around the island, but never advanced beyond small-scale, cottage industry. Material procurement strategy was mostly in the form of scavenging with the aim to find materials that required as little effort as possible to transform into quernstones. As material procurement sites often covered expansive areas, largely without any clearly defined outcrops or mines, the odds of finding any indications of raw material procurement are slim at best. The scattered raw materials were also only pared to size at the procurement sites, and querns were mainly hewn to form at home with the aid of hammer and chisel. It would therefore be more likely to find specialised production discard on the farms themselves, e.g. in a smithy or a storehouse and their close vicinity. Considering quernstone production in foreign localities where centralised mass production took place over hundreds of years like in Norway (Baug, 2015a) for example, anticipated material traces in the archaeological record would e.g. be multiple and often large outcrops and mines where raw material was extracted, large amounts of accumulated production debris and discard, housing and encampments for the workers. Not to mention production debris in the home/workspace of the craftsmen themselves when finishing touches were done at home. Such large-scale material traces are not present in Iceland as material procurement sites were commonly scattered and relatively small. The production itself was small-scale, only lasted around 150 years and largely took place in a quernstone masons' home. Many hints and descriptions of raw material procurement traditions were found in Icelandic historical sources. However, no clear indications of such practices were found on sites visited during field work, and are unlikely to be found, as craftsmen rarely stayed on the largest sites longer than a day or two and disruption of the landscape was minimal. Production took place in the home over the winter. No Icelandic on-farm workshops or smithies of craftsmen from the 18th or 19th century have ever been excavated so the extent of production debris that would be detectable on such sites in unknown. Although hints can certainly be found for any such future research in ethnoarchaeological research projects in Central America of village stone masons producing metates and manos on a similarly small scale (see Cook 1982, Hayden 1987 and Searcy 2011).

Material transport was difficult as modes were mainly the masons own back, timber skis/sleds and/or horses. Known recorded material procurement sites were at most 10-15 km away from a masons' or nearest inhabited farm, unless the mason travelled around and then sites could be further afield. Time spent on any one material procurement trip, i.e. travel to and fro, search and prefabrication on-site, was commonly only a day or two at most, and routes had to be fairly easily travelled, especially with the heavier loads. Raw material exploitation varied between the island's active volcanic zone and the geologically older outer margins. Within the volcanic zone materials were commonly acquired from vast and exposed post-glacial lava flows, while sites outside it were more commonly erosional formations, like landslides and mountain screes and exposed remnants of central volcanoes. In areas where post-glacial lava flows are non-existent, and especially outside the active volcanic zone, material procurement was likely a bit more difficult. Potential procurement sites are more scattered and difficult to approach, and smaller quantities of suitable materials are found in any one place. In those areas the quernstone assemblage suggests, that in the Modern Period at least, imported quernstones were more common. However, dearth in Icelandic raw material availabilities cannot be considered to have been too large a hinderance in the revival of Icelandic quernstone production in any region.

It can also be suggested that in general masons likely did not look for raw materials or produce quernstones for people far beyond their main sphere of influence (<40-60 km diameter around their residence as discussed in Chapter 5), except perhaps in a few cases were raw materials were that more common in their near vicinity and product demand was sufficient, as was seemingly the case e.g. with the Húsafell-Geitland production in Borgarfjarðarsýsla in the Southwest. But how far is too far and why should it matter? This discussion awakens further questions regarding how distances travelled for raw materials and work were actually valued within the farming community, how much masons would have charged for their time and how search for raw materials could have affected the price of a quernstone. We will now turn our attention towards estimating the costs and complexities of producing, buying and/or using unground grain and quernstones, in order to get closer to understanding why Icelandic farmers and craftsmen could have considered it worthwhile to change their ways.

~ Chapter 8 ~

The Grind and Hew: Costs and Complexities of the Innovation Pair

Af alúð jafnan verk sitt vann,
vinum hlýr í mótið.
Í svangan magann setti hann
sauðinn fyrir grjótið.
Author unknown

The stanza above was recited to this author by retired farmer Björn Sigurðsson in Úthlíð in Árnessýsla during fieldwork. Its author is unknown but according to Sigurðsson it was written about an underprivileged crofter who sold quernstones for wethers (isl. *sauður*) to eat. The nature of indigenous trade in Iceland is not well understood but it likely revolved largely around reciprocity and exchange of favours, goods and work. Many were too poor to afford to pay craftsmen for their product or repairs. Ríkharður Jónsson comments rather bleakly on the Icelandic craftsman's lot when describing the profession of his father, blacksmith Jón Þórarinsson from Núpur in Berufjarðarströnd (b. 1842; this authors translation):

> '*A talented rural craftsman in this country, born before the middle of the last century* [19th], *generally was at a disadvantage within his community. Men knew that the craftsman could do anything, which is why he was duty-bound to do everything asked of him, otherwise he was a cursed boor and disobliging. But getting paid for craftsmanship in those days was certainly not a given. The craftsman was obliged to hand over his creations, as some sort of instalment for his talent, and often it demanded a high price. My father hated the begging* [of his neighbours] *for repairs the most, which was not surprising, as it gave him no joy,* [… and very often he received nothing but promises as payment]. *Not to indicate that no one paid for my father's craftsmanship and some did so very well. Although I don´t blame my neighbours greatly for this slovenliness. The times simply were not better than this* [as] *most lived in poverty.*' (Einar Sigurðsson, 1972, pp. 28-29).

Through this description it could be suggested that the quernstone may have had more potential as social currency rather than as a source of financial profit. That being said, when a customer could actually pay for a quernstone it may have been a good addition to the household economy, provided that production costs did not exceed their exchange value. But how large of an addition would they have been? How many were needed to keep up with demand? Looking back to Chapter 2, the six most important factors to consider with regard to estimating material innovation complexity and its potential effects on innovation acceptance or rejection are:

1) *Ease of initial observation and access to relevant information* (awareness, principles and how-to knowledge), *both pre-existing and new.*
2) *Ease of application and relative advantage of use* (trialability, level of comfort, time and work savings).
3) *Ease of maintenance* (e.g. frequency and cost of repairs, tools and spare parts) *and innovation durability.*
4) *Ease of continued manufacture* (e.g. complexity/interchangeability of core elements and availability/expense of raw materials, parts or tools).
5) *Ease of acquisition* (access to/production cost of innovation for prospective buyers) *and demand*.
6) *Socioeconomic profitability* (profits/prestige) *and compatibility* (ideological context; religious, political etc.).

Figure 8.1 gives some idea of the complex inter-relationships of the various parameters that need to be considered when thinking of quernstone acquisition, production and use. It has been established in previous chapters that many craftsmen had experience with using and making e.g. their own iron tools along with anvils, troughs, basins, lamps,

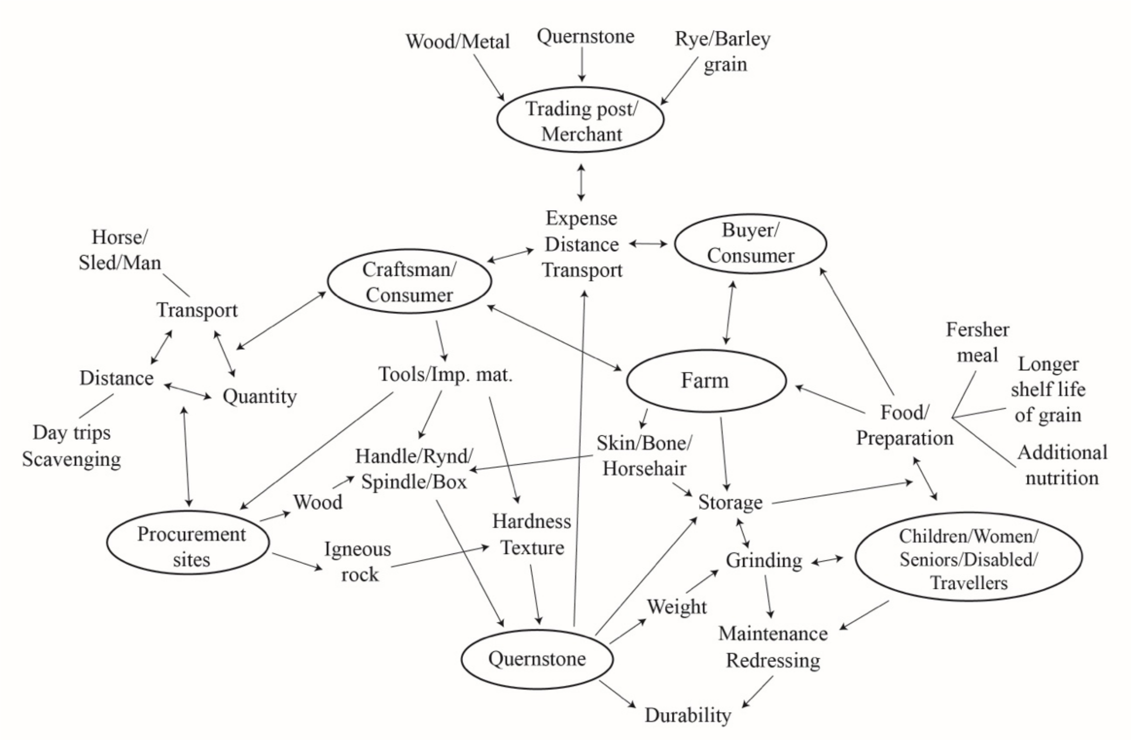


Figure 8.1. The tangled web of Icelandic quernstone acquisition, production and use.

bowls, sledgehammers and weights (for e.g. looms and nets) from natural Icelandic rock. Age-old traditions in making such objects meant that there was already knowledge in every county about the availability and usefulness of local resources. Imported meal was an old general staple in many people's diet. After import of unground grain had taken the place of ~50% of total import it never dropped below that mark again and only increased slowly as time passed. Neither unground grain or quernstones posed any threat to social norms or the economic status quo. Governmental efforts in innovation introduction created awareness in every county and provided plenty of access to get acquainted with and/or try out quernstones and for a decade rewards were handed out for production in almost all counties. There was no foundation for mass production or long-distance transport of quernstones across country due to a primitive transport systems, but farmers and farming craftsmen who had opportunity likely made querns for their own personal use, exchanged them through a trading station if they lived close to one and/or directly to an end-buyer, very likely by order. Few participants seem to have been interested in making quernstone production their main livelihood but farming craftsmen took it on as part-time work (*Kaufsystem*; Hrefna Róbertsdóttir, 2008, p. 33) and the work was done mostly at home. Lack of iron for tools or materials for other quernstone components (i.e. handle, rynd, pivot) does not seem to have been a stumbling block and there are no indications apart from the fretfulness of a few government officials that it was a problem anywhere in Iceland.

This does not change the fact however, that integrating unground grain and quernstones into a household will have been a noticeable undertaking with varied advantages and disadvantages, expenses and profits for farmers and farming craftsmen and their households. In this chapter the more detailed positive and negative complexities of buying, making, maintaining and using a quernstone within a farming household will be considered in more detail. The first section introduces exchange value ranges of quernstones as they are reported in documentary sources, followed by a discussion of production requirements, their cost estimations and a querns' net worth to a farming craftsman in section two, based on those values. In the third and final section the up- and downsides of buying and grinding grain as needed and using a quernstone, are also considered.

Buying unground grain was not only cheaper, it may also have stretched a cook's meal supply in terms of increased volume as the grain was ground and little time was lost to grinding grain, at least in the early stages. After the first surge in the late 18th century, yearly quernstone demand in county could be easily met by 1-2 men, with plenty of time to spare for other craft projects. Time spent on such projects needed to be carefully doled out, however. It was not profitable for a craftsman to travel much further than 40 km out from his place of residence in search of materials if prices were to be kept to a minimum for an easier sell and modest profit. A craftsman had the opportunity to make a profit ranging in worth from one wether up to a whole cow or six breeding sheep (10-120 ells) at least, depending on how many and how elaborate the querns were. They would therefore have been a good boost to the household economy, although it is considered likely that quern prices will commonly have been kept fairly modest. To the general buyer acquiring a quernstone would likely be equivalent to buying a fridge or a laptop in today's world with a compatible choice range in prices and quality, which will have provided an opportunity for the rich and at least some of the poorer alike to acquire a quernstone compatible to the size of their purse.

8.1. Acquiring a Quernstone: The Official Exchange Values

Information regarding the cost of quernstones has been found both in 18th century government records connected to the quernstone production revival and in estate records from the 18th and 19th centuries. Good querns were generally considered to be worth around 1-3 state dollars (Tables 8.1 and 8.2). According to Sæmundur Magnússon Hólm, craftsmen in Vestur-Skaftafellssýsla around 1780 charged about 40 *ells* (or 1 state dollars and 48 shillings) for making a good quern from scratch when such production was being revived, although mostly it was not negotiated by official exchange rates but through mutual agreement (Sæmundur Magnússon Hólm, 1958 (1781-1782), p. 133). In 1765, fifteen years prior to his publication, a 'meal quern' (isl. *mjölkvörn*) that was likely second-hand was registered as part of an estate at Syðri-Fljót in Meðalland, Vestur-Skaftafellssýsla, and valued at 1 std, 24 shillings or ~34 ells[48] (Már Jónsson, 2015, p. 92 and 100). In 1783 Jón Ásmundarson in Berserkseyri had:

> '[…] *sold every pair of quernstones for 2 dollars even* [~54 ells,]*, and thereby saved the local people 1 state dollar and 75 shillings* [~48 ells] *in the exchange, compared to what they cost at the trading post.*' ("RÍL III," 1782b, p. 291).

[48] 96 shillings in 1 state dollar.

In the 1783 reports to the Exchequer, many different price and size ranges of indigenous querns were reported, and a synthesis of the information provided can be seen in Table 8.1 (see also Ólafur Olavius, 1965a, p. 75, querns sold for 90 shillings in Eyjafjarðarsýsla in the 1770s). Between 1776 and 1787 foreign querns cost between 2 std, 74 shillings and 3 std, 19 shillings at the trading posts (~74-85 ells), depending on their size. In contrast the price range of the indigenous querns was very diverse between counties in Iceland, but they were usually sold for less than half the price of the foreign querns. No clear trends were observed within the modern quernstone group in the Icelandic quernstone assemblage with regards to foreign querns perhaps being more common on larger farms compared to the smaller farms and crofts, but this is not surprising. A foreign quern may perhaps have been an exciting new accessory during the revival in the late 18th century. However, through time they decreased in value as they circulated and passed through estates, inheritance, and exchange right along-side the Icelandic production. As early as 1792 a used '*Danish*' hand quern was a registered part of an estate in Gautavík in Suður-Múlasýsla (Table 8.2) and only valued at 68 shillings or 19 ells (Már Jónsson, 2015, p. 188 and 191). The 18th century reports suggest that value estimates of the new indigenous production were largely based on and merged easily with the pre-existing exchange traditions. Prices do not change much either for almost a hundred years, as varied examples of value estimates in estate records generally stay around 1-3 state dollars (27-80 ells) for a serviceable quernstone in the box, at least up to the mid-19th century (Table 8.2).

