Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Department of Economics

The determinants of a dairy farmer to stay in business

- "the case of Jämtland County"

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Master's thesis· 30 hec · Advanced level
Agricultural Programme - Economics and Management
No 1003 · ISSN 1401-4084
Uppsala 2016

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- **"the case of Jämtland County"**

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Credits: 30 hec
Level: A2E
Course title: Independent project/degree in Economics E
Course code: EX0537
Programme/Education: Agricultural Programme - Economics and Management

Faculty: Faculty of Natural Resources and Agricultural Sciences
Place of publication: Uppsala
Year of publication: 2016
Name of Series: Degree project/SLU, Department of Economics
No: 1003
ISSN 1401-4084
Online publication: http://stud.epsilon.slu.se

Key words: dairy production, *decision-making, economics of scale/size, future, Jämtland County, ordered probit model, strategic management*

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Acknowledgements

First of all I would like mention how thankful I am for the time that I got to spend at the Swedish University of Agricultural Sciences (SLU). It has been a pleasure to be an SLU student and the University has given me not only great knowledge, but also a possibility to study abroad as well as friends for life. For that I'm forever grateful.

I would like to take the opportunity to thank my supervisor Professor Yves Surry at the Department of Economics, SLU for all his help and support throughout the writing process of this thesis. If it wasn't for his knowledge, ideas and tremendous patience I would never have been able to finish this work. Thank you! I would also like to thank my assistant supervisor Margareta Persson and her colleagues Eva Engström, Helena Eriksson and Jöran Hägglund at the County Administrative Board in Jämtland County for giving me the opportunity, support and help making it possible for me to conduct this research.

I would also like to thank all the dairy farm owners/farm managers that responded to my survey as well as participated in the interviews I conducted. If it wasn't for your valuable thoughts, opinions and experiences this thesis would never have been completed. A great thanks to you all!

Additionally I would like to thank my family and friends for your support throughout this writing process, with a special thanks to my lovely parents and grandmother who always believe in me. Thanks to you all I managed to complete this thesis.

Last but not least I would like to finish off by dedicating this thesis to my wonderful grandfather who has been one of my strongest supporters throughout my life.

January 2016
Linnea Högberg

Abstract

Agricultural production essential for human livelihood generating: food, fiber, and ecosystem services is conducted worldwide. All since the introduction of modern technology within the agricultural sector the productivity rate on farm level has increased significantly (Zvelebil & Dolukhanov, 1991) and farm units have become larger in size (MacDonald *et al.*, 2000). In Western Europe such development has led to a decrease in the number of farmers conducting production and Sweden is no exception (The Swedish Board of Agriculture, 2012). All since 2005 the number of Swedish dairy farmers conducting production has declined with 21 % (LRF Milk, 2015a), as for the case of Jämtland County the corresponding number is 50 % (LRF Milk, 2014:pers., com., Eriksson, 2015). Furthermore the overall rate of cattle grazing in the region has declined with 13 % during the same period of time (LRF Milk, 2015c). The reduction in the number of cattle grazing contributes to a number of societal consequences in Jämtland County: discouraging biodiversity (Jämtland County Administrative Board, 2010), taking fertile agricultural land out of production (Bruinsma, 2009) and decreasing the number of job opportunities in rural areas (SN, 2015).

Given the information above the aim of this study was to identify factors, if any, influencing dairy farm owners/farm managers in Jämtland County when making a business related decision with respect to further dairy farm maintenance. The objective of the study was also based on the findings to comment on the future of Jämtland County's dairy sector. The data used to conduct the analysis was collected through a mixed method approach, using surveys and interviews.

The results from the quantitative study (surveys), according to estimations from an ordered probit model showed that the farm owners/farm manager in Jämtland County considered the following factors when making decisions with respect to further dairy farm maintenance, the number of employees on farm level, the farmers year of birth (age) and the parameter uncertainty (changes in weather conditions, outbreaks of various diseases and pests). Furthermore the study showed that the farm location seemed to be of significance, as a producer operating in Åre County was less likely to maintain production over time.

The results of the qualitative study (case studies, interviews) showed that dairy farm owners/farm managers in Jämtland County considered factors such as availability of new technology, agricultural land and labor, together with their family situation, possibilities to co-operate with other producers geographically, regulations related to production and the option of receiving financial support from the EU and Swedish Government when making business-related decisions with respect to further dairy farm maintenance.

Sammanfattning

Jordbruksproduktion bedrivs i hela världen och är nödvändig för människors överlevnad genom att genera: livsmedel, fiber och ekosystemtjänster. Introduceringen av modern teknologi i jordbruket har lett till att produktiviteten ökat på gårdsnivå (Zvelebil & Dolukhanov, 1991) samtidigt som gårdarna expanderat i storlek (MacDonald *et al.*, 2000). I Västeuropa har denna utveckling lett till en minskning i antalet aktiva lantbrukare där Sverige inte är ett undantag (The Swedish Board of Agriculture, 2012). Antalet svenska mjölkproducenter har minskat med 21 % sedan 2005 (LRF Milk, 2015a), där motsvarande siffra för Jämtlands län är 50 % (LRF Milk, 2014): (pers., com., Eriksson, 2015). Under samma tidsperiod har även antalet betande nötkreatur i regionen minskat med 13 % (LRF Milk, 2015c). Att ett mindre antal nötkreatur finns i området får en mängd konsekvenser för det Jämtländska samhället i stort. Detta genom att påverka biodiversitet negativt (Jämtland County Administrative Board, 2010), minska antalet hektar produktiv jordbruksmark (Bruinsma, 2009) och bidra till att färre arbetstillfällen finns tillgängliga på landsbygden (SN, 2015).

Givet den information som presenterats var syftet med denna studie att undersöka vilka faktorer, om några, som Jämtländska mjölkproducenter tog hänsyn till när de tog beslut om ett fortsatt mjölkföretagande. Målet med studien var också att baserat på det eventuella resultatet att kommentera framtiden för Jämtländsk mjölkproduktion. Data som användes för att genomföra analysen samlades in genom två olika typer av metoder, d.v.s. enkäter och intervjuer.

Resultaten från den kvantitativa studien (enkäter), enligt estimering från en så kallad ordered probit modell, visade att mjölkproducenter i Jämtlands län tog hänsyn till följande faktorer när de tog beslut gällande ett fortsatt mjölkföretagande, antalet anställda på gårdsnivå, lantbrukarens födelseår (ålder) och parametern osäkerhet (väderomslag, smittspridning av sjukdomar och angrepp av skadedjur). Vidare visade studien att gårdens geografiska placering synes påverka en mjölkproducents beslutsprocess gällande ett fortsatt mjölkföretagande, då en lantbrukare som bedrev produktion i Åre kommun var mindre benägen att fortsatt bedriva produktion över tid.

Resultaten från den kvalitativa studien (fallstudier, intervjuer) visade att Jämtländska mjölkproducenter tog hänsyn till faktorer så som tillgången på modern teknologi, jordbruksmark, arbetskraft på gårdsnivå, deras familjesituation, möjligheten att kunna samarbeta med andra producenter i det geografiska närområdet, regler relaterade till produktionen och chanserna att kunna få tillgång till finansiella stöd från EU och den Svenska Staten, när de fattade beslut i sitt mjölkföretag.

Abbreviations

CAP	Common Agricultural Policy
EU	European Union
LFA	Less favored area

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1- Introduction

Agricultural production is conducted worldwide being essential for human livelihood generating food, fiber, and ecosystem services. Emerging into farming has been revolutionary for humanity, forming the modern day society. Over the years yields have increased significantly a result of an introduction of commercial fertilizers, pesticides and plant breeding in production (Kirchmann & Thorvaldsson, 2000).

Tilman *et al.* (2011) showed that as the world population continuously grows the future demand for food and fiber is ought to increase. Previous research has shown that the total global food supply has to more than double during the upcoming 50 years in order to fulfill the overall demand (Tilman *et al.*, 2002). On the same note Steinfeld *et al.* (2006) stated that as the population becomes more affluent they tend to change their way of consuming goods, demanding livestock products to a higher extent.

Olesen & Bindi (2002) showed that the growing season is likely to stretch in the Northern hemisphere. They predicted that such development would be a result of an increase in global temperature, making it beneficial to produce agricultural products in remote areas. In relation to this statement Bruinsma (2009) also made it clear that agricultural land shouldn't be taken out of production, as it's likely to be needed for the purpose of food and fiber production in the future.

Agricultural production is associated with a number of constraints such as availability of land, capital and labor. A farmer will therefore have to consider all these aspects (Debertin, 2012) in relation to public policies when making business-related decisions (Abraham, 2013). In Western Europe, were Sweden is no exception the average farm units have increased in size all since the 1950s (The Swedish Board of Agriculture, 2012:MacDonald *et al.*, 2000). Such development has been possible due to the highly mechanized production (MacDonald *et al.*, 2000), a result of the increased level of technology used on farm level (Bragg & Dalton, 2004).

During the past 25 years nine out of ten Swedish farm owners/farm managers have been forced to stop conducting agricultural production. This development contributes to a range of negative consequences for the entire society, for example by reducing the number of available job opportunities in rural areas as well as a loss in terms of knowledge on best agricultural practices (Wästfelt, 2015). Even if the farm units in Sweden have had a tendency to increase in size, large areas of agricultural land has been taken out of production nationally (The Swedish Board of Agriculture, 2013). Agricultural land taken out of production is often deforested or used for development of buildings and infrastructure. Agricultural land has mainly been taken out of production as an extension of an increased level of efficiency on farm level due the use of new technology. This in combination with farm owners/farm managers difficulties achieving profitability in production as business in conducted on a world market (The Swedish Board of Agriculture, 2013).

Managing agricultural land through various practices, especially by having cattle grazing is essential in order to enhance biodiversity (Swedish Environmental Protection Agency, 2012). According to Swanson (1997) farm owners/farm managers play an important role in such work by performing agricultural practices on a daily basis. Furthermore enhancement of

biodiversity is of such importance that the Swedish Parliament has implemented an objective called "A varied agricultural landscape" which is one out of 16 environmental quality objectives (Swedish Environmental Protection Agency, 2012).

Jämtland County with its 126 760 citizens (Statistics Sweden, 2010b) is located in the North Western part of Sweden, see figure 1. Agricultural practices are carried out in all (eight) municipalities on County level with intensification around the lake Storsjön. Approximately 58 000 hectares of land, 1 % of the County area is used for agricultural production, where 73 % of that land is used to produce ley and other crops and the remaining land is classified as pastureland (Jämtland County Administrative Board, 2015). 64 % of the County area is covered by forest (Statistics Sweden, 2010a). The growing season in the County is short but intense, and rapid changes in terms of weather conditions may occur (Jämtland County Administrative Board, 2011).

