

Farmers' Choice of Seed Strategy - a case study of farmers' operational decision making

Angelica Lindkvist
Ida Ottosson



Master's thesis • 30 credits

Agricultural programme – Economics and Management

Degree project/SLU, Department of Economics, 1253 • ISSN 1401-4084

Uppsala, Sweden 2019

Farmers' Choice of Seed Strategy - a case study of farmers' operational decision making

Angelica Lindkvist
Ida Ottosson

Supervisor: Jerker Nilsson, Swedish University of Agricultural Sciences,
Department of Economics

Assistant supervisor: Chrysoula Morfi, Swedish University of Agricultural Sciences,
Department of Economics

Examiner: Richard Ferguson, Swedish University of Agricultural Sciences,
Department of Economics

Credits: 30 credits
Level: A2E
Course title: Master thesis in Business Administration
Course code: EX0906
Programme/Education: Agricultural programme –
Economics and Management 270,0 hec
Responsible department: Department of Economics
Faculty: Faculty of Natural Resources and Agricultural Sciences

Place of publication: Uppsala
Year of publication: 2019
Cover picture: Angelica Lindkvist
Name of Series: Degree project/SLU, Department of Economics
Part number: 1253
ISSN 1401-4084
Online publication: <http://stud.epsilon.slu.se>

Key words: decision making, operational decision making, farmers' decision making, social capital, social network, trust, farm-saved seed, certified seed

Abstract

Farmers make challenging and complex decisions almost every day. The focus of this study is farmers' choice of seed. They can choose to buy certified seed, use seed that they clean from the previous year's harvest or use a combination. The farmers' choice of seed is an operational decision, which may have both economic and environmental consequences. They need to consider many factors in their decision, analyse their current situation and future risks.

There is no earlier research about farmers' choice of seed, which means that the present study contributes to a new dimension of research. The farmers' choice is complex and includes many factors, such as choice of seed, what soil the farmers have, past harvest and the price for crops. In their choice, the farmers have to consider different types of risks. Their cognitive process affects how they make decisions.

This study aims to clarify farmers' decision-making regarding the choice between using purchased certified seed or seed from their own preceding year's harvest. The empirical basis consists of data about how 13 Swedish farmers assess this choice, their sources of information and social networks.

A qualitative method is suited for this study because the study requires deeper answers from the farmers that participated. To get viewpoints that are more varied the data was collected through semi-structured interviews. The theoretical framework is behavioral theories, i.e., decision-making process, social network, trust and collection of information.

The result shows that when farmers choose seed by cleaning the previous year's harvest, this main reason is that they find this cheaper. One farmer, however, chose only certified seed, because he considered certified seed to be a high-quality commodity. Other farmers had the opposite opinion, i.e., cleaned harvest from previous year is of higher quality. Some farmers experienced that they were limited as concerns their choice of seed.

The conclusion is that the farmers in this study do not consider the choice of seed to be particularly difficult, because it is an operational decision. They have a habit and experience enough to make these decisions. Furthermore, the farmers' social network affects the decision making. Not the least, the choice between certified seed and farm-saved seed is influenced by economic factors.

Sammanfattning

Lantbrukare fattar dagligen beslut som kan vara både utmanande och komplexa. Fokus i denna studie är lantbrukarnas val av utsäde. De kan välja mellan att köpa certifierat utsäde, rensa utsäde från föregående års skörd eller använda en kombination av båda metoderna. Lantbrukarnas val av utsäde har både ekonomiska och miljömässiga konsekvenser. De måste väga in många faktorer i beslutet, analysera sin nuvarande situation och framtida risker.

Studier av lantbrukares beteende vid val av utsäde har aldrig tidigare gjorts, vilket betyder att studien bidrar med en ny dimension till forskning. Studiens problem är att lantbrukarnas val är komplexa och inkluderar många faktorer i beslutsprocessen, till exempel val av sort, vilken jord de har, tidigare skörd och spannmålspriser. I valet måste lantbrukaren även beakta olika risker. Lantbrukarens kognitiva förmåga påverkar besluten.

Syftet med studien är att klargöra lantbrukares beslutsprocess vid val mellan att använda inköpt certifierat utsäde och utsäde från tidigare års skörd. Studien bygger på intervjuer med 13 lantbrukare. Fokus ligger på deras bedömningar och vad som påverkar dessa såsom sociala nätverk och informationskällor.

En kvalitativ metod är lämplig, eftersom studien kräver djupare svar från lantbrukarna. Empirin är insamlad genom semi-strukturerade intervjuer för att få flera synvinklar. Studiens teoretiska bas består av beteendevetenskapliga teorier om beslutsfattande, sociala nätverk, tillit och informationsinsamling.

Resultatet visar att när lantbrukarna väljer egen rensat utsäde, är det främst för att detta innebär lägre kostnader. Några lantbrukare upplevde att det fanns begränsningar vad gäller deras val av utsäde. En lantbrukare valde enbart certifierat utsäde, eftersom han ansåg att det var en kvalitetsråvara. Motsatsen uttrycktes av andra lantbrukare, som ansåg att det egna utsädet var en kvalitetsråvara.

Slutsatsen är att lantbrukarna inte upplever val av utsäde som särskilt svårt, eftersom det är ett operationellt beslut, och lantbrukarna har en vana och erfarenhet att fatta sådana beslut. Lantbrukarnas sociala nätverk påverkar deras beslutsprocesser. Valet mellan certifierat och egen rensat utsäde påverkas inte minst av ekonomiska faktorer.

Table of Contents

1	INTRODUCTION	1
1.1	Background	1
1.2	Research problem	2
1.3	Problem analysis	3
1.4	Aim and reasarch questions	4
1.5	Outline	4
2	SEED INDUSTRY	5
2.1	The seed industry market in Sweden	5
2.2	Certified seed	5
2.3	Value chain for the production of certified seed	6
2.4	Farm-saved seed.....	8
3	THEORETICAL FRAMEWORK	9
3.1	Decision-making process	9
3.2	Farmers' information collection theory	12
3.2.1	<i>Information collection</i>	<i>12</i>
3.2.2	<i>Social network.....</i>	<i>13</i>
3.3	Farmers' decision making	14
3.4	Theoretical conclusions.....	16
4	METHOD	19
4.1	Research approach	19
4.2	Literature review	20
4.3	Multiple case study	20
4.4	Empirical data.....	21
4.4.1	<i>Construction of the interview schedule</i>	<i>21</i>
4.4.2	<i>Data collection</i>	<i>21</i>
4.4.3	<i>Choice of respondent.....</i>	<i>22</i>
4.4.4	<i>Data analysis</i>	<i>23</i>
4.4.5	<i>Data presentation.....</i>	<i>23</i>
4.5	Quality assurance.....	24
4.5.1	<i>Trustworthiness.....</i>	<i>24</i>
4.5.2	<i>Authenticity</i>	<i>24</i>
4.6	Ethical consideration	25
5	RESULTS AND ANALYSIS	26
5.1	Description of respondents.....	26
5.2	Theoretical interpretations.....	29
5.2.1	<i>Theoretical interpretation 1 Pre-evaluation of alternatives</i>	<i>29</i>
5.2.2	<i>Theoretical interpretation 2 Operational decisions</i>	<i>31</i>
5.2.3	<i>Theoretical interpretation 3 Social network</i>	<i>34</i>
5.2.4	<i>Theoretical interpretation 4 Selectivity</i>	<i>35</i>
5.2.5	<i>Theoretical interpretation 5 Economic factors</i>	<i>38</i>
5.2.6	<i>Theoretical interpretation 6 Experience</i>	<i>41</i>
5.2.7	<i>Theoretical interpretation 7 Evaluation.....</i>	<i>42</i>
6	DISCUSSION.....	44
7	CONCLUSIONS	48
	REFERENCES	50
	APPENDIX	56

List of figures

Figure 1. Outline of the thesis. Own processing..... 4
Figure 2. Value chain for production of certified seed, modification of Morfi (2018) 7
Figure 3. Process of farm-saved seed. Based on own analysis 8
Figure 4. Model of decision-making process, own version of (Blackwell, Miniard and Engel 2006)..... 9
Figure 5. Model of farmers' behaviour, own version of Martin-Clouaire, (2017, p. 538, figure. 2)..... 14

List of tables

Table 1. An overview of the interview's respondents 26
Table 2. Seed strategy, distribution of certified seed versus farm-saved seed in year 2018..... 29
Table 3. Estimated seed cost 40
Table 4. Description of the length of experience 42

1 Introduction

This first chapter introduces the topic of this study. It begins by describing the background and continues with defining the problem and problem analysis. Furthermore, the aim of the research is defined and at the end of the chapter the outline of the study is presented.

1.1 Background

The seed is a prerequisite for crop production. Every year the farmers need to make a choice for which seed to use when sowing the fields. The choice of seed has an economic significance for the individual farmers and the market. In 2012 the Swedish seed market amounted to 250 million USD (Morfi 2018). Seed stands for five percent of the total cost of crop production and is an essential input for the farmers' production (SOU 2004:72). In Sweden, there are approximately 2,550,000 hectares of agricultural land and almost 950,000 hectares are cultivated with cereals (Swedish Board of Agriculture 2019a).

Farmers' can choose either to buy certified seed, use seed from last year's harvest or a combination of both. If the farmers choose to buy seed, it has to be certified through the Swedish Board of Agriculture or Frökontrollen Mellansverige AB (Swedish Board of Agriculture 2019c). These are the only organizations in Sweden that have the right to certify seed born plants. This means that there is an official control of the quality, health, purity, and variety of authenticity. After the certification, the seed is classified in different categories. The seed receives the classification depending on how well it measures up to the requirements set by the organizations (Swedish Board of Agriculture 2019c). Farmers can purchase seed from various retailers who offer different varieties of seed with various attributes (Lantmännen, 2019b; Gullviks 2019; Swedish Agro 2019). Therefore, farmers' choice of retailer might affect the range of seed varieties.

An alternative to using certified seed is to use seed from last year's harvest, so-called farm-saved seed. The farmers are allowed to use farm-saved seed with the exceptions of certain seed varieties such as hybrid varieties (Swedish Board of Agriculture 2019d). Approximately one-quarter of the seed used in Sweden in 2015 was farm-saved seed (Morfi 2018). When farmers choose to use farm-saved seed the Swedish Board of Agriculture recommends the farmers to take a sample for analysis of the seed in order to measure the quality and to reduce the risk of spreading pest and diseases (Swedish Board of Agriculture 2019d). The information gained from the tests are often necessary in the decision-making process in seed strategy.

The farmers' choice of seed and how they calculate the risks with using farm-saved seed from their own harvest or buy certified seed from a retailer can be seen as a strategy. This strategy could change from one year to another depending on the current situation. In the decision-making process, the farmer needs to do a risk and consequence analysis and taking into consideration all the available information. Information is an essential part of the decision-making process to consider the options (Blackwell, Miniard and Engel 2006). The information can be retrieved from either the memory in terms of knowledge and experience or collected from different sources such as market, peers and family.

The farmer needs information for all sorts of decisions that are made (Martin-Clouaire 2017). One sort of decision is operational decision making. The operational decision also requires that information in terms of knowledge is internal and quiet in the farmer's mind. Operational

decisions are decisions made by the farm manager, which is connected to action according to the farm's daily task. In addition, this is influenced by the agriculture output in terms of type, quality and quantity. The farmer's decision on the farm can have both environmental and economic consequences. Therefore, decision making is a highly complex process which entails a lot of details and planning for the future. The process must include analyzing the current situation and at the same time calculating the future risks.

1.2 Research problem

A big part of managing a farm is decision making, which in many cases can be very complex and challenging. The farmer needs to evaluate every situation with the risk and possible outcome of every decision and then choose which risks are worth taking and at what cost. The use of lesser quality seed could result in lower quality and volume of grains and in the worst case in the spread of diseases all of which can result in an income loss. Even if the loss of income one year might be marginal for the individual farmer the prospect of a more extended period with lower income and tighter margins could be substantial. This can also be seen on an aggregated level.

For the individual farmer, the choice of seed is complex and the farmer needs to take into consideration different factors, for example, variety choice, the type of soil on their land, earlier harvest results, type of varieties that can be sold on the local market and the storage capacity. All these factors have an impact on the farmer's decision. The decision-making process can be viewed as a time-consuming cognitive process considering that it depends upon knowledge, experience, intuition as well as a network which might take a long time to create (Martin-Clouaire 2017). The farmer often needs to create a network of social relationships such as family, neighbors, tradesmen, other farmers and coworkers to use as a knowledge base. These networks all may affect the farmer's decisions in all aspects of farming.

Previous studies by Martin-Clouaire (2017) and Öhlmér, Olson and Brehmer (1998, 2001) have researched farmers' decision-making process with different angles and points of departure. Martin-Clouaire (2017) research focuses on farmers' operational decision-making processes on a farm level. The study develops a conceptual modeling framework which structure is based on the decision-making behavior of the farmers. The author described this as a set of cognitive processes: perception, interpretation, goal reasoning, planning and judgment. Martin-Clouaire (2017) highlights that more research is needed in the field of farmers' decision-making behavior. Öhlmér, Olson and Brehmer (1998, 2001) research have developed a conceptual model that focuses on the farmers' intuitive decision-making process. The authors emphasize that more research is essential to get a wider understanding of the farmers' intuitive decision-making process.

Furthermore, this study derives from that more research in the field of farmers' decision making is needed. Decision making has not been studied in the context of seed strategy. The decision-making process is a cognitive process which needs to be studied more in order to better understand how the farmers think (Martin-Clouaire 2017). The farmers' cognitive process varies based on their individual knowledge, experience and environment (Martin-Clouaire 2017). Moreover, the process is affected by internal and external factors such as past experience and social factors (Blackwell, Miniard and Engel 2006). When looking at the way the farmers act it could come across as irrational to the outsider but might be perfectly rational to the farmers considering their preconditions and knowledge base (Björklund and Nilsson

2014; Deffuant, Huet and Amblard 2005; McCown 2005). *The focus of this study is therefore on the farmers' operational decision making in the context of seed choice (farm-saved seed or certified seed) as well as any potential economic consequences depending on the farmers' choice of seed.*

1.3 Problem analysis

Individual versus organizational decision-making behavior. Farmers as small business owners make decisions as individuals or in consultation with a co-partner. Organizational decision making refers to a decision that is made by several people, most typically a board of directors. This distinguishes farmers, in particular, small business owners, from large corporations. In the case of limited liability companies, the board can consist of only a few people who are often family members or business partners. Hence, the operational decisions are made either individually or in close collaboration with the other board members. When a farmer reaches a decision individually, consumer and human behavior is relevant to understand the purchase behavior when other theories for the farmers' behavior are limited. Small business owners' decision-making behavior is similar to the one of the consumers' (Björklund and Nilsson 2014).

Operational, tactic versus strategic decisions. A decision is considered operational when the effects of it last from one to a maximum of three years. The seed that is used during the season is affecting the farmers' quantity and quality of harvest during the current year and therefore the time period for the impact of the decisions is short. The choice of seed is an operational decision, which matches what Martin-Clouaire (2017) writes about operational decisions. Conceptually, this implies that a decision made by the farmer can be considered as an action. The decision of seed choice is not considered to be strategic according to the authors' (Roberts, Thomas and Bergez 2016 p. 64) definition of strategic decision: "*Strategic decisions aim to build a long-term plan to achieve farmer production goals depending on available resources and farm structure*".

Outcomes of the decision-making process. In the operational decision, farmers have a degree of freedom in their decision-making process since they are small business owners. This means that they can choose relatively freely if they want to use farm-saved seed or certified seed in the production. Though factors such as requirements set by the retailers and the availability of certain varieties limit the farmers' freedom in the choice of seed. A farmer with more experience and knowledge will be able to make a more informed crop decision. If the farmer has a high degree of freedom but is unsure of certain decisions a good relation to people with the knowledge and experience is essential to give a sense of security.

The social context of decision making. Relationships and social networks can benefit each farmer's business operations. The farmer's company can benefit from the different networks that have been build up. Good contacts can, for example, help the farmer to negotiate and get better prices that could in turn make the decision making easier. Through social relationships, the farmer might also get access to information which could facilitate the decision alternatives. Farmers may also be able to make new contacts through their existing social networks which can ease decisions or extend their information base. New information may change the farmers' perspectives and preferences. According to Martin-Clouaire (2017), the farmers' decisions are primarily based on their motives, beliefs, preferences and perceptions.

The theoretical basis chosen for this study is behavior theory. The alternative theoretical framework would be neo-economic theories like transaction cost theory incomplete contract theory and agency theory. However, as all these theories include decision-making processes by the farmers' the chosen behavior theory is considered appropriate. Furthermore, the empirical limitation considered in this study is that the farmers grow cereals on 100 to 1000 hectares land. This study focuses on the farmers' decision making regarding the major grain types in Sweden, i.e. wheat, barley, rye and oats.

1.4 Aim and reasarch questions

By the previous reasoning, the aim of the study is determined.

This study aims to clarify farmers' decision-making process regarding the choice of using purchased certified seed or seed from their own preceding year's harvest.

In order to achieve the aim, the following research questions will be answered:

- *How do social networks affect the decision?*
- *How are the operational decisions related to the farmers' strategies?*
- *How does farmers' experience the choice of seed?*

1.5 Outline

This section describes the outline of the study, which is shown in figure 1. The first chapter of the study is an introduction to the topic, including background, problem analysis, and the aim of the study and research questions. Thereafter follows chapter two, which describes crop production based on the seed with perspectives from both the market and the individual farm. The theoretical framework is present in the third chapter, which includes the section decision-making process, farmers' information collection and farmers' decision making. The chapter ends with the theoretical conclusions. The fourth chapter contains the method used in the study, which includes a presentation of the research approach, literature review, multiple case study, empirical data, quality assurance and ethical consideration. Furthermore, the next chapter presents the empirical data, analysis and discusses the theories based on the empirical data. The chapter begins with a description of the respondents and followed by theoretical interpretation structured form theoretical conclusions. The sixth chapter presents the discussion. The last chapter of the thesis presents the conclusions of the study and suggest future research.



Figure 1. Outline of the thesis. Own processing

2 Seed industry

This chapter describes the seed industry. The first section is an overview of the seed industry market in Sweden, which is presented for a deeper understanding of the seed industry and the general market. This is followed by a description of certified seed, thereafter a map of the value chain of the production of certified seed. Furthermore, a description of farmed-saved seed is presented. The intention with this chapter is to facilitate an understanding of the results and analysis, discussion and conclusions.

2.1 The seed industry market in Sweden

The Swedish import of field crops has been fluctuating because of seed values and quantities (Morfi 2018). Seeing that the exported seed was almost double as much as the imported seed and 2012 the exported seed exceeded the value of 9 million USD. However, the Swedish export quantities have increased because of the value decrease of the field crop.

Laws and regulations define how the certified seed in Sweden can be exported and imported as a product (SFS 1976:298). Certified seed may be sold throughout the EU countries (Swedish Board of Agriculture 2019c). Swedish farmers may also purchase seed from other EU countries if the seed first is checked for wild oat (Swedish Board of Agriculture 2019c; SOU 2004:72). Considering the Swedish Seed law, the seed must be either certified or quality controlled for the seed to be sold in Sweden (SFS 1976:298). Furthermore, for instance, the law regulates the certification of seed and sale. Requirements for certification and the certification itself are issued by the Swedish Board of Agriculture. In order to sell a regulated species of agricultural plants and vegetable species it must be approved by The Swedish Board of Agriculture as well as follow the EU directives (Morfi 2018). For Swedish farmers to be allowed to sell cereals, the seed must be approved by the Swedish list or the EU list of varieties (Swedish Board of Agriculture 2019e).