As quernstones were not a common household item prior to 1776 they will not have been recorded in any quantity before that time. Unfortunately, estate records are like churchyards and can therefore not be used to demonstrate with any confidence when exactly quernstone ownership first took off. The rate of initial acceptance of quernstones cannot be traced with the aid of estate records nor the quernstones assemblage itself (i.e. oldest quernstones lost, see previous discussion in Chapter 6). Quernstones preserved in estate records represent only querns owned by those who die. They are helpful when considering general price estimates of used quernstones, but large quantities of querns can spend years in circulation before finding themselves recorded on paper (Hildur Gestsdóttir, 2009, p. 132). They will also only show a delayed timeline. If young men in their 30s-50s buy or make a quern in the 1780s, but live out their life into old age (60-80 years old), their querns will only have come into play in estate records in any quantities

Table 8.1. A rough estimate of quernstone diameter groups produced and average prices in the autumn of 1783. The information was collected from the correspondence of Icelandic sheriffs to the Exchequer.

	Size group	Price in 1783
Icelandic querns, pair	38-43 cm	48 sh to 1 std
	44-56 cm	1 std to 1 std 48 sh

Table 8.2. Examples of quernstone prices between the 18th and the early 20th centuries from unpublished estate records originating in Skagafjarðarsýsla between 1760 and 1910 collated by Edwald Maxwell (2018, pers. comm.) and Árnessýsla 1773-1782 (ED 1/7.5) and Dalasýsla 1782-1804 (ED 1/3.4) collated by this author in 2014 (from photographs supplied by Már Jónsson taken at The National Archives of Iceland), along with random samples found in published estate records from 1722-1840 by Már Jónsson (2015, 2017, 2018) from various places in Iceland (mostly Vestmannaeyjar and Strandarhreppur in Gullbringusýsla).

Year	Description - accessories	Condition	County	State dollars	Shillings
1765	Meal quern (malikvörn/malkvörn)		Vestur-Skaftafellsýsla	1	24
1781	Hand quern, box (stokkur) and iron		Árnesssýsla	3	-
1782	Hand quern and box		Árnesssýsla	2	48
1785	Meal quern (5 ells)		Rangárvallasýsla	1	24
1788	Quern with irons (í járnum)		Dalasýsla	-	48
1789	Hand quern		Þingeyjarsýsla	-	48
1791	Quern	Old	Suður-Múlasýsla	-	18
1791	Icelandic hand quern and box		Dalasýsla	-	32
1792	Danish hand quern		Suður-Múlasýsla	-	68
1792	Quern and box		Gullbringusýsla	-	48
1795	Quern and box		Gullbringusýsla	1	-
1795	Quern and box	Useful	Norður-Múlasýsla	1	24

1796	Quern box with ruined stones	Useless	Dalasýsla	-	6
1802	Quern and box		Gullbringusýsla	-	64
1804	Quern		Gullbringusýsla	-	32
1807	Meal quern		Mýrarsýsla	1	32
1807	Hand quern, box and iron rod		Skagafjarðarsýsla	2	-
1809	Quern		Gullbringusýsla	-	16
1811	Quern and box		Gullbringusýsla	1	-
1814	Quern and box		Gullbringusýsla	-	48
1818	Quern and box		Gullbringusýsla	1	-
1819	Quern and box		Gullbringusýsla	1	-
1819	Quern and box		Gullbringusýsla	1	-
1820	Hand quern, box and iron	Useless	Skagafjarðarsýsla	-	48
1821	Quern and box		Gullbringusýsla	-	48
1821	Quern and box		Gullbringusýsla	-	48
1822	Quern and box		Gullbringusýsla	-	48
1822	Quern and box		Gullbringusýsla	-	48
1831	With box		Skagafjarðarsýsla	3	-
1834	Meal quern with box		Vestmannaeyjar	1	-
1835	Meal quern with box		Vestmannaeyjar	2	-
1835	Meal quern with box		Vestmannaeyjar	1	-
1836	Meal quern with box		Vestmannaeyjar	1	32
1837	Meal quern and box		Vestmannaeyjar	-	64
1837	Meal quern and box		Vestmannaeyjar	2	-
1837	Meal quern and box		Vestmannaeyjar	-	62
1839	Meal quern and box		Skagafjarðarsýsla	1	-
1839	Meal quern and box		Vestmannaeyjar	1	48
1839	Meal quern and box		Vestmannaeyjar	-	64
1839	Meal quern		Vestmannaeyjar	1	-
1840	Meal quern and box		Vestmannaeyjar	2	-

1840	Meal quern and box		Vestmannaeyjar	-	64
1846	Meal quern in box		Skagafjarðarsýsla	1	-
1847	With box	Very poor	Skagafjarðarsýsla	-	48
1856	Meal quern and box		Skagafjarðarsýsla	2	48
1856	Meal quern and box, foreign?		Skagafjarðarsýsla	4	-
1857	With box, foreign?		Skagafjarðarsýsla	4	-
1860			Skagafjarðarsýsla	-	20
1860	Meal quern		Skagafjarðarsýsla	1	48
1865	Meal quern and box, foreign?		Skagafjarðarsýsla	6	-
1866	2 querns	one very old	Skagafjarðarsýsla	5	-
1878	Foreign quern?	New	Skagafjarðarsýsla	8	-
1885	With box		Skagafjarðarsýsla	2	48
1903	Meal quern and box		Skagafjarðarsýsla	1	-

in the very late 1790s and long into the 1800s. Therefore, by the time grain import started to increase again in the early 1800s the first quernstones to enter circulation in the 1770s and 80s were likely only just starting to appear more often in estate records.

8.2. Making the Quernstone: The Costs of Quernstone Production

8.2.1. The Quernstones' Value

Handicraft permeated all levels of society, in farming chores, household production, layovers at the fishing stations and traveling in-between. Quernstone production was a male oriented task that could be performed by general farmers and farming craftsmen at various ages at convenient times during the winter, when workload was lighter and there was less conflict with other important tasks. The initial participants in quernstone production in the second half of the 18th century experimented and formed experiences and familiarity, and perhaps even sparked an element of competition, while others more sceptical only gradually followed in their footsteps. Keeping up, and potentially even increasing, social status and respect was generally considered more important than economic expense, at least among the more affluent (Rogers, 2003, p. 231).

The specific reasons why individual masons made or acquired quernstones to begin with can only be loosely imagined but there will have been an element of submission to authority and a desire to emulate. At least some district officers, priests and their followers were taking part in the production for the rewards and perhaps some who were recruited by other district officers or priests will have felt obligated, whether they received rewards or not. Some were innovative and curious but did not want or could not easily afford an imported quernstone and either made one for themselves or hired the nearest craftsman or handy farmer for the task. Some will have seen potential for a personal niche in handicraft and additional income on a semi-permanent basis, and yet others were perhaps forced to buy unground grain and did not have a neighbour who could grind it for them. There may even have been an element of farming craftsmen pushing quernstones on other farmers as easy payment for goods owed, whether the recipient needed one or not. It may also have been easier for some farmers to have their own quernstone, so as not to have to travel far to grind grain during the winter when travel was often more difficult. There is nothing to suggest that some of the affluent farmers could not have indeed preferred to stick to the imported meal and left some of the poorer farmers to buy and grind the grain, which left them in need of a quern. This may for example have been the case in Reykjavík in 1770 where unground grain was seemingly forced on the poor without an accessible quernstone (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, p. 76), at a time when grain import was in its infancy.

It seems like common sense that during the early stages, a household would not have acquired an expensive quernstone unless they felt they really needed it, and there will have been such sensible people. However, there is also the possibility that for many the quernstone may have become an aspirational appliance or a status symbol. Bought mainly for display, but perhaps also in the hope of needing it more in the future. It may well be that only around 40% of households in the late 18th century acquired a quernstone, before the leap in grain import quantities in the early 19th century. That would be the sensible scenario. It is however also well known that overadoption does take place and adopted innovations do not always have the same meaning as they would appear to, or should perhaps, have. Less affluent peasants have even been "*typified by impulse gratification*" (Rogers, 1969, p. 377). As an example of unsensible and status related innovation adoption, Rogers (2003, p. 231) described how many American farmers bought overly expensive, high "Harvestore" silos that could be seen from miles around, and sometimes even more than one, rather than buying cheaper and less conspicuous versions that worked just as well. Barnett (1953, p. 331) pointed out how Singer sewing machines were placed in their owners' front windows for display in many homes in Palau in the central Pacific, whether or not they were used or even worked. Not to mention a famous Icelandic example of a weird fad, the Clairol Foot Spa that took Iceland by storm in 1982 and became one of the most popular Christmas presents ever (1 machine for every 17 Icelanders, ~14.000 sold in total), but mostly ended up in storage after a somewhat disappointing experience (Helgi S. Sigurðsson, 2009). Perhaps the Icelandic quernstone became a coveted household item that turned up in a majority of households long before the early 19th century, whether they were needed or not. But whatever the scope or final reason for early quernstone acquisition, imported grain caused increased demand for quernstones and enough import, raw material availability and handicraft know-how, both foreign and indigenous, ensured that it could be met. And Icelandic self-sufficient farming craftsmen could make the project their own.

In late 20th century peasant communities in Guatemala, the importance of metates and manos for grinding large amounts of maize for the family every day far outweighed their high price (Horsfall 1987, p. 359). Almost every household had at least one pair, whether rich or poor (Horsfall, 1987, pp. 358-359; Searcy, 2011, pp. 75-77 and 107-108). Many of the peasants in Guatemala had to buy them from the few stonemasons available, while others inherited or were gifted one from their parents. The majority of Icelandic farmers could have made rotary quernstones themselves. That of course does not necessarily mean however, that everyone did, and many farmers who perhaps knew a craftsman, and were willing to pay for it, will have simply ordered one. Those less affluent who had the confidence to make a quernstone will have had little reason to buy one in a society where every scrap of wool counted as currency. However, neither does it mean that they would never have wanted one. The Norwegian quernstones will certainly not have been any less effective than the Icelandic ones with regards to grinding potential or durability, but they were much more expensive (Tables 5.3, 5.8 and 5.9). Imported quernstones cost around 67-85 ells (2 std 48 sh – 3 std 19 sh), which according to Búalög (Arnór Sigurjónsson, 1966, pp. 26-28, 44, 52 and 54; see also Búalög, 1775) resembled the price of e.g an average saddle (50 ells), a steel anvil (60 ells), a cow without a calf (80 ells), two barrels of meal (80 ells) or a craftsman's pay for 14 days plus food (80 ells). According to Gísli Gunnarsson (2017, pp. 36-37) feeding and clothing a farm hand for a year cost around 52 ells a month. Buying a foreign quernstone would therefore potentially have been equal to adding another farm hand to the family that needed at least a month's worth of food and clothing, maybe even two. In Iceland today the minimal amount needed for a single individual to live per month has been estimated at ~200 thousand krónur ("Reglur um fjárhagsaðstoð frá Reykjavíkurborg," 2018, pp. 4-5). This equals e.g. the price of a quality laptop, a large couch, or two large refrigerators in a society where the level of consumption and quality of living are much higher than in the 18th century. For the above average farmers, craftsmen and priests this may have been manageable, but for farmers and crofters with few sheep and a large family, which constituted the majority of Icelandic farms, a foreign quernstone was likely too large a bite to swallow in one go. However, acquiring an indigenous one was an entirely different matter. The prices of Icelandic quernstones were also varied and in 1783 they ranged from 13-40 ells (48 shillings to 1 state dollars and 48 shillings). The Icelandic quern was in a price range with a year old wether (10 ells) or three fall lambs (15 ells), new rope (12 ells), two new shovels with iron (12 ells), 1-2 ewes with lamb (20-40 ells) or a good foal (40 ells; Arnór Sigurjónsson, 1966, pp. 26-28 and 44-45). This means they were essentially ~50-80% cheaper and more affordable than new foreign quernstones (67-85 ells; 2 std 48 sh – 3 std

19 sh), and that is without the cost of transporting the foreign quernstone home, but they would still have been a positive boost for a household economy.

8.2.2. Yearly Demands

After the initial surge in quernstone import and local production, demand for quernstones will likely have been low at least until the early 18th century when grain import increased beyond 50% and total import quantities started to increase beyond the 18th century norm. It is not possible to ascertain exactly how fast indigenous quernstone production increased through time in the beginning, although estate records may provide some hints. As an example, in Skagafjörður querns start appearing in estate records at the beginning of the 19th century but seemingly only become common around 1830 (Table 7.4), which would coincide with the increase in total grain import (Figure 4.6). These quernstones may however have been in circulation for years prior to being recorded as part of an estate in the 1830s and quernstones in circulation are by no means all recorded in estate records.

As mills became more common mid-19th century demand will have increased, as many farms needed/wanted both a handquern for winter and a millstone for the months when the mills could run (*ÞÞ. 15325*). During the late-18th and 19th centuries the total number of farming households (tenant farms and crofts) changed very little, and the number of village households only began to grow in the late 19th century. Once acquired querns could last for decades, and when well-made and scrupulously maintained, long-term maintenance costs (sharpening/redressing, renewal of accessories etc.; Figure 8.1) will likely have been low. As the majority of the Icelandic quernstones were vesicular, sharpening/redressing at least will not have been needed often. Because of their durability, existing quernstones (both foreign and indigenous) were likely also commonly passed on, reused (some quernstones in the Icelandic assemblage were composites of e.g. one foreign and one indigenous quern or one much used and one relatively new), distributed and circulated while they were still in working order, e.g. through inheritance, gift giving and estate auctions. No indication has been found of the Icelandic quernstone being inherited specially through the female line as in many other societies using quernstones (Alonso, 2019). These factors would likely have kept the need for new production at modest levels and made production on any larger scale unnecessary, except perhaps closer to growing towns like e.g. Reykjavík and Akureyri in the mid- to late-19th century.

It was previously discussed above that perhaps between 5.000 and 19.000 indigenous quernstones may have been produced during the 150 years that quernstones were in use and likely in larger numbers during and after the mid-19th century. If 60-80% of the farms in the late 19th century had either a mill, a hand quern, or both, the total number of querns in circulation at that point in time could have been between 4.000-12.000 querns. If we suppose that total demand was between 15-20 thousand querns it would mean on average between 100-135 quernstones nationwide per year, or up to 4-6 querns in each county. Yearly production for one county could therefore well have been maintained by one quernstone mason (e.g. like Þorsteinn Jakobsson is thought to have done for Borgarfjarðarsýsla), where they were not simply made by the farmers themselves, whenever they needed them. Many farming craftsmen likely made only one or two quernstones in total, while few took on production in the long term. When a farmer made a quernstone for himself, he will at least not have lost much in production cost (rock, iron, wood, time) when it was compared with a quernstones' decades of durability.