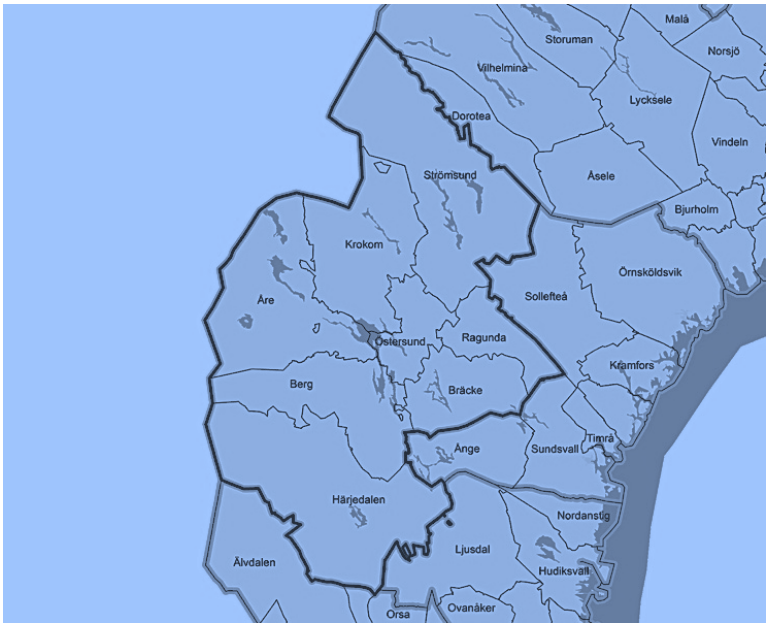

Figure 1. Map of Jämtland County
Own processing after information from (Valmyndigheten, 2009: Jämtland County Administrative Board, 2015)

The level of entrepreneurship in the region is strong and a large proportion, approximately 68 % of the producers operate a small-scale agricultural production (Engström, 2015). The dairy farms in general play an important role in terms of generating additional job opportunities, apart from providing the farmer with employment. According to statistics a single dairy farm provides an average of five job opportunities in rural areas (SN, 2015). In 2014 the number of agricultural firms in Jämtland County were 1570 (The Swedish Board of Agriculture, 2014b), providing employment for approximately 4000 people with an annual turnover of one billion SEK. The milk produced in the County is delivered to either the companies Arla Foods or Norrmejerier (pers., com., Westman, 2015) . The price paid per liter milk is adjusted according to the world market price (Arla Foods, 2015).

In terms of financial support the farmers in Jämtland County annually receive approximately 252 million SEK from by the EU and the Swedish Government for various purposes. The three major financial supports provided to farmers in the region are the single farm payment (31 %), compensatory aid (22 %) and the support for ley production (20 %), (Engström, 2015). On average 35-40 % of the profitability within agricultural firms in the region is

generated by financial support from the EU and the Swedish Government (pers., com., Persson, 2015).

In Jämtland County it's common for producers to adapt to new technology as well as diversify their production (Engström, 2015). The most common complement to agricultural production are forest management (79 %) (The Swedish Board of Agriculture, 2007), various entrepreneurial activities (12 %) and tourism (23 %). These activities contribute to somewhere in-between 10-50 % of the agricultural firms annual turnover (The Swedish Board of Agriculture, 2014a). The tourism industry is important to Jämtland County, by providing an annual turnover of 3, 5 billion SEK (ÖP, 2010), which is approximately 13 % of the regional annual turnover with respect to both goods and services (Swedish Agency for Economic and Regional Growth, 2015). 40 % of the farm owners/farm managers conducting production are under the age of 40 whereas 35 % of the producers are older than the age of 50 (Engström, 2015). The majority of the population in the region has completed a two year secondary education as their highest level of education (Statistics Sweden, 2015).

1.1 Problem

During the past 10 years the number of farm owners/farm managers in Sweden conducting dairy production has declined by 21 % (LRF Milk, 2015a). The same trend is visible in Jämtland County, a region that has experienced a 50 % decline in the number of active dairy producers during the same time period (The Federation of Swedish Farmers – LRF Milk, 2015a:pers., com., Eriksson, 2015). The overall number of cattle grazing in Jämtland County has declined by 13 % since 2005 (LRF Milk, 2015c). According to the County Administrative Board in Jämtland County such development is a result of a reduced number of active dairy producers regionally (Jämtland County Administrative Board, 2015:The Swedish Board of Agriculture, 2013) as 65 % of all beef produced comes from dairy farms (Swedish Meat, 2015).

The beef-and dairy sectors play an important role for the overall agricultural productivity in Jämtland County, especially when considering land use. Approximately 40 % of the agricultural land in the County is utilized for beef-and dairy production purposes (The Swedish Board of Agriculture, 2013). This is mainly a result of the beneficial climate for production of ley, a necessary input in production when keeping cattle (Jämtland County Administrative Board, 2015).

As previously stated nearly two out of three dairy farm owners/farm managers in Jämtland County have stopped conducting dairy production during the past 10 years. The number of active producers have been reduced of 260 dairy producers in December 2005 (LRF Milk, 2014), to 129 dairy producers in January 2015 (pers., com., Eriksson, 2015), see figure 2.

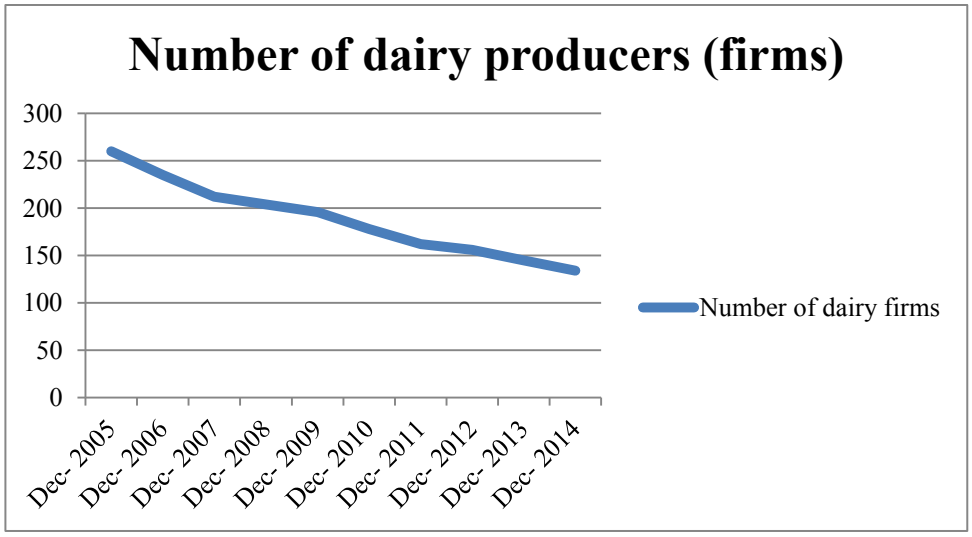

Figure 2. Number of dairy farmers (firms)
Own processing after information from (LRF Milk, 2015a:pers., com., Eriksson, 2015)

In December 2005 the number of cows producing milk on County level was 9,551 compared to the number 7,449 in December 2014, a 22 % decline (The Swedish Board of Agriculture, 2014b), see figure 3.

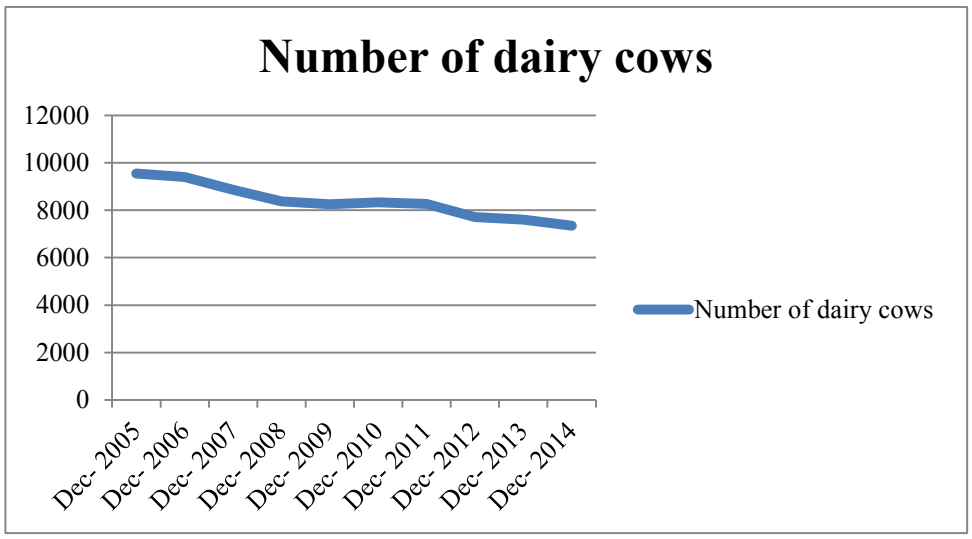

Figure 3. Number of dairy cows
Own processing after information from (The Swedish Board of Agriculture, 2014b)

The decline in the number of dairy farm owners/farm managers conducting production on County level contributes to a range of negative consequences for the entire society. According to previous research having animals grazing is crucial in order to keep the landscape open preserving natural-and cultural values as well as enhancing biodiversity (The Swedish Board of Agriculture, 2013). Beef-and dairy producers play an important role generating such landscape through the practices they perform (Swedish Environmental Protection Agency, 2012). An open landscape provides beneficial conditions to carry out tourism activities in Jämtland County (Jämtland County Administrative Board, 2010). If land management isn't conducted in a way where it's kept open in favor of such activities the tourism sector in itself might experience substantial economic losses.

Olesen & Bindi (2002) showed that the growing season most likely is going to stretch in the Northern hemisphere, as a result of an increase in global temperature making it beneficial to produce food and fiber in these areas. Tilman *et al.* (2002) stated that the global production of food and fiber has to more than double within the next 50 years in order to fulfill the overall demand. Bruinsma (2009) showed that agricultural land therefore shouldn't be taken out of production, since the land will be needed for agricultural production purposes. Given this information preservation of agricultural land in Jämtland County can be essential in order to fulfill future food, animal feed and fiber needs especially since the land is fertile (Jämtland County Administrative Board, 2014).

Dairy farms are often considered to be core businesses in rural areas. One single dairy farm in Sweden generates five other job opportunities elsewhere in the economy (SN, 2015). Losing a dairy producer as a result of a farm exit may therefore lead to negative consequences for an entire community, especially since a farm often is operated by a family unit. Entrepreneurs serving farm owners/farm managers would be forced to move elsewhere in order to find a job leaving behind a depopulated society struggling to keep services as schools, healthcare and retailers as the population isn't large enough for such businesses to sustain (Skarelius Lille, 2015).

Given the information listed above it's necessary to identify the reasons that potentially could explain the decline in the number of active dairy farm owners/farm managers in Jämtland County, if the ambition is to change the current development.

1.2 Aim and methods

This project was initiated carried out on behalf of the County Administrative Board in Jämtland County. The aim of this study is to identify factors, if any, influencing dairy farm owners/farm managers in the region as they made a business related decision with respect to further dairy farm maintenance. The objective of the study was also based on the findings to comment on the future of Jämtland County's dairy sector.

In order to fulfill the aim, this study will address the following research questions:

1) If a farm owner/farm managers is ought to continue his/her dairy production in a time period of five years from now, what factors, if any, will he/she consider when making such decision?

1) If a farm owner/farm manager considers a certain factor when making a business related decision with respect to further dairy farm maintenance, why is such factor of importance?

This research seeks to provide knowledge that potentially could be used by the County Administrative Board in Jämtland in their continuous work supporting dairy producers regionally.

In terms of the empirical material all farmers in Jämtland County conducting dairy production in January 2015 a total of 129 producers were asked to participate in the study. 125 dairy farm owners/farm managers received a survey by postal mail and four producers were interviewed. The interviews could be considered as a case study. Data was collected no matter of production method used (conventional or organic), the herd size, the number of full-time

employees, the number of years in production, the business structure, or the technical equipment used on farm level. Data was collected during May 2015 to July 2015.