The grain growers are essential for the Swedish seed industry. Farms that are efficient and have a good economic outcome with quality are important for the households and the economy of society (SOU 2004:72). Many factors are important to achieve the best result in crop production and one of them is to use high quality seed. Approximately 24,000 farmers were grain growers in 2017 (Swedish Board of Agriculture 2019b). Agricultural statistics from SCB show that wheat is grown in 47 percent of the cereal acreage in Sweden, followed by barley with 31 percent and oats with 15 percent.

In Sweden, the most prominent crop in 2017 was cereals in terms of production output (Morfi 2018). The total quantity on the Swedish market of certified seed for cereals in 2016/2017 was 152,470 ton (SCB 2018). The total use of cereal in Sweden includes seed for peas and field bean amounts to 230 000-240 000 ton (SOU 2004:72). However, in 2001 the seed markets amounted to 6% of the total agricultural costs.

2.2 Certified seed

Farmers who buy certified seed have certain guarantees. According to the Swedish Board of Agriculture (2019c), the definition of certified seed is *“That seed is certified means that an official control has been made of quality, health, variety authenticity and variety purity”*. The production of certified seed has special requirements, the seed should have high germination

rate, and the minimum for oats, barley, rye and wheat needs to be at least 85% and for triticale 80% (Swedish Board of Agriculture 2019h). The certification helps the farmer to guarantee the right kind of seed. The certified seed is typically treated against seed-borne diseases or is sufficiently healthy in order to be classified as certified. The seed should promise purity to a certain level, which means that the certified seed should not contain too much of other varieties. This also applies to weeds, for example, zero tolerance against wild oat.

The farmer is guaranteed that the product is certified by the obligatory labeling, which must include the variety name, species, and seed classification (Swedish Board of Agriculture 2019c). There must also be a certification number for the particular batch so that it can be traced, which the farmer then can control through the Swedish Board of Agriculture. The certified seed are divided into different seed classes such as class A, B, C, C1, C2 (Weidow 1998). The higher the class of certification is, gives a higher requirement of the certified seed (Swedish Board of Agriculture 2019c). For example, wheat in class A may only contain two seed of other cereal per kilogram per seed and class C2 is a utility seed that is allowed to contain 14 seed of other cereal per kilogram per seed.

The health of the harvest is crucial for farmers who grow cereals for seed use, so that harvest can be classified as certified seed (Swedish Board of Agriculture 2019f). It is important to use cultivation techniques to reduce the risk of diseases. Other factors that have an impact on the quality is for instance crop rotation, conditions such as drainage, soil and soil structure, distance from fields with the same crop, tillage, the timing for sowing, emergence, fertilization and harvesting time. It is important that all parts of the system are managed in an optimal way.

Each field that is grown to be used as certified seed is subject to field inspecting (www, Swedish Board of Agriculture 2019c). The control of growing crops is followed throughout the growing season to get a good variety. Thereafter a sample is taken of the seed that is representative of the whole harvest batch to be analyzed in a laboratory.

Certified seed can be divided into two categories of seed, hybrid and line varieties. The hybrid seed has been crossed with itself and cannot be used in the next generation as farm-saved seed (SOU 2004:72). These varieties are characterized by attributes such as higher yield. Hybrid varieties cannot be used for farm-saved seed due to lower yield than their hybrid parents and are not permitted in most countries either (Gary et al. 2017). This forces farmers that purchase hybrid seed varieties to buy new seed every year.

2.3 Value chain for the production of certified seed

Morfi (2018) describes the seed supply chain as the process in which the actors are required before a farmer can purchase the seed as an input in the production. This long value chain can be divided into two industries, namely plant breeding and seed production. Further, in this section, a summary of the major parts of plant production is described and also some of the actors in the value chain. The value chain for the production of certified seed presented is shown in figure 2.

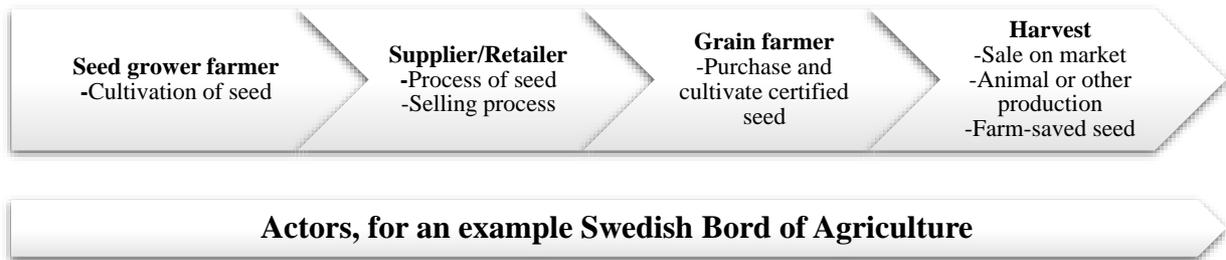


Figure 2. Value chain for production of certified seed, modification of Morfi (2018)

In the beginning of the production chain for certified seed are farmers who grow seed with the intention to create certified seed. The farmers need to be careful during the seed cultivation with for example the crop rotation (Swedish Board of Agriculture 2019d; SOU:2004). Field inspection is a requirement in the process of certifying the seed. The seed grower uses seed in class B, which is a basic seed with the aim of becoming a certified seed in class C (SOU:2004). The class B seed is produced by the class F seed, which is used to maintain the variety.

When the crop is ripe the farmer harvests the field and transports the harvest to the farm for drying and storing (SOU:2004). The seed supplier obtains the harvest to the processing facility and a sample is taken for a pre-analysis, in order to provide an indication of the quality of the batch and to determine which treatments are needed. The next step is to process the seed and that often includes events such as internal transports, cleaning the seed, taking sample collections for official laboratory analysis, treatment of seed-borne diseases if needed, packing in bulk bag, sealing and labeling. The official laboratory analysis and sampling are carried out on each batch of seed according to the Swedish Board of Agriculture directive.

If the results of the analysis are satisfying, and the certification is completed the seed can be sold to farmers. The sale and distribution of seed usually occur during the winter and is delivered by the retailer to the farmer (SOU:2004). If the retailer obtains seed after the season it can be stored and sold later. On each batch, the certificate has a best-before date and after that date the product can be sold but a new analysis and certificate are required.

The farmer purchases the certified seed from the supplier to cultivate the crop. After harvesting, farmers can have several options depending on the crop and the farmers' plan and requirement. One option is to use the crop in animal production or in other productions such as energy (Swedish Board of Agriculture 2019i). The farmer can also choose to save the harvest in order to use it as farm-saved seed (Morfi 2018). Another option is to sell the harvest to the supplier by contract or spot-price (Lantmännen 2019a).

Thus, farmers who choose to buy certified seed can start by looking at the larger organizations. On the Swedish market, there are five major organizations breeding crop varieties of seed-borne plants (Morfi 2018). The main suppliers are Lantmännen and Scandinavian Seed, with the latter being an umbrella organization for Forsbecks AB, Skånefrö AB, and Svenska Foder AB. Other relevant suppliers that the farmers could trade with are Gullviks and Swedish Agro (Gullviks 2019; Swedish Agro 2019).

2.4 Farm-saved seed

“An alternative choice for a farmer to obtain seed is by saving and replanting seed produced by seed that the farmer previously purchased” (Morfi 2018 p.27). Farm-saved seed is a good option for the farmers’ input in cereal production. Compared to certified seed the price of farm-saved seed can be approximately 1/3 of certified seed and concerning quality it can be relatively similar if the farm-saved seed is cleaned or treated (Morfi 2018).

The use of farm-saved seed is highly regulated by Intellectual Property Rights (IPRs) (Morfi 2018). An example of such rights is that the use of own seed has to be subject to a fee. The farmer is responsible for declaring the use of the farm-saved seed on the farm. The current fee in Sweden is set by LRF and the Swedish Seed Trade Association (SVUF) (Swedish Board of Agriculture 2019f; Morfi 2018). The farmer pays the fee only if the total farming area exceeds 23,7 hectares for cereals. The fees collected by the Swedish Seed Trade Association for the use of farm-saved seed are later distributed among breeders as compensations for their research and development activities (Jordbruksaktuellt 2018).

The process of farm-saved seed is shown in figure 3. After harvesting and drying, the farmers are advised to take a sample on the farm-saved seed for analyzing with the purpose to test the quality before using (Swedish Board of Agriculture 2019d). A requirement for a great cereal harvest is a high-quality seed (Eurofins 2019). By analyzing the grain, farmers can find out if it is suitable as a seed. Analyses typically include germination rate, health analysis and soot analysis. Germination gives the farmer an indication of the amount of seed that is recommended. Health analysis aims to test if the seed should be treated. Further analysis can be conducted such as the involvement of other species, water content and vitality tests.



Figure 3. Process of farm-saved seed. Based on own analysis

After the analysis, the farmer usually cleans the farm-saved seed, by a local or mobile seed cleaning firm that comes to the farm or in rare cases by the farmer’s own equipment. The purpose of cleaning the harvested seed is to get a higher quality of the seed (Swedish Board of Agriculture 2019g). However, this means a cost for both the service and through a reduced exchange of seed. By cleaning the grain, the seed gets a higher quality by reducing the seed sizes, weeding seed, straw residues, and chaff. The cleaning can also affect seed-borne diseases such as soot. Another advantage of cleaning is in cases of oats or barley where cleaning takes off the tips or brushes so that the seed goes easier through the seed drill.

During the cleaning, it can be a good option for the farmer to dressed the seed or in other words use a treatment on the seed. The outcome of the analysis determines whether the seed needs to be treated (Swedish Board of Agriculture 2019f). Seed can be treated to become free from seed-borne diseases. In comparison with a later treatment of the crop with plant protection products, this is a better method based on the effect that the treatment provides and a better alternative for the environment. If a treatment of the seed is needed it is based on the percentage of the cores that have the presence of a certain infection. Furthermore, seed can be treated with micro-nutrition (Hushållningssällskapet 2019). Micro-nutrition treated seed has been shown to have improved germination and emergence of plants.

3 Theoretical framework

The theoretical framework is used as a tool to analyze the interviews with the farmers. At the beginning of the chapter, the decision-making process is presented. The following section is theories about information collection, which is divided into farmers' information collection and their social network. The third section is focusing on the more specific decision-making process of the farmers and their specific thought process. The chapter is summarized into seven theoretical conclusions.

3.1 Decision-making process

This decision-making process model shown in figure 4, describes how individuals make decisions by defining and mapping the thought process (Blackwell, Miniard and Engel 2006). It shows the thoughts and activities that occur in the brain during the decision-making process when evaluating a purchase. The model is a generalized theory based on the individual's decision making and this decision-making process. As shown in the model both internal and external forces affect how individuals think, evaluate situations and act. Every time an individual makes a purchase with the purpose to solve a problem, satisfy a want or a need. The author's model includes different phases such as the users' need for recognition, information collection, the pre-purchase evaluation of alternatives, the process of purchase, consumption and post-consumption evaluation.

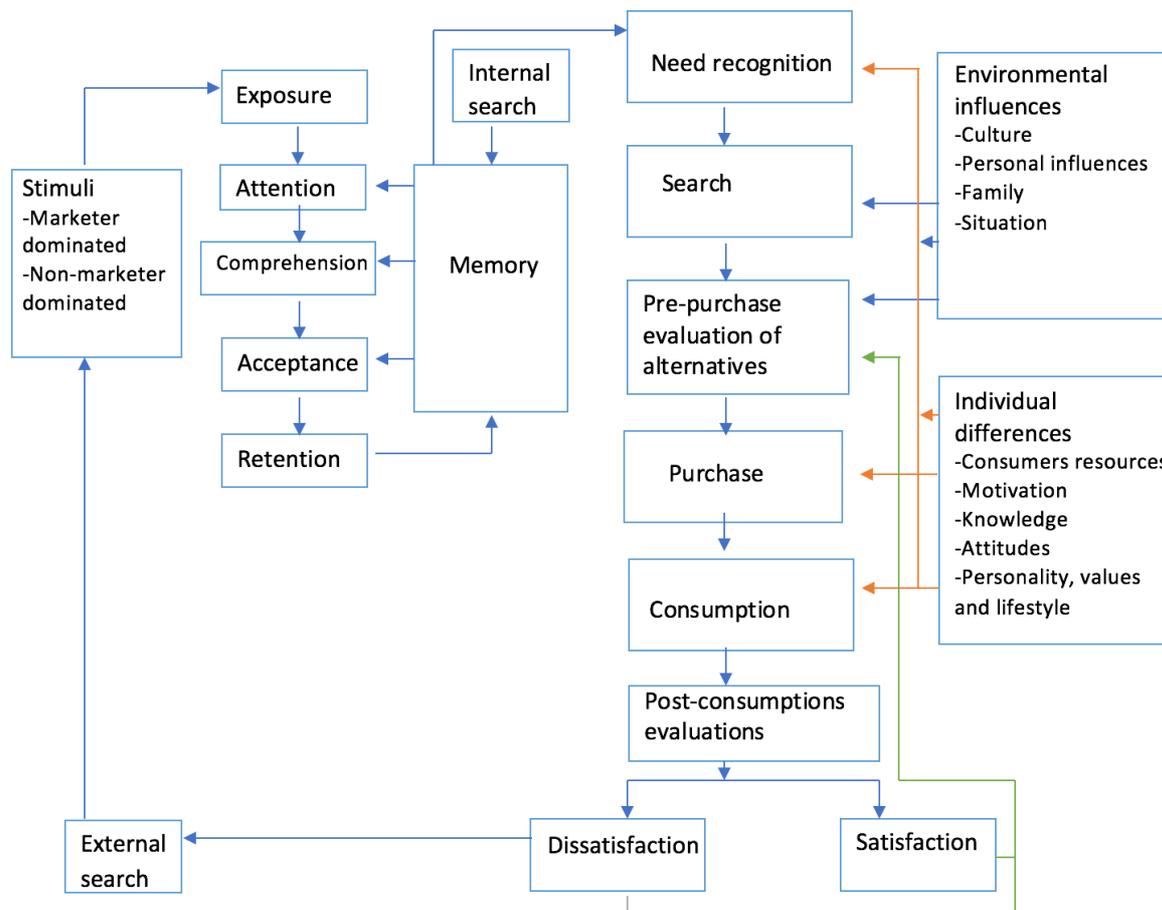


Figure 4. Model of decision-making process, own version of (Blackwell, Miniard and Engel 2006).

The purchase of goods or services is based on either a need, a want or a problem that needs to be solved (Blackwell, Miniard and Engel 2006). ***Need recognition*** appears when the perceived ideal differs from the actual state. People unknowingly make a cost benefit analysis before purchasing a product, this to see if the price of the product is lower than the cost of the problem it could be expected to solve. This means that the starting point when selling a product is to recognize the unmet needs of the buyer and then market a product accordingly, making a so-called problem recognition of an unmet need.

When the individual has recognized a need the ***search*** for information can start with the purpose to find a solution to satisfy the need (Blackwell, Miniard and Engel 2006). A person can find information through either their own prior knowledge or experiences which is called ***internal search*** or through ***external search*** which means collecting information from family, acquaintances or the market. How one searches for information differs as well as what kind of information a person is looking for. Sometimes the individual need general information to solve a specific problem and in other cases more specific information is needed when looking for a specific product. The search for information can be both active and passive. There are many factors that determine the extent of the search such as personal interests, income, size of the purchase, past experiences, prior perceptions of the brand and customer ***satisfaction***. If the person is satisfied with prior experiences with the brand of the product, the search behavior may be limited or absent. This also means that other options may have difficulty getting attention no matter their content.

The next phase in the decision-making process, after the search for information is the ***pre-purchase evaluation of alternatives*** (Blackwell, Miniard and Engel 2006). This is when the individual evaluates the possible options that the individual has identified. Questions raised at this stage are about which alternatives are best suited when the cost, quality and brands of the products are weighed together. During the comparison, the focus is set on what is considered to be the most important variable in order to finally narrow down the options before the purchase of a product occurs. In the buyer's ***memory*** both pre-existing and new information is evaluated are stored and used by the individual as part of this process.

The fourth stage in the decision-making process is the ***purchase*** (Blackwell, Miniard and Engel 2006). When the decision to make a purchase is made, the individual passes through two phases. In the first phase, the individual chooses a supplier. At this stage, the purchase might still be stopped or there might be a change of brand. Some reasons for not making a purchase or to choose another product, brand or seller can be that the price, the location of the distributor, the smoothness of the sales process, or something as hard to predict as traffic-flow problems. The next phase involves the specific choice, which is often influenced by a salesperson. Thus, the decision might be altered.

The next phase is the ***consumption*** of the product. This can occur either immediately or be postponed (Blackwell, Miniard and Engel 2006). If the purchase comprises a larger volume than what is needed for direct consumption it is often possible to store the product for later use. The way the individual uses the product might also determine how long it will last.

Post-consumption evaluation is the last step in the decision-making process (Blackwell, Miniard and Engel 2006). At this stage, the individual evaluates the experience of the products and determines if the buyer is satisfied or dissatisfied with the purchasing process or products. Dissatisfaction can occur when the outcome or the product did not match the set

expectations. The way the consumption of the product is perceived by the consumer can influence the consumer satisfaction and affect the likelihood of the individual returning to the same brand or recommending it to others. Emotions play a significant part in the evaluation of a product or a transaction, emotions can be described as “*a reaction to a cognitive appraisal of events or thoughts*” (Blackwell, Miniard and Engel 2006 p.84).

The decision-making process has a complex and dynamic nature (Blackwell, Miniard and Engel 2006). Even though there is a lot of options, people are usually rational and make systematic use of the information and therefore consider the implications of their actions. There are different variables that can influence decision making. These variables are divided into two groups, *individual differences* and *environmental influences*. Individual influences consist of *consumer resources, motivation, knowledge, attitudes and personality, values and lifestyle*. In every decision, the individual brings three primary resources to the decision-making situation which is time, money and information reception and processing capabilities. When an individual has a goal-directed behavior the motivation is activated. However, the way to reach this knowledge differs among individuals. Other things that can affect the decision making are personality, values and lifestyle. The decision is influenced by the attitude towards the product or services. The environment that the individuals live in can be complex. In addition, their decision-making process can be influenced by the environmental factors such as *culture, family, personal influences and situations*. The individual is affected by the culture such as values, ideas and artifacts. The family is usually a primary decision-making unit, which can be complex and the roles can vary depending on the situation. However, the individual's behavior can be affected by whom they are close to. They follow the norms and expectations that others are providing. The decision-making process is depending on the situation and whether it has changed.

In the degree of which the individual is involved in the decision-making process affects the outcome of the decision, the involvement can be described as “*the level of perceived personal importance and interest evoked by a stimulus within a specific situation*” (Blackwell, Miniard and Engel 2006 p.93). The individual acts to minimize the risk and maximize the profit from purchase and use of the product. The individual involvement can range from high to low which is determined by how important the individual perceives the product or service. This in turn affects the motivation for information search and the involvement in the decision making. The degree of involvement is related to two time-factors, the first variable is how much time the individual can devote to the problem solving and the second factor is how quick the decision needs to be made.

When an individual is making a purchase decision, they normally have a number of possible alternatives to choose among (Blackwell, Miniard and Engel 2006). Therefore, they do not consider alternatives that not are available for them. Only a subset of available alternatives is considered during the decision-making process. The authors describe this as *consideration sets* or also known as *evoked set*, which are “*those alternatives considered during decision making*”. Sometimes, individuals are very loyal to a brand and only consider these alternatives and then the consideration set is small.