8.2.3. The General Production Costs

The quernstone is a fairly basic appliance, two slabs of rock with a few other loosely connected components of simple design: handle, rynd, spindle and spindle plug. The main material types needed to reproduce it were essentially only three; rock, wood and iron. The stone slabs were igneous rock, the spindle was mainly made of iron wedged in a wooden plug, and the handle and rynd could be made of either iron or wood. Later in the Modern period, tin was also often melted to fuse iron handles and rynds to the runner. Using an iron girdle was likely not needed very often. These materials were all commonly accessible in Iceland, although production of trading goods and tools made of imported wood and/or metal like iron was strongly reliant on the availability and costs controlled by the foreign merchants and the crown (Figure 7.44). Useful, local rock materials could be found all around the island, albeit in varied localities, qualities and quantities. In Guatemala the metateros' had to pay modest rent to the landowner to exploit the rock formations on his land (Nelson, 1987, 150) but no indications of such fees were found in Icelandic sources. One source (*JÁM XI,* p. 181) was found regarding the right of the church at Einarsstaðir in Reykjadalshreppur to gather rock materials in the land of Kasthvammur to use in gravestones (isl. *legsteinaítak*) so it is not impossible that some quernstone masons that made multiple querns may have had to pay or negotiate for access to raw materials, but it will not have been common. After an initial exploratory period, masons will have formed a good idea of where useful raw materials could be found in their area. Material procurement efforts, transport methods and distances, however, will have affected how many quernstones could be transported/made at any one time and potentially affected their price.

How the work of a quernstone mason and the querns price was valued and determined is unclear, but the aspects that need to be considered in connection with quernstone value are:

1) Work spent on the quernstone (salary of a craftsman 4 ells per day + 2 ells for food).
2) Cost of raw materials (rock, iron, tin, wood).
3) Distances travelled for materials.
4) Transport of the quernstone to the client.

If we bring forward the two stereotypes from Chapter 5, Myllu-Kobbi and Einar from Svartárkot, the nature of the price estimates for a single quernstone would have differed. Myllu-Kobbi sometimes travelled around and took work where he could find it. If he made a quern for a farmer he stayed with during his wanderings, the price of materials would have fallen directly on the farmer, while Myllu-Kobbi's salary would have constituted food and board plus the time and effort put into finding raw materials near the buyer's home, hewing the two slabs, making the accessories and assembling. Experienced Guatemalan metateros needed around 2-3 days at most to acquire blanks and make a single, fully-fledged metate and mano pair. Making the pair from blanks at home took an experienced mason about one day using iron tools (Hayden, 1987, p. 42; Searcy, 2011, p. 54). The metate may perhaps be considered a more complicated appliance to make than the rotary quernstone as it has three narrow legs and a tilting grinding surface which are complicated to do, but it also requires no other accessories or materials for it to work as a grinding tool after it has been formed other than the stone mano (excluding tools for any later sharpening). It can therefore be proposed that making a rotary quern could also have taken 2-3 days at most including making the handle, rynd and spindle. The craftsman's salary would have been 12-18 ells (4 ells for a days' work + food and board worth 2 ells), less if you were considered a farmer or a farm hand if he was paid according to the Búalög (Arnór Sigurjónsson, 1966, pp. 43 and 47-48)[49].

According to Búalög (Arnór Sigurjónsson, 1966, pp. 47-48) each craftsman was to receive 6 ells in travel expenses for each *Day's-Journey* travelled (isl. *þingmannaleið*, one day of travel, estimated to have been ~37,5 km (Snara, 2018), for a *Day's-Run*, isl. *daghleypa,* 18 ells, ~112 km = 0,16 ells/km). If Einar in Svartárkot made a quernstone from scratch to sell complete to a buyer the quernstones' price would have included rock material transport, his salary and materials for accessories. Travel to Hrauntunga may have been around 24 km (Table 7.3) there and back to Svartárkot, equalling just under 5 ells in transport costs when counted according to the *þingmannaleið* estimate (0,16 ells/km). These were likely day trips and if a single day was simply counted as a craftsman's workday it could have been estimated at 6 ells. Transport cost for such a day trip may therefore have been estimated at around 5-6 ells. If we consider that on a single trip material was collected for 1-5 quernstones, the transport costs would be around 1-6 ells for each quernstone (1-5 horses, 2 large flagstones on each horse). Based on this, a single quernstone made in two days would cost at least 13 ells (transport 1 ell, work 12 ells) up to 29-30 ells (1 day for transport and 3 days for work on one quernstone). Spindles, rynds and handles made of iron were not weighed during fieldwork, but it is considered unlikely that together they weighed more 0,5-1 kg and would therefore have cost no more than 0,5-1 ells if they were made with good iron. If the quernstone was also fitted with an iron gridle the cost could go up to 2 ells. It is not unlikely however that the fittings could also have been made from recycled scraps or broken iron tools, which would mean they would have been cheaper. The cost of a handle and/or sail + spindle plug made of native wood like birch would likely have been negligible. One cost example of a good, ready-made quernstone could therefore be broken down like this:

- Raw material acquisition, 1 day = 1 ell up to 6 ells (depending on the number of flagstones acquired in one trip).
- Production, 2-3 days = 12-18 ells, potentially less if mason was seasoned and/or a farmer/farmhand who was payed less for the workday
- Accessories = wood <0,5 ells, iron (1-2 kg) 1-2 ells, bone likely free.

[49] It must be noted however, that e.g. in 1806 in Strandarhreppur in Gullbringusýsla, a day's work was valued at 48 shillings or 13 ells, (M. Jónsson, 2018, pp. 267-270), which is somewhat higher than is quoted in Búalög in the late 18th century.

- Total cost could range between 13-26 ells, with working hours constituting over 80% of the quernstones value.

In the example above, transport of the quern to the customer is not included. If customers collected their quernstones themselves from the craftsman, his transport costs for the finished quernstone were of course none, and the profit 12-24 ells. This way making five quernstones, or the potential yearly demand, would mean total profit of 60-120 ells or the price of ½ to 1 cow or 3-6 breeding sheep. This would be a good addition to a household in Iceland where the livestock assets of average farms were generally around 1-2 cows and 30-50 sheep (see discussion in section 3.3.3). Fairly cheap and largely locally available natural raw materials, elbow grease and time, were thus transformed through action into a new, additional commodity that could occasionally be exchanged for other important general staples without much expenditure of extra resources. Prices were likely mostly negotiated beforehand but payments, which were as a rule in goods, were often delayed. Excess material profit and usury were considered shameful, but transport costs were considered natural, as long as they were fair (Jón J. Aðils, 1971, p. 566). Finding the middle ground between spending time on materials, material procurement and the actual production of querns in terms of keeping prices manageable will have been a balancing act. If a single craftsman meant to make one quern only for himself without exceeding one ell for raw material transport cost, he would have had to keep within ~5 km of his residence and preferably know exactly where to go. If a craftsman spent one day finding materials, most likely within a 20 km radius of his farm, and two days to make his quern, it would technically cost him about 18 ells for his own work + <1-2 ells in accessories. By doing it himself, he would of course only lose time and did not have to shell out the ells in goods he would rather eat or exchange for other necessities.

If a craftsman travelled 40 km away from his farm for raw materials (two day trip for 12 ells; Figure 8.2), he would have to collect materials for at least twelve quernstones if transport costs were not to exceed 1 ell for each quernstone, not including the 1-2 workdays in raw material processing on site that would likely be needed. If Einar had ever travelled the 60 km from Svartárkot to Húsavík for a foreign quernstone his travels could have potentially taken two days to get there and back with loaded pack horses. The foreign querns would therefore technically have cost him 80-100 ells in total. Perhaps part of the reason that the sheriff of Vestur-Skaftafellssýsla declined the two free querns

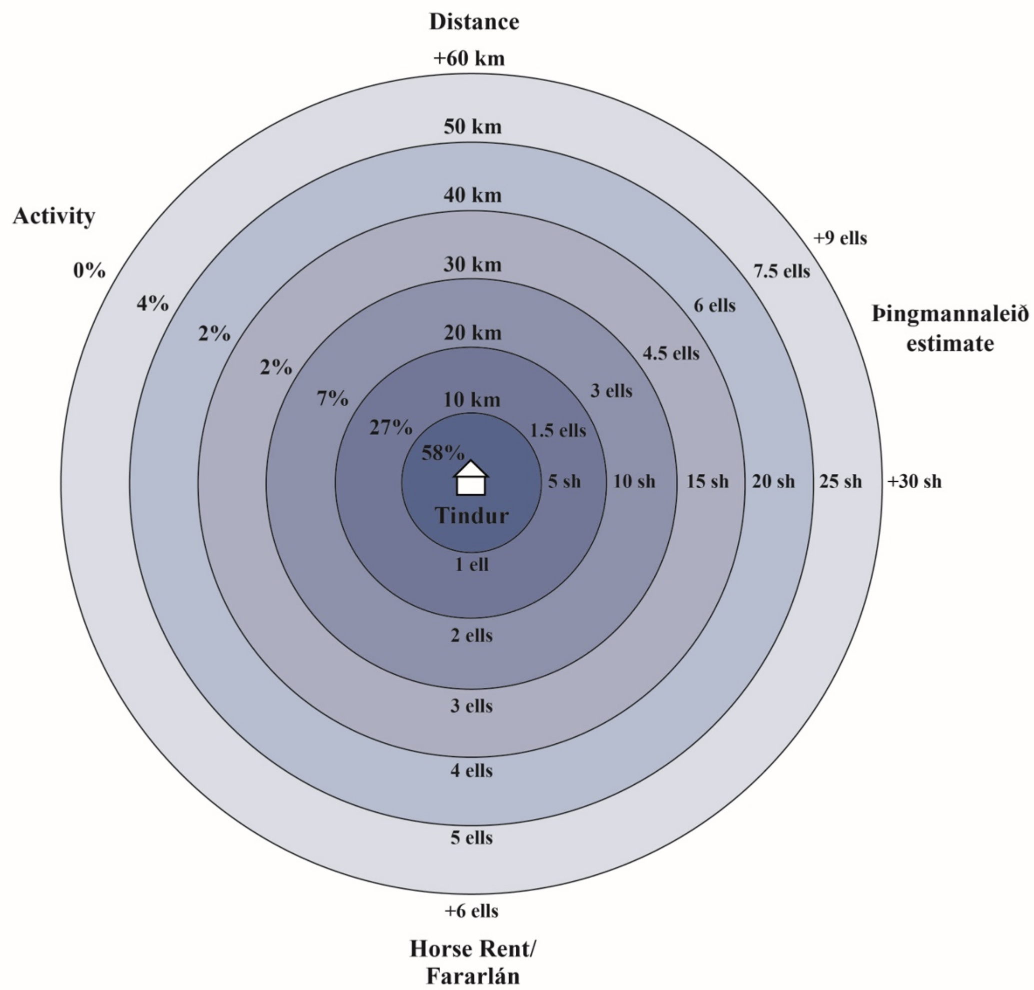


Figure 8.2. Cost of travel outwards from the craftsman's farm in ells and shillings. According to Búalög a day of travel (~40 km) was estimated to cost 6 ells (see also Figure 3.8) while horse rent could be estimated to have been ~1 ell for every 10 km.

that had been allocated to his county was that transporting them the 120 km distance from Eyrabakki home to Vík was simply not worth the effort. Sæmundur Magnússon Hólm quoted 40 ells as the price for a quernstone from Meðalland. If we suppose that the quernstones Hólm described would have been ordered through and distributed from Eyrarbakki trading post, the distance from Meðalland to Eyrarbakki is ~160 km on a map. If the quernstone cost 14 ells (12 ells for 2 days of work, 1 ell for 1 kg iron, 1 ell for raw material transport) that leaves 24 ells. If we convert the 24 ells into about 4 þingmannaleiðir (6 ells for each day travelling ~150 km) the estimated distance is very similar to the measured distance from Meðalland to Eyrarbakki. However, it must also be noted, that if we think of transport costs in horse rent it could have been somewhat cheaper (isl. *hestaleiga/fararlán*, one rentable horse had to be able to carry 50-80 kg, isl. *hestburður*, Lúðvík Kristjánsson, 1985, p.469; Snara, 2019). To rent one horse to transport general goods the same distance would cost roughly ~15 ells (~2 fish/1 ell for every 10 km). But one horse could likely only carry from 1 quernstone up to 2 pairs of Icelandic querns at most, depending on their size and density (the lightest quernstone around 15-20 kg, heaviest known ~60 kg), against only 1 pair at most of Norwegian quernstones (one unused quern rarely lighter than 30 kg).

If one quernstone took at most 3 days to make, plus 2 ells for iron, the quernstone itself would cost 20 ells. That leaves 20 ells, or 3,5 days' worth of travel (up to ~130 km/65 km radius), for transport of material home and transport of the quern to the buyer if the price was not to exceed 40 ells. If a buyer fetched the quernstone himself the craftsman could essentially spend the 3,5 days finding raw material for the quernstone. It is of course difficult to imagine how much time and work an Icelandic farmer would consider worthwhile to spend on a quernstone, taking into account that in the 18th century people were used to traveling long distances on foot, even with heavy loads. According to Hayden (1987, pp. 11 and 153-155, figure 2.1) the Guatemalan metateros he interviewed had a principle zone of product distribution around his place of residence that ranged between 25 and 70 km in radius. The craftsman mainly transported the stones to his home for finishing touches and to markets in other villages. Stones bought closer to home, e.g. in their village, were usually picked up by the buyer. Searcy (2011, pp. 68-70) reported that some metateros' were known to carry 2-3 metate/mano pairs to market on their back over distances ranging from 20-100 km, even over mountainous terrain. In 2012 Scholnick (2012, pp. 8-9) considered late 17th and 18th century gravestone production in Massachusetts, where the gravestones were transported up to 60-65 km away from the workshop. However, about 98% of all the gravestones were found within its 40 km radius, and transport costs often approached the cost of the finished gravestone. This supports the suggestion that a farming craftsman's area of influence in Iceland would likely have been mostly concentrated within a 40 km radius from his home (80 km diameter), but his influence could still occasionally reach beyond 80-100 km. And more often than not at least some useful raw material for quernstones could be found within this area.