1.3 Scope and delimitations

The scope of this study will focus on identifying the factors, if any, influencing dairy farm owners/farm managers in Jämtland County when making a decision with respect to further dairy farm maintenance. This study was also ought to only focus on the decision-making process of the dairy farm owners/farm managers regionally, as the work had been to extensive if considering such process for all producers keeping cattle in the region. The initiator of this project was interested in knowing why dairy farm owners/farm managers in Jämtland County had decided to exit production during the years 2006 to 2014. In order to answer such question a survey was sent by postal mail to these producers. The main findings from this survey however aren't included in this thesis but available upon request from the writer. In this thesis the size/scale of a dairy farm was distinguished by the number of cows kept in production, this in order to avoid having two variables such as the amount of agricultural land cultivated often used to determine the farm size and the size of herd explaining the same thing.

Knowledge in terms of potential factors influencing dairy farm owners/farm managers in Jämtland County when making business related decisions with respect to further dairy farm maintenance constitutes for a theoretical gap. Hansson & Ferguson (2011) identified such factors affecting producers in central parts of Sweden when making a decision to further develop the farming business as opposed to maintain production intact, or exit. On the same note Hansson (2007) studied the driving and restraining forces on dairy operation linked to strategy and how such aspects affected the overall farm performance. There are similarities between the study subject to this thesis and the research by Hansson (2007) especially in terms of the theoretical framework used. The theoretical framework used for the analysis in this study is delimited to include the concepts of (dis) economies of scale, (dis) economies of size, comparative advantage and strategic management.

1.4 Outline

This thesis consists of seven chapters, see figure 4. *Chapter 1* includes an introduction to the research problem together with a problem statement. This chapter also entails the aim, scope and the delimitations of the study. *Chapter 2* holds a presentation of the theoretical framework and the literature review used to carry out the analysis. C*hapter 3* contains a presentation of the conceptual framework and methods used to conduct the study. *Chapter 4* contains the empirical findings of the study. *Chapter 5* holds an analysis and a discussion linking the empirical findings to the theoretical framework and evidence from the literature review. C*hapter 6* includes the conclusions together with suggestions on further research.

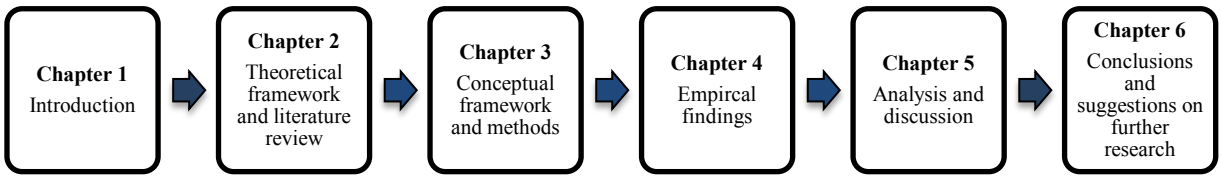

Figure 4. Illustration of the thesis outline

2- Theoretical framework and literature review

This chapter develops the theoretical framework of this thesis and holds a literature review. The theoretical framework is based on the concepts (dis) economies of scale and size and comparative advantage presented together with a strategic management model in which the findings from the literature review are categorized. The concepts (dis) economies of scale, (dis) economies of size and comparative advantage are presented in order to establish the theoretical framework needed, when striving to achieve the aim of this research.

MacDonald *et al.* (2000) showed that the average farm size in Western Europe has increased significantly all since the 1950s. Brady (2007) stated as agricultural production is conducted on a competitive world market and therefore producers are forced to adjust their production accordingly often with respect to cost minimization. Additionally, according to Debertin (2012) agricultural production is performed with respect to a number of constraints.

Given these circumstances the researcher is ought to believe that farm owners/farm managers will consider the concepts (dis) economies of scale, (dis) economies of size and comparative advantage when making a decision with respect to further dairy farm maintenance, as they strive to cut costs in production to remain profitable. Previous studies on decision-making within agricultural businesses are reviewed in order to understand the role of this study. A brief introduction of a farm owner/farm managers general decision-making process according to Lunneryd (2003) is presented, to understand the various steps taken by a producers when making decisions related to production. This section also includes a deliberation of the overall goal of a business venture, according to Bakka *et al.* (2006) and Debertin (2012), as producers in Jämtland County most likely will strive to achieve such targets when conducting production.

At the end of this chapter a strategic management model developed by Hansson (2007) is presented. This model is used in order to categorize different factors that according to the extensive literature review may influence a dairy producer when making a decision to maintain or exit dairy production. The choice of using this strategic management model came about, as it was developed to categorize potential factors that could influence Swedish dairy farmers when making decisions with respect to further dairy farm maintenance.

2.1 Economies of scale, economies of size and comparative advantage

Economies of scale and economies of size are common concepts found in a number of business related areas. According to Pindyck & Rubinfeld (2009) a firm operating on a larger scale have the chance to benefit from the concepts economies of scale and economies of size in a number of ways. These reasons are listed below and may or may not be relevant to agricultural production.

The firms' average cost of production is likely to decline as the level of output increases, something that may occur as a result of the following reasons (Pindyck & Rubinfeld, 2009):

1) Workers in an operation of a larger scale have a chance to perform tasks in which they are most efficient.
2) A firm operating on a larger scale is often more flexible in terms of the combination of inputs used in production. A manager in such operation might have an opportunity to adjust the inputs used accordingly and therefore improving the level of efficiency in production.
3) A manager operating on a larger scale may have a chance to purchase inputs needed in production at a lower cost, this due to bargaining power by buying in bulk.

In some cases, a producer is likely to experience an increase in the average cost of production as the level of output increases, three reasons may explain such shift (Pindyck & Rubinfeld, 2009):

1) In the short run, a production increase may limit a producer in terms of performing his/her daily tasks efficiently as a scarcity of inputs such as machinery or buildings may occur.
2) A manager may find it difficult to manage a larger operation as the number of duties associated with production increases and become more complex.
3) The advantage of buying larger quantities may not be present once reaching a certain production level. In this case the available supply of inputs needed to conduct production may be limited, leading to an increase in costs.

Pindyck & Rubinfeld (2009) define the concept of economies of scale as a situation in which a firm can double the level of output without doubling the cost associated with such action. The opposite condition of economies of scale is called diseconomies of scale. This concept occurs when the costs more than double as the level of output generated increases two times.

According to Debertin (2012) (dis) economies of size exist when the level of output change. All levels of inputs don't have to change proportionally. This concept can describe what will happen to the costs per unit produced when the quantity of output for example is doubled or halved whereas the level of inputs won't increase proportionally. Allen *et al.* (2009) stated that producers operating according to economies of scale and size have a possibility to benefit from the concept of comparative advantage. Producers may take advantage from such notion as they specialize in production, focusing producing one single good.

Debertin (2012) showed that agricultural production is operated with respect to a number of constraints such as available, land, capital and labor. This means that the agricultural sector differs from other sectors where production is conducted. Furthermore Debertin (2012) found

the concept of economies of scale is stricter compared to the concept economies of size. This as the concept of economies of scale refers to the fact that inputs and outputs change proportionally whereas economies of size doesn't.

In terms of agricultural production economies of scale and economies of size may occur as a farm owner/farm manager is able to spread fixed costs on a larger amount of output produced. He/she can in this case use the same set of equipment on a larger area of agricultural land cultivated or keep additional animals in a barn without increasing the actual barn size (Debertin, 2012). Furthermore a farm owner/farm manager may also benefit from the previous stated concepts by using bargaining power, cutting the costs of inputs (seeds, animal feed or fertilizers) when demanding larger quantities.

Diseconomies of scale and diseconomies of size in agricultural production can take place as a farm owner/farm manager is obliged to hire additional labor in order to manage additional units of agricultural land or animals. Up to this point the farm owner/farm manager may have been able to operate the production successfully due to his/her skillset. The additional labor hired however may not possess the same knowledge as the farm owner/farm manager and as a result the cost of production could increase. Additionally the previous stated concepts can become reality as a farming operation increases to such an extent where the assumption of a purely competitive model isn't met. As a result the large-scale operation will determine a certain price of the inputs needed in production and may no longer be able to sell the output produced at the given market price.

2.2 Strategic management

Cook & Hunsaker (2001) define strategy as a plan that considers the organization, finances, implementation process, control, improvement and potential goal-reformulation, all in all to achieve a certain production target. Allen *et al.* (2009) elaborate on the complexities of the managerial life, stating that all decisions made by a manager can be classified as strategic or non-strategic. The non-strategic decisions won't involve other people and their actions whereas strategic decisions on are characterized by interactive payoffs. This means that the consequence of a manager's decision-making won't only depend upon his/her own actions taken but also by other managers' actions carried out in the near environment.

Lunneryd (2003) showed that a farm owner/farm manager's decision-making process consists in four different steps such as, problem detection, problem definition, analysis/choice and implementation. Managers tend to create a strategy as they strive to maximize an outcome given a controlled set of variables. In this case a manager may have the ability to control some of these variables whereas some of them are beyond their control (Allen *et al.*, 2009). Bakka *et al.* (2006) stated that stakeholders strive to make rational decisions. Rougoor *et al.* (1998) showed that such decisions most likely never will be made as the decision maker may face lack of information or knowledge in order to act completely rational. In the context of agricultural production Debertin (2012) showed that a farm owner/farm manager instead would strive to make a reasonable decisions with a profit-maximizing outcome, given a number of constraints. The farm owner/farm manager will therefore have to consider all these aspects when making business-related decisions i.e. forming a strategy (Harling & Quail, 1990).

Lee *et al.* (1999) distinguished three levels influencing a farm owner/farm managers' ability to form a strategy namely, the internal, external, and operational environment. Within these

levels/environments it's possible to find a number of factors affecting further farm maintenance. The internal environment corresponds to an area where the farm owner/farm manager has full control. The external environment relates to an area being out of control for the farm owner/farm manager whereas the operational environment constitutes an area where the producer has some control.

Gasson *et al.* (1988) showed that an additional dimension should be included when discussing strategic management within the agricultural sector, the so-called micro-social environment. This in particular since a vast majority of all farms are run by a family unit, co-operating with other agricultural businesses in the geographical area.

Hansson (2007) combined the internal, micro-social, external and operational environments previously presented in a model, see figure 5. This model will function as a theoretical framework when identifying and categorizing the factors, if any, influencing a farm owners/farm managers' decision-making process with respect to further dairy farm maintenance. The findings from the literature review are included in this model in order to make it easy for the reader to grasp the material.

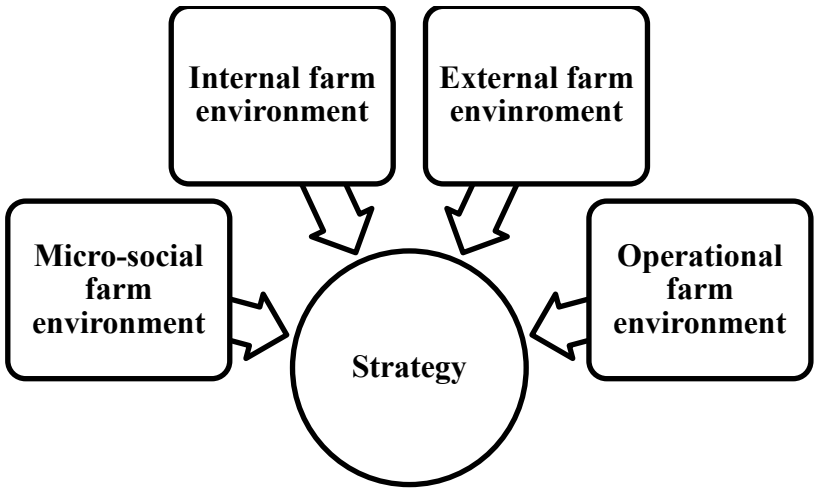

Figure 5. Framework to identify factors affecting the decision-making process
Own processing after information from (Hansson, 2007)

2.3 Previous studies

2.3.1 Internal environment

Debertin (2012) stated a farm owner/farm manager will make business related decisions in an attempt to maximize profit by minimizing cost of production with respect to number of constraints such as availability of agricultural land, capital and labor. According to Gloy *et al.* (2002) a farm owner/farm manager would have to consider the level of financial performance in the business venture in order to profit maximize. The level of financial performance is for the most part explained by the productivity rate within production, a result of the amount of modern technology used on farm level.