Since most purchases are repeated over time the individual can either repeat the problem solving or make a habitual decision-making process (Blackwell, Miniard and Engel 2006). Repeated problem solving mostly occurs when the individual is *dissatisfied* with the previous purchase or when the earlier product is not available. In this situation, the individual needs to weigh the time and energy it takes to search for another option with the consequences of using

the same product. When an individual is satisfied with a prior purchase or product, they often turn to habitual decision making, which is to choose a product on routine or habit.

Individuals will often have a clear idea of what price they are willing to pay for a product and they will often not consider any products outside this price range (Blackwell, Miniard and Engel 2006). If a product does not meet a *decision rule criteria* the other strengths of the product cannot compensate for the lack of this attribute. The individual might also establish a hierarchy of what attribute is the most important. This will then be the feature which the others are compared to.

3.2 Farmers' information collection theory

3.2.1 Information collection

When it comes to the farmers' decision making regarding the seed use on their farms the farmers need to collect a lot of data to process before they make a decision. To make these decisions the farmers need to gather a large quantity of information and analyze their findings. One of the attributes that they need to analyze is the price of the seed that year and compare this to the vulnerabilities of each choice. The individual needs to process all information that is collected from the *external search* before making any conclusions (Blackwell, Miniard and Engel 2006).

In Blackwell, Miniard and Engel (2006) the individual decision-making process, is defined by different stages presented to explain how information is processed. When information reaches an individual the preliminary process of information collection starts. The next stage is to *evaluate* if the information is worth attending to or store. If the information is deemed relevant enough the individual will try to *comprehend* the information and decide whether to dismiss or accept it. If the message is *accepted* there is a good chance that existing beliefs will be modified or changed. Finally, the goal is for the individual to store the information in such a way that it can be usable and acceptable also in the future.

For the supplier to get their target group to receive the information about a product or a service they will use all means (Blackwell, Miniard and Engel 2006). Information sources can be divided into two categories. The first is called *market-dominated*, which is the retailers' way of informing and persuading. For example, this can be done through the channels as sellers, websites and advertising. The other information sources are *non-marketed dominated*, which plays a major role for the individual's critical perspective. This information is retrieved through channels such as friends, family, opinion leaders, and the media. The information can be spread by word to mouth, reports from the government or industry and mass media or internet.

Observation is an important tool in the information collection process in the agro-ecosystem, according to Martin-Clouaire (2017). It can be difficult for farmers to obtain up-to-date information on their surroundings such as landscape, fields, and livestock. The farmer must monitor their soil, the weather and other environmental aspects to gather information for their decision-making process. Even though farmers are often open to new inputs and information flows they can become uncertain when a lot of new information or uncertain information is gained at once (Huet et al. 2018). Mintzberg, Raisinghani, and Theoret (1976) shows that it can be costly for an individual to develop a new complex option or assumption in aspects such as time, cognition and effect.

Knowledge is information stored in the *memory* and part of the knowledge can be retrieved from the memory when an individual is attempting to solve a purchasing problem (Blackwell, Miniard and Engel 2006; Kool 1994). Another type of information that the farmer needs is environmental information. During the decision-making process, different kinds of information are combined with the aim to *evaluate alternatives* or *attributes* before the farmer buys the product. A lot of information used in the process is unspoken and a lot of the farmer's knowledge is never written down (Jacobsen 1994 see Aubry 1997). According to Martin-Clouaire (2017), one characteristic of the operational decision making is that knowledge is often tacit in the farmer's mind.

3.2.2 Social network

Humans form groups for different purposes. For example, one reason is that the individual will accomplish more as a group than alone. Family is the group that you cannot choose which affect us the most in the decision-making process (Blythe 1997). Others that influence the individuals besides the family is the reference group (Blackwell, Miniard and Engel 2006; Blythe 1997). This behavior has historically grown stronger since hunting and defending in a group gives them a better chance of survival (Blythe 1997). Therefore, the individual keeps working in teams for social aspects and practical points.

For a farmer, the social aspects are important when it comes to information collection (Deffuant, Huet and Amblard 2005). The individuals are connected to each other in a social network, were they make their decisions depending on the trade-offs among them. To get new information and knowledge farmers can change their source, to whom farmers talk to, for example, their advisor (Huet et al. 2018). The farmers can, therefore, get a more effective social environment for their purposes. The farmers' social opinion about a decision needs to be high enough for them to consider making an innovative change. This social opinion is a directly perceived value and it is determined by the surrounding and the social neighborhood where the decisions take place (Deffuant, Huet and Amblard 2005). This could be connected to the *environmental influences*, which also include close social relations (Blackwell, Miniard and Engel 2006).

Social capital is a complex concept and can be defined in different ways. One definition by Portes (1998) is that social capital is the use of social networking relations. Another is Putnam (2000 p.19) that define social capital as "*social networks and the norms of reciprocity and trustworthiness that arise from them*". Social capital cannot be consumed in the same way as economic capital (Halpern 2005). Thus, economic capital may run out while social capital always will exist if there is trust between the individuals. The important social networks need to be cared for in order to generate social capital (Kim and Aldrich 2005). The strong connections between the agent and network are defined as effective and repeated relationship exchanges (Nelson 1989).

For the farmers to have a strong connection among each other trust is needed. It has also long been recognized how important trust is when handling economic exchange (Hansen, Morrow and Batista 2002). A commonly used definition of trust is that "*trust is the extent to which one believes that others will not act to exploit one's vulnerabilities*" (Hansen, Morrow and Batista 2002 p.42). Like other forms of productive assets, trust has a value and it can be lost or loses value (Wilson 2000). These relationships of trust form over time and can vary during the relationship of the actors involved. Studies have analyzed the relationship between the

supplier and buyer, how it concludes that trust is an important tool for the relationship's development and maintenance (Smeltzer 1997). Kool (1994) expands on this view and describes how many farmers are loyal to one brand and vendor due to the relationship that they have formed with them. This relationship is usually being developed during a long-time period and does not include a contract agreement.

3.3 Farmers' decision making

Martin-Clouaire (2017) argues that farmers' mental process must be considered to be able to explain farmers' behavior. The author develops a model in order to explain farmers' operational decisions. These decisions are included in the daily routine of the farmer. An example of such, is the decision related to inputs required for crop production. This decision is made by the farmer himself or in close consultation with a small group of people who are regarded to have a certain level of *environmental influence*. These people can be family, advisers or neighbors (Martin-Clouaire 2017; Kool 1994). Martin-Clouaire (2017) presents a conceptual framework for farmers' operational decisions processes as the outcome of acquired knowledge and information. The cognitive processes that are included are interpretation, perception, planning, goal reasoning and judgment.

The cognitive decision-making process differs significantly between farmers (Martin-Clouaire 2017). Therefore, their behavior cannot be explained without understanding their mental process. A starting point is to analyze their functions and activities, which will lead them to their goal. According to Martin-Clouaire (2017) by studying the individual cognitive process regarding decision making a model of farmers' operational decision making can be generated. This model is shown in figure 5. Farmers cognitive capacity to cope with complex choices is limited (Kool 1994). Another limitation for the farmer is the time that can be disposed in the decision. The ability to process information can thus be considered subject to certain restrictions and limitations.

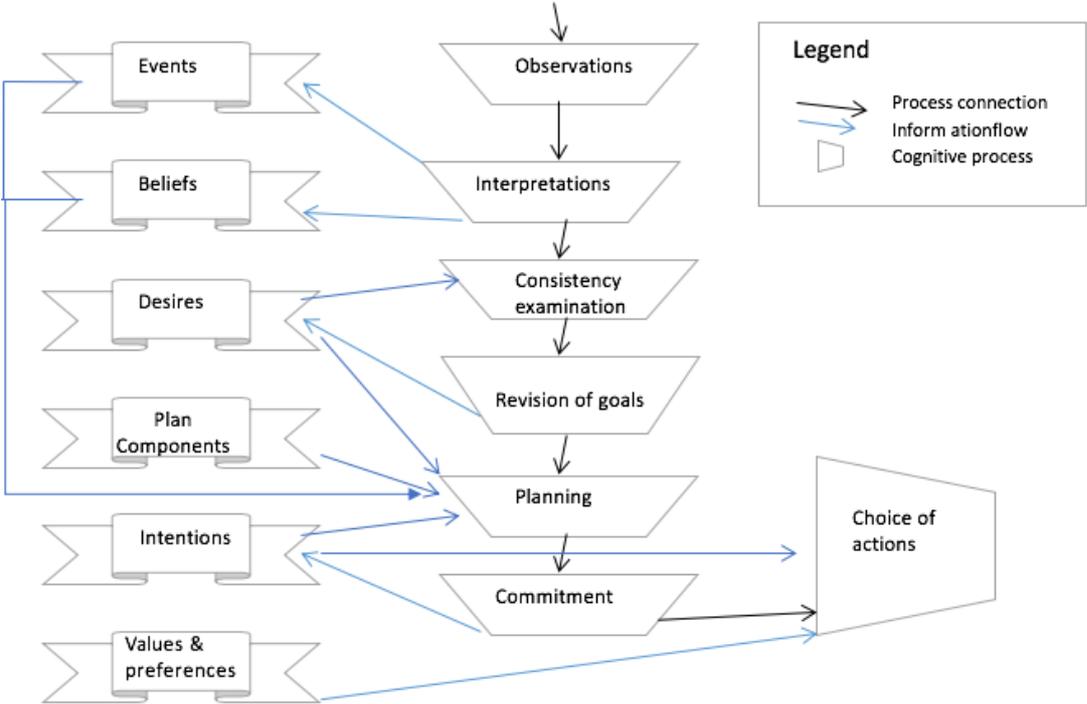


Figure 5. Model of farmers' behaviour, own version of Martin-Clouaire, (2017, p. 538, figure. 2).

The farmers' cognitive process includes seven steps namely observation, interpretation, consistency examination, revision of goals, planning, commitment and choice of action (Martin-Clouaire 2017). The first step is observation, which is reviewed in the section 3.2. Thereafter the farmer uses interpretation, which includes analyzing an abnormal situation and finding ways to explain it. The outcome of this step depends mostly on the farmers' mental state whereby *memories* about past events have major significance. The farmers' interpretation of a situation generates beliefs are the source of decision-making behavior.

Martin-Clouaire's (2017) model can be viewed as complementary to the model developed by Blackwell, Miniard and Engel (2006), since both models describe the decision-making process. The first step according Blackwell, Miniard and Engel (2006), referred to as *need of recognition* occurs mainly through observation and interpretation. The farmers *search* for information through observation but also through their *memory* which relies on the interpretation reflecting earlier events. In Blackwell, Miniard and Engel (2006) third step; *pre-evaluation of alternatives*, a comparison is made between the alternatives. The farmers make the comparison by planning and valuing the options and subsequently ranking them according to their preferences. Later, the *purchase* and *consumption* occur when the farmers choose their course of actions. The last step in Blackwell, Miniard and Engel model is *post-consumptions evaluations*. This step can be interpreted in Martin-Clouaire's model through the farmers' evaluation of decisions and the outcome by the farmers' desires, values and preferences.

Other scientists who have developed a model for farmers' decision making are Öhlmér, Olson and Brehmer (1998) by studying the traditional decision-making model as a process on different farms. The authors concluded that the models must be revised to suit the farmers' decision-making process. The revised conceptual model includes the following phases: problem detection, problem definition, analysis and choice and implementation or action. During each phase four sub processes are defined. The sub processes are namely; searching and paying attention, planning, evaluating and choosing, and bearing responsibility. The model is nonlinear for farmers' decision making, which means that the farmer will not always follow the model's structure and do all the steps. Furthermore, can all the steps be interpreted in Blackwell, Miniard and Engel (2006) model of the decision-making process: *need of recognition, information collection, pre-purchase evaluation, purchase and consumption*.

Based on this model Öhlmér, Olson and Brehmer (1998) assesses the way the farmers take decision in the phases of the revised conceptual model. The decision making by the manager is more or less based on intuition and analysis (Öhlmér 2001). The authors argue that the decision-making process is depending on a scale which reflects the conscious level of effort made by the farmers. This level of effort varies from lower levels of intuition to higher levels of "aided analysis" (Beach 1997 see Öhlmér 2001). An analytic decision making is more expensive because it requires more time and information (Öhlmér 2001). According to the author farmers tend to use the intuitive decision making which is faster and cheaper rather than the analytical. The farmers tend to have this behavior also in investment decisions, which is often based on farmers' gut feeling or intuition (Björklund and Nilsson 2014).

Farmers' intuitive decision making can be partly explained through the operational level were decisions become a routine for the farmer. Farmers' decisions regarding crops recurs annually as it is naturally expected (Aubry 1997). This decision appears in several stages of agricultural production in a given time of the year, for instance, when sowing, fertilizing and

weeding. This recurring decision making gives the farmers experience and a possibility to develop a routine (Jacobsen 1994 see Aubry 1997). Due to the recurrent decision, the appearance of a learning process is possible (Nitsch 1991 see Aubry 1997) as well as the development of routines (Cerf 1994 see Aubry 1997). Therefore, the farmers can plan the activities for their crop production.

In the agriculture production, farmers need to make many operational decisions, for instance, the choice of seed. In production theory, the farmers have three central choices (Kool 1994). The first one regards what the farmers *want to produce*. This means the development of a plan for which product or combination of products will be produced. The second choice the farmers are confronting is *how much to produce*, which requires a plan for the level of output. The third choice is *how to produce*, what combination of inputs the farmers need. The optimal solution is based on the production function and the prices for inputs and outputs. “*The outcome of this analysis specifies inputs needed to produce a certain amount of output in order to maximize profits*” (Varian 1984; Chambers 1988 see Kool 1994 p.15).

Farmer’s production outcome is affected by many operational decisions that the farmers make. Decision making for the farmers is becoming increasingly complex and is a key factor for performance in economic, environmental and organizational aspects (Daydé et al. 2014). Farms with similar conditions often have different performance outcome (Solano et al. 2006 see Dyadé et al. 2014). This has been shown to be due to the farmer’s skills in decision making, ability to deal with uncertainty, ability to weigh in many factors and lastly the ability to adapt to changes.

3.4 Theoretical conclusions

The theoretical framework of this study is concluded in this section. These are linked to the aim of this study and therefore focuses on farmers’ decision-making regarding the choice of seed strategy. The conclusions will be interpreted during the analysis of the data and are the structure for the discussion.

Theoretical conclusion 1 - Pre-evaluation of alternatives

In the beginning of the farmers’ decision-making process, a pre-evaluation of the alternatives is needed.

The basis of the decision making for the farmers is to have information and to evaluate which alternatives that are possible. Furthermore, the farmers have to compare these alternatives in order to make a choice. According to Blackwell, Miniard and Engel (2006) the individual makes this in the step *pre-evaluation*. While in Martin-Clourie's model (2017) the farmers do this step-in decision-making process by planning, which includes values and preferences. Öhlmér, Olson and Brehmer (1998), denotes this step as analysis and choice.

Theoretical conclusion 2 - Operational decisions

The farmers’ operational decisions are repeated and the decisions for purchases occur regularly.

The operational decision is a repeated process, which means that the farmers will learn by previous experiences and have knowledge stored in their *memory*. Therefore, the decision-making process can be shortened. Reoccurring decisions can be a habit or a routine when the individual is purchasing a product (Blackwell, Miniard and Engel 2006). This will lead to different *decision rule criteria’s* were the farmers’ value attributes to establish a hierarchy for

them. The repeated decisions have an impact on the farmers' *degree of involvement*. This can be connected to an operational decision within crop production where decisions are made every year (Aubry 1997). The concepts in the process that Martin-Clouaire (2017) describes are activated repeatedly throughout the production process.

Theoretical conclusion 3 - Social network

The social network influences the farmers' decisions.

Social capital is an important resource for farmers. In addition, trust is a building block for the relation and a valid information source. However, the trust from the social relationship has a value which may be lost or lose value (Wilson 2000). Therefore, it is important for the maintenance and development of social relationships (Smeltzer 1997). New information and knowledge can be obtained through social aspects (Huet et al. 2018). Therefore, the social capital is a way to use the social networking relations (Portes 1998). The social relationships are important when the decision to make a purchase is made (Blackwell, Miniard and Engel 2006). It is important to trust the supplier because one retailer must be chosen above another.

Theoretical conclusion 4 - Selectivity

The farmers' selectivity is both conscious and unconscious during the decision-making process.

When the farmers are making their decisions in different aspects, a selectivity process is made. This can be done through a conscious and active choice of the farmers but also passively when it happens unconsciously. Selectivity occurs in several different parts in the decision-making process, for example in the memory, exposure, evaluation, interpretation and through social relations. The farmers value the personal relation to the salesman before the retailer as a company. According to Kool (1994), loyalty builds on the relationships. The selectivity choice is thus personalized rather than branded tied. Another selectivity that is made consciously is when the individual decides if the information is relevant (Blackwell, Miniard and Engel 2006). Selectivity can be made through consideration set, which forms the framework for the alternatives that the decision is made within. Furthermore, Martin-Clouaire (2017) implies that farmers have different preferences and values which can affect the selectivity.

Theoretical conclusion 5 - Economic factors

Economic factors impact the farmers' decision making, such as input and output prices.

The purchase is affected by the price of the product. The individual monitors prices and other important attributes during the decision-making process (Blackwell, Miniard and Engel 2006). Production theory's three central questions are due to the farmers' production plan, which specify what input and the amount of input needed (Kool 1997). To optimize the production the price of inputs and outputs is essential. Already when the buyers decide that they have a need for a cost benefit analyzes to be made in order to find a suitable product (Blackwell, Miniard and Engel 2006). However, their actions to minimize the risk and maximize profit due to the economic factors, are of great importance when purchasing and using products.

Theoretical conclusion 6 - Experience

When farmers make decisions, they develop experiences for future decision making.

Operational decisions are recurrent and when farmers make them annually, repeated decisions give them an opportunity for a learning process (Aubry 1997). Therefore, these decisions become a learning process and a routine is developed. This can be connected to (Blackwell, Miniard and Engel 2006) repeated purchases over time.

Theoretical conclusion 7 - Evaluation

The farmers make an evaluation of their decision, which has an impact on future decision-making processes.

The farmers make an evaluation of the year and if they could have made any other decisions. The evaluation process determines if they are satisfied or dissatisfied with the experience of the purchasing process or the product (Blackwell, Miniard and Engel 2006). A similar evaluation is made by the farmers in the models of Martin-Clouaire (2017) and Öhlmér, Olson and Brehmer (1998). Martin-Clouaire (2017) interpreted evaluation in the steps, values, preferences and desires. However, in Öhlmér, Olson and Brehmer (1998) this can be interpreted in the sub processes, evaluating and choosing, and bearing responsibility.

4 Method

In this chapter, the chosen methodology is described. The chapter contains a discussion of suitable research method. Thereafter the literature review and multiple case study are presented. The section empirical data describes how the interview schedule is constructed, how data have been collected and how the respondents are selected. The section ends with an explanation of how data is analyzed and presented. Thereafter a discussion of the thesis quality assurances is presented. The chapter ends with ethical considerations.

4.1 Research approach

The qualitative research approach is appropriate to use when a deeper understanding of the individual perspective is required (Golafshani 2003). Therefore, to fulfill the aim, the authors consider, it appropriated. *The aim of this study is to clarify farmers' decision-making process regarding the choice of using purchased certified seed or seed from their own preceding year's harvest.* Furthermore, this involves studying individual farmers who have crop production.