8.3. Using the Quernstone: Expenses and Profits in the Daily Grind

Early in the 1780s unground grain had become a stable import and there was nothing to prevent people from buying it other than price and/or timing, i.e. whether customers could afford buying grain and/or showed up at the trading posts before the grain sold out, or was the only thing left. As cereals were already a staple in people's diet and total import of cereals did not change in any way in the 18th century beyond the Skaftáreldar surge between 1783-1786, the economic relationships of costs vs benefits of grain compared to other food types consumed is not considered to have been a great factor in the rate of acceptance of unground grain. Cereals were likely bought by the same social classes as before, whether ground meal or unground grain, and at the time the amounts of imported cereals never satisfied public demands either. Cereals did not provide much scope for profits for the merchants, so they were reluctant to increase import quantities beyond the norm. Between 1750 and 1820 consumption of cereals was around 50-100 gr on average per person a day. Post-1820s it starts to increase however as trade opens up and shipping traditions change with increased ship arrivals each year and their larger cargo transport capacities, until the mid-19th century grain import reaches a peak and overall cereal consumption is around 200-250 gr/day per person (Table 7.5; Figure 4.6). And as import increases, so does the grain/meal ratio until it reaches ~90/10 around 1860, which suggests that farmers will not have wanted to stop grinding their own grain.

It is considered unlikely that transporting and storing unground grain at home was any more difficult for farmers than it had been previously with regard to meal. Grain stored well, as long as it could be kept dry, and it was ground periodically in bulk and/or as needed. Ethnographically, grinding grain is usually reported to be the sole responsibility of women (Alonso, 2019). In 18th and 19th century Iceland grinding grain was also generally considered a female task (Páll Vídalín and Jón Eiríksson, 1985, p. 73), but it was certainly never left completely to them. There is no indication in historical sources of traditions however, regarding female ownership of quernstones, or of specific grinding rituals. Although the pretty love heart on quernstone 66 (Figure 6.44) might indicate a gift ordered by a husband for a wife. Making the quernstones was a dominantly male profession (although it cannot be ruled out that perhaps one or two women made some as well) but grain was ground by women, children and older farm hands (both male and female), the disabled, wanderers and visitors (see also discussion in Chapter 1). Grinding grain for others could bring additional income in small fees or favours and/or odd jobs in return for using the quernstone and provided the less fortunate passing through one way of earning a little extra or simply repaying hospitality and food.

From this information it can be judged that the male heads that generally made the innovation decision for each household of acquiring or making a quernstone very likely did not have to worry about the actual hard work needed to grind the grain on a permanent basis, and it is also unlikely it will have factored much in the initial innovation decision. However, the time needed to grind the grain will indeed have been an important factor in forming an attitude towards the innovation. It was time that needed to be taken away from other important chores, but during the late 18th century the time needed to grind the small amounts of grain consumed in average households is unlikely to have been considered much of a hinderance. As was briefly mentioned previously above, the decision maker was also most likely to be the one to eat the food made with added meal (gruel, soups, bread, sausages etc.) and would therefore have directly experienced any shortage or uncomfortable changes in his usual fare, as well as any benefits that could be felt when using freshly ground grain rather than stale imported meal. The imported grain was seemingly cheaper (Figure 4.3) than the meal in the late 18th century, and it may perhaps have been even more helpful that when grain is ground it increases in volume (e.g. 1 metric cup of rye grain weighs ~180 gr vs 135 gr of dark rye flour, 30% weight difference; AVCalc, 2019) and therefore less grain was likely needed to get the same volume of meal regularly used before[50].

It is not possible to ascertain how much cereals each household consumed exactly but there will have been variations in quantities between them. In Table 8.4 rough examples of daily and yearly consumption of cereals between households (kg) has been put together based on information provided by the import statements and calculations of average consumption through the years (Table 8.3). A household of 5-10 people consuming 50-100 gr each would have needed about 0,3-1 kg of cereals a day. If there were farming families of similar size that consumed 150-200 gr each every day, they would have needed ~1-2 kg. This translates to 2-14 kg a week. For comparison, a standard bag of flour sold in stores today is 2-2,5 kg. According to Hamon and Le Gall (2013, p. 116) roughly 2 kg of millet (*Panicum miliaceum*) can be ground every hour (30-35 gr/min) on a standard saddle quern by an experienced person. How exactly that would translate to a rotary quernstone is unclear. It is unlikely, however, that it would grind much faster, although it would of course depend on the size and quality of the quernstone and the experience of the person grinding, how much could be ground in an hour. When Moritz and Jones (1950) experimented with a Romano-British handquern (~34 cm in

[50] It is considered highly likely that Icelandic 18th century housewifes generally worked with volume rather than weight in their cooking.

Table 8.3. Average consumption of imported cereals in Iceland between 1750-1872.

Years	Average import (tons)	Gr/day per person	10 people/ farm (kg)
1750-1760	880	60	0,6
1790-1795	1400	90	0,9
1806-1819	1300	80	0,8
1840-1849	3400	160	1,6
1862-1872	4800	200	2

Table 8.4. Rough estimations of daily and yearly consumption of cereals (kg) depending on household size (5-100 people) and varied quantities consumed by one person (gr).

	Quantity of cereals per person/day (kg)									
	50 gr		**100 gr**		**150 gr**		**200 gr**		**250 gr**	
Family/ household size	**Day**	**Year**	**Day**	**Year**	**Day**	**Year**	**Day**	**Year**	**Day**	**Year**
5	0,3	90	0,5	180	0,8	280	1	350	1,3	450
10	0,5	180	1	360	1,5	550	2	730	2,5	900
15	0,8	270	1,5	540	2,3	800	3	1100	3,8	1400
20	1	370	2	730	3	1100	4	1500	5	1800
50	2,5	900	5	1800	7,5	2700	10	3600	12,5	4600
100	5	1800	10	3600	15	5500	20	7300	25	9100

diameter) they found that just under 0,5 kg of finished product of ground wheat could be had every hour (7-8 gr/min, 100 revolutions/min). This time, however, included both the grinding and any necessary sifting procedures to make the flour suitable for baking. *Time Team* also did an experiment in episode 14.9 (Taylor, 2007) with similar results, where it took about 2 hours to grind 1 kg of wheat grain into very fine flour (~8 gr/min) on a small hand quern by an inexperienced male grinder. Grinding rye grain for gruel, which was the main Icelandic staple, will likely have taken less time than grinding meal for bread which was made much less frequently. Previously we discussed how one quernstone may have served 2-5 households on average in the early 1780s. If we take the middle ground and suppose that ~1 kg could be ground in 1 hour (16-17 gr/min) on a rotary quern, it can be extrapolated that in the late 18th century where consumption in one average household was perhaps 0,3-1 kg a day or less, grinding grain for the week would potentially have taken up 2-7 hours. If two households shared a quern, grinding for the week would have taken twice that time, or from ~35 minutes to 2 hours each day. If five households shared a quernstone, grinding for the week (10-35 kg) would have taken between 10 and 35 hours, or 1,5-5 hours every day. As a specific example, in 1703 the great church farm at Oddi in Rangárvallasýsla had 14 people in the household of the main tenant farm and 36 people in addition dotted around it between 7 crofts, 50 people in total. If all the people ate cereals, their total consumption (50-100 gr p.p./day) would have been 18-35 kg for the week. This would mean 18-35 hours at one quernstone over the week, or 2,5-5 hours/day, for one of the larger household clusters on the island. It certainly suggests that the more querns available for the job the better, or better yet, let a small mill do the job.

In households where consumption was modest, and there will have been many, it would have been easier and more convenient to share the use and/or cost of a quern with a neighbour for the daily or weekly grind. It was certainly not a significant amount of time that would have initially been taken away from other important chores and will have been an important consideration when forming an opinion of whether to adopt the quernstone or not. No ethnographical information has been found in Icelandic sources indicating any form of specific preparation of rye or barley before grinding. It is unlikely that ground meal was sieved in any way before use (Ólafur Ólafsson, 1791, p. 181), although it is not impossible it was sieved perhaps e.g. before baking flatbread. It seems probable that the rye will have been dehusked abroad before export and the pearled barley could likely be ground directly, making any form of preparation largely unnecessary. However, if any such work was indeed needed, the amount of time working on grinding the grain would have increased somewhat. If grain was to be ground fine enough only a little fist of grain could be ground at a time and the quernstone could not be turned too fast or the grain had to be run through the quern multiple times (*ÞÞ. 15325*). Where querns were turned by hand for long periods of time, as they often were e.g. in the wintertime, and commonly by children, women and old people, the weight of the quernstone may also have been an important consideration. Norwegian quernstones were much heavier than the vesicular basalt quernstones. As an example, we can compare mica schist quernstone 72 (d: 47,5-48,5 cm, th: 11,5-12,5 cm, 59,5 kg) and vesicular basalt quern 9b (d: 48-49 cm, th: 11 cm, 35,4 kg) where there is a 24 kg/40% weight difference, despite the Icelandic quernstone being slightly larger in diameter and having a much smaller pivot hole, and consequently a larger lower grinding surface. This may have made the Icelandic quern not only much cheaper, but easier to work with as well.

Regardless, as level of consumption increased post-1800s, more and more time would have been spent at the quern. The need to acquire a quernstone for the household would have increased, especially during the wintertime, but the reluctance to spend time grinding grain by hand and wearing out the household quernstone for outsiders would have increased as well. When consumption reached 200-250 gr per person/day, grinding grain for a household of 10 people for the week may have taken one person with one average sized quern ~7-9 hours, or 1-1,5 hours each day. It is perhaps not surprising therefore, that as grain consumption increased into the mid-19th century, simple household water- and windmills also became more and more common. The mills were then built (mainly with rock, turf, iron and timber) and maintained by farming craftsmen and/or the farmer himself, and then often supervised by the children during grinding. In the second half of the 19th century even many of the poorer crofters had hand querns e.g. in the growing villages of Reykjavík and Hafnarfjörður (Finnur Jónasson et al., 2019, pp. 39-40, 42, 125-126 and 145-146), despite much of the meal (10%) being imported to such areas. This suggests that even the poor found it worthwhile and could acquire a quernstone to grind grain. Finally, as import of grain wound down at the end of the 19th/early 20th century, the quernstones and mills were abandoned and the discarded querns were mainly used in walls, as post pads and steps, as decorations and weights, e.g. for fence line ends, on top of salted meat barrels and haystacks.

8.4. Conclusions

Total cereal import did not change beyond switching out meal for cheaper unground grain. As a result, there was likely no great change in traditional cereal consumption quantities or availability/access to cereals, beyond the merchants saving costs in grinding the grain before export. Compared to the traditional staple production of meat and milk products and stockfish, which were considered most important, cereal was only ever a modest addition to that staple and not considered in any way as a substitution. Until perhaps after the mid-19th century when total import quantities changed. The economic relationship between the costs/benefits of grain vs other foods is not considered to have been much of a factor during and in the aftermath of the Skaftáreldar eruption either, as for many there were no other options to be had. No other food products were imported in any substantial quantities to replace the meat and milk products poisoned and lost.

The quernstone merged easily into the pre-existing exchange traditions as a general commodity. It is not possible to get a precise picture of the rate or reasons for quernstones appearing after being re-introduced. There are hints, however, that after an initial surge in the 1770s and 80s their numbers may have been fairly low and stable into early 19th century. One quernstone will likely have served 2-5 households on average, until their numbers begun increasing again in the early 1800s as total import of cereals, grain especially, began to increase beyond the long-established norm. Between the second half of the 18th century and the early 20th century, prices of indigenous quernstones change very little, commonly ranging between ½-1½ state dollars or 13-40 ells. Indigenous querns were usually sold at around half the price of a foreign quernstone or less. For modern comparison the quernstone could perhaps be likened to an appliance such as a laptop or a fridge, but there is a difference between a 12" 128 GB HP Pavilion and a 15" 500 GB MacBook Pro; or an 80 L Matsui fridge and a double, 400 L Samsung fridge and freezer combo with an ice cube machine. Similarly, the quernstone was a graded innovation with a few simple interchangeable components providing a flexible range that could be adjusted to people of different affluence and lasted long enough to continue its use-life as a second hand (or perhaps even third or fourth hand) appliance. An expensive appliance, but not totally beyond the budget of the average Joe when it was really wanted/needed. The simplicity of the design and interchangeable components of varied values and sizes made the quern a more flexible innovation and more affordable to the less affluent and easier to reproduce by the general farmer. In areas where farmers and craftsmen had to spend more time and/or effort to find good materials for quernstones it is likely that those who indeed had close enough access to useful materials only made quernstones for themselves and perhaps their nearest neighbours. For others living in such areas it was likely more convenient and/or more cost effective simply to acquire an imported or second-hand quernstone.

During the early stages when the quernstone was being considered as an innovation, average cereal consumption was fairly low. Consequently, the relatively short time needed to grind the grain will not have caused much negative attitude regarding additional workloads associated with the quernstones usage. The grain was cheaper than meal and may also have stretched further for the cook when it was ground as needed. As consumption increased in the 19th century the time needed for grinding will also have increased considerably. This resulted in the gradual appearance of makeshift at-home water- and windmills all over the island past the mid-19th century, and a much greater need for both quernstones (or handquerns) for winter and millstones for the summer. Average yearly demand for indigenous quernstones was likely always low in each county (<5-10 querns/year), however, and could have been supplied by only one or two men who would also easily have time for other crafts besides, when the querns were not simply made as needed by the farmers themselves. The quernstone became one of the more important nodes of the household. It called for work in the form of stone masonry, grinding and supervision from men, women and/or children (although judging from old folk custom descriptions not very happily from their point of view), and provided modest additional income, both to the farmer as a socioeconomic commodity, and as a tool that needed action and maintenance which was sometimes provided by visitors and dependents for modest compensation. The humble quernstone essentially served and influenced all levels of society.

~ Chapter 9 ~

Successful Innovation Diffusion: A Synthesis of Utility and Social Compatibility

"*I truly believe that a mediocre idea that generates enthusiasm will go further than a great idea that inspires no one. For this reason, leaders must be able to arouse enthusiasm in their people. And in order to accomplish this, they themselves must first be enthusiastic.*"

Mary Kay Ash (2008, p. 73).

"*It is not the meek who have inherited the earth, but the opportunists.*"

David Attenborough (Salisbury, 2003).