The level of technology used on farm level contributes to a farm owner/farm manager's perception of future farm maintenance. Farmers investing in new technology are more likely

to maintain production and further invest in the business, compared to a producer sticking to old technology (Jones, 1999). In terms of a dairy operation the productivity rate may be influenced by factors such as the production system used (milking robot), the herd size as well as the average production per cow (Gloy *et al.*, 2002). The number of cows kept in production often corresponds to the general farm size. Producers conducting dairy production with smaller herds tend to be inefficient, facing higher costs of production compared to large-scale operations (Tauer, 2001).

A farm owner/farm manager specializing in production is more likely to maintain a high level of profitability compared to producers diversifying in production. Furthermore a farm owner/farm manager may be able to cut costs in production achieving a higher level of profitability if preventing outbreaks of diseases, in this case the herd will generate a higher value of the milk produced (Bragg & Dalton, 2004).

The history of a business can explain when in time a farm owner/farm manager is more likely to maintain or exit production. From a business cycle analysis point of view an exit often occurs during the consolidation phase rather than during the start-up and maturity process (Bragg & Dalton, 2004).

2.3.2 Micro-social environment

Hansson (2007) showed that a farmer is ought to consider aspects that are related to the social-and family situation when making business related decisions in regards to the farming operation. Bragg & Dalton (2004) showed that farmers in general and dairy farmers in particular are highly dependent on the possibility of purchasing inputs needed in production from neighboring enterprises. Stam (1991) followed up on this notion stating that farm owners/farm managers with the ability to co-operate with other producers in the agricultural sector geographically are more likely to remain in business. According to Källström & Ljung (2005) farm owners/farm managers found it important to have the ability of sharing knowledge among each other so-called "collaborative learning". This in order to feel appreciated for the work conducted.

According to Gale (1994) farm owners/farm managers will consider the aspect of age when making a decision with respect to further dairy farm maintenance, where an older producer is more likely to exit production compared to a younger one. Furthermore producers of a higher age will consider the possibility of being able to pass on the business to a family member/other person, a so-called successor. If such option isn't present the farm owner/farm manager has less incentives to further invest in the business (Calus & Van Huylenbroeck, 2008) as well as to increase the amount of land cultivated. He/she will most likely instead decrease the amount of land cultivated prior to an exit (Gale, 1994). According to statistics from LRF 40 % of all Swedish farmers currently have reached an age of 65, meaning that they are planning on retiring in favor of a successor within a time period of 2-3 years (Land, 2014).

Being a farm owner/farm manager is associated with many risks. According to studies performed in the US, farmers and especially the ones over the age of 55 are subject to substantially higher risks of injury and mortality. In primary agricultural production it's common for producers to get hurt when handling machinery or livestock (Amshoff & Reed, 2005). Amshoff & Reed (2005) showed that there's a clear linkage in-between a farmer's status of health and his/her performance. Health as a factor may influence a farm owner/farm

manager when making a decision to either maintain or exit production. This since poor health may affect the farm profitability negatively. According to Viira *et al.* (2009) a farm owner/farm manager is in need of mental and physical support from family members in order to manage production successfully, if such elements are missing such circumstances may constitute for a farm exit.

It has become more and more common for farm owners/farm managers to find jobs elsewhere in the economy away from the primary production. These jobs are often considered as off-farm employment (Goetz & Debertin, 2001). Income generated off-farm is stated to contribute to the quality of life for a farm owner/farm manager. Bjornsen & Mishra (2012) showed that off-farm employment could be considered as a risk reduction parameter with regards to the primary production. The income that is received off-farm could in this case be used within the farming business for various purposes compensating for a low profitability. According to Goetz & Debertin (2001) off-farm employment may contribute to a higher rate of farm exits. Boehlje (1992) showed that such development constitutes for a sociological response, where the risk of receiving a low-income on the farm forcers farm owners/farm managers out of production.

Öhlmér *et al.* (1998) showed that the level of education is ought to influence the decision-making process of a farm owner/farm manager. According to Kimhi & Bollman (1999) a farmer is likely to exit farming when finding an off-farm job. This as such employment, which often is possible due to an education, provides a higher level of utility compared to the job on farm level.

2.3.3 External environment

The aspect of uncertainty is considered to be out control for the farm owner/farm manager, making it difficult to predict the actual outcome of production. In reality uncertainty may constitute for changes in weather and outbreaks of various diseases (Debertin, 2012).

Public policies could be considered as an element that is out of control for the farm owners/farm managers. Hansson (2007) showed that many farm owners/farm managers' often experience that they have slim possibilities of influencing public policies, policies that affects how they can and should carry out production. Additionally Bentley *et al.* (1990) and Gale (2003) stated that such policies may force a farm owner/farm manager out of business.

The Common Agricultural policy (CAP)

The Common Agricultural Policy (CAP) implemented by the EU to a certain extent affect how farmers carry out their agricultural practices. This since the policy entail regulations with respect to animal welfare, land management, human health and additionally provide the farm owner/farm manager with the option of receiving various financial supports.

The premises for CAP were set up in 1957 through the "Treaty of Rome". The policy included five main objectives, 1) to enhance agricultural production, 2) guarantee that the farmers could stay in business, 3) stabilize the markets for agricultural commodities (supply and demand), 4) ensure food security and 5) ensure for food being affordable (The Swedish Parliament, 2015).

In order to reach the previously stated objectives three principles with respect to the agricultural commodity market within the EU were established, 1) introduction of guaranteed

prices a so-called intervention price, 2) promotion of sales and purchases of goods produced in the EU and 3) creating of a budget set aside for agricultural purposes in which all member states had to contribute to. Over the years CAP as a policy has faced major structural changes, and the current reform is built upon two pillars, pillar 1 and 2 (The Swedish Board of Agriculture, 2015a).

Pillar 1

In the current reform pillar 1 includes financial support provided to farmers in a form of direct payments together with market management measures (European Commission, 2013). In 2007 the direct payment represented 26 % of the average farm income compared to 33 % in 2009 (European Commission, Agriculture & Rural Development, 2011). The direct payments are primarily provided to a farm owner/farm manager in a form of basic income support (European Commission, 2015a).

The direct support is a financial support that a farm owner/farm manager can obtain no matter of crops cultivated as long as the land is managed according to the EU regulations. The farm owner/farm manager will in this case achieve financial support in relation to the number of hectares of land cultivated. Prior to this reform farm owners/farm managers achieved a financial support according to amount of output generated (The Swedish Parliament, 2015).

The direct support is called single farm payment (The Swedish Parliament, 2015). In order for producers in the EU to be entitled to such payment agricultural production has to be conducted on at least four hectares of land (arable-and pastureland) with payment entitlement and the farm owner/farm manager has to fulfill the cross-compliance. The cross-compliance are regulations considering aspects such as, the environment, animal welfare and human health (Stora Enso 2014).

Pillar 2

Pillar 2 of the CAP focuses on environmental-and rural development. These policies are created to support and promote farmers as well as entrepreneurs to stay in business in rural areas. The second pillar is co-financed by the EU and the member states. In the Swedish during the program period 2014-2020 36 billion SEK can be distributed to farm owners/farm managers nationally for various agricultural related purposes (The Swedish Parliament, 2015).

Less favored area (LFA)

In the EU, a less-favored area (LFA) is defined as an area that faces natural constraints affecting the ability to conduct effective agricultural production, such as a dry area, short growing season, warm/cold climate, tendencies of depopulation and mountain areas (European Commission, 2009). In order to avoid a scenario where farmers abandon such land they are entitled to receive a payment called compensatory aid. In order for a farm owner/farm manager to receive this payment he/she has to fulfill the cross-compliance. A farmer will get paid according to the amount of land managed (ley, green-fodder- and pastureland) in relation to the size of the herd kept in production (The Swedish Board of Agriculture, 2015c).

Swedish farmers and CAP

All since Sweden joined the EU in 1995, Swedish farm owners/farm managers have to adjust their production according to the regulations implemented, not only by the Swedish Government but also the EU. Its common knowledge that CAP has been through various structural changes over the past few years. A farmer can apply for the single farm payment, an

income support if fulfilling certain requirements on how to manage land. If a farmer applies for the single farm payment he/she at the same time applies for the Greening support. This financial support can only be obtained if getting the single farm payment, and fulfilling certain requirements in terms of crops grown etc. The level of payment received depend upon the value of the payment entitlements (The Swedish Board of Agriculture, 2015b).

Dairy quotas

The dairy quotas was introduced in 1984 in order to address the oversupply of milk on the EU market (European Commission, 2015b). The quotas replaced the system where farmers were guaranteed a certain price of the milk produced, leading to the oversupply of milk. Every EU country was assigned a quota that later on was divided and assigned to individual producers (DN, 2015). If an EU-country would exceed the quota limit a fee would have to be paid, as a form of a penalty. From April 1st 2015 the dairy quota was abolished (LT, 2015). As the quotas were abolished there are no longer any limitations in terms of the amount of milk produced within the EU. The farmers will get paid according to the world market price of milk (Svensson, 2015).

Implications of CAP

According to statistics CAP have had an impact and keeps influencing the structure of the agricultural sector in the EU. The most common examples of such structural changes are the increase in the size of farm units (Viira *et al.*, 2009) and the reduction in the number of active farmers (Hansson, 2007). Farm owners/farm managers of today have to adjust their production according to the global market demands and at the same time they are obliged to follow regulations created by government (environment, animal welfare and food quality requirements), (Higgins & Lawrence, 2007). There are examples of farm owners/farm managers deciding to exit production due to an increase in the number of regulations related to their business (Abraham, 2013). Furthermore Pietola & Lansink (2001) showed that farmers might change their way of conducting agricultural production as a result of CAP. This since such policies tends to affect the achieved level of profitability in production.

According to Svensson (2015) the abolishment of the dairy quota system may affect the decision-making process of Swedish dairy farmers. This since the abolishment of the quota may open up for producers within the EU already experiencing favorable conditions for production to expand their businesses further producing even more milk, leading to a decline in the world market price of milk given that the demand for milk will remain the same. As a result of such development dairy producers may decide to exit production as they find it difficult to achieve profitability in production due to the declining world market price of milk.

2.3.4 Operational environment

Farm owners/farm managers has to adjust production according to the world market demands of a certain product (Brady, 2007). In order for a farm owner/farm manager to survive financially under such conditions he/she is often forced to either further invest in- or cutting costs in production (Hansson & Ferguson, 2011). Bragg & Dalton (2004) stated that modern day agricultural production is capital intensive and therefore associated with large investments.

Brady (2007) showed that individual producers have a limited ability to have an impact on in- and output prices on a market. Goetz & Debertin (2001) showed that a low output price in general resulting in a low farm income most likely would constitute for a farm exit.