There are mainly two different approached, which is a qualitative or a quantitative research strategy (Bryman and Bell 2015). However, there is also a mixed approach of both qualitative and quantitative research strategies. A quantitative approach implies that numerical values are collected were theories are tested. However, the qualitative approach has a focus on a deeper understanding of how individuals perceive and interpret the social reality. This applies to this study because of farmers' perceived behavior and their social context are central. This thesis focuses on deeper understanding instead of quantification of data collection. The paper intends to understand the farmers' decision-making process and their choices between certified and farm-saved seed. Therefore, the qualitative research design is deemed suitable. The qualitative method has some shortcomings that are important to be aware of when choosing the method. For instance, Bryman and Bell (2015) argue that qualitative studies have problems with generalization and that the empirical data with case study is not a sample that represents the population. Moreover, that research can be considered as too subjective, is difficult to replicate and there is lack of transparency.

Epistemology is defined by Bryman and Bell (2015) as what is considered appropriate knowledge in a social world. Epistemology has two head positions either positivism or interpretivism. The interpretivism position is considered the best starting point for this study. Interpretivism is better suited for research on the social world, which this study does by studying farmers' behavior. Social science differs from natural science, were the subject being studied is people and their institutions. Therefore, another research procedure is required to understand the subjective meaning of social actions.

Bryman and Bell (2015) describe the ontological position as to how the social world is regarded. There are two positions within ontology, objectivism, and constructionism. The ontological position of the study is constructionism (Bell, Bryman and Harley 2019). This means that social phenomena and their impact caused by social actors, which can constantly change (Bryman and Bell 2015). Related to this study is constructionism suitable due to the farmers' behavior and their perceived reality are studied in a deeper understanding.

In this research process, an inductive or a deductive approach may be used (Bryman and Bell 2015). An inductive approach is better suited for this study and usually used in a qualitative

study. The reason for this is that the focus is to generate a theory from the research. In addition, a grounded theory approach is often used for data analysis by inductive researchers (Bell, Bryman and Harley 2019).

4.2 Literature review

A literature review has been made to construct the theoretical framework and the description of the seed industry. The search of the literature is crucial for the study (Bryman and Bell 2015). It is important to be familiar with the literature in the field of the subject to gain confidence in the studies issues (Yin 2013). The purpose of the literature review is among others to discover what is already known, relevant theories and concepts. Also, what research methods have been applied in the field, who the key contributors to the research are and if there is an unanswered research question in the area (Bryman and Bell 2015). This process includes judgments of what to include or exclude. Reading the literature develops an understanding of the subject of this study.

In search of appropriate and relevant literature, the following databases have been used: *Google*, *Google Scholar*, *Web of Science and Primo*, which is the database of SLU library. Search words that have been used to find literature are for example: decision making, operational decision making, farmers' decision making, social capital, social network, trust, farm-saved seed and certified seed. Furthermore, SLU library has been a resource in the form of a wide range of appropriate books. The peer-reviewed resource has been used in terms of articles to ensure the study's trustworthiness. Furthermore, other sources have been reviewed by the authors through choice of source and comparison with other sources.

During the literature review, an unexplored area in the research about farmers decision-making process regarding seed use was discovered. The unexplored area is a neglected gap-spotting (Sandberg and Alvesson 2011). Furthermore, this is described by Sandberg and Alvesson (2011, p.30) as "*The most common version of neglect spotting was to search for aspects in existing literature that have been overlooked despite a wealth of studies*".

4.3 Multiple case study

As the research of Swedish farmers' decision-making process is a relatively unexplored area regarding seed use, a case study is a suitable tool to use. In this study, a deeper understanding of how that individual experiences and makes decisions is requested, which means that multiple case study is an advantageous research design. Therefore, case studies as a method is used to observe the complexity of particular cases, which then the authors aim to generate an intensive examination (Bryman and Bell 2015). The case refers to the situation, individual, group, organization or what the studies are interested in (Robson 2002). Furthermore, great importance is also attached to the context in which this is studied.

A case study is a choice of what is to be studied not a methodological choice (Stake 2005 see Gentles et al. 2015). Therefore, purposeful sampling is an important tool for a case study (Yin 2013). Yin (2011, p. 311, see Gentles et al. 2015) explains this as "*The selection of participants or sources of data to be used in a study, based on their anticipated richness and relevance of information in relation to the study's research questions*". The cases chosen in this study has relevance with their distinct context, which is in line with this thesis.

This thesis identifies and focuses on multiple farmers. However, as there is variation in the structure and age between the farmers the authors saw an opportunity to compare the different farmers and analyze them. The number of cases in a multiple case study depends on various factors that must be tested in each study (Gentles et al. 2015). However, if the study uses 15-30 cases it can be hard for the authors and readers to understand the uniqueness and interaction during the interview (Stake 2006 see Gentles et al. 2015). In this thesis, 13 cases are studied, which gives the authors an opportunity to observe the data and what theories can be connected to it. However, a single case would be easier to analyze in detail and go in depth on the data (Yin 2013). Such an approach would be difficult in this study because farmers use different strategies. By studying several case studies it was possible for the authors to have different perspectives on how farmers choose seeds.

4.4 Empirical data

4.4.1 Construction of the interview schedule

Interview schedule has been developed to structure the interviews, shown in Appendix 2. The interviews were organized through a combination of the main questions, follow-up questions and probes (Rubin and Rubin 2005). In order to find data for the study, the responsive interviewing model has been a framework. This provides depth and detail, vivid and nuanced data and the answers from the interview are rich with thematic material. The basis of the interview is the main questions and these questions ensure that the research question is examined. Furthermore, the following question is developing questions as comments on the respondent's previous conversation in order to explore concepts, themes and ideas. The interview contains probes to keep the discussion going or clarify what has been said.

The interview schedule was built on information from the theoretical framework and chapter the seed industry. The questions were developed with interaction to the aim and research questions. It was built on various blocks of questions developed from the theoretical conclusions. The first block was about the general farm, other topics in the blocks were certified seed, farm-saved seed, decision making, and social aspects. Each block had an open question at the end for supplements to be possible. To overcome the risk that the issues did not cover the subject and the complexity of the cognitive processes.

4.4.2 Data collection

Semi-structured interviews have been used to collect empirical data for this study. In semi-structured interviews, the interviewer has a formal interview schedule but are able to vary the sequence of the questions (Bryman and Bell 2015). The questions are more general compared to a typical structured interview schedule. The interviewer can ask further questions to get significant replies. The question can be changed or added based on the interviewer's perception of what is most appropriate (Robson 2002). In addition, questions can be omitted as they are considered inappropriate. During the interview, formulations of questions can be changed and explanations can be given. The authors want to create a deeper understanding with supplementary questions of the basis of the farmer's choice of seed. Therefore, the authors consider semi-structured interviews suitable for this study.

To this study, 13 interviews were conducted. The interviews took place between the 4th and the 16th of April 2019. The farmers had experience as an agriculture manager between 3 years and 47 years. The interviews took place in the farmers' home, whereby the farmers could feel comfortable. The atmosphere during the interviews was easy-going and pleasant.

They appreciated that the authors were interested in their business and the farmers' practical everyday life. All farmers who were asked to participate in this study agreed directly.

Before an interview, the farmers were asked if they were comfortable with the conversation being recorded in order to facilitate the handling of data. Twelve of the farmers agreed to be recorded. One farmer was not comfortable, which were compensated with more accurate notes and summary of the interview immediately after. Before the interviews the farmers were informed of the purpose and content of the study through an introduction to the interview, see Appendix 1.

During the data collection, the concept of data saturation has been used, in order to assess when enough interviews with farmers have been made. Data saturation describes by Gentles et al. (2015) as the point in the research where more data collection contributes with little or no new information. However, in the qualitative research smaller amounts of data can be used because the purpose of the data collection is to understand the complexity, depth, variation and context of the phenomenon. Qualitative research does not seek to represent the population as for the quantitative analysis. Sufficient sample size is achieved when the qualitative data is saturated, another interview would contribute with little or no new information at all. During the data collection, the authors considered data to be saturated after 13 interviews. Several of the interviews had responded similarly at this stage. The organic farmers were the data saturation achieved after an interview because organic farmers did not have as many varieties to choose between and the seed was purchased.

All interviews were done in Swedish since the data collection was made with Swedish farmers. Bryman and Bell (2015) emphasize that there are potential languages and translation problems when data is collected in a language other than English. In order to overcome this problem, it has been advantageous to be two authors in order to be able to interpret and critically examine what has been translated. Furthermore, the library at SLU service with the Center for Academic Language has been helpful for specific expressions and questions regarding this.

4.4.3 Choice of respondent

The farmers that were interviewed in this study have crop production as the main occupation and they are accustomed to making decisions regarding seed. The first selection of respondent has been made by contacting some farmers that the authors have met earlier in the education at the school of the Swedish University of Agriculture. More respondents were chosen after the first interview by a recommendation from other farmers that were interviewed in the first selection. This is called the snowball method, which is a form of convenience sample where the researchers make initial contact with a small relevant group and then uses these to establish new contacts (Bryman and Bell 2015). However, the problem with this method is that it is very unlikely to be representative of the population. The authors still had certain criteria's that they emanated even if they used the snowball method. They could have a side business but the cereals needed to be the largest part on the farm. After the suggestions of other farmers, the authors called the farmers and asked for an interview. An example of how this was done was when the authors had an interview booked in the morning. From this farmer, they received three recommendations. After the interview, the authors called the recommendations and asked to come directly for an interview. This farmer, in turn, gave a better recommendation. This resulted in four interviews being made the same day, even though only one was booked before the day began.

It turned out to be an effective method to call the farmers and asking them to come directly. The farmers were in the starting blocks for the spring tillage, but a setback in the weather which delayed the work and therefore the farmers had time for an interview. The authors believe that they would have had a hard time booking an appointment because it is difficult for farmers to book meetings during this intensive work period. Therefore, they had plenty of time for the interviews because the authors could come when it worked for them. Since the interviews were carried out just before the spring tillage, the questions were highly relevant and the things the authors asked about had recently been decided upon.

4.4.4 Data analysis

After the interview, data was compiled and analyzed. This was done by leaving the farmer and then stopping at a suitable place to talk through the interview and what impressions the authors received. Then the interviews were transcribed and the notes were copied in connection with this. Bryman and Bell (Heritage 1984:238 see 2015) highlight the benefits of recording and transcending the interviews. For instance, it helps the limitations that are in the memory and that we do not replace or distort what interview respondents said. Furthermore, it gives a more thorough and repeated examination of what is being told and it ensures that the researcher's values or bias influenced the study by other researchers being able to examine the data. Bryman and Bell (2015) also highlight that one disadvantage is that it is very time-consuming for the researcher, it can take five to six hours of one recorded speech hour. The material with notes and interview transcription is called data below. The notes enabled us to note how the farmer answered the questions and what was emphasized. For example, the authors could note if the farmer was convinced in the voice or if he pointed out something in particular.

Subsequently, the data was sorted. The data material from each interview went through and markings were made with seven overcoating colors to sort the material after the seven theoretical interpretations we had. During sorting, interesting observations of the data were noted. The structure and structure of the interview made it easier to sort the data. Difficulties in sorting data arose from the peasants answered several questions at once or on questions that came later in the interview. In these cases, questions were deleted to avoid repetition. Sometimes the farmers responded to something completely different and then the question needed to be re-worded and asked again.

Then, data were analyzed as to each theoretical interpretation by comparing results from each interviewee with each other. Furthermore, the results were compared with the theory in chapter three. After that, the material was further reviewed to ensure that nothing was missed. The analysis of the data begins already after the interviews are done (Rubin and Rubin 2005). For the authors to analyze the qualitative data it is important to use their creativity as a tool in contrast to a quantitative study where rules control more (Trost 2010). It is practical to follow three steps to analyze and interpret data. The first step is to collect the data through qualitative interviews. Secondly, the authors need to analyze the data that is collected, which is the transcribe notes and the recordings and other impressions. The third step is interpretation of the data. This is when interesting observations of the reality is interpreted with theoretical tools.

4.4.5 Data presentation

The collected data is structured after the theoretical conclusions, which are the basis for the data collection through the constituted structured interview guide. The seven theoretical conclusions are the basis for the seven theoretical interpretation, which is presented in chapter

five. Furthermore, chapter five consist of data presentation and analysis. In some of the sections, a table of data is presented to give an overview. The chapter starts with a description of each farmer in order to improve the understanding of each case and their context. The results are connected to the studies theories.

4.5 Quality assurance

To assure the quality of the study some criteria are established (Lincoln and Guba 1985; Guba and Lincoln 1994 see Bryman and Bell 2015). In qualitative study trustworthiness and authenticity are usually used to achieve good quality in research. These two terms are established in the study to evaluate the qualitative study. Furthermore, trustworthiness is made up of four criteria to achieve qualitative assurance: credibility, transferability, dependability and confirmability. For authenticity are following criteria suggested: fairness, ontological authenticity, educative authenticity, catalytical authenticity, and tactical authenticity.

4.5.1 Trustworthiness

The credibility of the study is going to determent how correctly understood the researcher's apprehension is in the social reality (Bryman and Bell 2015). Since it entails that the research is performed in good faith. Furthermore, it is important that the participants confirmed the results, which can be done by sending the empirical findings. In this study, credibility is ensured by using respondent validation. This means that the interviews will confirm the collected empirical data. It is particularly popular in qualitative research to ensure that the findings match the research participants' perspective and experiences.

Qualitative research is more in-depth and oriented to the contextual uniqueness (Bryman and Bell 2015). An empirical problem is that the results can, therefore, be difficult to transfer to another context, and even in the same context in another time. The authors in this study have chosen to use a thick description, which inclines to get a rich amount of details of culture and the respondents. The reason is that it is possible to determine whether the result can be used in another social context.

Dependability is important to establish trustworthiness in qualitative research (Bryman and Bell 2015). This means that complete records of all phases are kept throughout the process. This is ensured in this study since all phases are explained in this method chapter. Furthermore, it is impossible to show complete objectivity in qualitative research (Bryman and Bell 2015). However, the researchers can show that they have been acting in good faith and with an objective mind. This means that their personal values and theoretical implications have not consciously influenced the results and the study has established confirmability. This study will be using confirmability to ensure that personal values have not influenced the results and the analysis. To achieve this the study has been confirmed by examining the result to obtain reasonable results without the researchers' personal values.

4.5.2 Authenticity

The fairness of the research is depending on if the viewpoint of all members is fairly represented and if they provide correct information to the authors (Bryman and Bell 2015). In order to obtain fairness in this study, the authors use respondent validation, which should increase the reliability of the study. This study will fairly perceive the farmers by letting them go through the empiric before the study is published. This is to make sure that the researchers have made correct interpretation and to change possible misunderstandings. It is important for

this study to not help the participants to a better understanding of their social context, which is called ontological authenticity. The researchers in this study will not use educative authenticity, which means that they help the participants to get a better understanding of their surrounding and social setting. Additionally, they will not use catalytical authenticity to change the participant's circumstances with actions. Lastly, the authors will not take tactical measures to empower to participants so that they take other actions.

4.6 Ethical consideration

It is essential to include ethical conclusions in a qualitative study (Bryman and Bell 2015). When doing a study that is handling the participants own values and experience it is important to consider the ethical aspects. These aspects are volunteering, integrity, confidentiality and anonymity. To respect the farmers' integrity all farmers were asked if they were comfortable to be recorded, the authors explained what the recording would be used for and how it would be managed after the end of the study. Only one farmer indicated that he was not comfortable, which he did by expressing "*Is it necessary*". The authors answered that it was not a problem but he had to be patient by the extra time it would take to make notes, which was not a problem. The new layout worked well and the material was comparable to the other interviews which were transcribed. Furthermore, all farmers voluntarily participated in the study.

Throughout the study, the researcher's role is important for the ethical decisions that are made (Kvale and Brinkmann 2014). Therefore, the researcher's task is to archive as high scientific quality as possible. High scientific quality is obtained by publishing as correct results as possible and where they are controlled and validated (Bryman and Bell 2015). The authors in this study have tried not to affect the result from the participant during the interviews. The answers from the farmers need to be interpreted from the context. According to Creswell (2014) the authors' personal background can have an impact on the interpretation of the respondents. In this study, the authors have a background in agriculture business, which implies a higher understanding of the farmers' thoughts and context. Additionally, parables and synonyms can be used, as well as proverbs, which means that the researchers must be attentive (Bryman and Bell 2015). Sometimes a clarification was required through a follow-up question to ensure that the correct information had been perceived.

During the interviews, some of the farmers became interested and would like to take part of the results of the study. Emails were collected in these cases to be able to send the thesis later. In order for the farmers to be able to find out more about the results, a poster was made for Thesis day. This is planned to be sent out by letter to all farmers after the thesis is published.

5 Results and analysis

This chapter presents result and analysis of the study. Firstly, a description of the respondents that have participated in this study. Thereafter, each section starts with a theoretical interpretation, which are structured from the theoretical conclusion in the theory chapter. Under each section the results are described and analyzed by the theory.

5.1 Description of respondents

In the following section, the respondents are presented. Furthermore, table 1 shows an overview of the interviewed respondents. After that a short description of each farmer and their business to provide for a background and an understanding of the context, results and analysis. All farms used in this study are located in Sweden. Furthermore, the central part of the company consists of plant cultivation, which means that the choice of seed is an essential and fundamental issue in the farmers' activities. The acreage on the farms are shifting from 100 to 1000 hectares. All farms in this study are conventional except two which is organic. Most respondents have plant cultivation as their primary occupation unless it is otherwise stated.

Table 1. An overview of the interview's respondents

Fictional name	The farms crop production	Company	Including the family in business
Adam	270 ha	Proprietary firm	Yes
Bert	320 ha including 100 ha roughage	Limited liability firm	Corporation occurs
Carl	500 ha including 100 ha roughage	Proprietary firm	Yes
David	100 ha	Proprietary firm	Yes
Edward	500 ha	Limited liability firm	Yes
Fredrik	340 ha	Proprietary firm	No
Gustav	1000 ha	Limited liability firm	No
Hans	500 ha including 50 ha organic	Limited liability firm	Yes
Ingmar	520 ha	Limited liability firm	Yes
Joakim	150 ha organic, Krav certified	Proprietary firm	No
Kent	650 ha	Limited liability firm	Yes
Lennart	560 ha	Limited liability firm	Yes
Magnus	185 ha	Proprietary firm	No

Farmer A: Adam

Adam operates the farm as a proprietary firm, which he took over in 1999. The farmer's children work on the farm when needed, furthermore, one employee is occasionally hired. The farmer grows 270 hectares of plant cultivation and has complementary activities. The farm grows conventional cereals and has drying and storage facilities. The storage covers the needs but not the drying capacity. The farmer mainly grows oats, barley, spring wheat, autumn wheat and rape. The farmer also works as the head of a larger company and is used to making qualified decisions.

Farmer B: Bert

Bert operates the farm as a proprietary firm that he started in 1994. The company has one employee and Bert works a few days a month outside the farm as a farm consultant. The agriculture has about 320 hectares of plant cultivation, cattle, and other activities within the farm industry. The farm grows 100 hectares of roughage with 80 hectares of grass and 20 hectares of corn, about 75 hectares of cereals and legumes for forage with crops such as

barley, peas or beans. The remaining area is the sale of crops, wheat, and winter rape. The farm has drying and storage capacity that covers the farms need but sells oilseeds on contracts that are delivered directly at harvest.

Farmer C: Carl

Carl has a limited liability firm together with his nephew and two children. Carl has been a farmer since 1994 when he took over the family businesses. The company operates about 500 hectares of arable land, have cattle, and other activities within farm industry. The farmer also has companies in other industries but works full time with agriculture himself. The company has three full-time employees and one assistant when needed. One third of the cereal production is used as feed for animal production, and two-thirds are market crops. As forage for the cattle he uses barley, rye wheat, and peas. For the market, he grows crops such as autumn wheat, spring wheat, malt barley, and winter rape. The farm has drying and storage capacity that covers 90% of the farms need.