In a perfect innovation diffusion scenario, all households would want and have the opportunity to buy unground grain and acquire a quernstone. They would buy as much as they required and unground grain would become the only cereal import type. There would be no hindrance to import, either of grain or querns. Merchants would be 100% willing to import as much as needed and have plenty of cargo room to meet everyone's demands for every year. Successful innovations have in the past been observed to have a take-off point between 3-15% acceptance in a focus group. At the height of grain import in the 1860s the average consumption of cereals was around 230 gr/day. If a whole nation of 45 thousand people in 7800 households had been given the opportunity and shown willingness to consume 230 gr/day in the late-18th century, and all was in the form of unground grain, about 3800 tons would be needed each year for all of them. To trigger a take-off point at 3% complete household acceptance, ~115 tons of unground grain/year and ~235 quernstones would be needed. According to preserved import statements this ideal point could have been reached in 3-4 years at the end of the 1770s. If there had been no delays in import and innovation diffusion after 1776 and innovation acceptance had grown exponentially like an unchecked disease in a perfect S-shaped curve after 3% critical mass had been triggered, a 100% saturation point in grain import would easily have been reached well before 1800 and water and windmills would have taken off much sooner. If all households could quickly and easily acquire a foreign quernstone and grain import continued unimpeded, after saturation not many new querns would have been needed for at least 50 years. And if well affordable import had continued as needed on a regular basis for the 150 years of quernstone rule, the Icelandic quernstone assemblage would be 100% foreign. If however, the ~600 foreign quernstone models had been the only ones imported, local raw materials were of infinite supply in every corner, there had been no public desire to own a foreign quernstone, and all future quernstones had through the years been made locally by the heads of each and every household; the foreign querns would slowly have disappeared from the assemblage due to wear and tear. There would have been no need for Icelandic querns to have any fixed value and they would be useless as a general commodity. The final assemblage would be equally distributed and mostly Icelandic, with perhaps a few very old and worn foreign quernstone stragglers thrown in. All quernstones would have the potential to be very varied in appearance and mirror their local geology perfectly. Or if we consider the opposite end. If only a few Icelandic procurement sites with homogenous raw material had been expansive enough to produce quernstones on a mass scale and easily distributed, the local quernstone typology and its material range and texture could be assembled into few and relatively uniform groupings dotted across the island.

This historical narrative and the Icelandic quernstone assemblage show clearly however, that these ideal scenarios are far from reality. Never-the-less, it is intriguing to find strong commonalities between innovation introduction tactics of late-18th century Scandinavian government officials and an American sociological innovation diffusion paradigm formed almost 200 years later. The aim of this thesis was to reconstruct this single innovation diffusion episode to find out why this particular approach to the quernstone production revival was successful, and identify any significant typological and material changes in the Icelandic quernstone assemblage resulting from the significant increase in quernstone use post-1770 up to the early 20th century. In this synthesis of historical archaeological research into innovation diffusion and innovation complexity in the 20th and 21st centuries the focus was directed to a few key aspects and their complex interconnectivity that needed to be considered in the reconstruction and its interpretation. These aspects are:

1) The history and impetus of the idea, the government tactics used during innovation introduction and distribution, and their effects,
2) the general adopters and their innovativeness, the participating quernstone masons and their level of craft specialisation, their mobility, communication and social interconnectivity,
3) the relative compatibility and complexity of unground grain and the quernstone as an innovation pair facing potential adopters, and finally

4) their encompassing and directive spatial surroundings; national, regional and local; the natural as well as political, economic and social.

In this final chapter the main lines in this historical archaeological narrative are first gathered together into a coherent whole before general lessons and conclusions are finally drawn together at the end to tie the knot.

9.1. The Historical Archaeological Narrative That Emerged

9.1.1. The Initial Innovation Ideas and Introductions

The main lines in the Icelandic rotary quernstones' existence; its history, its purpose, its production and its typological developments, have been traced from the late 9th century to the early 20th. It was first transported over the North-Atlantic to Iceland as an age-old concept, when the island was permanently settled in the late 9th century and reproduced in Icelandic volcanic rock as early as the late-9th/10th century. Initially, cereals were likely cultivated all around the island. However, during the 11th-13th centuries such cultivation slowly became mainly concentrated along the southern coastline from Skaftafellsýsla in the Southeast to Faxaflói in the Southwest and ready-ground meal became an import staple. During and after the 12th century climate conditions deteriorated, and local cereal production became more difficult. Around the same time, Norwegian trade connections and political influences in Iceland also strengthened. No foreign quernstones have as yet been found clearly connected with the many 9th-11th century archaeological sites that have been excavated in Iceland. It is therefore considered likely that Norwegian quernstones from the Hyllestad and Saltdal areas were only a common import and used alongside Icelandic quernstones between the 12th and mid-14th centuries, and mainly in the South. Any remaining cereal production efforts in the South were finally abandoned in the late 15th/early 16th centuries and a 150-200-year cereal cultivation hiatus began. As the 18th century dawned, cereals accounted for about 10% of the Icelanders' diet (70-80 gr/day on average per person, ~25 kg a year). They were largely in the form of rye meal imported from Denmark and mainly used in gruels, soups, offal sausages and occasionally unleavened breads. Rotary quernstones were only used to bruise malt for brewing on a few of the wealthiest farms scattered around the island, and to grind wild lyme grass, mainly in a small isolated area called Meðalland in the county of Skaftafellssýsla in the Southeast.

At the turn of the 18th century the authorities attempted to revive Icelandic cereal cultivation, but after a period of vigorous debate, and isolated and uninspiring cultivation experiments the project petered out. Through further Icelandic governmental direction, the combination of cereal import was instead changed in the 1770s. Quantities of unground grain (rye and pearl barley) were increased at the expense of ready ground meal simultaneously alongside efforts to revive indigenous quernstone production all around the island, and this approach was much more successful. The idea to start importing unground grain and integrating mills and handquerns into the small, and relatively poor Icelandic farming community was pitched in the late 1760s. What followed was a period of slow-moving discussions and research that was directed mainly by the governors and more enthusiastic sheriffs, taking almost 10 years. Import of unground grain began immediately but only in very small quantities and likely only by special order from more enthusiastic innovators interested in the project and/or change agents specifically affiliated with the government. In 1770 the plans were officially deemed acceptable and worth further inquiry by top Icelandic government officials at parliament and The First Land Commission provided royal approval. However, it was not until five years later that it was officially resolved that grinding grain should happen at home, preferably with locally produced querns. The governmental aim hatched primarily by Icelandic government officials was always to build on the old socioeconomic foundations and do only enough so that the indigenous population could and would take over quernstone production and become self-sufficient. This will have played a crucial part in the success of the campaign as it got the inhabitants themselves seriously involved in the development of the project. Inquiries were made to bishops, sheriffs, priests and district officers regarding information on the usefulness and availability of rock materials. Inspirations for local production were sought in Meðalland in Vestur-Skaftafellssýsla and locally produced malt querns and lyme grass querns were sent to the Exchequer in Copenhagen for assessment with positive results.

The project finally started in earnest in 1776 with the government putting its basic foundations in place by initiating large-scale import of unground grain at more favourable exchange rates than the meal and examples of foreign quernstones to all 25 trading posts. The bishops had pledged their support and thereby given the clergy a green light. The innovation pair of querns and unground grain constituted no significant threat, to either social or religious norms. Meal already had a long-standing niche in the people's daily lives and benefited the majority of the population without resulting in any significant friction either between or within classes. Total import of cereals did not change beyond the norm, as the amounts of imported meal were simply decreased as regularly as the unground grain import was increased. It is also very likely that the final destinations of the imported supply remained unchanged. I.e. it was continually bought in similar amounts between the same social classes as before, and the majority likely went to the more affluent farms. Grain import indeed became a permanent yearly arrangement, but it would take about 35 years for the grain/meal ratio to reach beyond the 70/30 mark on a permanent basis, without a doubt delayed by the effects of the Napoleonic Wars (1803-1815). The responsibility of demonstrating and distributing the imported quernstones to the public initially fell mainly to the sheriffs and merchants in each county. The sheriffs had already tapped some of the local knowledge through priests and district officers during project development, so awareness of the plan will have already spread somewhat ahead among the general population at the district level. Despite the rudimentary postal service and primitive road systems, information and awareness will have spread easily once the introduction had begun. The homogeneity of the Icelandic social structure was ideal for successful information spread and more influential discussions, as both official and personal information exchange (news/ideas/opinions/experiences) was commonly through interpersonal communications. The majority of Icelandic farms were strongly interconnected with neighbouring households through frequent and necessary communications and interactions during daily farm work routines (especially those connected with keeping, slaughtering and herding the sheep) and other often similar and interconnected socioeconomic responsibilities and needs. The sheriffs, district officers and priests commonly had strong social ties and lived in close vicinity to their subordinate farmers and farming craftsmen and information flowed easily across the few class-divides, both within and between districts, e.g. in church and at annual county and district assemblies and meetings. Population mobility was also frequent and often reaching across multiple county and regional lines. Annual trading expeditions and the general workforce seasonally criss-crossing the island between fishing stations and haymaking, formed weak, but often far-reaching, networks and links among the populace, exchanging and imparting with information and news in random directions along the way.

The sheriffs and merchants as change agents likely provided physical demonstrations and personal insights while distributing the how-to and principles knowledge required to successfully grind the grain with the foreign quernstones. The merchants were required to service all the trading posts annually, but they were not allowed to take any great part in local production. This made their operations certainly fixed to the spot, but as the average farmer commonly paid them 1-2 visits each or every other year, they were important hubs for information distribution. The sheriffs likely introduced the innovation project through letter writing and through interpersonal communication in their own homes and at the annual county and district assemblies where farmers would gather en masse and carry innovation awareness, ideas and opinions along with them into each and every district. The sheriff in Eyjafjarðarsýsla for example, led by example and bought nothing but grain for his household after import started and introduced and demonstrated the grinding of grain in his home to anyone willing to observe and/or participate. In 1778 the sheriff in Barðastrandasýsla directed experiments in mill construction with the help of a Norwegian milling apprentice. All such public and personal participations and contributions to information flow and easy access to the innovation at the regional level were indeed crucial to keep the word spreading. The merchants and itinerant advisers like the Norwegian milling apprentice, provided weak cosmopolitan links to foreign knowledge and the government officials were the information gatekeepers. However, as change agents high in the socioeconomic pecking order and strongly affiliated with the foreign governing body, they had little part in directly influencing the general public's final innovation decisions.

The 10-year period between 1778 and 1788 was a troublesome one, with erratic and unusually cold weather fluctuations, a catastrophic volcanic eruption and an outbreak of smallpox. The merchants had the opportunity to encourage farmers to buy grain for a trial and/or a quernstone or two for the long haul, but after a period of free demonstrations they will eventually have started charging for grinding. Foreign quernstones were imported as the government orders could be met, but there were clear complaints that they were too expensive. The foreign quernstones were only meant to serve as models and inspiration to further quernstone acceptance and indigenous production, but the Exchequer responded to the complaints in 1779 and decreed that 200 quernstones would be imported free of charge and spread to all the trading posts. It is unclear who exactly received the free quernstones, but the sheriffs were responsible for their further distribution. Most will no doubt have arranged a free one for themselves and likely handed out (or perhaps directed others to pick up) the rest to more affluent relatives and influential associates, priests, district officers and/or more affluent farmers in their county, who often were also capable craftsmen. These acceptors in turn became opinion leaders, additional hubs of access, information flow and inspiration at the local level in their respective districts, for good or bad.

9.1.2. Incentives, Forcing Agents and Information Diffusion

In 1781 rewards were also set up for participation in experimentation and development of indigenous quernstone production and the merchants were obligated to accept locally made quernstones for sale at the trading posts. The rewards were funded by The Royal Danish Agricultural Society and the Danish government and handed out every year but one, between 1781-1790. Continuing the how-to and principles knowledge distribution (at least to those who could read), the sheriff of Barðastrandarsýsla put together a detailed pamphlet based on his milling exploits which was distributed to all counties, and scholar Sæmundur Magnússon Hólm published a treaty on the exploitation of lyme grass in Skaftafellssýsla, including a short introduction to quernstone production. In 1782 the grain import had been increasing gradually for seven years and the grain/meal ratio had increased to 50/50 without any significant change in total import quantities. This will have pushed many to acquire a quernstone to be able to keep meal as part of their traditional daily diet and resulted in actual experience of the difference between freshly ground and imported meal, either directly with the aid of a private quern or on the side lines through another's. Unfortunately, no information was found whether the merchants were under any instructions regarding how to distribute/sell the unground grain alongside the meal or whether the public was allowed to dictate what they bought. No records of complaints or disappointments concerning the attributes of freshly ground meal have been found either. The grain was cheaper, had a longer shelf-life, likely tasted better and those in charge of meal preparations will have found it giving higher volumes of meal. If a household that was used to buying imported meal for the year, bought the same amount of grain instead for less money, it would not only save money but also potentially get more meal out of it than before. Average daily consumption was relatively low at this point, so finding the time needed to grind the grain (1/2-1 hour/day) will not have been a large threshold to cross either, and all these benefits were quickly and directly felt by the individual adopter. On those grounds, there is no reason to believe that initial adopters had much reason to reject the grain or spread negative opinions which would have damaged the innovation's reputation as they would have done with regards to the cereal cultivation experiments.

Import of foreign querns seemingly reached a peak in 1783 (just over 600 querns), and by then the number of imported quernstones would easily have sufficed to provide all the top government officials, the bishops, the sheriffs, priests and district officers with a quernstone. But the 200 free imported quernstones would not have been enough to grind all the imported unground grain and many could not afford buying imported foreign quernstones, which will have also called for indigenous production if the grain was to be consumed in the regular manner and not go to waste. That same year, the Danish Exchequer demanded progress reports on the developments of quernstone use and indigenous production. Rewards had only been handed out for two years and were still being developed and tweaked. Reports indicated that prices of indigenous quernstones were very varied and there was discussion regarding the necessity for clear standard prices in local quernstones production. Querns were being brought to trading stations for sale, but there were also reservations about involving the merchants in local quernstone exchange, and in places querns were piling up at the trading stations. As the reports were being written in the fall of 1783 the catastrophic Laki eruption had begun and in the following year the Exchequer gave the public total freedom to acquire a quern in any way they chose. This provided the option of sidestepping the trading posts entirely without consequences, unless specifically on the hunt for a foreign quern, and this freedom may have been a significant easement for local quernstone producers.

The grain/meal ratio had just reached the 50/50 mark but now began rocking between 40/60-80/20, especially between 1783 and 1787 when there was a considerable increase in grain import during the aftermath of the eruption. Whether import of foreign quernstones was continued after a large drop in quantities in 1784 is unclear. It is considered likely that it may have been the case, but only in small quantities as is hinted by the quernstone assemblages' material composition of 25% foreign/75% Icelandic. Import was certainly not meant to be in any way a hinderance to the revival of local quernstone production. The considerable increase in grain import could also have raised the need for quernstones as even more grain needed to be ground for traditional consumption. On the other hand, loosing 20% of the nation may have released some used quernstones back into circulation, and the fact that some of the grain may simply have been fed to the farm animals to keep them alive, makes the effects this period had on quernstone use and local production very uncertain. The import of grain certainly did not cease, however, although by 1788 the grain/meal ratio had dropped down to around 50/50 again, and it hovered in that range for ~15 more years into the early 1800s when grain import started to increase again at the expense of meal.