Rahelizatovo & Gillespie (1999) stated that high debts might influence a farm owner/farm manager when making decisions with respect to further maintenance, as an increase in bankruptcy, a result of a higher debt is likely to force the producer out of business.

2.4 Concluding remarks

This section holds a summary of the main findings from the literature review, see table 1, categorized according to the model developed by Hansson (2007) with linkage to the theoretical framework previously presented in this chapter. Furthermore this section includes an explanation on why the concepts embedded in the theoretical framework are applicable to the decision-making process of a dairy producer in Jämtland County.

According to MacDonald *et al.* (2000) the average farm size in Western Europe has increased all since the 1950s. Brady (2007) stated as agricultural production is conducted on a competitive world market forcing producers to adjust their production accordingly, often by minimizing costs based on a number of constraints (Debertin, 2012). Given these circumstances it's likely that farm owners/farm managers in Jämtland County will consider the concepts economies of scale, economies of size and comparative advantage when making a decision with respect to further dairy farm maintenance, as they need to expand in scale/size and increase the level of efficiency in production in order to be profitable. In reality this may imply that a producer will increase the size of the herd, invest in new technology on farm level or focus the agricultural activities towards a processes in which he/she is most efficient.

Other factors expected to be considered by a dairy farm owner/farm manager when making a decision with respect to further farm maintenance are, his/her age, family situation, ability to co-operate with other producers in the geographical area, in-and output prices of goods needed in production, the number of EU and Swedish Governmental regulations related to production and the possibility of receiving financial support through the previously stated authorities. These aspects are likely to be considered, as they ultimately will affect the overall level of profitability achieved within the business venture.

Table 1. Summary of factors according to the literature

Environment	Factor	Explanation	Source	Jämtland County
Internal environment *Considers the resources under the direct control of the farm owner/farm manager*	**Level of technology** Milking robot (on farm level)	Producers investing in new technology (milking robot) are more likely to maintain and expand their production	Gloy *et al.* (2002) Jones (1999)	Adoption of new technologies in production (on farm level) in the County is common (Engström, 2015).
	Number of employees on farm level Size of herd on farm level	The number of employees on farm level and the herd size in a way measures the range of a farming operation. A farm owner/farm manager may experience a decline in the average cost of production as the size of an operation increases, an increase that could require additional labor. Additional labor may however not process the same skillset as the farm owner/farm manager making production inefficient.	Pindyck & Rubinfeld (2009) Debertin (2012)	A vast majority of all farms in Jämtland County consist in smaller units (less land and smaller herds), 68 % of the producers conduct production on a smaller scale (Jämtland County Administrative Board, 2015).
	Geographical location of the farm (municipality) Åre	Land as an input is necessary in order to conduct agricultural production. Additionally such land would need to be fertile in order for production to be profitable.	Debertin (2012)	The agricultural land, located around the lake Storsjön is substantially fertile (Jämtland County Administrative Board, 2014). Producers conducting production in the area face favorable condition for agricultural production, compared to producers operating production in a municipality such as Åre (mountain area), which will constitute for a farm exit. Åre municipality was of interest as the municipality currently to a high extent is being exploited for the purpose of tourism activities due to its location.
Micro- social environment *Relates to the social situation of the farm owner/farm manager and his/ her family situation*	**Year of birth** Age	Producers will consider the aspect of age when making business related decisions. An older farmer is more likely to exit production compared to a younger producer. Poor health as a result of high age may also lead to a farm exit.	Gale (1994) Amshoff & Reed (2005)	35 % of all farmers conducting production in the Jämtland County are over the age of 50, whereas 40 % are under the age of 50 (Engström, 2015).
	Family situation	Mental and physical support from family members is essential in order for producers to maintain production. If such elements are missing this may constitute for a farm exit. Producers with a successor are more likely to further invest in and maintain production.	Viira *et al.* (2009) Calus & Van Huylenbroeck (2008)	40 % of the farmers in Jämtland County are over the age of 50. This means that they are likely to retire within a couple of years. According to statistics from LRF 40 % of all Swedish farmers over the age of 65 that they are planning on retiring in favor of a successor within a time period of 2-3 years (Land Lantbruk, 2014).
	Level of education	The level of formal education influences how producers are able to detect and define a business related problem. An off-farm job a result of a higher level of education may constitute for an increased level of utility, leading to a farm exit.	Öhlmér *et al.* (1998) Kimhi & Bollman (1999)	According to statistics the majority of the population in Jämtland County has completed a two-year secondary education as their highest level of education (Statistics Sweden, 2015).
	Option to co-operate with neighboring farms	Producers will make business related decisions with respect to the possibility of co-operating with neighboring farmers. Producers with such ability are more likely to maintain production. Furthermore if conducting production in a populated area the producer may benefit from social services available locally.	Stam (1991) Källström & Ljung (2005) Skarelius Lille (2015)	The level of entrepreneurship in Jämtland County is strong (Engström, 2015).
	Level of specialization	Producers that specialize in production are less likely to exit farming, by utilizing the concept of comparative advantage.	Goetz & Debertin (2001) Bragg & Dalton (2004) Allen *et al.* (2009)	Many farm owners/farm managers in Jämtland County carry out a diversified agricultural production (Engström, 2015).

External environment *Constitutes the macro-economic environment where the farm owner/farm manager doesn't have control*	**Regulations** Regulation with respect to animal welfare	Producers have to adjust production according to environmental, food- quality, animal welfare requirements and payment schemes. There are examples of farm exit as a result of an increase in the number of regulations, since such often are associated with higher costs in production.	Viira *et al.* (2009) Bentley *et al.* (1990) MacDonald *et al.* (2000). Brady (2007) Pietola & Lansink (2001) Abraham (2013)	Producers in Jämtland County are required to adjust production according to the EU regulations as well as regulations implemented by the Swedish Government.
	Option to receive financial (availability of) support through CAP and the Swedish Government Subsidy	EU provides additional financial support to farm owners/farm managers conducting production in areas (less favored areas) facing natural constraints affecting the ability to conduct effective agricultural production. In order to receive this payment the farmer has to fulfill the cross-compliance.	The Swedish Board of Agriculture (2015c)	Jämtland County is classified as a less-favored area (European Environment Agency, 2009). Meaning that the producers have the option of receiving additional financial support through the EU as they face less favorable conditions for agricultural production (European Commission, 2009).
	Uncertainty Changes in weather conditions and outbreaks of various diseases and pests	Producers may struggle to predict the outcome of production as a result of changes in weather conditions and outbreaks of diseases or pests. Off-farm employment can contribute to risk reduction, as it provides additional income.	Debertin (2012) Breustedt & Glauben (2007) Bjornsen & Mishra (2012) Boehlje (1992)	The growing season in Jämtland County is short and intensive, and the weather changes constantly (Jämtland County Administrative Board, 2011).

Operational environment *Reflects the situation on the market- where the farm owner/farm manager has some control*	**Option to receive credit from financial institutes**	Agricultural production is capital intensive and associated with large investments. High debts may constitute for a farm exit.	Bragg & Dalton (2004) Rahelizatovo & Gillespie (1999) European Commission (2009)	Farm owners/farm managers in Jämtland County have a willingness of adapting to new technologies (Engström, 2015). Technologies that for the most part require availability and access to credit.
	Future market prices of in- and outputs needed in production Future market prices of milk	Producers make business related decisions with respect to the future prices of in-and outputs needed in production. A low output price may function as a constraint for further farm maintenance.	Bragg & Dalton (2004) Goetz & Debertin (2001) Brady (2007) Bragg & Dalton (2004)	The level of entrepreneurship in Jämtland County is strong (Engström, 2015). It's therefore possible to assume that producers sell and purchase goods and services from one and other when carrying out production. The majority of the dairy producers in the region deliver milk to Arla Foods or Norrmejerier, the dairy processors operating in the area (pers., com., Westman, 2015). These firms adjust the prices of milk paid to the farmers according to the world market price (Arla Foods, 2015). A market price that currently are considered to be low.

3- Material and methods

This chapter includes an explanation of the research approach used in this thesis. It entails a presentation of the various methods applied to gather and analyze empirical material. The methodological choices are made on the basis of certain literature. This chapter also holds a description of the ethical issues, along with comments on the quality assurance of this study.

3.1 Research design

In terms of methodological framework there are traditionally two alternatives to consider when conducting a study, a quantitative-and a qualitative approach (Robson, 2011). According to Robson (2011) such approaches are often considered to be either fixed or flexible in terms of how data is collected. In a fixed design the decision on how to collect data is made prior to the actual data collection process whereas a flexible design constitutes for a plan on how data is ought to be collected. Furthermore Robson (2011) states that these two approaches shouldn't be considered as opposites. A combination of the two approaches may instead be preferred in order to carry out an accurate analysis. To sum it up, a fixed research design (quantitative method, using surveys) is more useful when studying a causal relationship between two or more variables, whereas a flexible research design (qualitative method, case studies using interviews) is preferred if aiming to study a problem in depth (Kvale, 2014:Robson, 2011).

The decision of using a quantitative-and a qualitative research approach for this particular study was made since according to Robson (2011) such combination is likely to improve the overall reliability of a study. The quantitative approach made it possible to research the causal relationship of a set of independent variables (number of factors listed in chapter 2) with respect to a dependent variable (further dairy farm maintenance) within a time period of five years from now. The qualitative approach, as an individual decision-making process is complex made it possible to detect aspects that potentially hadn't been discovered before.

3.1.1 Validity and reliability

When conducting research it's important to keep the concept of validity in mind. The level of validity refers to the precision of the result. With a larger sample it's more likely that the results obtained in the study represents the true conditions of the real world. In terms of this study a combination of a quantitative-and a qualitative approach was used to improve this rate. Another important aspect to consider when constructing research is the term reliability. Reliability measures the level of stability or consistency when performing a certain test. The result should be the same no matter of the person doing a certain test (Robson, 2011).

3.1.2 Evaluation of theoretical framework and literature review

According to Yin (2009) it's crucial to use appropriate theoretical concepts when creating a research design, this ultimately to achieve a certain predetermined aim. A process, identifying such concepts is unfortunately time consuming but important all in all to understand the information obtained through the research. As for the case of this research it was essential to get a deeper understanding of a farm owner/farm manager's decision-making process in general with respect to various constraints, before developing a questionnaire/survey as well

as an interview guide used to collect the data. A comprehensive literature review was therefore performed in the beginning on this research project.

The theoretical concepts presented in the previous chapter are relevant for this study as farm owners/farm managers due to the current market situation are likely to expand their business in cutting costs in production, in order to survive financially utilizing the concept of economies of size/scale and as an extension comparative advantage. Furthermore the concept of strategic management is relevant, as producers most likely will create a plan on how to proceed when carrying out production. A plan that is ought to be based upon a number of factors, factors that supposedly could be identified through this study.

3.2 Surveys

The quantitative approach, using a survey provides a broad coverage and the data received may be subject to various statistical tests (Denscombe, 2009). A survey can be anonymous or confidential. In an anonymous survey the researcher doesn't have the option to trace the respondent, whereas in a confidential survey the respondents are subject to coding, making it possible to determine the origin of the response (Patel & Davidson, 2003). In this particular research the surveys were completely anonymous.

The package sent out to the dairy farm owners/farm managers included, a cover letter, a questionnaire and a self-addressed envelope. The supervisor at SLU and as well as the supervisor at the County Administrative Board in Jämtland County approved the survey before it was sent out by postal mail to the farm owners/farm managers in Jämtland County.