Farmer D: David

David operates the farm as a proprietary firm. The farmer took over the family farm in 1972. However, David has worked at the farm since he was a child. The farmer grows 100 hectares conventional of plant cultivation. Last year was the last year the grain cultivation was grown as seed. The farmer mainly grows oats, barley, rye, clover and autumn wheat. The farm has drying and storage facilities, which covers the farms need.

Farmer E: Edward

Edward has a limited liability firm together with his cousin. The copartners each have a farm center which is 20 kilometers apart, but they have joint operations in one company. Edward started the limited company 2005. The agriculture consists of 500 hectares of crop cultivation and the farm grow conventional cultivation. The seed grown is on contract and is often grass seed as red clover and timothy and sometimes also legumes such as field beans and peas. The cereal crops that are grown are autumn wheat, spring wheat, and malt barley, as well as oilseeds such as summer rape and winter rape. The farm has drying and storage capacity of 85% in a normal year.

Farmer F: Fredrik

Fredrik has a proprietary firm and has been a farmer since 1998 when he took over the farm from his father. The farmer had a bachelor degree at the Swedish University of Agricultural. The farmer's sons help on the farm if needed. The farm-grown conventional crops and it consists of 340 hectares of crop cultivation, were the farmer mainly grows autumn wheat and preceding crops for autumn wheat such as malt barley, forage barley and summer rape. The farm can dry and store about 800 tons of grain, which is about 50% of the farms need. Some wheat is delivered directly to central grain collection silos but mainly farm retrieval.

Farmer G: Gustav

Gustav operates a limited liability firm and plant cultivation. The farm has 1000 hectares of arable land with plant cultivation, and he has been farming for almost 40 years. Furthermore, the company has also business within another industry with a lot of employees. The company's vision is to conduct efficient and sustainable agriculture to leave behind a better soil. They grow mainly wheat and preceding crops. In the crop rotation, the company has also included a new crop that has not previously been grown in Sweden to a greater extent. The farm has drying and storage facilities but not to cover the farms need. The farmer has the possibility to clean and dressed seed the cereal seed on the farm.

Farmer H: Hans

Hans has a limited liability firm together with his partner. Hans has been a farmer since 1991. They farm 500 hectares of arable land, of which 50 hectares are organic, and also, they have other activities in the industry. Crops grown on the farm are mainly autumn wheat and thereafter rape, malt barley and peas. The farmer sometimes has imported seeds from other EU countries. The farm has drying and storage that cover the farm's needs.

Farmers I: Ingmar

Ingmar has a limited liability firm together with his brother. They have been farmers since 2000 and the farm has 520 hectares of arable land. Crops grown on the farm are autumn wheat, spring wheat, barley, and rape. The farm can dry and store about two-thirds of the farms need. They can also store farm-saved seed in their old facility.

Farmer J: Joakim

Joakim has a proprietary firm and a joint stock company. He took over the farm in 1986, and the farm has 150 hectares of crop production. During the winter months, he works within another industry. The farm grows organic crops. The crops on the farm are autumn wheat, peas, rape also, 1/6 of the area for green manure. The farmer uses a crop rotation and every sixth-year green fertilizer is used. The farm has drying and storage facilities for about 200 tons, which will not cover the farms need.

Farmer K: Kent

Kent took over his family farm in 2005 which is a limited liability firm. The company has 650 hectares of plant cultivation and rental activities. The farm mainly grows autumn wheat to a mill, and as a crop, the farm grows rape, barley, hay silage for sale as well as linen or peas. In the company, there is a focus on sustainability by thinking about the climate to a great extent and optimizing production using technology. The company currently has poor drying and storage opportunities and is looking to invest in the near future. Today, the company has a drying agreement with the neighbors. Grain delivery takes place through farm inhibition or that the farm hires an external haulage company.

Farmer L: Lennart

Lennart has a limited liability firm together with his son. The company has 650 hectares of plant cultivation and a few other businesses. The farm grows autumn wheat, spring wheat, malt grains, oats, rape and timothy seeds. The farm has the opportunity to clean and dressed the seed at home. Furthermore, they also have drying and storage facilities that mostly cover the farm's needs, but some have to be delivered when harvesting to the central grain collection silos. The farms storage and drying facility is suitable for farm-saved seed, which is in line with the farmer's strategy to use as much farm-saved seed as possible.

Farmer M: Magnus

Magnus has a proprietary firm and has been self-employed for 12 years. However, for 3 years he has a farm that he operates himself. The company has an employee and also seasonal workers as needed. The company has 185 hectares of arable land and also has activities within another industry. The crops that are grown are mostly autumn wheat and then spring wheat, winter rape, oats and barley grains. Magnus can dry and store grain to be used for next year's seed. Remaining harvesting for the market is delivered directly upon harvesting to the farmers' central grain collection silos.

5.2 Theoretical interpretations

5.2.1 Theoretical interpretation 1 Pre-evaluation of alternatives

In the beginning of the farmers' decision-making process, a pre-evaluation of the alternatives is needed.

Among the farmers in this study, it was most common to use both certified and farm-saved seed. This is presented in table 2 where four of the farms used only certified seed. However, Ingmar would also like to use more farm-saved seed because it is a cheaper method, but he had a limitation only to buy certified seed since the farm had problems with wild oat. Ingmar also considered that the certified seed provided certain guarantees for the seed. Hans bought always certified seed except when he cleaned the seed that he imported from Germany, which he did in order to renew the generation and use the variety again. The reason he chose only to buy certified seed was that he felt that it was quick and easy. Another reason is that Hans has a genuine interest in new varieties. Joakim has organic cultivation and uses only certified seed, which he only sees advantages with. The reason for this is that he imagines that it should be better than farm-saved seed and that he thinks it is secure. The last farmer of the respondents who only used certified seed was Kent, who felt that certified seed gives him complete control over where the raw material comes from and its germination. He wants to use raw materials for good quality, which is one of the reasons why the farm only used certified seed. The only negative aspect that he thought of was increased transport because the farm had a focus on sustainability. For some farmers, there was not an alternative to use farm-saved seed instead, they purchased certified seed. In agreement with Martin-Clouaire (2017), this could be because this group of farmers has different values and preferences than the agricultural group that uses both certified and farm-saved seed. Kent explains that he has high preferences on his seed. Therefore, he only purchases certified seed. While, for example, Edward and Adam believe that they can get high quality on their farm-saved seed by being careful and taking analysis samples, this will instead be their preferences on high-quality seed.

Table 2. Seed strategy, distribution of certified seed versus farm-saved seed in year 2018.

Case	Certified seed	Farm-saved seed
A - Adam	30%	70%
B - Bert	40%	60%
C - Carl	50%	50%
D - David	75%	25%
E - Edward	50%	50%
F - Fredrik	20%	80%
G - Gustav	70%	30%
H - Hans	100%	Sometimes, when Hans imports a new variety, the harvest can be farm-saved seed to further use.
I - Ingmar	100%	0%
J - Joakim	100%	0%
K - Kent	100%	0%
L - Lennart	0%	100%
M - Magnus	15%	85%

Nine respondents choose to both buy certified seed and to use farm-saved seed. Several farmers stated that they cleaned a larger amount last year than they usually do. The main reason why farmers clean their seed was of economic reasons. In order to clean their seed, a labor effort is required from their working hours and also sometimes transports, some farmers felt that they had time to clean while others indicated that they had to prioritize other tasks. By using the farm-saved seed as long as transports are reduced, which is good for the environment stated several of the farmers were an advantage. Edward, Fredrik, and Magnus felt that farm-saved seed provided flexibility and that they could clean the amount that is needed. Edward believes that cleaning seed could provide at least as good quality as certified. Lennart reasoned that it was possible to use the grain of lower quality in order to be able to clean more and get high quality on the seed.

The reason why farmers choose certified seed before farm-saved seed was the common position that sometimes renewal of the seed is needed or because the farmer wants to try another or a new variety. Bert and Carl considered that if the analysis shows that there is a need for dressing the seed, they think about buying certified instead because dressing is costly. If they after all uses their seed and dressed of seed was recommended, this was obviously something that they would do.

In this part of the decision-making model by Blackwell, Miniard and Engel (2006), the individuals have already gone through the phases of the need for recognition and search for information. They examine what alternatives they have and compare them to each other. The most important variable for this evaluation seems to be the price for those who choose between certified seed and farm-saved seed. They analyze the yield on previous crops of a certain variety to see if it can be worth investing in a new variety that can yield more returns or similar parameters like winterhardy. Martin-Clouaire (2017) can explain this phase in the planning process where farmers identify and value which alternatives. Further, in Öhlmér, Olson and Brehmer (1998), this phase can be described in the step *analysis and choice*.

All farmers except one of those who used farm-saved seed regularly tested all their seed for analysis. Fredrik, who used a mobile cleaning system, felt that they knew the need for dressing and of the germination by the fact that the cleaners knew what other farmers had for results on their samples in the local area. The reason for doing the analysis was that it constituted a basis in the decision, such as the amount of seed and if there was a need to dressed the seed.

Familiar to most farmers was that weather conditions that ruled the proportion of autumn and spring sowing. Besides, due to weather and how early the harvest will be to have time to sow their desired amount. The operational decision was made during the year, depending on the outcome. For those who used farm-saved seed, it was possible to be more flexible and clean the amount needed. Gustav and Lennart had their cleaning machines on the farms and were able to clean the seed and dressed after the need. However, Gustav said he had been a little lazy and could clean more of the seed. Magnus and Edward felt that cleaning their seed was flexible and to clean the amount that was needed as depending on how large a proportion as possible in the autumn.

When it comes to what variety of crop to grow, none of the farmers found that the choice is particularly challenging. Farmers feel safe in these types of choices. Some of the farmers felt that the market limited how many varieties they could choose from but that there were many. While some farmers experienced that they could choose between a certain number of options,

for example, Carl and Bert had four to five options for autumn wheat that were suitable to grow in the area.

All farmers took part in the different variety trials that were done, and they were interested in new varieties and how they work. Hans and Fredrik stated that they had a nerdy interest in seed and read the variety trials carefully. Hans has imported seed from Germany to get new varieties, but he says that it became more expensive and if you want a lower price you should rather look at countries like Latvia. Other farmers were more cautious with a new variety, Bert explained that he waits two to three years when a new variety came, to see the outcome and he further reasoned, *“You know what you have, but you do not know what you get”*. The strategy for the new variety varied, some bought into the whole area while others brought in certified seed to a part of the area for the crop to first test it on the farm and then be able to clean it if they were satisfied. When the farmer chooses between old varieties and new varieties, Blackwell, Miniard and Engel (2006) would explain this by dividing the individual using the memory for the information that already exists and comparing it with the new information on, for example, the new variety.

For most, yield was an essential part of the choice of variety for the crop. However, Edward used to sow directly, which means very reduced soil cultivation, much felt that he needed to look at other parameters than other farmers, for example, winterhardy before yield. From Blackwell, Miniard and Engel (2006) this can be explained by decision rule criteria. Edward has another criterion for what is required of a good crop that cannot be replaced by another variable such as harvesting.

5.2.2 Theoretical interpretation 2 Operational decisions

The farmers' operational decisions are repeated and the decisions for purchases occur regularly.

According to Aubry (1997) every year the operational decisions for crop production are decided, which Martin-Clouaire (2017) describes as a repeated decision in the production process. The data show that the farmers often have a plan for the year's crop production. However, the farmers might want to do some changes depending on what is possible for autumn sowing because it is desirable. Overall, this study confirms that the choice of seed is an operational decision.

When it comes to how the farmers experience operational decision making regarding seed, the farmer Bert expressed himself in the following way *“There is a lot of other concerns that I am thinking about, but perhaps not so much about the seed. The decisions come every year, and you are used to making them”*. The majority of participants agreed with the statement that the experience of decision making is repeated regarding seed. In all cases, the respondents reported that the decision was not hard to make. Most farmers mean that it is important to have an overall perspective on plant cultivation where seed constitutes one part. The reason is that the farmer can then make a good and quick decision. Gustav means that an overall perspective is necessary for a good plant cultivation production. Several of the farmers narrate that the choice of seed is of great importance. Gustav expresses himself as follows *“Choice of crop and variety, is about spreading harvest time but also spreading risks”*.

The farmers create a habit to make decisions regarding seed. This is consistent with Blackwell, Miniard and Engel (2006), who explains about recurred decisions. Furthermore, the authors explain that if the individual is satisfied with a product or a purchase the

individual tends to make a habit or routine of the decision. This is the case when farmers in this study reflect on their own behavior. Another standpoint about recurrent decisions that are discussed is repeated problem solving, which occurs when an individual is dissatisfied with a purchase or a product. However, the farmers in this study do not repeat problem-solving when purchasing a new variety due to dissatisfaction. The farmers can be satisfied with the variety that they have but by curiosity or the desire for more returns, better wintering or emergence of crop after sowing wants to try a new variety. Most farmers use a variety that they are satisfied with but a few farmers change because they are dissatisfied. This would correspond to Martin-Clouaire (2017), who describes that the farmers have additional goals and desires that they want to archive. Carl says that he replaces seed and buys every three years to renew the seed, he is satisfied with the varieties that he grows. By being curious he can try new varieties because, for example, it has been shown to yield more return on field trials than the variety the farmer already uses. Adam says he is satisfied with the varieties he grows but wants to try new varieties if there is any new exciting on the market that increases the return. Most other farmers had similar reasoning as Carl and Adam. However, Joakim deviates, because he felt that new organic varieties are rare.

In all cases, the farmers look at the choice of seed as a process and that it is a part of the plant cultivation planning. Most farmers find it hard to estimate the time for the decision. They stated all from 40 hours to no time at all, where the decision is made automatically. However, this depends on what elements this time defines. Some of the grain farmers are aware that they spend a lot of time thinking about the decision. Hans says that he thinks about it all the time, for example, when he performs tasks on the farm such as harvesting or sowing. Furthermore, this can connect to Blackwell, Miniard and Engel (2006) explanation on high and low involvement. Farmers who have good knowledge can make decisions with low involvement because they feel that they do not have to spend much time on the decision. Others make decisions with high involvement and the farmers often see it as an interest and have high motivation for finding information, such as Fredrik and Hans who carefully read about variety trials annually.

Blackwell, Miniard and Engel (2006) explains that involvement can be linked to two-time factors, which is how much time the individual can put on the decision and how quickly the decision needs to be made. Most farmers had other activities alongside crop production. Only two companies were entirely dedicated to planting breeding. This can mean that these farmers who have other activities feel that they cannot priorities their desired time for the decision about seed. Magnus says he would have liked to spend more time because he thinks it is amusing to check out new varieties. Some of the farmers state that it has happened that a seller has a call and said that a new variety is coming to an end and that they have to decide if they want to order, a quick decision needs to be made if they want that variety.

This could connect together with recurrent decisions described by Blackwell, Miniard and Engel (2006), which requires a lower degree of involvement. Recurrent decisions make it possible for the individual to make an easy and quick decision. In addition, Öhlmér, Olson and Brehmer (1998) argue that the model for the farmer's decision making is non-linear. This can be interpreted as that farmers can go back and forth, or skip some steps during decision making. This is in line with the results of this study, that certain steps in the decision model can be skipped. Should this also apply in Blackwell, Miniard and Engel (2006) decision making model, this could also say that the individuals receive a reduced degree of involvement.

For the farmers that use farm-saved seed there are two different strategies on how they go about it. The first strategy used by the farmers was to plan ahead if they should be sowing a field and use that grain for seed next year. Adam, Bert, Edward, Fredrik, Lennart, and Magnus planned before sowing that the cereals would be used as their own seed. Adam additionally thought about if he needed extra roundup on the field. Bert explained that he was thinking with extra care and also included interventions such as combating wild oats and fungi disease in his calculations to get a good seed. Edward did not make special efforts in the field but he was careful with the drying, "*The germination can be affected if you dry the cereals with too high heat, when harvesting with a high water content I usually take out a batch that I dry with a lower heat to be able to use for seed*". Fredrik does not make any special efforts because it will be seed. However, when drying the cereal, he did it in a different way, the reason is that he believes that it is not necessary to try the grain to 14% it is enough with 15% because it will soon get back into the soil again. Lennart explained that he was thinking about the crop rotation and if, for example, barley after oats is sprayed against wild oat and waste seed. Even Lennart was careful with the heat during drying. The storage on the farm is also adapted to be able to clean the farm-saved seed with small pockets that facilitate the handling of the seed. Magnus had the strategy of growing grain just to use as his own seed. He chose a good shift to have the best conditions to get a good seed, for example, it would be free from wild oat and no problems with weeds.

Another strategy used by farmers Carl and Gustav is to make decisions as to whether it should be used as farm-saved seed, in connection with the harvest. Carl chose whether it would be seed depending on what quality he had obtained and how it looks in the field, "*If the grain has good quality and the variety worked well then I will clean it*". For both strategies, this phase can be linked to planning in the Martin-Clouaire (2017) decision making model. The strategy with the agricultural group that planned before sowing, for the other farmers, was planning to use the grain as the farm-saved seed at a later stage in the process, at the harvest of the cereals.

The step planning in Martin-Clouaire's (2017) decision making model happens even when farmers purchase certified seed. In all cases, the farmers purchased certified seed, even if Lennart reported that he did not buy this year. Four of the farmers purchased only certified seed while the rest did it to renew the seed or change variety. The seed was purchased twice a year, for spring and autumn sowing. Most farmers say they buy in the seed about three months before sowing. One of the farmers believes that as a professional farmer, they keep track of the market and keep up with the media if any shortage should occur. During the study, several farmers found that if they wanted a specific variety, they need to plan and order seed in time. Bert says that "*They are the farmers who call the sellers in the middle of spring, which means that they can take what is available.*" Planning is a phase of great importance which is shown in Martin-Clouaire's model (2017). Planning is necessary for the farmer to get a product that they deicers and is consistent with the farmer's preferences. Ingmar tells us that the sellers often have promotions if you order the seed well in advance. Bert usually makes a rough order early on seed and then changes it if needed before delivery. Blackwell, Miniard and Engel (2006) describe that during the purchase step, the purchase can still be stopped, and it is possible to change product or brand. Which corresponds to what Ingmar tells us is possible to change the order of seed.

When farmers buy a new kind of seed, they have different reasoning. Some sample varieties on the part of the area for the crop to be sown while others buy seed for the entire area. Adam tells that last season he tried a new variety spring wheat of 20% of the crop area to see if it

yields better than the variety he had before. Adam adds to how he does with new varieties depends on the crop and what new variety is. Sometimes he purchases seed for the entire area and sometimes for part of the area, this also relate how David think about this. He tries new varieties in principle every year, but he usually starts cautiously, for example, last year he tested a new variety of 5% of the area.

Edward tries new varieties on one part of the area to see if he is satisfied with the outcome. For instance, last year the farm tired “*Linus*” autumn wheat and if he was satisfied with the outcome, he planned to use the variety as farm-saved seed. Unfortunately, it was not a good reference year considering the drought in 2018 to evaluate the variety. Therefore, Edward chooses to try again in 2019 for a new evaluation of the variety. The farmer Ingmar also tried Linus as a winter wheat last year on a part of the area. The new variety looked worse than the variety that already had been on the farm. However, during harvesting it turned out that the new variety had a higher outcome, “*It is essential to look at the yield of the harvest; otherwise, would have thought that the old variety had given more because it looked stronger and better in the field.*” Lennart and Magnus do in a similar way. However, Lennart and Gustav argue that it is vital to ensure that there is a trade for the new variety that is being tested. Gustav thinks it is exciting with new varieties and this year he has tried a whole new variety of legumes that many farmers have not cultivated before. The buyer and the price are agreed before sowing, so Gustav emphasizes trading for the crop.