The rewards did not stop either. For six years (1784-1790) the rewards were handed out after production became unregulated by the state, encouraging initial search for and experiments with local raw materials. Each year the rewards were partly or wholly moved into one or two new counties until they had been handed out for mill building, quernstone production and/or development at least once in all but five counties. They were handed out to a merchant, to district officers, priests and/or farming craftsmen who were also often closely socially connected to each other. A few sheriffs and more affluent priests, district officers and farming craftsmen, built mills fitted with either a foreign or local quernstone. A lowly Danish farmer and a Norwegian apprentice will not have been characters of much consequence at home, but represented important hubs of experience in quernstone production and milling for the Icelandic situation. They could potentially enervate a few of the curious and the innovative but may not have been influential enough to convince the more sceptical locals. The priests, district officers and craftsmen, however, were strongly socially connected to the general public. As central opinion leaders in their communities who were also very likely heads of their own tenant farms, they had more social gravitas to influence and enlighten public opinion and prompt neighbours into action, especially if they had good reputations. A few priests will have participated in quernstone production, but they were more important in their parish as sources of user experience and opinion, which could be spread among their parishioners face-to-face, e.g. at regular church gatherings. More commonly, farming craftsmen and regular farmers and farm hands who generally possessed assorted skills and experiences in handicraft from daily life, took on the actual production of handquerns under the direction of the district officers, who themselves were often craftsmen as well. They were important as opinion leaders and sources of information and experience, regarding the production itself.

As the last rewards were handed out in 1790, the official involvement of the Danish government seems to have ceased entirely. No further requests for progress reports were issued but they may not have been needed anyway. The incentives may already have formed more than enough working innovation hubs across the island to develop sufficient positive innovation reputation and social momentum for continued contagion of quernstone use and establishment of such production on a permanent basis. The steady import of unground grain firmly took the place of at least 50% of the meal, which will have pushed many to acquire a quernstone, and in turn upped the demand for local production. The incentives reduced the financial risks that initial adopters had to take to try out the new innovation and gave them a blueprint on which to base future development in local quernstone production. The innovations and necessary knowledge were assessed and spread further by influential people who were strongly socially connected within their community and formed a bridge between the government and the general population. It increased innovation visibility and provided easier access to it for the few innovative parties to test further for themselves, and for the more sceptical to simply observe on the side-lines any potential advantages or disadvantages through someone they admired and/or trusted before making a decision to either make or buy a quernstone.

Total quantities of imported cereals oscillated between 800-1800 tons/year until after the Napoleonic Wars (during which cereal import was often seriously lacking) when they finally started increasing far beyond the age-old norm during a period of socioeconomic prosperity between 1820 and the late-1850s. Gruel was a daily fare and it can be calculated that during the late 18th century the average cereal consumption was 70-80 gr a day/person, but the fact remains that the level of consumption will have been graded, both in social and geographical space. Affluent farms consumed more, while the more average consumed less and yet others very little, although exact consumption ratios between farms are as yet unclear. It is unlikely however, that there were many homes that never saw it. At the trading stations the distribution of the imported grain between farmers will have been random from year-to-year and some did not go every year. It is unlikely that ordinary farmers had the opportunity to order meal/grain beforehand. Household needs may have differed between seasons and the timing of a farmer's arrival at the trading post would influence the product range available to them. Some would always have to leave with grain, whether they wanted to or not. Once grain became a regular exchange good it will also have pushed some to acquire a quernstone to be able to grind it when offered or sought in local exchange for other goods and/or services, during times when the trading stations were out of reach.

The grain/meal ratio did not pass beyond the 50/50 point until the beginning of the 1800s and saturation level never reached much beyond 90/10. There will always have been people with varied attitudes and affinities towards innovations; a certain number of late adopters biding their time, side-adopters having their grain ground by the family, a neighbour or a friend, and some non-adopters (the poor, cautious, obstinate, cheapskates, eccentrics etc.) ignoring innovation completely by refusing to buy unground grain at all. Why grain import seemingly lingered around 50% for a few years at the end of the 18th century is unclear, but there will have been circumstances where it was necessary or more convenient to buy meal. Those with lower innovation thresholds that accepted the grain acquired a quern, while those that were cautious and/or ate less waited and observed, only hopping on the bandwagon at a convenient opportunity once the innovation had proved its metal. Foreign querns were too expensive for some and there were areas where acquiring or making quernstones was harder. Some of the meal was also consumed under circumstances that did not call for a quern or time could not be spared for grinding, e.g. at the fishing stations where quarters were cramped, or during the high farming season. It may even well be that some farmers bought both; meal for the summer and grain for the winter, when long-term storage was more important and more time to spare for grinding.

In their interdependence the imported grain certainly acted as a forcing agent and formed additional demand for quernstones. There is no way of knowing at the household level exactly who received and/or bought the 600+ foreign quernstones, but they provided an important incentive and opportunity for imitation and re-production. As the amounts of imported grain grew, more querns were needed. This called for indigenous production as well and pushed the locals to participate and find workable solutions for their communities, which in turn gave the project a better chance of long-term success. In a society rewarding self-sufficiency and industriousness, versatile handicraft projects of stone, wood and/or iron were part of the daily life and travels of the majority of Icelandic farmers and farming craftsmen, so they were more than capable of making quernstones and taking over quernstone production. The masons were grown men of all ages (~20-80) who mainly headed, or were associated with, regular tenant farms of average affluence (11-30 hundred). Their tight work schedules and often stretched resources will have made many farms vulnerable to unplanned fluctuations or extra burdens to their workloads and economies. The grain was simply substituted for meal, and grinding will not have taken up too much time while consumption habits were small-scale, so there will not have been much additional costs in that respect. Making or acquiring a quernstone however, was perhaps a slightly different kettle of fish.

9.1.3. Quernstone Production and Trade Brought to Life

If the island had not had enough raw materials to at least partly satisfy demand, or the people had not been able to, or seen a need, to take up quernstone production at the local level, in time the project would have collapsed like a badly baked soufflé. Or at least slowed down momentarily above the societal rung that could not afford new quernstones, until cheaper used ones slowly came into play. The government officials received mixed responses when they scanned the possibilities of finding local raw materials to carry local production forward. Varied quantities of raw materials due to regional differences in geological formations was considered by some to present a significant hinderance to the development of local production, as they were rarely sought beyond ~20-40-km from a craftsman's or a customer's residence. In some counties, rarity or difficult access to raw materials may indeed have slowed progress down and/or made such production less common. If a quern mason had to spend so much time and energy looking for raw materials, e.g. by travelling much further than 40 km away from his farm, that in the end his quernstone actually became more expensive than the imported one, such production was not viable. Imported quernstones certainly seem to have been at least slightly more common at the islands' outer margins, e.g. in the West- and Eastfiords, where local raw materials were likely more scattered and difficult to acquire, and this could also have had some effect on the slow total unground grain volume increase. However, in those areas there will also have been raw material sources (e.g. erosional formations and exposed central volcanoes) that quern masons could exploit locally in small amounts as well. The development of local production was certainly faster in areas where project participation of sheriffs, district officers and/or farming craftsmen was more active and where availability and access to raw material was easier (e.g. in vast and exposed post-glacial lava flows), e.g. in Eyjafjarðarsýsla in the North, Árnessýsla, Rangárvallasýsla and Vestmanneyjasýsla in the South, and Dalasýsla and Snæfellsnessýsla in the West.

In the project's early stages, the rewards and any initial production will have brought windfall profits for those with an opportunity to take advantage. The main ingredients in the production, the manual labour (i.e. time) and the rock, were essentially risk free as long as they were approached and manipulated sensibly, and it constituted a modest addition to a farming craftsman's resources, whether sought or offered in traditional goods exchange. Locally scavenged rocks or flagstones (mainly vesicular, basic and intermediate volcanic rock) were pared and transported home on horseback or through manual labour. These largely free local rock materials could be transformed at home or with a potential buyer whenever convenient, into a completed quern in 1-3 days with metal hammers and chisels (often also home-made), and without much need for, or dependence on, the foreign trade networks beyond the norm. Accessories (handles, spindles, rynds etc.) were mainly made of wood and/or iron and sometimes fused in place with melted metal. The quernstones price commonly ranged between ½-1½ state dollars or 13-40 ells, which was around half the price of a new foreign quernstone or less. This was likely a somewhat large single bite to swallow for a general farmer or crofter wanting to acquire one, but not by any means an overwhelming obstacle. Richer farmers and priests could buy a large (and potentially shiny) foreign quernstone, have it fitted with a new iron handle and rynd and place it in a timber mill or a lavish box on legs with a fiddly mechanism to adjust the runners' grinding height. While the crofter could buy or make a small handquern from an Icelandic boulder scavenged in a river in the next fiord over, with accessories made of left-over timber and/or iron, and place it on a skin on the floor during grinding. In short, the quernstone was an innovation of manageable technological complexity that could be moulded and adjusted to various socioeconomic situations in a very short period of time. Its benefits could be felt directly and quickly by users and producers alike all over the island. They were easily assimilated with the Icelandic exchange traditions and their price range changed very little during their 150-year presence.

More innovative and government recruited participants initially experimented with production. Where rewards were handed out, raw material availability, human capability, interest and opportunity all came together alongside the opinion leaders that bought or were given the imported quernstones, to form initial hubs for further innovation diffusion scattered all over the island. The men who officially received rewards may not have been that many, but the 1783 reports from Rangárvallasýsla suggest that the total number of farmers and farming craftsmen willing and/or persuaded to take on quernstone production in Iceland could have been much higher than those known to have received rewards. In their respective areas the reward recipients were likely only the more well-connected tip of the iceberg and many more were trying their hand at making quernstones and thereby increasing the visibility and accumulating experience to pass on to other more cautious adopters. As more people accepted the innovation pair, potential risks for later adopters slowly diminished. Information spread outwards from those initial hubs into the community through the strong and frequent interconnectivity of family ties, neighbours, colleagues and cliques; forming clusters of knowledge, experience and innovation accessibility. Weak ties and population mobility spread them further into other areas to form new hubs, especially where raw materials were abundant. Pre-existing local knowledge and experience in Vestur-Skaftafellssýsla in the Southeast likely diffused through time into Rangárvallasýsla, Múlasýsla and beyond. As project participation was likely very active in Rangárvallasýsla, Árnessýsla, Eyjafjarðarsýsla and Barðarstrandasýsla they were without a doubt also very important as central regions in further information distribution, as they were all crucial seasonal destinations of the general work force flowing between the largest farming regions and the fishing stations.

The initial governmental efforts may have tipped the balance and made further spread of the quernstone inevitable in the early 1780s, but it is unclear how many or how fast quernstones were made or acquired, or how long it took for the quernstone to reach all potential adopters and saturate the market. It is likely that after an initial surge in more active areas in the late 1770s and 80s the number of new quernstones produced will have lowered and become more stable until both total cereal import and the unground grain/meal ratio started increasing again after 1820. Once quernstones became a common possession one quern will likely have served between 1-5 households at most, before at-home mills became much more common. However, it is not possible to shed light on the development of the exact ratio of quernstones to households through time, as querns could be shared by families and neighbours at varied distances to each other, just as often as other farmers wanted or had to keep one to themselves. Grain import stalled around the 50% mark in the late 1780s and stayed that way into the early 19th century when it increased to 70%, and only reached 80-90% in the mid-19th century. However, in years where import statements are preserved at least, once there, it also never dropped below the 50%. Farmers therefore definitely did not want to stop grinding their own grain, but this cannot be used to predict that quernstones spread accordingly, however. Farmers that did not switch completely to grain may well have bought both, and/or periodically switched from one or the other, depending on the time they had available to grind grain and product availability when they turned up at the trading posts. Sensible farm management aside, if the quernstone became a status symbol like the Range Rover Sport and Wedgewood service sets, or a fad like the lava lamp and Tupperware, it may well be that the majority of farms acquired a quernstone in one way or another early on in the process to keep up with the neighbours, earn a little extra or simply pay some debts, no matter if it was needed at that point in time or not. Perhaps in the hope of being able to achieve higher levels of grain consumption for the family in their distant future.

Through the 19th and early 20th century indigenous quernstone production was likely always just a fairly small and well manageable part of the total output of the farming households of industrious farming craftsmen in possession of drive and raw materials to take on such a project. Demand for indigenous quernstones was likely never sufficient for it to be viable for anyone to become a fulltime quernstone mason (<5-10 quernstones a year per county). This demand could have been met by one or two men in each county (~20-40 men in total across the island), where quernstones were not simply made as needed by the farmers themselves. However, this also meant that farming craftsmen did not have to give up any of their other usual craft projects and regular incomes to make way for the quernstone in their repertoire. It is indisputable that the quernstone became a common and central household appliance, although it must be noted, that the exact saturation level of quernstones, i.e. the exact percentage of households that had querns at the height of grain import, is unclear. It was both useful as a commodity that provided an occasional additional income, and as an appliance that required regular maintenance and attention from men, women and/or children. As grain consumption increased (~230-250 gr/day on average in the mid- and late-19th century), longer hours were needed by the quern. Gradually water- and windmills popped up all over the island as the 19th century passed, both in connection with growing villages and age-old farms, and formed a need for both quernstones (or handquerns) for winter, and millstones for the summer. Often, the millstones and handquerns were one and the same, used in the mill in the summer and moved into the house to serve as handquerns in the winter. It might be possible to get a better idea of the final saturation point by mapping all known at-home mills and dissecting in more depth the social spread of cereal consumption, but this data is not readily available and must therefore wait another day. The grain/meal ratio became fixed around 80-90/10-20 around the turn of the 19th century and remained so into the 1870s when imported meal and flour became more and more common again as milling technologies in Europe and North America evolved in the 1870s and 1880s and cargo transport to and from the island became easier and more frequent. In the end the quernstones and mills were gradually abandoned before the turn of the 20th century.

9.2. The Remaining Spatial and Typological Patterns

This historical chain of events rebooted and changed the composition of the Icelandic quernstone assemblage considerably after 1770. Icelandic quernstone masonry changed, from being the prerogative of a few craftsmen very rarely making malt querns and rye grass querns for the most affluent in a few small and/or isolated areas, into an island-wide practice, with farming craftsmen servicing a slowly increasing public consumption of imported unground grain on a larger scale. The innovation diffusion paradigm lacks a discussion of empirical expectations of changes in time and space under various conditions, but this is not a problem here as the available data simply does not give the opportunity of reconstructing long-term diffusion patterns on the ground. The three available data sets are names of over one hundred known quernstone masons, a scatter of potential and utilised raw material procurement sites and a quernstone assemblage of just under 500 quernstones and fragments, mainly from the 18th and 19th centuries. To be able to map acceptance, diffusion patterns and production rates in geographical detail across space and time, all buyers of foreign quernstones, all raw material procurement sites and the ~3-4 generations of quernstone masons active for ~150 years between 1770 and 1920 would have to be known. The recorded quernstones would all need to have a clear production date and the three latter data sets would preferably have to be firmly linked over the entire course of production, from raw material site, to mason to user/buyer and quern. This unfortunately is not the case by any means, and there is no possible chance of such detailed information ever being catalogued or unearthed in the future. Although not impossible, due to general wear and tear it is also unlikely that many of the original quernstones imported or made in the late-18th century survived into the 20th. The oldest Icelandic quernstone recorded with a concrete date was made in 1867, just over 90 years after the first querns were imported and ~50-60 years before the quernstone was finally abandoned. It is therefore likely that the quernstone assemblage mainly represents the last 50-100 years at most and it can only be used to consider material (foreign vs Icelandic) and typological (textures, types and decorations) distribution at a regional level at the time it was abandoned at the height of grain import in the mid- to late-19th century. Largely, the detail between the beginning and the end is lost and the exact nature and rate of quernstone production and spread is unclear. However, each data set and historical documents have provided clues that have been combined to reconstruct the general nature and development of spread and the intermingling of import and local production of quernstones and can at least partly explain the final snapshot of the varied quernstone typology and distribution preserved in the ubiquitous Modern quernstone assemblage.