3.2.1 Survey/questionnaire

According to Patel & Davidson (2003) it's important for a researcher to keep in mind how questions in a survey are standardized, so that all respondents are faced with the same ability to interpret them. The questionnaire was sent to farm owners/farm managers in Jämtland County operating dairy production in January 2015. The questionnaire was divided into six sections, section A, B, C, D, E (part 1 and part 2) and section F and included a total of 39 questions (some had a sub-question, a-u). The majority of the questions were highly structured, in a form of multiple-choice, together with some open-ended questions, making it possible for the respondents to provide answers of their own. Table 2, displays the structure of the survey.

Table 2. Structure of the survey

Sections	**Variables**
Background information	Gender, age, level of education, family situation and geographical location of the farm
General information	Herd size, technology on farm level, type of production, number of years in production
Business structure	Business structure, labor force, on-and off farm employment, annual turnover, level of debt, motivators for production
Land management	Land managed (rented and owned), crops cultivated, fodder production, forestry
Decision-making (part 1-and part 2)	Future vision/-s, factors potentially influencing the decision-making: input- and output prices of goods needed in production, natural resources, co-ops, available capital, uncertainty (with respect to weather, diseases, pests), structural changes (CAP) etc.
Business climate	Political actions, feedback intended for the County Administrative Board in Jämtland County

3.2.2 Cover letter

It may be difficult to control that answers obtained through a survey are honest and sincere. It's therefore important to motivate the respondents to actually reply honestly to the questionnaire (Denscombe, 2009). A cover letter can potentially increase the response rate, and such letter was therefore included in the package sent to the dairy farm owners/farm managers. The cover letter contained a brief explanation of the thesis project, the last day of response as well as contact information to the student, supervisor at SLU and supervisor at the County Administrative Board in Jämtland.

The lack of personal contact a result of sending the survey to the respondents by postal-or electronic mail may constitute for a lower response rate, affecting the ability to draw relevant conclusions from the material obtained. This aspect has to be taken under consideration when carrying out the analysis.

3.2.3 Sample size

Robson (2011) argues that by receiving answers from a larger number of respondents the results obtained are more likely to represent the true conditions of the real world. In this study the survey was sent to 125 dairy farmers' currently operating production, in January 2015. The County Administrative Board in Jämtland County provided a list of these dairy farmer in April 2015. The list, an excel sheet included a total of 129 farmers. Four of the producers were interviewed hence they didn't receive the survey.

Before the survey was sent to the dairy farmers, a "test survey" was sent to four randomly picked people. These respondents were of different age and had different level of education. They gave feedback on the survey, and the survey was adjusted accordingly.

3.2.4 Mailing and response rate

The package containing a cover letter, questionnaire and a self-addressed envelope was sent out to the dairy farmers by postal mail. The choice of doing so was made as the County Administrative Board, at the time of this study didn't have access to the dairy farmers e-mail addresses. All packages were sent out by postal mail from the County Administrative Board in Jämtland County's office in Östersund on the 4th of May 2015. The last day for the dairy farmers to fill out the survey and send it back to the County Administrative Board in the self-addressed envelope was June 29th 2015. An additional letter containing a thank you message to the producers that had responded to the questionnaire and a reminder to the ones who hadn't answered was sent out by postal mail on June 8th 2015 from the County Administrative Board office in Östersund.

According to the list, the excel sheet provided by the County Administrative Board in Jämtland, 129 dairy farmers conducted dairy production in January 2015. As previously stated the survey was sent to 125 of these farmers, since four of them were interviewed. Out of these 125 surveys, 53 of them were filled out and sent back to the County Administrative Board office in Östersund and later on forwarded to Uppsala for analysis. The material was organized in an excel-sheet and later on modeled in the computer program TSP. 44 of the questionnaires were filled out completely and nine questionnaires were partially filled out. Seven farmers had missed answering one question, one farmer had missed answering four

questions and one farmer had missed answering 20 questions. The response rate for the dairy farmers currently operating dairy production regionally was 42 % (53/125=0, 424).

3.2.5 Loss of responses

When conducting a study a researcher will always experience certain losses in terms of the number of completely filled out surveys received. The internal losses occur as the respondents don't fill out the questionnaire completely skipping certain questions, whereas the external losses are faced when the respondents forget to return the form to the researcher.

Internal losses may be a result of respondents being stressed to such an extent where they skip out on answering certain questions. The external losses on the other hand may occur as the survey gets lost in the mail either on the way to the respondent or on the way back from the respondent to the research institute. The survey may also once it's received by the respondent get mixed up with other mail at the house, newspapers and advertisement and therefore aren't filled out. Furthermore a number of respondents may also not be interested at all in participating in a study and therefore avoid filling out questionnaire.

3.2.6 Econometric approach

The answers from the survey are subject to a quantitative model deliberating if a causal relationship between the dependent-and independent variables existed. Analyzing if any of the factors presented in table 3, found in the literature, were considered by the dairy farm owner/farm managers as they made a decision to either maintain or exit dairy production.

Table 3. Factors hypothetically influencing a decision-making process

Environment	**Variables**
Internal environment	x_1: Level of technology on farm level (robot) x_2: Number of employees on farm level x_3: Size of herd on farm level x_4: Geographical location of the farm (municipality) Åre
Micro-social environment	x_5: Year of birth (age) x_6: Family situation x_7: Level of education x_8: Option to co-operate with neighboring farms x_9: Level of specialization
External environment	x_{10}: Regulations (with respect to animal welfare) x_{11}: Option to receive (availability of) financial support through CAP and the Swedish Government (subsidy) x_{12}: Uncertainty (changes in weather conditions and outbreaks of various diseases and pests)
Operational environment	x_{13}: Option to receive credit from financial institutes x_{14}: Future market prices of in- and outputs needed in production (future market prices of milk is tested for in the econometric model)

In an ordered probit model it's possible to estimate the empirical effects of an individual explanatory variable on a dependent variable, this is achievable if the value of y is discrete.

In general models the dependent variable will take a value of 0, 1, 2… etc. This isn't however always the case (Greene, 2003) instead variables can be included in different categories, they are so called polychotomous variables. In reality this implies that a respondent of a survey/questionnaire have the ability to choose from a number of options when answering a question, strongly agree, partially agree, indifferent no opinion, partially disagree and strongly disagree. There are five different alternatives, ranking them from the strongest to the weakest answer. Strongly agree will in this case be better than partially agree, etc. The alternatives are ordered, and an ordered probit model can therefore generate appropriate estimates.

Furthermore as the answers are scaled and of qualitative character, it isn't possible to say that one value is twice as preferred as another one, its only possible to say that one value is preferred to another one (Asteriou & Hall, 2011).

The respondents of the survey were asked to answer several questions according to a graded scale of 1-5, from strongly agree (1), partially agree (2), indifferent no opinion (3), partially disagree (4) to strongly disagree (5). In the model these answers were recoded from 1-5 to 0-4.

An ordered probit model of further dairy farm maintenance is specified as the following:

$$y_i^* = \beta' x + \varepsilon \qquad (1)$$

In this case S_i^* constitutes for the latent dependent variable with regards to the individual dairy farmers decision-making, related to a set of internal, micro-social, external and operational environment characteristics (discussed in chapter 2) in the term x, β is the estimated coefficient of such x. Additionally ε represents the individual error term, which is normally distributed N (0, 1).

The ordinal variable y_i represents the actual decision-making of the dairy farm owners/farm managers (which will be discussed further on), it's observed by the parameter y_i^*. However since it isn't possible to fully observe y_i^*, the following is observed according to (Greene, 2003):

$$y_i = \begin{cases} 0 \; if \; y_i^* \leq 0 \\ 1 \; if \; 0 < y_i^* \leq \mu_1 \\ 2 \; if \; \mu_1 < y_i^* \leq \mu_2 \\ \quad . \\ \quad . \\ \quad . \\ J \; if \; \mu_{J-1} < y_i^* \end{cases} \qquad (2)$$

The μ´s constitutes for the "cut-offs" the thresholds denoting the transformation from one parameter to another (likelihood for a certain choice related to y="further dairy farm maintenance within a time period of five years from now"). Five different categories were distinguished in this study:

$$y_i = \begin{cases} 0 \; if \; strongly \; agree \; to \; further \; dairy \; farm \; maintenance \\ 1 \; if \; partially \; agree \; to \; further \; dairy \; farm \; maintenance \\ 2 \; if \; indifferent \; or \; no \; opinion \; to \; further \; dairy \; farm \; maintenance \\ 3 \; if \; partially \; disagree \; to \; further \; dairy \; farm \; maintenance \\ 4 \; if \; strongly \; disagree \; to \; further \; dairy \; farm \; maintenance \end{cases} \qquad (3)$$

The ordered probit model can be estimated in different ways, through Maximum Likelihood estimation or a Bayesian method. In this case the Maximum Likelihood estimation is used. As for the normally distributed error term the probability for each category will be:

$$\begin{aligned} \Pr(y_i = 0) &= \varphi(-\beta' x) \\ \Pr(y_i = 1) &= \varphi(\mu_1 - \beta' x) - \varphi(-\beta' x) \\ \Pr(y_i = 2) &= \varphi(\mu_2 - \beta' x) - \varphi(\mu_1 - \beta' x) \\ &\quad . \\ &\quad . \\ &\quad . \end{aligned} \qquad (4)$$

$Pr = (y_i = J) = 1 - \varphi(-\beta' x)$

The term φ represents the standard normal cumulative density function (cdf). Additionally in an ordered probit model it's impossible to observe the marginal effects of a change in x, with that said the value of β couldn't be interpreted directly. The marginal effects of the independent variable on the probability of deciding on the Jth choice of further dairy farm maintenance is calculated as the following:

$$\frac{\partial \Pr(y_i=J|x)}{\partial x} = \beta\left[\phi(\mu_{J-1} - \beta' X) - \phi(\mu_J - \beta' x)\right] \quad (5)$$

The term ϕ represents the standard normal density function.

The dependent variable in this study represents the dairy farm owner/farm manager's likelihood of maintaining dairy production within a time period of five years from now. The variable is ordinal representing the highest likelihood for a dairy farmer to maintain production compared to the least likelihood of continuing running production. The coding in the model entails the following 0 "strongly agree" to further dairy farm maintenance, 1 "partially agree" to further dairy farm maintenance, 2 "indifferent or no opinion" to further dairy farm maintenance, 3 "partially disagree to further dairy farm maintenance" and 4 "strongly disagree to further dairy farm maintenance". The analysis is based on the number of dairy farm owners/farm managers that filled out the questionnaire.

3.3 Case studies

Robson (2011) elaborates on the advantages of using a qualitative approach with case studies conducting interviews when collecting data. He states that it's possible to gather information in depth through such method, information that later on could be used to carry out an accurate analysis.

3.3.1 Case study questionnaire

An interview can take various forms depending on the structure of the questions asked. The interviews performed in this study were semi-structured. These interviews could be considered as a "pilot study". The list, an excel sheet of dairy farmers currently operating dairy production during January 2015, provided by the County Administrative Board in Jämtland served as a basis when finding dairy farmers to interview. Eight farmers on the list were randomly contacted and four of them agreed to participate in an interview (three by phone and one carried out in person). The length of the interviews varied (30 minutes to 2 hours). The farmers interviewed were promised to be anonymous.