Bert believes that it is best to buy into the entire area and cultivate the same sort on the farm. He thinks it is difficult to have many varieties, but it is still six to seven crops grown on the farm. Besides that, it becomes problematic when storing the grain to try to separate a lot. Carl and Fredrik reasoned similarly and used the same variety on the whole area. Joakim has organic plant cultivation and therefore does not try new varieties, “*It is sad that no new varieties are produced for us who grow organically... It has been the same varieties since 1970*”. He says that the varieties that come today are based on being able to be sprayed.

5.2.3 Theoretical interpretation 3 Social network

The social network influences the farmers’ decisions.

The social network can be an important influence on the farmer’ decision regarding seed. The majority of the farmers’ considered that their network regarding the decision consisted of their advisor and the sellers. The author Portes (1998) considered that social capital is the use of social networking relations. In this study Adam describes how he uses a neighbor to get good advice on seed and what can be smart to use, he tells us “*I ask my neighbor for advice because I see him as my advisor, the reason for this is because he is so knowledgeable in plant cultivation*”. Furthermore, the advisor and salesman can be used as social capital.

More than half of the farmers use a field exhibition group with their neighbors to get information and ideas for their own fields. Fredrik thinks it is exciting to look at neighbors’ fields and how it goes for them, while Hans does not think it is necessary at all. He thinks it only takes a lot of time and that he rather would spend that time going around and checking out his own fields. However, the majority of the participants agreed that this is a good way to use their social capital.

Another way for the farmers to use their social capital is when they go to different fairs or use social media. At the fairs, they can meet old contacts which whom they can have a discussion and meet new contacts that can come up with new inputs. The social media are easily

accessible but can provide a good insight into how others do and then get used of the social network. Huet et al. (2018) reinforces this by explaining that new information and knowledge can be obtained through the social network.

In this study, the majority of the farmers explain that they make decisions regarding the seeds themselves. By analyzing the participants, the authors understand that the farmers are seeking confirmation from their relatives. Blythe (1997) call this the reference group. It is a group that influences the individual when it comes to decisions. An example from the participants is when Hans explains that he likes to get a nod from his partner when he is to make the decision about seed. It gives him more confidence and he does not feel alone if it turns out to be a bad decision in the end. Both Edward and Ingmar operate the agriculture business together with a co-partner. This meant that they made decisions about which seed they should use together. None of these experienced this as a problem, the reason was that they often think in a similar matter in this question.

The majority of the farmers are purchasing certified seed from several salesmen. Everyone expresses that trust is an important part of the relationship with their salesman. Most of the farmers state that they have three to four companies that they can trade off but that they mostly buy from one salesperson. It is important to have several companies to buy from because it makes it possible to compare prices and variety options. The majority of the farmers used several companies when buying seeds, but it was also important to have confidence in the salesman in each of the companies. Hansen, Morrow and Batista (2002) describes that trust as *“trust is the extent to which one believes that others will not act to exploit one's vulnerabilities”*. Therefore, can it be difficult to trust the sellers in full, explains Joakim and Ingmar, because the salesman's goals are to make the business and make money out of it. Bert tells us that he prefers to shop with someone you trust. *“Especially when you got older, before it was just a price question if one salesman was one percent cheaper. Now I see it more long-term and hopefully you get a better price if you are a loyal customer”*.

Trust are also an important part of the relationship between the farmer and the advisor. It can be easier to trust the adviser because the purpose with their work is to give the farmer support and knowledge. However, Joakim was disappointed with his adviser when he advised Joakim to cultivate a variety that did not cope with the circumstances of the year. That resulted in Joakim losing a lot of money on that decision. Joakim understood that it is still only he who have to take the consequences of this miss and that has led him to lose confidence in advisers. Joakim has an overview of the entire business, which the advisor does not have, this makes it easier for Joakim to understand if the advisor advice will work in the long run and the climate and soil that he has. Bert and Carl describe that they have not received enough information and knowledge from their adviser, which has led them to terminate this service. This means that they today have greater contact with their salesman on these issues.

5.2.4 Theoretical interpretation 4 Selectivity

The farmers' selectivity is both conscious and unconscious during the decision-making process.

The farmers' selectivity can be unconscious and it is difficult to observe during the data collection. The reason for this is that the farmer unconsciously chooses an alternative without reflecting over the choice. However, conscious selectivity has been observed during the data collection. Selectivity is an important part of decision making because the farmer must choose between alternatives, which means that the farmer chooses one alternative over another.

Selectivity has been found to exist in the farmers' choice between certified and farm-saved seed, in the choice of a variety, in the choice of relationships and in the choice of information.

Selectivity can be an active cognitive process, when the farmer chooses between alternatives, a conscious and active choice is made. Furthermore, selectivity can also be considered passive, a process when the farmer is not aware that he is making a choice. Martin-Clouaire (2017) describes how the cognitive decision-making process differs between farmers. The authors of this study have observed that farmers have different cognitive processes. For instance, some farmers have explained that they do not have to think about the choice while others are considering the choice by reading brochures or similar. Furthermore, obstacles and limitations can be a factor that the farmer experiences affecting selectivity. In this case, the farmer does not make an active choice without obstacles or limitations selects the alternatives and the farmer adapts his decision making according to the prevailing circumstances. Selectivity arises in several parts of the decision making models and affects the entire decision-making process.

The farmers' view on how many varieties they have to choose from differed significantly. The view on how many choices existed on variety alternatives varying between the farmers, from almost unlimited number of varieties to a few numbers as alternatives. The farmer Gustav believes that he can choose to grow everything that is on the market, almost unlimited with varieties. Some of the farmers note that the agreements sometimes regulate the choice of variety. Edward tells the of his malt grain contract that governs the variety he grows. *"It depends if I can get a lot on the contract, then I have to choose the variety listed in the contract"*. Many of the farmers say therefore that the market controls the variety they grow. Lennart says that there are too many varieties to choose between, and there are a lot of varieties that he is excluding. Furthermore, Lennart argues *"I stick to the usual varieties, the most important is that the cereals can be sold."*

Hans also looks at the German seed market to find alternatives to grow because he thinks these varieties work well in the farm climate zone. Hans says there are many options he chooses between, he gives as an example that for winter wheat there can be 100 varieties, but many of these do not fit because of winter hardness, lack of market or long transport of the grain after harvest. Joakim as an organic farmer believes that Lantmännen has 2-3 alternatives in the autumn wheat varieties that suit him. Although Joakim thinks he can choose any variety if it is not treated. Joakim explains that the new varieties on the market are made to work in conventional areas because it requires spraying agents to cope with diseases, which is not suitable for his cultivation.

In the practical choice between certified and farm-saved seed, it is observed that the respondents made a selective choice. A deeper argument about the farmers' choices can be found in theoretical interpretation 1, pre-evaluation. Overall, it can be stated that all farmers who used both certified and farm-saved seed made the selective choice with economic factors as the main reason. Out of the farmers who used only certified seed, different motives were stated for the decision. The farmer Ingmar had a limitation in this choice because of wild oat, and the selectivity was due to the circumstances of the obstacle. Kent a quality raw material and hence he did not choose the farm-saved seed.

For those farmers who had a limited number of options, and a selectivity had already taken place. They had created what Blackwell, Miniard and Engel (2006) describe as "decision-

making criteria". Limitations and obstacle affect the farmer's choice, and a selectivity adapts to the prevailing circumstances surrounding the obstacle or limitations. Bert, Carl, Edward and Ingmar usually choose different varieties of autumn wheat to spread the harvest and have the opportunity to establish autumn crops, such as winter rape. All three farmers believe that they had three options for autumn wheat. Bert emphasizes that the choice of variety is always justified and that he has arguments for the crop and variety he chooses. One parameter that many farmers look at is the variety that fits their type of soil and climate zone, which eliminates alternatives. A practical example of this is Fredrik who says that 10% of his area has too low a pH and cannot grow anything. Several farmers, including Bert and Edward, claim that there are no obstacles and limitations if you plan on time. However, this is due to the individual's experience of an obstacle or limitation.

Limitations and obstacles affect the farmers' choice of seed. Magnus choice of varieties is limited to Lantmännen's seed varieties, as he can only deliver to them. By building a drying and storage facility, it would give him more options regarding seed varieties, since he would not be dependent on selling to Lantmännen. Furthermore, when Magnus chooses a variety, he primarily looks at properties and how it could work on his soil. The limitations with the farms drying and storage of cereals gives Magnus limitations to trades the seed with Lantmännen, which gives a selectivity in which retailer he trades with. Furthermore, Magnus mentions that he relies on the salesmen's recommendations regarding variety selection. This can be linked to the step purchase and the specific choices in the decision-making process model by Blackwell, Miniard and Engel (2006), which is choices influenced by the salesmen.

In social relations, a selective choice is also made. Bert and Carl had previous advice but thought that in relation to the cost it was not worth it, Bert says "*The advisor for crop production must have more knowledge than me*" when he tells us why he ended the advice support. Both farmers mention that they listen a lot to their salesmen when it comes to questions about seed, where the personal relationship is important. A selectivity in this case is based on person rather than company. According to Kool (1994), the loyalty the farmer has for a brand or a vendor depends on the how the relationship is formed, which is in line with several of the farmers' relationship with their salespeople. Other farmers such as Edward, for example, instead have that relationship with their adviser. Edward says that he often discusses with his advisor about varieties and once he has to make the purchase, he is clear about what he wants. Ingmar also values advisors and the field exhibition group rather than sales people due to the value of social relationships and information exchange the occur within the group.

Information gathering takes place selectively because the individual chooses what information he is exposed to and what information is stored in the memory (Blackwell, Miniard and Engel 2006). As far as the farmers are concerned, they take in information in a similar way, but some rely more on the vendor while others rely more on external sources as advisors. Common to all farmers is to take part in a variety of trials, either through the results of a variety of trials through the annual publication of a book, advisers' letters, the Internet or a variety of trials at trade fairs such as Borgeby's agricultural fair and Brunnby's agricultural fair.

In the choice of information on seed, several farmers' states that they talk to neighbors but not as the most important source. Magnus states that he mainly listens to his salesman about 70%, then talks to farmer colleagues about 20%, especially if they are satisfied with something and the rest of the information he says comes from mixed sources, for example, agricultural

newspapers. Farmers tend to choose information from advisors or salespeople in front of other sources of information in this study.

Consideration sets are described by Blackwell, Miniard and Engel (2006), which is the framework within which the individual makes decisions. This can be strongly linked to selectivity were the farmer makes decisions within a framework. The frame can consist of what Martin-Clouaire (2017) describes as desire, preferences and value, what the individual prefers for product or brand. Also, Blackwell, Miniard and Engel (2006) describe that considerations set may be smaller if the individual is loyal to a brand. Most farmers in this study often have several vendors but often prefer one rather than the other, of which they have preferences. Magnus has an obstacle that allows him to only choose the one vendor, and therefore gets a smaller consideration set. Other factors that the study has shown to influence consideration sets are the local climate zone, what is suitable to grow in the area, which varieties the farmer prefers or is used to and previous experiences.

5.2.5 Theoretical interpretation 5 Economic factors

Economic factors impact the farmers' decision making, such as input and output prices.

The study has shown that farmers are cost-conscious and that the economic perspective is important for operational decisions. It is mostly about farmers wanting to minimize the cost and maximize profits. Dyadé et al. (2014) explains that farmers' decision making becomes more complex, and that decision making is a key factor for performance in economic environmental and organizational aspects. This empirical study shows that all respondents take these aspects into consideration during their decision making. However, the farmers have some different views on what is the best decision regarding these aspects.

All farmers who used farm-saved seed stated that the main reason was to minimize costs. For example, Adam says that the choice between certified and farm-saved seed depends entirely on the prevailing price picture. He argues that there are no disadvantages to certified seed but that the profitability of grain producers is pressed and it is important to keep as much of the revenue as possible. Furthermore, he argues *"We do not have a margin to pay 30-40 percent more for a product that we already have in our own stock."* Magnus also thinks the farm-saved seed provides cost savings, if the wallet was free, he had chosen certified or *"Had it separated 0,50 SEK / kg, I could might as well buy everything certified."* Furthermore, the farmer says that you should not save on costs in such a way that there are consequences for the quality of the seed. *"You must not become stupid either, sometimes you need to renew the seed,"* he adds. Magnus believes that if it separates more than 1.5 SEK/ kg, it is worth cleaning seed or if the grain price high in combination with this, they can in this case be better to sell the grain and buy in certified seed. Bert is on the same track, *"Farm-saved seed is the cost issue, buy certified spring wheat is about 4.5 SEK/kg this year or get your own seed for 3 SEK/kg, there is a certain difference"*. Furthermore, he reasoned in the same way as Magnus *"Seed is a basic requirement and one should not save in such a way that one are making a fool of themselves"*. The farmer Kent who only used certified considered that he wants quality raw material and was prepared to pay that price.

According to Blackwell, Miniard and Engel (2006) the individual often has a clear picture of what they are willing to pay for a product. Furthermore, the authors explains that individuals often monitor the price of the product. This is in line with the farmers' behavior, they are well informed and aware of the current prices for certified seed and the cost of cleaning and dressing. The price plays a major role in the decision-making process. The farmers states that

the price of cleaning seed is between 0.3 SEK and 1.5 SEK per kilo, for example, due to dressing are needed, or if labor costs are included. Most estimated the cost to 1 SEK per kilo plus transport and the cost of getting the grain out. Lennart tells about the price of fertilizer, it is only possible to get a few pennies cheaper while the price of seed can differ a crown and can be influenced by using farm-saved seed, *“That wage cannot be done anywhere else.”*

The farmers can minimize the cost of input goods by using their own farm-saved seed. This can be linked to production theory (Kool, 1994) that the prices of input goods and outcome, to optimize production. The study shows that most farmers strive to maximize their profit. Bert and Carl mention that they are interested in precision cultivation in the future, were the amount of evaluation is adapted to the soil type. This can be linked to the fact that they are looking for an optimal solution to reduce the use of inputs, which results in cost savings and to get a better and more even crop. The choice of seed is highly relevant to the three main issues of production theory.

Adam and Fredrik state that if the price for seed will increase in the future, they will use farm-saved even more. Adam further argues that the price for seed this year has been high. Kent argues that he is not concerned about the lack of seed on the market, if this should occur, he has the option to use farm-saved seed. Edward and Hans think that farm-saved seed is good because it gives competition to hybrid varieties. Hans, who today purchases everything certified, believes he will use farm-saved seed in the future more if prices continue to increase. Hans considers that the seed price follows the grain price quite well, the price is about 2,5 times more than the sale price for grains.

Some of the farmers grow seed or barley on contract. Here is the contract that governs the choice of crop. One more dimension is that the seed cultivation requires a certified seed. Several of the farmers believe that the main thing is that there is a trade. Bert says it is important that there is a seller on the other side who wants to buy the variety. Some of the farmers also study the price for the market crops in the choice of variety. His looks at the sale prices and believes that *“The mill controls which varieties are grown”*. Furthermore, corporate strategies differ in terms of variety selection. Carl thinks that he can just as well grow fodder/ethanol wheat because he can harvest later because the quality parameter is not as important, *“At the moment the difference in price is too small, the margin I can save on drying, in addition, I do not need to be equally worried quality parameters”*. While Edward is always investing in bread wheat quality and using varieties that suit it. Quality parameters also determine what to grow when it comes to malting barley. Many farmers state that they have problems with high protein and hence whiskey malt grains are better because higher protein content demanded. For example, whiskey malt grain is easier for some farmers to grow than malt grain for beer.

All farmers think it is economically justified to treat the seed if needed. Magnus estimates that it costs around SEK 160 per hectare and that the outcome of the dressing is difficult to know, but he trusts the Frökontrollen Mellansverige AB recommendations. *“A bad year with poorer conditions may be worth it”*, says Magnus. Edward trusts that it pays off if it is being recommended. Fredrik believes that he would not dare to grow if it had not been treated with dressing.

Lennart who only use farm-saved seed and cleaned his own seed describes that he made it from cereals of poorer quality. Normally, they usually clean away 10% but for this year it was about 30% of greenery and other things that needed to be cleared. He describes that he would

have been low paid for this cereal because of the low quality but after the cleaning it became a really good seed.

Table 3 shows the farmers' estimate of the seed cost part of the inputs needed for the cereal production. The inputs for grain production are seeds, commercial fertilizers, plant protection products, diesel and do not include costs such as working hours and machines. Most farmers made an estimate of the percentage of seed. Several of the farmers commented after the estimate that it was an estimate calculation and may differ depending on the prevailing price for seed and cleaning of farm-saved seed. Furthermore, several of the farmers analyzed that it also depends on the cost of the other input goods, which may differ significantly between the years and also the need for inputs. The majority of farmers estimate the cost to be 15-25%. Several of the farmers say that the share of the cost of the seed also depends on which crop and variety are used. Joakim said that as an organic grower he places 50% of the inputs for seed, which differed from the estimate of farmers who had conventional cultivation of cereals. Carl says that it depends on the cost of other inputs. Three of the surveyed farmers could not answer that question. Lennart says that *"It is impossible to say, but as little as possible"*. Gustav says that it is about as much as the fertilizer.

Table 3. Estimated seed cost

Case	Seed cost % of inputs	Comment
A - Adam	15-20%	Estimates this percentage
B - Bert	15-17%	Estimates this percentage
C - Carl	20%	Estimates this percentage
D - David	15-20%	Estimates this percentage
E - Edward	15-20%	Estimates this percentage
F - Fredrik	20%	Adds roughly equal parts to seed, pesticides, fertilizer and diesel.
G - Gustav	-	About as much as fertilizer.
H - Hans	Less than 20%	Estimates this percentage
I - Ingmar	-	Don't have an answer to this.
J - Joakim	50%	Ecological, estimates this percentage
K - Kent	10%	Estimates this percentage
L - Lennart	Impossible to say	As little as possible on the cost of seed.
M - Magnus	25%	Estimates this percentage

In a broader perspective, Carl and Gustav argue that the choice of crops and varieties is about spreading risks, both for the cultivation risk with, for example, diseases and droughts that affect the economy of the crop but also for risks around the price picture. Carl says that *"By cultivating different crops, I spread risks in different directions in terms of cultivation risk but also the pricing risk. The price on the market can fluctuate and it is difficult to know which crops go up in price and which ones go down, you should not put all the coins in the same bag"*.

An observation noted during the data collection is that obstacles and limitations can affect the costs of production and give the farmer less negotiation opportunities. Obstacles and limitations are described in more detail in theoretical interpretation 4 - selectivity. To give some concrete examples of the economic dimension, some of the farmers, for example, Fredrik, state that he must sell part of the harvest directly because of the liquidity. Magnus

states that he would like to store the harvest and be able to sell to whom he wants, but since he has no dryer, he is restricted to trading with Lantmännen because their central grain collection silos is closest. Furthermore, they also influence that he can only buy seeds from them because he can then be sure that they receive the varieties.

Farmers have to declare the use of their farm-saved seed and pay a fee to the SVUF (Morfi 2018). Gustav believes that this is important to truthfully report and pay the fee in order to contribute to the development of new varieties. Lennart has the same opinion and emphasizes that it is important. Farm-saved seed is said to consist of 25% of the total use of seed (Morfi 2018). This study indicates that this percentage is in practice greater, some of the farmers' stories and the use of seed that the percentage should be higher. Some of the farmers state that they have cleaned their seed at a small operator and not reported the full amount.

5.2.6 Theoretical interpretation 6 Experience

When farmers make decisions, they develop experiences for future decision making.