Quernstone distribution was initiated with foreign querns and through the nature of governmental structure and planning, initial distribution patterns were hierarchical as the querns were pointedly distributed through foreign merchants to and through the governors and sheriffs in each region and county down the line into the districts, likely to many priests and district officers across the whole island. Prior to the 18th century, known imported quernstones were ~25% of the Icelandic quernstone assemblage and mainly originated in the Saltdal and Hyllestad areas in Norway (mica schist). After import was re-established the foreign quernstones continued to be only ~25% of the total assemblage, but the sources changed and became more varied. Only a couple of possible Hyllestad stones were found (a source that had previously ruled supreme), alongside standardised and mass produced quernstones and millstones likely largely originating from Selbu in Norway, southern Sweden and Germany (mica schist, sandstone, conglomerate and volcanic rock). Together, the historical sources and a few foreign quernstones in the assemblage suggest that they were often simple blanks with a flat grinding surface and without any accessories or surface dressings beyond a simple collar when they arrived. However, one foreign merchant received a reward for adapting the imported querns to their new environment and one foreign farmer made quernstones in the South, suggesting at least a modest input of foreign designs into the rebooted indigenous quernstone production. The earliest foreign querns were widely distributed between counties and likely served as models for many farming craftsmen with varied skills and experiences who could also all put their own distinct marks on the quernstone assemblage.

Perhaps some sheriffs may have participated in initial quernstone production experiments but no clear indication of this was found. The production began and mixed with foreign quernstones mainly at the parish/district level in all counties but once there, the nature of distribution will have morphed into familial/neighbourhood patterns and spread out into the community as a few priests and many district officers and their farming families and followers took on local production, at least in terms of those that received production rewards. In time other more random additional production farms lead by farming craftsmen will have joined the fold as well but always such nodes would have appeared close to and been moulded through time by the viability of any available raw material procurement sites. Due to variations in geological availability and geographical accessibility to useful rock materials, regional microclimates of production were formed. Raw materials were more accessible in the more volcanically active post-glacial regions in the Northeast, along the Southeast and South coasts and into the West but rarely in enough quantities to justify or sustain mass production to any large degree. In the geologically older regions in the East, Northwest and Westfiords viable materials were harder to come by and more scattered, although still available in various places in small amounts. This would have made it necessary and/or more cost effective for some farmers to acquire foreign quernstones at the trading posts and indeed to a degree, foreign quernstones seem more common in the regional assemblages of these areas. It is also possible that some more affluent farmers may have bought foreign quernstones simply for show, although it is unclear at what exact level of affluence farmers could or could not afford a foreign quernstone or how large a portion of foreign quernstones in the assemblage would represent such pretentious purchases. Final import numbers of quernstones through the period are unknown but the assemblage demonstrates a 75%/25% ratio of indigenous to foreign querns, so foreign querns will not have been needed too often and/or been available at the trading posts in any quantities. It must be noted however, that it is also possible that as economic conditions improved post-1820, cereal import increased beyond the norm and mill building increased, that it would have become easier for farmers to buy and/or come by foreign querns and that perhaps such querns were more commonly only a later addition to the overall assemblage.

It is also possible that rather than acquire a foreign quern many would have preferred the lighter and more easily maintained, naturally vesicular indigenous rock for handquerns, especially as less able-bodied men, women and children were commonly the ones to grind the grain. Raw materials and indigenous quernstones were likely rarely transported very far from their source so they would commonly reflect their regional geology through the ages. Fewer and more scattered material procurement sites with low material availability call for scattered quernstone masons with few querns to their name and less chance to practice, resulting in greater variation and perhaps roughness in quernstone appearance. Where material procurement sites had greater volumes of material, like e.g. in Geitland in the Southwest, any single mason could have had more quernstones to his name, possibly resulting in more chance to practice and in greater homogeneity and sophistication in quernstone appearance. Only in the vicinity of the village of Reykjavík in the Southwest will there have been any opportunity to make quernstone production a more regular profession. Very little, if anything, has been preserved in terms of archaeological evidence at the actual raw material sites, which in themselves are extremely difficult to find due to minimal and very short-term exploitation.

The Modern Icelandic quernstones are certainly utilitarian and often rather rough and ready. However, they also often show very different levels of skills, shapes and sizes, personal preferences and flair between farms, districts and counties. The local querns were in a majority of cases made of very serviceable fine-grained and vesicular volcanic rock, both before and after the revival. In terms of functional aspects, the post-1770 querns more commonly had low to completely horizontal grinding surfaces (<1 cm) and more variation in handle fittings. This was likely due to a combination of pre-existing indigenous knowledge and foreign import being used as inspiration, and the change in the main grain types (from malt to barley and rye) being ground. More concave/convex grinding surfaces still did not disappear entirely, which is not very surprising as at least in places some pre-existing traditions in quernstone masonry would likely have been carried forwards. There are also a few dubious pre-1770 examples that suggest that a completely horizontal grinding surface could be found in older contexts, but it was likely very rare. As pre-1770 production was isolated and very small scale, and imported querns were never decorated or formed in any way beyond a simple collar around the eye, few preconceived notions regarding decorations seem to have been imported or pre-existing in the country. Therefore there is a very clear, almost complete, change in decorative motifs and markings after the 1770s. Localised designs are certainly common, but the many preserved quernstones that were all decorated with an embossed Greek cross for example, also show that frequent human mobility and/or interconnectivity could potentially also spread a single inspirational idea far and wide. The durability of quernstones meant that yearly demand for new quernstones was likely always fairly low and they could occasionally be passed on down the line for at least one generation. To sum up, where materials were available Icelandic farmers and craftsmen made quernstones to grind their imported grain and/or line their household coffers a little bit, and where more foreign querns were needed/wanted they could be acquired. All these different factors have indeed influenced and moulded the visible regional patchwork patterns of the relatively new, used and reused quernstones, both foreign and Icelandic, that are present in the final quernstone assemblage now spread across the island. In essence the variations and nuances in flair and sophistication of the Icelandic quernstone appearance cannot be expressed by any typological system beyond the fairly simple one presented here, without it becoming an incomprehensible mess of instructions and branches of provisos and codicils.

9.3. Manageable Opportunities for Advancement Without Change

Through this all-encompassing analysis of the histories of cereal cultivation experiments and the quernstone revival in Iceland it has become clear that the more important cogwheels in the acceptance of unground grain and the quernstone production revival were: 1) the relative homogeneity of the farming community and its far-reaching communication networks, 2) government supported access to innovation and the driving effect of unground grain import, 3) widespread information distribution and availability of product models (both imported and indigenous) at multiple hubs, 4) sufficient general availability of cheap, indigenous raw materials for utilitarian home-production, 5) widespread self-sufficiency in general handicraft among the Icelandic population and the fact that quernstone production was an acceptable and modestly productive male task, 6) the manageable technological complexity of the innovation, and 7) the quickly obvious and generally accepted usefulness of the quernstone in daily life.

The late-18th century innovative measures took place within the same spatial and strongly and widely interconnected socioeconomic context without any considerable hinderances to information flow. The only things that were different were the innovations themselves; their composition and complexity and compatibility to that context, and the socioeconomic and political perspectives towards them (Table 9.1). The initial state funded plans for the initiation of indigenous cereal cultivations in the 1750s were sparked by the local governments' dissatisfaction with Icelandic economic conditions as they compared to the outside world. Their initial plans were perhaps somewhat over-ambitious, but fairly logical and awareness was spread far and wide. There was no reason to suggest that importing examples of foreign equipment for testing or soliciting the help and knowledge of farmers with experience in cereal cultivation, could not at least have provided some initial experiences and insights into how to proceed further and what obstacles lay in store. And indeed, they did, even if the outcomes were not the ones that were desired. There is little doubt that the families that moved from Denmark and Norway to Iceland in the early 1750s had no idea what they were getting themselves into, how

Table 9.1. The introduced innovations: the main positive and negative (in red) aspects of cereal cultivation, unground grain and quernstones.

	Cereal Cultivation	**Imported Unground Grain**	**Quernstones**
Previous Conditions	Imported meal, cereal consumption already 10% of the nation's daily nutrition, often damaged during transport, both to the island and farm. Little cultivation practiced, kitchen gardening rare.	Imported meal, cereal consumption already 10% of the nation's daily nutrition, often damaged during transport. Goods exchange and distribution traditions already in place. No real change in status quo.	Miniscule and very localized farm production for grinding malt for brewing and for grinding wild lyme grass.
Political Regulation	Never became necessary.	State regulated from the start, foreign merchants in charge of import.	No state regulation of production, never banned or hindered in any way, even after mills became more common.
Change Agents and Opinion Leaders	Government officials (governors and sheriffs), a few more affluent landowners and scholars experiment, families imported to teach, only 2-3 Icelanders educated, few other visible supporters among the general public in historical sources.	General support among government officials in charge of decision to import unground grain, general public opinion vague but at least some enthusiasm to try.	General support of government in charge, some enthusiasm among farming craftsmen and priests to experiment, spread around the island, little education needed but some experimentation.
Incentives/Forcing Agents	Free seeds and grain varieties imported for experimentation, modest rewards for experimenting.	Government initially lowers prices, unground grain generally cheaper than ground meal, +50% of import of unground grain forces some to acquire a quernstone.	Free imported quernstones for change agents and potential opinion leaders in each county (priests/district officers), modest rewards for production. Needed to grind grain for traditional use in gruel, bread and sausages.
Potential Producers	The average tenant farmer could have undertaken cereal production for personal consumption but mass production on a few select farms was unsuitable.	N.a.	Majority of the farming households could have tried their hand, many farming craftsmen (5-10% of the male population) took on the challenge.
Potential Adopters	Same.	The exact distribution, or ratio, of public consumption of cereals between the poor and the most affluent is unclear. The upper classes are thought to have claimed the majority, but all consumed a little. ~90% grain import saturation reached mid-19th century.	Initially perhaps around 40% of farms at least had potential use for a quern, after 1820 querns likely spread to 70-90% of farms but exact saturation level unclear.

Tools and Accessories	No tools available for large scale production. A few examples imported, reproduction required a lot of material and skill to make. Icelandic craftsmen could have made/repurposed existing tools for cultivation on a small scale for personal consumption.	Timber, horsehair and skin needed for chests and bags for transport and/or storage. Unlikely to be any more difficult to transport meal home on horseback vs unground grain.	Useful tools (hammers/chisels) available and many farming craftsmen capable of making some for themselves.
Natural Conditions and Raw Materials	Climate conditions very unfavourable for cultivation. Iron, good timber and leather needed for ploughs, scythes etc. all imported and expensive.	Climate conditions occasionally unfavourable for ship arrivals in terms of sea ice and choppy seas. Timber both available locally and imported, horsehair and skin bags produced on farm.	Serviceable rock for querns scattered to ubiquitous, varied between geographical areas, rarely sought beyond 40 km away from source/craftsman/buyer. Raw materials cheap, iron for handles/rynds reused or imported, wood for rynds/handles/boxes imported or local birch/willow.
Observation, Access and Application	Very localised experimentation and long-term commitment. Starting costs will have been high, planting tricky, high maintenance.	Spread from all trading posts, high visibility and testability fairly easy and pros/cons quickly observed.	Imported querns spread initially from all trading posts, good visibility, once fitted with handle and rynd testability quick and pros/cons easily observed. Difficult to transport.
Product Reliability and Demand	Very low. Long production time and moderate to low chance of success.	Fairly regular import but dependent on foreign merchants and good sailing conditions.	Import rare, dependent on foreign merchants and level of social affluence. For indigenous quernstones high. Low yearly demand but short production time, long lasting and easy to maintain.
Relative Advantages	To the average farmer a very good addition to diet and decrease in external household expenses. Would have freed space on merchant ships for other essential import goods.	Cheaper option than meal, longer storage. Many may have considered it as a better option compared to stale/moulded meal.	As a product a good addition to a household economy. Could be produced at any convenient time. Initially little time was needed at the quern to grind for household needs but as consumption increased time length would have become a problem.
Material Range	Narrow and inflexible as an innovation. Could be cultivated in varied quantities depending on household size.	Low total import quantities, often did not meet demand. Sold by volume, can be bought in varied quantities depending on affluence/ available capital in any given year.	Wide. From small, home-made quern laid out on skin, to a foreign millstone in a timber-built water/windmill.

much manual labour would be needed and expected of them to get a suitable parcel of land ready and maintained for cultivation to succeed in Iceland. The families were lodged with government officials and more affluent landowners and were supposed to experiment with growing cereals (e.g. barley, rye and oats) and vegetables. Þórhallsson (1771, p. xii-xiii) comments that from the start the families were set on using the same methods their forefathers had used, which turned out to be largely incompatible with Icelandic conditions. As outsiders of low social status, the families will have had little influence to inspire others around them from the start. Any unwillingness to discuss and/or exchange ideas and possible methods with the local farmers will have put the their back up, many of them not being that open minded either (Hrefna Róbertsdóttir and Jóhanna Þ. Guðmundsdóttir, 2018, pp. 608-609), and any chance of the foreigners making an impression will have evaporated completely in the wake of their failures, no matter the reason.