The questions asked were included in a guide, a guide that was sent by electronic mail to the dairy farm owners/farm managers prior to the time of the interview. These interviews could be considered as a complement to the previously discussed survey. The interview questions covered various topics, topics found in two sections, section A and section B. Section A included questions constructed to gather background information of the dairy farm owners/farm managers and his/her business venture. Section B included questions used to identify potential factors influencing the farmers' decision-making process with respect to his/her business management. During the interviews it was possible to ask additional questions related to the various topics discussed, something that Denscombe (2009) announces as an advantage, providing depth.

The interviews were recorded and later on transcribed. From the transcribed material it was possible to distinguish various themes, advocated by Denscombe, (2009) as a strength of such methodology. Table 4 provides information on the date and form of the interviews. Prior to the date of the actual interviews three "test interviews" were conducted with individuals of different age, level of education and knowledge in terms of agricultural production. Once these interviews had been performed, some of the questions in the interview guide were adjusted accordingly.

Table 4. Farm owners/farm managers interviewed

Farm	Person interviewed	Date	Form
Farm 1	Farm owner/farm manager	2015-04-16	Phone
Farm 2	Farm owner/farm manager	2015-04-16	Phone
Farm 3	Farm owner/farm manager	2015-04-21	Phone
Farm 4	Farm owner/farm manager	2015-05-06	In person

Two interviews with three officials working at the County Administrative Board in Jämtland County was also conducted, see table 5, the information obtained constitutes for reference material in this thesis.

Table 5. County Administrative Board officials in Jämtland County interviewed

Person interviewed	Title	Date	Form
Margareta Persson	Manager at the Agricultural Unit	2015-05-05	In person
Jöran Hägglund Eva Engström	County Governor Rural Consultant	2015-05-05	In person

3.3.2 Case study analysis

In order to conduct an accurate analysis the data obtained through the interviews was divided into different groups (internal, micro-social, external and operational environment), finding various themes. Denscombe (2009) and Robson (2011) state that such method is efficient when intending to link empirical findings to theoretical concepts and previous findings from a literature review.

According to Patel & Davidson (2003) an interviewer might understand answers incorrectly if not being able to notice body language and facial expressions. This means that answers received during the phone interviews may have been misinterpreted by the interviewer, which will affect the final analysis in an unfortunate way, an aspect that the researcher was aware of. Furthermore it's always preferred to conduct a larger number of interviews in order to receive accuracy in terms of the responses, making it possible to generalize (Robson, 2011). As for the case of this study it would have been better to conduct additional interviews than the ones completed, interviews in person. This was however impossible due to a number of constraints, lack of time, geographical location of the dairy farms and the dairy producers wish not to participate in the study.

3.4 Ethical aspects

Ethics as a general concept is ought to be considered when conducting research (Flick, 2006). When conducting a quantitative-and a qualitative study it's important to consider the terms confidentiality and anonymity. This since a reader of a written report/thesis shouldn't be able to detect the participants of a study (Denscombe, 2009:Flick, 2006). A discussion on how to handle sensitive data was held with officials at the County Administrative Board in Jämtland

County, ending up in a decision of letting the dairy farm owners/farm managers that participated in the study to be completely anonymous. It was therefore important for the researcher not to include too detailed information about the farm owner/farm managers' dairy operations, as the number of active producers in Jämtland County at the time when the study was conducted was rather small potentially making it possible for readers to detect the participants.

4- Empirical results

This chapter includes a description of Jämtland County and its agricultural sector. Furthermore the empirical findings from the quantitative (survey)-and the qualitative study (case studies with interviews) are presented here.

4.1 The dairy sector in Jämtland County

In Jämtland County the dairy production and dairy processing industry constitutes for 55 % of the annual turnover within the agricultural sector regionally (Jämtland County Administrative Board, 2012). The dairy sector in Jämtland County is to a large extent homogenous, meaning that farms often consist in smaller units (smaller herds, limited amount of ag. land) cultivating ley and grains, maintaining pastureland, conducting off-farm work and having few units of labor on farm level. In terms of the number of cows kept in production the number varies from ten to 200 animals (The Swedish Board of Agriculture, 2014a), numbers that could be compared to the Swedish average being 77 (The Swedish Board of Agriculture, 2013).

During 2014 approximately 9,146 tons milk was produced on County level (15,2 % of the milk was organic), constituting for 2,4 % of all the milk produced in Sweden (LRF Milk, 2014). In 2015 January 121 dairy farmers delivered their milk to Arla Foods, 14 of them conducted organic dairy production (LRF Milk, 2014). The remaining eight producers delivered their milk to Norrmejerier where seven farm owners/farm managers conducted organic dairy production (pers., com., Westman, 2015a). The milk produced is processed in either Östersund, where Arla Foods has a dairy processing plant in or Umeå where Norrmejerier is located (pers., com., Westman, 2015b). Milk processing also occurs on farm level, in local small-scale dairy plats, the quantities processed are however minor in comparison to the bulk delivered to Arla Foods and Norrmejerier (pers., com., Engström, 2015).

The demand for organic dairy products is increasing nationally according to a report published by LRF-Milk in 2015, however at this present day the number of Swedish producers conducting organic dairy production isn't enough to fulfill the future overall demand. This gives potential for producers of changing their way of conducting production, becoming organic producers (JA, 2015). On this note Jämtland County has potential for organic dairy production. This as the majority of the animal feed used in production is produced on farm level, the level of pesticides used within production is low as it is today and the grazing period is likely to increase given the climate change, all requirements for organic production (Jämtland County Administrative Board, 2011).

4.2 Surveys

This section includes a presentation of the dairy farm owners/farm managers in Jämtland County who responded to the survey. The segment also holds the main findings obtained through the questionnaire in terms of the factors/aspects the producers considered and found as important when making a business related decisions with respect to further dairy farm maintenance, see table 6.

Table 6. The main findings from the survey/questionnaire

Section A: Background information	**Gender**	Men: 85 % (45 out of 53) [1] Women: 15 % (8 out of 53) [1]
	Age	Born 1961- 1970: 36 % (19 out of 53) [1] Average year of birth: 1962
	Level of education	Highest level of education completed (3 years as their highest level of education): 47 % (25 out of 53) [1]
	Family situation	Household (two or more adults including one or more children (over the age of 18)): 30 % (16 out of 53) [1]
	Geographical location of the farm *(The three most common)***	Krokom County: 30 % (16 out of 53) [1] Östersund County: 19 % (10 out of 53) [1] Bergs County: 17 % (9 out of 53) [1]
Section B: General information	**Technology on farm level**	Milking robot: 43 % (23 out of 53) [1] Tied system: 40 % (21 out of 53) [1] Pit: 17 % (9 out of 53) [1]
	Herd size	Dairy cows 21-60 animals: 55 % (29 out of 53) [1] Herd size on average: 58
	Number of years in production *(The three most common)*	Time period (11-20 years): 15 % (8 out of 53) [1] Time period (21-30 years): 34 % (18 out of 53) [1] Time period (more than 31 years): 32 % (17 out of 53) [1]
	Dairy plant/firm *Producers delivered milk to*	Arla Foods: 91 % (49 out of 53) [1] (5 out of them also delivered milk to a local- dairy plant) 9 % (4 out of 53) [1] delivered milk to Norrmejerier
	Organic vs. conventional production	Conventional production: 81 % (43 out of 53) [1], 4 % of the producers were planning starting conducting organic production Organic production: 19 % (10 out of 53) [1]
Section C: Business structure	**Business structure**	Sole proprietorship: 72 % (38 out of 53) [1]
	On/off farm employment *(The three most common)*	1) Beef production: 19 % (10 out of 53) [1] 2) Work not related to agricultural production: 23 % (12 out of 53) [1] 3) Work related to agricultural production: 30 % (16 out of 53) [1]
	Labor *Operated production on a full-time basis, number of employees*	Fulltime basis: 98 % (52 out of 53) [1] 2 full-time workers: 45 % (24 out of 53) [1]
	Annual turnover [3]	Annual turnover: 2 MSEK- 5 MSEK 45 % (23 out of 51) [1]
	Level of debt *(Loan to value ratio, LTV)*	LTV: 21-40%: 21 % (11 out of 53) [1] LTV: 41-60%: 21 % (11 out of 53) [1]
	Advisor [4]	Hired a professional advisor: 59 % (30 out of 51) [1]
Section D: Land management	**Land managed** *(Rented and owned)*	Cultivated 51- 150 hectares of land (incl. owned and rented land): 64 % (34 out of 53) [1] Agricultural land on average: 129 hectares
	Crops cultivated, fodder production [5]	Maintaining pastureland for gracing was common, together with cultivation of ley, a variety of grains, green fodder and peas and field beans.
	Forestry	Owned forestland: 91 % (48 out of 53) [1] Owned 51- 150: 31% (16 out of 52) [1], Owned 151- 250 hectares of forest and 31% (16 out of 52) [1], [2] The average amount of forestland owned was 210 hectares [3]

[1] *Indicates the number of respondents of the question*
[2] *All Counties were represented in the sample*
[3] *One respondent had missed out on completing the amount of forestland owned, the percentage rate is calculated with respect to 52 dairy farmers*
[4] *Two respondents had missed out on answering the question, the percentage rate is calculated with respect to 51 dairy farmers*
[5] *Statistics with respect to number of hectares of land cultivated for various purposes are available upon request from the researcher*

4.3 Econometric results

In order to determine which ones of the variables from chapter three that potentially could influence a dairy farmer in Jämtland County when making a decision with respect to further dairy farm maintenance a number of estimations were conducted. See table 7-10 for estimations from an ordered probit model, and table 11 entailing the corresponding marginal effects of the set of significant variables.

Table 7. Ordered probit estimates from equation 25
y=”further dairy farm maintenance within a time period of five years from now”

Variables		Coefficients	Standard errors	t-statistics	P-values
Constant*		67.7025	34.9765	1.93566	0.053
Level of technology (robot)	x_1	-0.44867	0.37515	-1.19597	0.232
Number of employees on farm level**	x_2	-0.37827	0.19141	-2.06253	0.039
Geographical location of the farm (municipality) Åre***	x_4	1.66892	0.50974	3.27405	0.010
Year of birth (age)*	x_5	-0.03344	0.01773	-1.88555	0.059
Level of education	x_7	-0.07168	0.14823	-0.48357	0.629
Option to co-operate	x_8	0.00857	0.15986	0.05360	0.957
Level of specialization	x_9	0.34444	0.37309	0.92322	0.356
Regulations (animal welfare)	x_{10}	-0.25847	0.24171	-1.06934	0.285
Availability of financial support (subsidy)	x_{11}	0.53032	0.37239	1.42409	0.154
Uncertainty (weather/outbreaks pests)**	x_{12}	-0.41423	0.16887	-2.45289	0.014
Option to receive credit from financial institutes	x_{13}	0.34053	0.31825	1.07000	0.285
Future market price of milk	x_{14}	0.41975	0.26161	-1.08165	0.279
/cut 1 (μ_1)		1.31673	0.25655	5.13248	0.000
/cut 2 (μ_2)		1.54996	0.27581	5.61967	0.000
/cut 3 (μ_3)		2.70949	0.40862	6.63079	0.000

Log likelihood: -58.0824
N: 51
Scaled R-squared: 0.52423
Mean of dependent variable: 1.62745
Std. dev. Of dependent variable: 1.39944
***, **, * represent statistical significance at five-and ten percent level, respectively
A factor without a prefix isn’t significant at any of the previous given levels

According to the findings from table 7, the factors that are significant on a 90 % level or better ultimately being considered by dairy farmers when making a decision with respect to further dairy farm maintenance are, the number of employees on farm level (95 % significance level), a farmers age (90 % significance level) and uncertainty (95 % significance level). The aspect, geographical location of the farm in municipality Åre was also significant (99 % significance level). Furthermore the scaled R-squared value equals to 0, 52423 meaning that the model is able to explain approximately 52 % of the variability in the probability of the various choice of the dairy farmer. Additionally it’s important to keep in mind that it might exist multicollinearity among the variables in this model.