The majority of farmers feel that they have made the same decision for a long time, which has meant that they can more easily make the decision regarding seed. It feels that they have gained experience over the years as a prime decision maker. Aubry (1997) explains that farmers take the same decision annually and develops experience. Blackwell, Miniard and Engel (2006) explain that repeated problem solving makes the decision easier to take because it is a repeating decision and the problems are already resolved.

In this study, farmers have operated their farm from 3 to 47 years, which is shown in table 4. This means a great difference in experience. David, who has operated the farm for 47 years, explains that he has gained more experience and that he today has no problem choosing which seed he needs or if he is going to use farm-saved seed or certified seed. While Magnus only has been running the farm himself for three years. When it comes to seed Magnus has continued to run the farm with the same strategy as his father. Since Magnus has grown up on the farm, he has had the opportunity to study the operation methods and strategies for many years in addition to the three years that he himself has operated the farm. This means that Magnus experiences enough experience to make the seed decisions without any problems. In conclusion, the result shows that the overall practical experience facilitates the decision making, which largely corresponds with Aubry (1997), which describes that the decisions are taken annually and then they develop experience.

Kent who has operated the farm for 14 years says that *“Seed is something that is quite constant, weather and wind do not affect so much when it comes to the seed. Sowing is something that one does. The seeds will be in the ground and so is it”*. Other farmers also stated that decision making became easier over time, Fredrik describes that he is now planning the seed less, but it works well anyway. Gustav says that he *“shoots more from the hip”* when it comes to decisions regarding seed. Öhlmér (2001) describes that farmers' decision making tends to be intuitive rather than analytical. This does not agree with the outcome of this study. A concrete example is Bert that describes that he always motivates his decisions regarding seed. However, an experience is built up that allows farmers to make decisions on gut feeling. Björklund and Nilsson (2014) describe that farmers in investment make their decisions on gut feeling. Gut feeling in this study depends on the experience, hence this is also in line with applicable operational decisions.

Table 4. Description of the length of experience

Case	Farm manager since year	Years of experience
A - Adam	1999	20 years
B - Bert	1994	25 years
C - Carl	1994	25 years
D - David	1972	47 years
E - Edward	2001	18 years
F - Fredrik	1998	21 years
G - Gustav	1989	30 years
H - Hans	1991	28 years
I - Ingmar	2000	19 years
J - Joakim	1986	33 years
K - Kent	2005	14 years
L - Lennart	1979	40 years
M - Magnus	2016	3 years

Operational decisions create a habit which leads to experience. Aubry (1997) describes that the farmer's knowledge is usually never written down. This can be linked to Martin-Clouaire (2017), which explains this phenomena in operational decisions. The author demonstrates that a character trait of operational decisions is that knowledge is usually silent and exists in the farmer's mind. In this study, Edward describes that he has the experience, but he has difficulty putting his finger on a specific experience that he has. It is more in his mind that the operational decision is made, which is linked to Martin-Clouaire's (2017) study. This thesis is also confirmed by David, who says that *“Over the years as a farmer, I have built up practical experience in plant cultivation that includes everything from the preparation of the sow bed to harvesting”*.

Adam, Bert, Carl and Magnus say that they wish to have more time for planning regarding seed. Because Adam has a chef position in another industry, a lot of time disappears for those decisions. The other farmers also have other activities which mean that they have less time for planning. Magnus says that he thinks it is very fun and wants to have more time for plant breeding plans and for example to go on more fairs with a variety of trials. The remaining farmers considered that they did not have to have more time to decide on seed, varieties or whether they should use certified or farm-saved seed.

5.2.7 Theoretical interpretation 7 Evaluation

The farmers make an evaluation of their decision, which has an impact on future decision-making processes.

The decision models include an evaluation of the decision. Blackwell, Miniard and Engel (2006) describe that the evaluation of post-consumption is a process that determines whether the individuals feel satisfied or dissatisfied with the product or the purchasing process. This is linked to an individual's feelings. The study shows that this is probably done both consciously and unconsciously. Most farmers indicated that they were satisfied with the purchase process, and the evaluation of purchase may be unconsciously performed by the farmers. All farmers are evaluated to a greater extent practically in the cultivation of crops in different forms, which was a more conscious process. Some express dissatisfaction with the crop selection this year, such as Edward who had much spring wheat last year and because of the drought, it was

the worst crop. In hindsight, *“When I see how the year turned out, I would choose to have a smaller area with spring wheat,”* says Edward.

The practical evaluation of the crop takes place throughout the cultivation period. Magnus describes that a clear evaluation of seeding emergence. Edward then thinks that wintering is important to study in terms of autumn crops because they can be critical in the climate zone that he is in and then it is important to have chosen the right variety that is winter-hardy. Joakim with organic plant culture thinks it is interesting to look at the whole plant process. He adds that it is also interesting with harvest to see how large the volume is. Most farmers describe that they looked at the fields to understand how the outcome of the harvest became, straw strength, the disease picture. Fredrik says that if a variety goes bad, it gets no other chance on the farm, it is replaced immediately.

6 Discussion

This chapter presents a discussion based on results and analysis. Furthermore, the intention is to get a broader perspective on the farmers' decision-making process regarding the strategy of seed use. In the discussion, farmers' differences are included and the analysis is linked to the theoretical framework.

Pre-evaluation of alternatives

According to Blackwell, Miniard and Engel (2006) the individuals examine the alternatives that they have and compare them, which is an important part of the farmers' decision-making process. For instance, when they choose between certified and farm-saved seed. The majority of the farmers' in this study advocated that a seed strategy was both certified and farm-saved seed were used. The reason for using farm-saved seed was for economic aspects and to use certified seed was to renew the seed or to try new varieties. For those farmers who only chose certified seed, there were various reasons. For example, one farmer uses the certified seed due to the values and preferences, and another farmer had limitations that affected it. According to Martin-Clouaire (2017) values and preferences have an important impact on the decision-making process. In addition, a significant factor affecting the farmers' choices are how they have made the decisions earlier and their experiences.

Operational decisions

Regarding operational decisions related to seed, none of the farmers experienced that this was particularly difficult. This could be because it is an operational decision and the decisions are regularly recurring. Furthermore, this means that the farmer creates a habit of making decisions about seed. An additional dimension can be that the decision about seed is in relevance to other decisions that the farmer experiences as "larger", "more important" or "thoughtful". Agriculture is a capital-intensive industry and an example of a decision of this nature can be the purchase of combine harvester or additional land. Furthermore, it can also be perceived to be forgiving to make a wrong decision about seed, because it is possible to make the decision differently for the next crop cultivation season. Farmers also find that there is a lot of information available on new varieties, for example through variety trials that facilitate decision-making regarding new varieties. Furthermore, the choice of seed can be considered complex in the sense that there are many factors for the farmer to take into consideration, for example, practical opportunities, harvest time if the plan works with next year's planning, crop rotation, the spread of risks and economic aspects.

Furthermore, most farmers in this study consider that the decisions are made in a process. The majority of the farmers find it difficult to estimate the time spent on the decision and this often happens over a long period of time. What activities decision making includes can be difficult to define and therefore it is difficult to measure in time. Some farmers state that they think of it all the time while others say that it does not put any time at all. Since the decisions are repeated, a habit is created to make the decisions, which can affect how much time is needed to make a decision. In addition, the farmer has silence knowledge that is difficult to define and describe. For example, this may be how certain varieties work locally on the farmer's land. This study shows that farmers' behavior regarding seed selection differs between individuals. This can be explained by the fact that they have different cognitive abilities, for example, how they analyze a decision. They also have different strategies, limitations, personality and interests as well as different degrees of professional knowledge, which affects decision making.

The study shows that the farmer's behavior regarding buying a new variety differs from the individual's behavior in the decision-making model by Blackwell, Miniard and Engel (2006). Furthermore, the authors states that the individual chooses another product if the individual is dissatisfied. While the farmers tend to change the variety of curiosity and a desire to optimize production through, for example, a crop that yields more, even though they are satisfied with the variety previously cultivated. The decision-making model is not adapted to farmers and therefore does not fully comply with their behavior. In this aspect, the Martin-Clouaire's (2017) model would fit better because it is adapted to the farmer's perspective. The farmer as an entrepreneur strives to achieve the business desires and goals, which can mean that a change of variety is desirable even though the farmer is satisfied with the variety used now.

Social network

Based on this study, the farmers make their decisions regarding seed individually. However, the farmers have a need of confirmation of the decisions regarding seed from people in their surroundings. This may be because the farmer does not want to stand alone for the outcome if it turns out that the crops were poor because of the seed choice. Blythe (1997) explains how important the reference group is, in order to confirm the decision. Another factor in this study may also be that the farmer has a need for confirmation from their social network that the decision is right.

According to Portes (1998), social capital is the use of social networking relations, which it turned out that some of the farmers used several different companies when they traded certified seed. This may be due to various reasons, for instance, some farmers' compare prices between companies to see where they can get the best deal. There were also farmers who only had one salesman and delimitate themselves to one company. This is probably due to the personal contact they have. Such a personal contact can both be beneficial but also unfavorable, because it can mean a good deal from the seller because they know each other but the farmer can miss opportunities and varieties that other companies sell. This may mean that the farmer places great trust on the individual seller. To have trust the individual does not believe that another would exploit one's vulnerabilities (Hansen, Morrow and Batista 2002). Therefore, farmers must be cautious about relying much on relationships, as this may mean that they lose control over the final decision.

Selectivity

In this study, only the farmers' conscious deliberations could be studied. The unconscious process is partly difficult to detect because the farmer is not aware that a choice is made. Selectivity can be observed in all parts of the decision models because the farmer makes choices during several parts of the decision-making process. Selectivity has a significant role in the decision-making process. Based on the *decision-making process model* by Blackwell, Miniard and Engel (2006), the farmer's selectivity can be found in all stages. In the first step *need of recognition*, selectivity is about which crops to grow. Furthermore, in the step *search*, the farmer makes a selective choice when it comes to information sources, information and people to talk with. In the *pre-purchase evaluation* step, the selectivity in the choice of variety, the choice of certified seed including the choice of retailer or farm-saved seed. During the farmer's *consumption*, selectivity takes place around such time and measures if the harvest is to be used as home-purified seed next year. In the last step *post-consumption evaluation*, the selectivity deals with which factors are included in the evaluation and what should be stored in memory for future decisions.

An important factor in selectivity is the farmer's cognitive process. Selectivity that has been observed in the selection of the relations and the farmers' relationships depend on personal chemistry and trust. In the study, it has been shown that farmers primarily choose sellers and advisors as the source of information in the first place and thereafter other sources such as newspapers, fairs, Internet. Selectivity in information is of great importance for how the decision is made and what argument is the basis for the decision.

In the study, the farmer's experience of how many varieties he has to choose between differs between the respondents. This may be because they have different *decision rule criteria* or *consideration sets* where selectivity has already occurred that is stored in the memory of previous decisions. They can be based on which farmers' obstacles and limitations, but also which preferences and values the farmer has. In some cases, the farmer has described that contracts can control the choice of the variety grown, the farmer's choice, in this case, is whether to grow on the contract or not.

Economic factors

The majority of farmers in this study state that the choice of seed depends largely on the pricing. However, there are farmers who state that it does not matter if you get a penny cheaper overall. Farmers have stated that they would use more farm-saved seed if the price went up on certified seed. The opposite occurs, if the price would go down, they stated that they will buy more certified because it is no longer worth the work cost to use farm-saved seed. This indicates that farmers would change their decision-making behavior, but how large the price difference required for farmers to deviate from their usual behavior in decision making is difficult to determine. Blackwell, Miniard and Engel (2006) states that the individuals have a clear picture of what they are willing to pay for a product. Farmers in this study have a clear picture of what they are willing to pay for seed. At a price change, most farmers argue that they would change their decision-making behavior.

An increased seed price is a future risk for the farmer, which can be counteracted by the possibility of using farm-saved seed. There is also a risk around the future sale prices, therefore the farmer should spread the risk by growing different crops. Some of the farmers have mentioned that the choice of crops is also about reducing the price risk. A complementary way this could be avoided is by contract. Growing different crops also means that the farmer reduces the cultivation risks, for instance, that a certain crop is exposed to pests or weeds one year, which causes a harvest reduction.

Experience

Aubry (1997) explains how farmers make decisions annually and therefore develop experience, which corresponds to the findings. The farmers' in this study, have operated their agriculture farms from 3 to 47 years. This means that they have a lot of experience. However, it does not seem to have much importance on the decision regarding seed and whether it should use certified or farm-saved seed. It seems more common that the farmers are raised on a farm and that means that they have a longer experience before they can take over the farm.

When it comes to the final decision, experience seems to make the farmers feel more secure in their decisions and they do not question themselves. The farmers describe that they have made a decision about the seed multiple times and for a long time, which makes the decision appear neither difficult nor problematic. Experience builds on gut feelings that can help farmers to make intuitive decisions. In this study, farmers often have an argument for the

variety they have chosen, which means that the decision can be regarded as analytical. Farmers' builds their silent knowledge from the experience that they have collected. This knowledge is probably of great importance for the decision-making process, but it is not measurable in this study because the farmers themselves find it difficult to express it.

Evaluation

According to Blackwell, Miniard and Engel (2006) the individuals evaluate their decisions. For farmers' this has an impact on future decisions because it is stored in their memory. When farmers evaluate the decision-making process, they do it consciously in practical parameters, for instance of emergence, winter hardiness and yield. In other evaluations of the process, such as purchases or relationships, the evaluation takes place more unconsciously. Different factors influence this process, for example, feelings during a purchase, which can make it difficult to make an analytical evaluation.

7 Conclusions

The final chapter includes the conclusions and ends with possible future research. The conclusion strives to answer to the aim of the study. *The aim of this study is to clarify farmers' decision-making process regarding the choice of using purchased certified seed or seed from their own preceding year's harvest.* With the analysis as a basis, this study aims to answer the following research questions.

- *How do social networks affect the decision?*
- *How are the operational decisions related to the farmers' strategies?*
- *How does farmers' experience the choice of seed?*

The result can be summarized into the following conclusions:

- The farmers' decision making regarding the choice between certified and farm-saved seed is not considered to be particularly difficult. This is explained by the decision being an operational and repeated decision, which creates a habit and experience.
- The social network influences the farmer's decision-making process. The farmers' get influenced through the different relationships by discussion and information. Salesmen and advisor are important actors in the farmer's social network, which requires trust to be of use for the farmer in their operational decisions. In the social network, the family and relatives confirm the farmer's decision regarding seed use.
- Selectivity occurs in all the phases of the decision-making processes. Selectivity has an important impact on the final decision. The farmers' cognitive process affects the selectivity.
- The economic factors have a clear connection to the choice between certified and farm-saved seed. It is important for farmers to minimize the costs in order to get as large margin as possible. It is important for the farmer to spread the risks for a minimum of an economic impact.
- Experience makes the farmer more secure on the decision but it is not necessarily needed as a farm manager. Farmers have arguments to why they make their decisions regarding seed use, which means that they do not only use the gut feeling which they get from their experience.
- Farmers tend to consciously and concretely evaluate the decision in the form of the crop's properties and yield. However, unconsciously the evaluation takes place in the social and abstract processes of decision-making.

In general, the farmers of this study cannot be compared to the theoretical models altogether. The models that have been used have different structures, which explains why they cannot be compared. The reality seems to be more complex than the models and the purpose of the models is to generally explain a behavior. It turns out that the general behavior theoretical model and the models of lower abstraction levels are a line with each other. This means that one model clarifies the farmers' different behavior according to their cognitive distinction while the other explains the individual decision-making in a deeper and more detailed structure.

The findings are valuable to increase the understanding and clarity of the farmers' behavior in the decision-making process regarding the choice of seed strategy. In addition, this study provides a deeper understanding of a few farmers' decision-making processes regarding their seed use.

Furthermore, it might be interesting for future research to do the same study but with plant protection and fertilizers. The reason this could be interesting is that there are other components the farmer has to take into consideration in the decision-making process regarding plant protection and fertilizers. As most of the farmers have expressed, seed is needed no matter in which crop and variety, and the choice is not so difficult to make. While in the case of plant protection and fertilizer it may be the question of making an action or not. Another possibility would be to do a more in-depth research regarding the SVUF fee and report, how many farmers report in and if they do it correctly.

References

Literature and publications

Aubry, C., Papy, F., Capillon, A. (1997). Modelling decision-making processes for annual crop management. *Agricultural Systems*, Vol 56, No 1 pp. 45-65.

Bell, E. Bryman, A. and Harley, B. (2019). *Business – Research method. Fifth ed.* Oxford: University press. Available: https://books.google.se/books?hl=sv&lr=&id=J9J2DwAAQBAJ&oi=fnd&pg=PP1&dq=objectivism+vs+constructivism+ontology+business&ots=GLBid9SDL&sig=-A_5n8dys37Wxpp9XtudxVGutFk&redir_esc=y#v=onepage&q=objectivism%20vs%20constructivism%20ontology%20business&f=false [2019-05-11]

Bryman, A., and Bell, E., (2015). *Business Research Methods*, 4th ed. Oxford Univ. Press.

Blythe, J., (1997). *The Essence of Consumer Behaviour*. ISBN: 0-13-356502-5 London: Prentice Hall.

Blackwell, R., Miniard, P. and Engel, J. (2006). *Consumer behavior*. 10th ed. Mason, Ohio: Thomson Business and Economics.

Björklund, T. and Nilsson, J. (2014). *Kalkyleringsmodeller i lantbruksföretag*. Alnarp, Sweden. In Swedish.

Creswell, J.W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches. Fourth ed.* Los Angeles: Calif: SAGE.

Deffuant, G., Huet, S. and Amblard, F. (2005). An Individual-Based Model of Innovation Diffusion Mixing Social Value and Individual Payoff Dynamics. *American Journal of Sociology*, 110, 1041-1069.

Daydé, C., Couture, S., Garcia F. and Martin-Clouaire R. (2014). Investingting Operation Decision-Making in Agriculture. *International Congress on Environmental Modelling and Software*. 21.

Gary, R., Stephen Kingwell, R., Galuhko, V. and Bolek, K. Intellectual Property Rights and Canadian Wheat Breeding for the 21st Century. *Canadian Journal of Agricultural Economics* 65 (2017) 667–691.

Gentles, S.J., Charles, C., Ploeg, J. and McKibbin, K.A. (2015). *Sampling in qualitative research: Insights from an overview of the methods literature*. *The Qualitative Report* 20(11), 1772.

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The qualitative report*, 8(4), pp. 597-606.

Halpern, D. (2005). *Social Capital*. London: Polity Press.

Huet, S., Rigolot, C., Xu, Q., De Cacqueray- Valmenier, Y. and Boisdon, I. (2018). Toward Modelling of Transformational Change Process in Farm Decision- Making. *Agricultural Sciences*, **9**, 340-350.

Hansen, M. H., Morrow Jr, J. L., and Batista, J. C., (2002). The impact of trust on cooperative membership retention, performance, and satisfaction: an exploratory study. *The International Food and Agribusiness Management Review*, **5**(1), 41-59.

Kvale, S. and Brinkmann, S. (2014). *Den kvalitativa forskningsintervjun*. Lund: Studentlitteratur.

Kim, P. H. and Aldrich, H. E. (2005). Social Capital and Entrepreneurship. *Foundations and trends in entrepreneurship*, **1**(2): 55-104.

Kool, M., (1994). *Buying Behavior of Farmers*. Wageningen, The Netherlands. ISBN: 90-74134-20-3.

McCown R. L., (2005). New Thinking About Farmer Decision Makers. *The Farmer's Decision: Balancing Economic Successful Agriculture Production with Environmental Quality*. J.L. Hatfield (ed.) Soil and Water Conservation Society, Ankeny, Iowa, USA, pp.11-44.