Local cereal cultivation as an innovation could have benefitted the entire population and increased public access to cereals as an additional source of nutrition considerably by sidestepping the bottleneck that was inherent in the regularly insufficient foreign import that was outside their control. However, local cultivation was in all essentials both incompatible and unhelpful to the Icelandic 18th century context and did not get past the experimental stage, despite promises of rewards and free import of samples for experimentation. It required a significant rearrangement of agricultural subsistence traditions and large amount of additional work at an inconvenient time, without much hope of success. When cultivation experiments were begun the quernstone had also not been introduced yet and farmers had little use for cultivated cereals if they could not grind them. Rye meal was the general staple, but rye turned out to be a poor fit in terms of local cultivation and environmental conditions. Barley and lyme grass became the main focus of very localised experiments but how best to process and consume them was at least by some considered problematic (*LFI*, 1853, pp. 670-671). Results, experiences and acceptance take time to develop and spread and it may well be that grain import post-1776 undermined any further efforts at cultivation experiments, causing them to be given up too quickly. However, it is also possible that if government officials and their central followers had settled their differences on the best way to proceed and tried again at the household level after the public had experienced the many advantages of the imported freshly ground grain, set themselves up with a quern and become familiar with kitchen gardening, they might have been more willing to consider growing cereals, at least in the more suitable areas like the South and Southwest. Icelandic farmers and farming craftsmen could perhaps have picked up production and aided in adapting simpler necessary tools for small scale cultivation, but it does not seem to have been put through much testing. Perhaps it would also have been better to direct introduction efforts and rewards towards the wives of opinion leaders, who were mainly in charge of food preparations. If a fair harvest of rye could have been enjoyed every year the innovation may well have slowly taken off, especially after its attributes became known and quernstones became more common. But in the end, why should the farmers spend time and energy on cereal cultivation when cereals were already being imported in the form of meal? If weather was bad enough to prevent ships importing cereals from reaching the island, chances are that local harvests were more than likely to fail as well, making the farmers no better off unless communal emergency stores were available. Which they were not. Many households were already accustomed to buying cereals and as a result could spend their time on something else productive. In the end, it was entirely sensible and prudent of Icelandic farmers to direct their attentions and energies to other projects more compatible and immediately useful to them and their family's welfare, and there were plenty of other better and easier options to choose from, including quernstone production.

From the start there was a general accord between top government officials and merchants regarding the import of unground grain and the introduction of quernstones and the innovation pair was strongly compatible with Icelandic socioeconomic norms. Nothing changed however, when the focus was switched from meal to unground grain, except its form. Meat and milk products and stock fish remained the main staple of the whole population and meal consumption did not increase, beyond perhaps moderately in volume during grinding. Limited access continued to be a problem as total import quantities of cereals and their traditional recipients remained largely the same. The ratio of unground grain to meal was initially quickly increased to ~50/50 in only ~5 years and in turn this change in form called for the use of a quernstone if the grain was to be consumed in the traditional way as meal. There is no way to know if there was any initial social threshold or take-off point somewhere between the observed 3-15% for grain acceptance as its potential position is completely obscured by the initial government directed increase and the huge jump in grain import after the 1783 eruption. However, the ratio seemingly never dropped below 50/50 again, except perhaps in years when no cereals were imported at all, e.g. during the Napoleonic Wars, so it seems farmers did not want to go back to imported meal, despite the added need to grind it on a regular basis. However, it still took over 60 years to reach peak grain import at 80-90/10-20 before it plateaued out for over ~30 years and then started dropping again in the 1870s. Therefore, the rate of acceptance of unground grain and its eventual success was slow moving, at least from a Modern point of view, despite the potential positive benefits that could have been felt when substituting cheaper grain ground as needed for stale imported meal. Total import numbers of cereals rocked up and down through the years, but it was not until trade routes opened up and shipping capabilities improved around the mid-19th century that total import quantities increased much beyond the traditional norm and became available to a larger portion of the population in greater quantities. And by then the grain/meal ratio was seemingly already on its way up to the 80/20 mark, despite any socioeconomic setbacks inherent in the Skaftáreldar eruption of 1783-1784 and the Napoleonic Wars.

The general nature of individual household orders of grain vs meal is unknown, as is the exact household saturation point for quernstone ownership accompanying the peak in grain import, but both the historical and the archaeological record confirm their long-term uptake and widespread ubiquity during and after the 30 years rule of grain import at the time of their abandonment, whether the querns be foreign or indigenous. No official records of local production numbers were ever compiled and import quantities after 1784 are unclear, but the final 75/25% ratio suggests that total import numbers were low and/or less interest or financial leeway for buying the more expensive foreign querns unless necessary, e.g. in areas were scattered local raw materials were in short supply. Foreign querns were at least not likely to be an important addition to a merchants' profit margins after the first 600 imported in the first 8 years. The government could import grain and querns to get the ball rolling but if the expensive foreign querns had not been bought in any quantities after the 200 free querns had been distributed and indigenous production had turned out to be unviable, the innovation pair would not have reached very many beyond the most affluent, and import of unground grain would perhaps have largely petered out again as it could not be ground. In such conditions where availability and price of import presented another potential bottleneck to innovation diffusion, without access to local raw materials to use in cheaper reproductions, the strong social networks, positive attitude, available talent for handicraft and innovation complexity or utility would be meaningless. But good local rock materials were indeed fairly widely available in many places and government encouragement and support in initiating local quernstone production was spread out over two decades. Governmental introduction efforts, information distribution and financial support were sufficient to drive and/or inspire many men, and to generate enough positive innovation reputation, in enough places and social situations around the island to get the general farming community more involved and invested in developing and continuing quernstone production on a permanent basis.

The most important cog in the innovation diffusion wheel, however, was the Icelandic farmers' self-sufficiency and their competence in varied handicrafts and materials, which made them highly adaptable general craftsmen. Icelandic farming craftsmen represent and important category of part-time specialists who were mainly (although not exclusively) successful and respectable farmers and opinion leaders who had acquired skills in certain crafts and serviced their farming neighbours from a farm of their own in an island community without towns or special craft/production centres. The part-time handicraft relationships between them and their customers were categorically different from full-time specialists, e.g. in urban contexts, who are normally seen to be central to models of innovation diffusion. The social status of the farming craftsmen was not determined by their craftwork but could to a certain degree certainly be enhanced by it. Seasoned farming craftsmen (10-15% of the adult male population) in central social positions as district officers and/or heads of more affluent farms were in a prime position to be gateways of talent, knowledge and approval when it came to technological innovations. They were able to experiment with and assume continued production of technological innovations that added to their repertoire and enhanced their social status. But in turn they could also ignore and even actively resist innovations that required specialisation beyond their capabilities, or reconfiguration of social or economic relations that were not in their favour. The assimilation of the quernstone with Icelandic social conditions and internal goods exchange traditions did not require any drastic changes to existing socioeconomic structures, however, any more than unground grain import did. Quernstone production constituted a change that augmented the traditional social structure and benefited participating social actors who were already in key positions of advantage within the patriarchy, i.e. males in general and farming craftsmen specifically. Those who added quernstone production to their repertoire were the ones who stood to gain the most from the entire production revival, but as it was only needed on occasion (at least after the first surge) it likely did not constitute too great an addition to their to do list. Which was a good thing, as a farming craftsman's time and geographical reach only stretched so far, and they all had many other responsibilities and irons in the fire. Where general availability of cheap, indigenous raw materials was sufficient, alongside the simplicity and flexible range and cost of the essential structural components, the innovation was quickly reproducible, manageable and a modestly profitable addition to general utilitarian home-production and goods exchange. And the wider the range in value and level of sophistication, the wider the range of potential exchange situations, for both masons (either as commodity or payment) as well as buyers.

9.4. Conclusions

Cereal cultivation failed because it was environmentally incompatible, too socially disruptive and initial innovation visibility was too localised. It was an expensive, long-term commitment without sufficient reliable socioeconomic return. It did not quickly and clearly improve on the status quo for both government officials introducing the innovation and the public receiving it. Although government officials and foreign merchants acted as an important gateway for initial and continued import of unground grain to the island, the innovation diffusion was only pulled into motion by the demands of consumers that were long used to cereals as a regular addition to their locally produced staples and experienced enough improvements and incentive to move permanently from imported meal to grain. Alongside them, farming craftsmen had capability and saw sufficient advantage in making quernstones as a regular and fairly risk-free extra income for their household. It was also a task manageable enough to perform in service of their local community, which some of them also presided over. As time passed the fixed interconnectivity of unground grain, and the quernstone as a reproducible and affordable commodity for a wide range of consumers of various affluence, kept up cyclic demand for one or the other as grain import continued to increase at the expense of meal.

From this exercise it can be suggested that for innovation diffusion to be successful, *ready access* to innovations and *opportunities for flexible* and *graduated localised innovation reproduction* within the receiving society are important contributing factors. However, success is mainly dependent on the premise that the innovations' *economic utility* and their *compatibility with traditional social relationships merge* successfully and preferably *enhance* one another clearly, quickly and as widely as possible. Most especially when it comes to the socioeconomic relationships between the key participating craftsmen, the innovations and their perspective patrons. It can also be suggested that the combination of government agents providing the Icelandic public with new information and widespread access to varied and potentially useful innovations, whilst simultaneously holding on to the old and traditional socioeconomic structure, played a significant part in successfully crank-starting socioeconomic progress in 18th century Iceland. It is often assumed that pre-industrial societies were rigid, and innovations viewed with suspicion. However, the human population is never either all innovative and open to innovations, or all backwards and unresponsive. It is indeed a fact that many children had their curiosities and aspirations repressed when they did not align with the means and expectations of their parents and their social class, but in some, curiosity, talent and drive followed some of them into adulthood and future potential opportunities for growth and change. A poor and uneducated population of subsistence farmers had neither preconditions, nor reasons to evaluate innovations through the eyes of economic progress for the good of the state. Working on the old foundations provided familiarity and a secure grounding for participants to work from. By giving the general public some leg-room and modest support to assess, experience and adapt the more useful and manageable innovations, on their own terms and in their own time, the people were given a personal taste of the positive gain that could be had from innovation in their daily life. It increased the nation's capital of technological knowledge and helped engender a more positive attitude towards innovations within the social fabric, which eased the way for future changes within society. While many of The New Enterprises' projects petered out fairly early on, they undoubtedly demonstrated to many the need and usefulness of education and apprenticeship as aid in future improvements, and provided an important glimpse of different ways of making a living and the potential improvements that could be had by accepting new methods and technologies into the community. It is certainly not the intention to imply that providing access to innovations parallel to government encouragement based on the old foundations is the only reason that Icelandic society was successfully turned towards the path of technological progress and change for the better, but it is without a doubt a large piece of the puzzle. Sufficient foreign financial support was not immediately available to invest in the country's infrastructure and there was no possibility or willingness to force people en masse to change their traditions. Therefore, acceptance, progress and the creation and/or accumulation of compatible technological and financial capital had to develop slowly from within.

Within the context of Icelandic historical archaeology this research presents an original look into the social positions and role of pre-industrial Icelandic craftsmen and their level of craft specialization, and hopefully fuels further interest for detailed future analyses of internal communication and trade networks (see also e.g. Gísli Pálsson, 2018 and his database www.jardabok.com for inspiration and information on archaeological network analysis in Iceland; and Sindbæk, 2010a; Sindbæk, 2010b for network analyses in Scandinavia) and the effects of extensive population mobility, of the nature of internal goods exchange and of sociological interpretations of Icelandic pre-industrial society and its material culture. There is certainly still room to look in more detail into Icelandic cereal consumption between social classes and the spread of at-home wind- and watermills in the mid-19th century, along with further comparison of Icelandic production with extraction methods of those in Scandinavia and on mainland Europe and more detailed geochemical mapping of quernstone raw materials. The quernstone catalogue will serve as a tool to help in future quernstone identifications and potential dating of Icelandic archaeological contexts. Innovation diffusion does not just happen in cities, but out in the countryside as well. This research gives insight into how pre-industrial farming communities came into contact with and evaluated innovations, what aspects can affect time-lags and flat out rejections of innovations in prehistory that are perceived as important by modern standards, and the potential effects that human adaptation and freedom for re-invention (imitation/knockoffs/replicas/skeuomorphs) can have on artefact typology during a single innovation diffusion episode. It is clear that such episodes and their results and effects will never have been exactly the same, even if they happened within the same community at similar times. Multiple key innovations, innovation pairs and/or composites, cannot be grouped together into larger cultural or material packages before each and every one of them has been considered individually (Barceló et al., 2014, p. 505) in context alongside their human adopters; their complexity, their presence, their mobility and their combined natural, socioeconomic and political circumstances at all spatial levels before the results can be combined together to form any coherent meaningful pictures of diffusion patterns and human acceptance of technologies on a wider scale.

Bibliography

Abbreviations

AÍ	Alþingisbækur Íslands I-XVII.
DI	Diplomatarium Islandicum – Íslensk fornbréf I-XV.
Hsk-A	The Akureyri Archives – Héraðsskjalasafnið á Akureyri.
IGD	Icelandic Geneological Database - Íslendingabók.
JÁM	Jarðabók Árna Magnússonar og Páls Vídalíns I-XIII.
JJ	Jarðatal á Íslandi: Með brauðlýsingum, fólkstölu í hreppum og prestaköllum, ágripi úr búnaðartöflum 1835-1845, og skýrslu um sölu þjóðjarða á landinu.
Lbs-Hbs	The National and University Library of Iceland, Reykjavík – Landsbóksafn Íslands – Háskólabókasafn.
LFI	Lovsamling for Island I-XXI.
NACD	The National Archives Census Database – Manntalsvefur Þjóðskjalasafns.
Pnr	Place name registers, The Árni Magnússon Institute for Icelandic Studies – Stofnun Árna Magnússonar í íslenskum fræðum.
RIL	Rit þess (konunglega) íslenzka lærdómlistafélags.
Sk.Æ.	Skagfirzkar æviskrár I-IV.
SHÍB	Sýslu- og sóknalýsingar Hins íslenzka bókmenntafélags 1839-1873.
ÞÍ	The National Archives of Iceland – Þjóðskjalasafn Íslands.
ÞÍ. Rtk.	Rentukammerskjölin, The National Archives of Iceland – Þjóðskjalasafn Íslands.
ÞÞ	The Icelandic Folklore Database - Þjóðháttasafn Þjóðminjasafns Íslands – The National Museum of Iceland.

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Rit þess (konunglega) íslenzka lærdómlistafélags [RIL] (1786b). XI. Konúngleg Verdlaun og Nádargiafir til framqvæmdar Biargrædisvegunum á Islandi, fyrir umstilli Rentukammersins, árit 1787. *VII,* 270-276.

Rit þess (konunglega) íslenzka lærdómlistafélags [RIL] (1783). XI. Konunglig Verdlaun og Nádargiafir til framfara Biargrædis vegunum á Islandi, fyrir tilhlutan Rentukammersins, árit 1784. *IV,* 307-312.

Rit þess (konunglega) íslenzka lærdómlistafélags [RIL] (1791). XI. Konunglig Verdlaun og Nádargiafir, til framqvæmdar Biargrædisvegunum á Islandi, fyrir umstilli Rentukammersins árit 1790. *XII,* 259-261.

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Rit þess (konunglega) íslenzka lærdómlistafélags [RIL] (1782a). XII. Konúnglig Verdlaun og Nádargiafir, til framqvæmdar Biargrædis vegunum á Islandi, fyri medalgaungu Rentukammersins. árit 1783. *III,* 281-288.

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