Martin-Clouaire, R. (2017). Modelling Operational Decision-Making in Agriculture. *Agricultural Sciences*, **8**, 527-544.

Mintzberg, H., Raisinghani, D. and Theoret, A. (1976). The Structure of "Un- structured" Decision Processes. *Administrative Science Quarterly*, **21**, 246-275.

Morfi, C., (2018). *The Structure of the Swedish Seed Industry*. Paper presented at the 22th International Consortium on Applied Bio-economy Research, The World Bank, Washington DC, 2018.

Nelson, R.E., (1989). The strength of strong ties: social networks and intergroup conflict in organizations. *Academy of Management Journal* **32**, 377-401.

Officiella kontrollen av utsäde (2004). *Utsädeskontroll i förändring - 2004:72* Stockholm: Jordbruksdepartementet.

Portes, A. (1998). Social Capital: Its origins and applications in modern sociology. *Annual Review of Sociology*, **24**: 1-24.

Putnam, R. D. (2000). *Bowling Alone: The Collapse and Revival of American Community*. Simon and Schuster paperbacks, New York.

Robson, C. (2002). *Real World Research – Resource for social scientists and practitioner – Researchers*. 2nd ed. Oxford:Blackwell. ISBN: 978-0-631-21304-8.

Rubin, H. and Rubin, I. (2005). *Qualitative interviewing – the art of hearing data*. 2nd ed. Thousand Oaks, CA: Sage. ISBN: 0-7619-2074-9.

Sandberg, J. and Alvesson, M. (2011). Ways of Constructing Research Questions: Gap-Spotting or Problematization? *Organization*, 18(1): 23-44.

SCB (2018). Jordbruksstatistisk sammanställning 2018, Stockholm.

SFS 1976:298. *Utsädeslagen*. Stockholm: Näringsdepartementet.

Smeltzer, L. R. (1997). The meaning and origin of trust in buyer-supplier relationships. *Journal of Supply Chain Management*, 33(4), 40-48.

Trost, J. (2010). *Kvalitativa intervjuer*. 4: e upplagan. Lund: Studentlitteratur.

Weidow, B. (1998). *Växtodlingens grunder*. 1. uppl. Helsingborg: Boktryck AB.

Wilson, P. N. (2000). Social capital, trust, and the agribusiness of economics. *Journal of Agricultural and Resource Economics*, 1-13.

Yin, R. K. (2013). *Case Study Research: Design and Methods*. 5th ed. USA: SAGE Publications.

Öhlmér, B. (2001). Analytic and intuitive decision making - Swedish farmer's behavior in Strategic problem solving. *I: Proceeding of the Third EFITA Conference*, Montpellier, Frankrike.

Öhlmér, B., Olson, K. and Brehmer, B. (1998). Understanding farmers' decision-making processes and improving managerial assistance. *Agricultural Economics* 18, 273-290.

Roberts M., Thomas, A. and Bergez J-E. (2016). Processes of adaptation in farm decision-making models. A review. *Agron. Sustain. Dev.* 36: 64. DOI 10.1007/s13593-016-0402-x

Internet

Jordbruksaktuellt www.ja.se

Lönsamt att ta eget utsäde (2019)

Available: https://www.ja.se/Default.asp?p=43203andpt=105andm=3433andfbclid=IwAR3eTBRHbJw74jwnM7LUvFVu1x2zcDCDwbTKGbEt8EmtNJUr9auIqb_PrkM [2019-01-28]

Eurofins www.eurofins.se

Utsäde (2019)

Available: <https://www.eurofins.se/tjaenster/vaextodling/utsaede/> [2019-02-03]

Swedish Board of Agriculture www.jordbruksverket.se ; statistik.sjv.se

A: Statistikdatabas (2019)

Available: <http://statistik.sjv.se/PXWeb/pxweb/sv/Jordbruksverkets%20statistikdatabas/Jordbruksverk>

ets%20statistikdatabas_Arealer_1%20Riket%20län%20kommun/JO0104B1.px/table/tableViewLayout1/?rxid=5adf4929-f548-4f27-9bc9-78e127837625 [2019-01-21]

B: Företag och företagare (2019)

Available:<http://www.jordbruksverket.se/download/18.563019b71642b2ff18eee280/1530098102447/Kapitel%202%20Företag%20och%20företagare.pdf> [2019-01-21]

C: Utsäde och sorter: Vad får du när du köper certifierat utsäde? (2019)

Available:<http://www.jordbruksverket.se/amnesomraden/odling/utsadeochsorter/vadfarduvidkopavcertifieratutsade.4.1cb85c4511eca55276c8000153.html> [2019-01-21]

D: Utsäde och sorter: Odling av utsäde (2019)

Available:<https://www.jordbruksverket.se/amnesomraden/odling/utsadeochsorter/fordigsomodlarutsade/odlingavutsade.4.1cb85c4511eca55276c8000189.html> [2019-01-22]

E: Sortlistor (2019)

Available:<http://www.jordbruksverket.se/amnesomraden/odling/utsadeochsorter/forutsadesforetag/sortlistor.4.1cb85c4511eca55276c8000312.html> [2019-03-21]

F: Använder du eget utsäde? (2019)

Available:<https://www.jordbruksverket.se/amnesomraden/odling/utsadeochsorter/anvanderduegetutsade.4.50cb902d1234ca17a7e80001285.html> [2019-02-03]

G: Utsäde - skadegörare, analys och behandling (2019)

Available:<https://www2.jordbruksverket.se/download/18.7914403215ba2c445964e55b/1493189514060/be28v2.pdf> [2019-02-04]

H: Kvalitetskrav vid certifiering av stråsådsutsäde (2019)

Available:<http://www.jordbruksverket.se/amnesomraden/odling/utsadeochsorter/vadfarduvidkopavcertifieratutsade/detaljerutsadestrasad.4.2399437f11fd570e67580002123.html> [2019-03-13]

I: Räcker spannmålen till alla? (2019)

Available:<http://www.jordbruksverket.se/amnesomraden/handelmarknad/allmantomhandelsochjordbrukspolitik/ulandsfragor/rackerspannmalenatalla.4.67e843d911ff9f551db800013655.html> [2019-03-13]

Lantmännen www.lantmannenlantbruk.se

A: Sälj din spannmål (2019)

Available: <http://www.lantmannenlantbruk.se/sv/spannmal/salj-din-spannmal/> [2019-03-13]

B: Kontroll and Kvalité ger resultat (2019)

Available:<https://lantmannen.com/vara-agare/tidningen-grodden/kontroll-och-kvalitet-ger-resultat/> [2019-01-22]

Gullviks www.Gullviks.se

Utsäde (2019)

Available:<https://www.gullviks.se/produkter/utsade/> [2019-01-22]

Swedish Agro www.swedishagro.se/

Utsäde (2019)

Available: <http://swedishagro.se/vaxtodling/utsade> [2019-01-22]

SCB www.scb.se/

Åkerarealens användning 1990-2017 (2019)

Available:<https://www.scb.se/hitta-statistik/statistik-efter-amne/jord-och-skogsbruk-fiske/amnesovergripande-statistik/allman-jordbruksstatistik/pong/tabell-och-diagram/akerarealens-anvandning-19902016.-hektar/> [2019-01-29]

Hushållningsällskapet www.hushallningssallskapet.se

Utsädesbetning av mineralnäring för studie (2019)

Available:<http://hushallningssallskapet.se/wp-content/uploads/2016/02/utsadesbetnin-mineralnaring-forstudie.pdf> [2019-02-12]

Personal messages

The farmers

Farmer Adam

Personal meeting, 2019-04-06

Farmer Bert

Personal meeting, 2019-04-07

Farmer Carl

Personal meeting, 2019-04-06

Farmer David

Personal meeting, 2019-04-07

Farmer Edward

Personal meeting, 2019-04-09

Farmer Fredrik

Personal meeting, 2019-04-09

Farmer Gustav

Personal meeting, 2019-04-10

Farmer Hans

Personal meeting, 2019-04-10

Farmer Ingmar

Personal meeting, 2019-04-10

Farmer Joakim

Personal meeting, 2019-04-10

Farmer Kent

Personal meeting, 2019-04-11

Farmer Lennart

Personal meeting, 2019-04-16

Farmer Magnus

Personal meeting, 2019-04-12

Acknowledgment

We would like to thank Jerker Nilsson for his inspiring teaching and constant support during his time of being our supervisor. We would also like to thank Chrysoula Morfi our co-supervisor for her contribution and help in our process. Furthermore, we would like to thank all the farmers' that have participated in the interviews to this study.

Uppsala, June 2019
Angelica Lindkvist & Ida Ottosson

Appendix

1. Introduction to the interview's

Following information was presented for all participants before the interviews. The purpose with this introduction was to not miss any information that was relevant from us to the farmers.

English version

We write a thesis on farmers' choice of seed. Today during the interview, we will ask questions about your company, your plant breeding strategy, your choice of seed, how you experience decision making, social and economic aspects. If you do not understand any of the questions, please ask us to clarify or if you do not feel comfortable or cannot answer any question, just refrain from answering. The purpose of the study is to clarify farmers' decision making regarding the choice of use between certified and farm-saved seed. From this we are interested in how you as a farmer think about the choice between certified and farm-saved seed. If you come up with something during the interview that you find interesting and want to share with us, we appreciate your general thoughts. All farmers will be anonymous in the study and therefore information that can be linked to you or your company will be confidential information to the greatest possible extent.

Do you want to know more about the study before we start?

Do you feel comfortable to record the interview? This will be used for our own research and will be deleted as soon as the results and analysis of the data is completed.

Swedish version

Vi skriver en uppsats som handlar om lantbrukares val av utsäde. Idag under intervjun kommer vi att ställa frågor om ditt företag, din växtodlingsstrategi, ditt val av utsäde, hur du upplever beslutsfattande, sociala och ekonomiska aspekter. Om du inte förstår någon av frågorna får du gärna be oss att förtydliga och om du inte känner dig bekväm eller inte kan svara på någon fråga är det bara att avstå från att svara. Syftet med studien är att klargöra lantbrukares beslutsfattande gällande valet av användning mellan certifierat utsäde och hemmarensat utsäde. Därav är vi intresserade av hur du som lantbrukare tänker kring valet mellan certifierat och hemmarensat utsäde. Kommer du på något under intervjun som du tycker är intressant och vill dela med oss så uppskattar vi dina generella tankar. Alla lantbrukare kommer att vara anonyma i studien och därför kommer information som kan kopplas dig eller ditt företag att i störst möjliga mån vara konfidentiella uppgifter.

Vill du veta något mer om studien innan vi börjar?

Känner du dig bekväm med att vi spelar in intervjun? Detta ska användas för vår egen del och kommer att raderas så fort sammanställningen och analysen av datan är färdig

2. Interview schedule

English version

Introduction,

- Short description about the thesis and the aim
- Tell them they are anonymous
- Audio Recording

Overall issues

The following questions will generally cover your farm.

1. To begin with, you can tell us briefly about your farm.
 - What business lines does the company have?
 - How many hectares does the farm grow?
 - What is your role in business?
 - How long have you run the farm/worked with agriculture?
2. What kind of cereal cultivation do you have?
 - Feeding, - Own seed, - Sale room - Seed for sale
3. Do you have drying and storage facilities?
 - Does it cover the farm's needs?
 - Seed storage?
4. How do you distribute your grain for sale?
 - Farm retrieval?
 - Central grain collection silos
 - Does the central grain collection silos receive all the varieties you want to grow?

Pre-evaluation

5. Which seed did you use for the previous year's crop cultivation?
 - Certified seed?
 - Own seed produced?
6. How did you think about the decision between certified seed or home-cleaned seed?
7. What arguments/motives did you have for the decision?
 - What are the most important aspects of seed?

Certified seed

8. How many options did you have when choosing from the varieties?
 - What made you choose the varieties you did?
 - Did you grow hybrid varieties?
9. What do you think are the benefits of buying seed?
10. What do you think are the disadvantages of buying seed?
 - How do you weigh the pros and cons when choosing seed?

Farm-saved seed

11. What do you think are the benefits of clearing your own?
12. What do you think are the disadvantages of using your own seed?
 - How do you weigh the pros and cons when using your own seed?

Operational decisions

13. How do you feel that your decision making is developing over time?
 - Have you learned anything in your previous decisions that you are now using? For example, a variety works better for you than another.
 - Have you used advice before deciding on seed?

- Do you think the choice will be more difficult over time as new variety options come?
- How much time do you spend on your decision?

Certified seed

14. Last season you bought seed when bought during the year?

- Did you get the quantity and variety you wanted?
- Were you satisfied with the purchase? If not, why?

Farm-saved seed

15. What quantity and what kind of varieties did you clean last year?

- Did you buy grain from someone familiar to clear the seed?
- Did you take a sample for analysis before cleaning the seed?
- How did you clear the seed? Mobile Dry Cleaning? Local?
- Do you treat the seed?
 - For example. Dressing or micronutrient
 - Did you get help with which treatment is needed?

16. Did you plan before sowing to clear your own seed or was it something that you made the decision afterwards?

- If you had planned it before, did you make any special action in the field?

Social network

17. Which actors did you talk to most recently about your choice of seed?

- Employees, family, acquaintances, salespeople.
- When you talk to your sales representative do you think you receive relevant information and advice?
- What do you value in this relationship?
- Do you always use the same seed salesman or compare different companies?
- How do you talk to an advisor about current seed issues?
- Are you familiar with and discussing how your neighbors have done with seed
 - Do you do the same as your neighbors?

18. Do you do the decision about seed yourself or jointly with someone?

19. Of whom did you last sell the seed?

- What do you value when you buy seeds?
 - Price, relationships, quality, fast delivery,

Selectivity

20. Are there any varieties you choose to remove? Why?

21. How do you get your seed and technology information?

- Fairs?, Newspapers ?, Social Media ?, Industry Colleagues?

Economic factors

22. How did you reason about cereal and seed prices when buying seeds?

- Compare prices and varieties

23. Do you think it is economically justified to treat the seed?

Experience

24. Are there any obstacles or limitations when making the decision? E.g. storage space, knowledge etc.

25. What have you learned through your decisions for future decisions?

26. What can you do better next time you make decisions?

Evaluation

27. How do you evaluate a variety after harvesting?

28. Do you wish you had had more time to spend on your decision?

29. Do you wish you had made any other choice with the seed during the last season

- Were you satisfied with your decision?
 - What are the difficulties in decision-making about seed?
30. In the future, are you worried about price changes or lack of seed in the market?
- Is this something that has affected you before?

Swedish version

Intervju schema

Inledning

- Kort beskrivning av uppsatsen och dess syfte
- Berätta att de är anonyma
- Ljudinspelning

Övergripande frågor

Följande frågor kommer att övergripande handla om ditt lantbruksföretag.

1. Till att börja med får du gärna berätta kort om ditt lantbruksföretag.
 - Vilka verksamhetsgrenar har företaget?
 - Hur många hektar odlar gården?
 - Vilken är din roll i företaget?
 - Hur länge har du drivit gården/arbetat med lantbruk?
2. Vilken typ av spannmålsodling har du?
 - Foder, - Eget utsäde, - Avsalu - Utsäde för avsalu
3. Har du torkning och lagringsmöjligheter?
 - Täcker det gårdens behov?
 - Lagring av utsäde?
4. Hur distribuerar du din spannmål för försäljning?
 - Gårdshämtning?
 - Spannmålsmottagning
 - Tar spannmålsmottagningen emot alla sorter som du vill odla?

Alternativ i beslutsfattnings processen

5. Vilket utsäde använde du till föregående års växtodling?
 - Certifierat utsäde?
 - Eget producerat utsäde?
6. Hur tänkte du i beslutet mellan certifierat utsäde eller hemma rensat utsäde?
 - Vilka argument/motiv hade du till beslutet?
7. Vilka är de viktigaste aspekterna när det gäller utsäde?

Certifierat utsäde

8. Hur många alternativ hade du när du valde bland sorterna?
 - Vad gjorde att du valde de sorterna som du gjorde?
 - Odlade du hybridsorter?
9. Vad tycker du är fördelarna med att köpa utsäde?
10. Vad tycker du är nackdelarna med att köpa utsäde?
 - Hur väger du samman för- och nackdelarna när du väljer utsäde?

Hemmarensat utsäde

11. Vad anser du är fördelarna med att rensa eget?
12. Vad anser du är nackdelarna med att använda eget utsäde?
 - Hur väger du samman för- och nackdelar när du använder eget utsäde?

Operationellt beslutsfattande

13. Hur upplever du att ditt beslutensfattande utvecklas över tid?
 - Har du lärt dig något i dina tidigare beslut som du nu använder dig av? Exempelvis att en sort funkar bättre för dig än en annan.

- Har du använt dig av rådgivning innan du fatta beslut om utsäde?
- Tycker du att valet blir svårare med tiden allt eftersom att nya sortalternativ kommer?
- Ungefär hur mycket tid lägger du på ditt beslut?

Certifierat utsäde

14. Senaste säsongen du köpte utsäde när under året skedde köpt?
- Fick du tag i den kvantitet och sort som du önskade?
 - Var du nöjd med köpet? Om inte, varför?

Hemmarensat utsäde

15. Vilken mängd och vilka sorter rensade du förra året?
- Köpte du in spannmål av någon bekant för att rensa till utsäde?
 - Tog du ett prov för analys innan du rensade utsädet?
 - Hur rensade du utsädet? Mobilt renseri? Lokalt?
 - Behandlande du utsädet?
 - T ex. betning eller micronäring
 - Fick du hjälp med vilken behandling som behövs?
16. Planerade du innan sådd att rensa eget utsäde eller var det något som du fattade beslutet efter hand?
- Om du hade planerat det innan, gjorde du några särskilda åtgärder i fält?

Socialt nätverk

17. Vilka aktörer pratade du med senast vid ditt val av utsäde?
- Anställda, familj, bekanta, försäljare.
 - När du pratar med din försäljare tycker du att du får relevant information och rådgivning?
 - Vad värdesätter du i denna relation?
 - Använder du dig alltid av samma utsädes försäljare eller jämför du olika företag?
 - Hur du någon rådgivare du pratar med gällande utsädesfrågor?
 - Är du insatt och diskuterar även hur dina grannar har gjort med utsäde?
 - Gör ni på liknande sätt?
18. Fattar du beslutet om utsäde själv eller gemensamt med någon?
19. Av vilka handlade du utsäde sist?
- Vad värdesätter du när du köper utsäde?
 - Pris, relationer, kvalitet, snabb leverans,

Selektivitet

20. Finns det några sorter som du väljer bort? Varför?
21. Hur får du din information om utsäde och teknik för utsäde?
- Mässor?, -Tidningar?, -Sociala medier?, Bransch kollegor?

Ekonomiska faktorer

22. Hur resonerade du kring priser på spannmål och utsäde när du köpte utsäde?
- Jämför du priser och sorter
23. Tycker du att det är ekonomiskt motiverat att beta utsäde?

Erfarenhet

24. Finns det några hinder eller begränsningar när du fattade beslutet? T.ex. lagringsutrymme, kunskap m.m.
25. Vad har du lärt dig genom dina beslut inför framtida beslut?
26. Vad kan du göra bättre nästa gång du fattar beslut?

Utvärdering av beslut

27. Hur utvärderar du valet en sort efter skörd?

28. Önskar du att du hade haft mer tid att lägga ner på ditt beslut?
29. Önskar du att du hade gjort något annat val med utsädet under förra säsongen?
- Var du nöjd med ditt beslut?
 - Vilka svårigheter finns i beslutsfattande kring utsäde?
30. I framtiden, är du orolig över prisförändringar eller brist av utsäde på marknaden?
- Är detta något som påverkat dig tidigare?