Table 8. Ordered probit model estimates from equation 45
y=”further dairy farm maintenance within a time period of five years from now”

Variables		Coefficients	Standard errors	t-statistics	P-values
Constant***		80.8701	31.5944	2.55963	0.010
Number of employees on farm level***	x_2	-0.50918	0.17212	-2.95832	0.003
Geographical location of the farm (municipality) Åre***	x_3	1.30850	0.46323	2.82473	0.005
Year of birth (age)**	x_5	-0.03985	0.01607	-2.48013	0.013
Uncertainty (weather/outbreaks pests)***	x_{12}	-0.35314	0.13350	-2.64527	0.008
Future market price of milk	x_{14}	0.281170	0.18342	1.53286	0.125
/cut 1 (μ_1)		1.20335	0.23415	5.12796	0.000

/cut 2 (μ_2)	1.41466	0.25111	5.62191	0.000
/cut 3 (μ_3)	2.42575	0.35806	6.85471	0.000

Log likelihood: -62.5910
N: 51
Scaled R-squared: 0.40755
Mean of dependent variable: 1.62745
Std. dev. Of dependent variable: 1.39944
***, **, * represent statistical significance at five-and ten percent level, respectively
A factor without a prefix isn't significant at any of the previous given levels

In table 8, four factors were significant on a 90 % level or better. Namely the number of employees on farm level (99 % significance level), a farmer's year of birth (95 % significance level) and uncertainty (99 % significance level). Additionally the geographical location of the farm (municipality) Åre was significant (99 % significance level). The scaled R-squared value for this specification equaled to 0, 40755, meaning that the model managed to explain approximately 41 % of the variability in the probability of the various choices of a dairy farmer (a farm maintenance or farm exit).

The scaled R-square value decreased for this specification compared to the value from table 7. A reduction that could be a result of the decrease in the number of explanatory variables included in the specification, going from 12 explanatory variables (table 7) to only five (table 8). The decline in the scaled R-square value ultimately proves that other factors, factors which weren't included in the specification are considered by producers as they make business related decision with respect to further dairy farm maintenance.

Table 9. Ordered probit estimates from equation 47
y="further dairy farm maintenance within a time period of five years from now"

Variables		**Coefficients**	**Standard errors**	**t-statistics**	**P-values**
Constant**		75.8691	32.2401	2.35325	0.019
Number of employees on farm level***	x_2	-0.53051	0.17485	-3.03418	0.002
Geographical location of the farm (municipality) Åre***	x_4	1.36175	0.46749	2.91290	0.004
Year of birth (age)**	x_5	-0.03706	0.01643	-2.25499	0.024
Family situation	x_6	-0.11994	0.11829	-1.01402	0.311
Uncertainty (weather/outbreaks pests)***	x_{12}	-0.38364	0.13698	-2.80071	0.005
Future market price of milk	x_{14}	0.25833	0.18508	1.39580	0.163
/cut 1 (μ_1)		1.21273	0.23591	5.14048	0.000
/cut 2 (μ_2)		1.42173	0.25222	5.63683	0.000
/cut 3 (μ_3)		2.44033	0.36127	6.75481	0.000

Log likelihood: -62.0689
N: 51
Scaled R-squared: 0.42193
Mean of dependent variable: 1.62745
Std. dev. Of dependent variable: 1.39944
***, **, * represent statistical significance at five-and ten percent level, respectively
A factor without a prefix isn't significant at any of the previous given levels

In table 9, the explanatory variables being significant on a 90 % level or better are the same as the ones displayed in table 7 and 8. The factors being considered by a dairy farm owner/farm manager when making a decision with respect to further dairy farm maintenance were the number of employees on farm level (99 % significance level), a farmers age (95 % significance level) and uncertainty (99 % significance level). Furthermore the geographical location of the farm (municipality) Åre was significant (99 % significance level). The level of significance increases in this specification compared to the individual significance level of the explanatory variables from table 7 and 8. Also at the same time the scales R-square value decreases to a value of 0, 42193 compared to the number 0, 52423 (table 7) and 0.40755

(table 8) meaning that the explanatory power of this model is reduced, compared to the previous ones. The model presented in table 9 is explaining roughly 42 % of the variability in the probability of the various choices of a farmer to either maintain or exit production. Additionally as the number of variables are reduced the risk of experiencing multicollinearity decreases.

Table 10. Ordered probit estimates from equation 44
y=”further dairy farm maintenance within a time period of five years from now”

Variables		**Coefficients**	**Standard errors**	**t-statistics**	**P-values**
Constant**		73.6913	30.7184	2.39893	0.016
Number of employees on farm level***	x_2	-0.50847	0.16966	-2.99696	0.003
Geographical location of the farm (municipality) Åre***	x_4	1.36134	0.44921	3.03053	0.002
Year of birth (age)**	x_5	-0.03597	0.01560	-2.30523	0.021
Uncertainty (weather/outbreaks pests)**	x_{12}	-0.32284	0.16887	-2.48416	0.013
/cut 1 (μ_1)		1.19893	0.23380	5.12796	0.000
/cut 2 (μ_2)		1.40542	0.24999	5.62191	0.000
/cut 3 (μ_3)		2.35432	0.34346	6.85471	0.000

Log likelihood: -63.8117
N: 51
Scaled R-squared: 0.37301
Mean of dependent variable: 1.62745
Std. dev. Of dependent variable: 1.39944
***, **, * represent statistical significance at five-and ten percent level, respectively
A factor without a prefix isn’t significant at any of the previous given levels

In the specification displayed in table 10 the explanatory variable “family situation” was taken out. This specification only held the variables that had been significant on a 90 % level or better from previous estimations. In specification four explanatory variables was significant at a 90 % level or better more particularly, the number of employees on farm level (99 % significance level), a farmers age (95 % significance level), uncertainty (95 % significance level) and the geographical location of the farm (municipality) Åre (99 % significance level), meaning that such factors were considered by a dairy producer as he/she made a decision with respect to further dairy production. Once again the scaled R-square value decreased from the levels displayed in table 7 (0, 52423), 8 (0, 40755) and 9 (0, 42193) to a number of 0.37301, meaning that the model succeeded to explain approximately 37 % of the variability in the probability of the choices (to maintain or exit) of the dairy farmer.

Given the findings from the ordered probit model, only four out of 14 proposed explanatory variables (factors) seemed to have an impact on the dependent variable y=“further dairy production within a time period of five years from now” by being statistically significant on a 90 % level or better. These explanatory variables were the number of employees on farm level, the age of a farmer, uncertainty (corresponding to changes in weather and outbreaks of various diseases and pests) and the geographical location of the farm (municipality).

According to Greene & Hensher (2009) the coefficients form an ordered probit estimation can’t be strictly interpretable, therefore the marginal effects from table 11, are commentated on accordingly. Table 11, holds the marginal effects for each and every one of the explanatory variables shown to be significant on a 90 % level or better.

Table 11. Marginal effects of further dairy farm maintenance

$\left(\frac{d_y}{d_x}\right)$ in each group, y="further dairy farm maintenance within a time period of five years from now"

	Geographical location of the farm, municipality, Åre (x_4)	**Year of birth, age** (x_5)	**Number of employees on farm level** (x_2)	**Uncertainty** (x_{12})
0 (strongly agree)	-0.30964	0.01057	0.13608	-0.22403
1	-0.15662	0.00535	0.06883	-0.11332
2	0.03291	-0.00112	-0.01447	0.02381
3	0.25864	-0.00883	-0.11367	0.11742
4 (strongly disagree)	0.17471	-0.00596	-0.07678	0.12641

The marginal effects calculated from table 11 are interpreted as, a one-unit change in "geographical location of the farm (municipality) Åre" increased the probability of ending up in the category $y_{ij=1}$ (strongly agree to further dairy farm maintenance) by -30 %. On the same note the probability of being in the category $y_{ij=2}$ (partially agree to further farm maintenance) was approximately -16 %. In terms of the higher categories such as $y_{ij=4}$ (strongly disagree to further dairy farm maintenance) a one-unit change in "geographical location of farm (municipality) Åre" increased the probability of ending up in such category of 17 %. Given the interpretation of the marginal effects it's evident that a producer conducting production in Åre municipality is less likely to maintain production within a time period of five years from now compared to a producers who isn't operating his/her production in this part of the County.

In terms of the explanatory variable year of birth (age), the marginal effects from table 11 are interpreted as the following, a one-unit change in the "year of birth of a farmer (age) a producer being born closer to this present year" increased the probability of ending up in the category $y_{ij=1}$ (strongly agree to further dairy farm maintenance) with 1 %. Furthermore the calculations shows that the probability of being in the category $y_{ij=2}$ (partially agree to further farm maintenance) was approximately 0.5 %. The estimations from category $y_{ij=4}$ (strongly disagree to further dairy farm maintenance) given a one-unit change in "the year of birth" (age) a producer being born closer to this present year" increased the probability of being in such category with -0, 6 %. This ultimately means that a younger producer is more likely to maintain dairy production in favor of an older producer who instead is more likely to exit production.

The marginal effects from table 11 considering the explanatory variable "number of employees on farm level" is interpreted as, a one-unit change in the "number of employees on farm level (a producer hiring additional labor)" increased the probability of being in such category $y_{ij=1}$ (strongly agree to further dairy farm maintenance) by 14 %. Additionally the estimations shows that the probability of being in the category $y_{ij=2}$ (partially agree to further farm maintenance) was roughly 7 %. In terms of the highest category $y_{ij=4}$ (strongly disagree to further dairy farm maintenance) given a one-unit change in the "number of employees on farm level (a producer hiring additional labor)" increased the probability with -8 %. Given the estimations of the marginal effects of the explanatory variable, number of employees on farm level, it's evident that a producer who makes a decision to hire additional units of labor to his/her enterprise are more likely to maintain production over a time period of five years from now compared to a producer who isn't interested to expand his/her labor force.

Given the estimations from table 11, the marginal effects on the explanatory variable "uncertainty (substantial changes in weather, outbreaks of diseases/pests)" is interpreted as the following, a one-unit change in the "uncertainty (substantial changes in weather, outbreaks of diseases and pests)" increased the probability of being in the category $y_{ij=1}$ (strongly agree to further dairy farm maintenance) by -22 %. Furthermore the estimations demonstrates that the probability of being in category $y_{ij=2}$ (partially agree to further farm maintenance) was -11 %. For the highest category $y_{ij=4}$ (strongly disagree to further dairy farm maintenance) a one-unit change in the parameter "uncertainty (substantial changes in weather, outbreaks of diseases and pests)" increased the probability by approximately 13 %. In this case it's clear that the producers who predicted an event of substantially bad weather conditions or outbreaks of various diseases or pests are less likely to maintain production compared to a producer who's more opportunistic in terms of future production conditions.

4.4 Case study background information

A total of four case studies in a form of interviews were completed with four dairy farm owners/farm managers conducting production in Jämtland County, as late as January 2015. This section holds a detailed presentation of each and every one of the producers and the structure of their enterprises. The following information is useful in order to carry out an accurate analysis, presented in chapter five.

4.4.1 Farmer 1

The farm owner/farm manager[1], a male born in the mid-1960s had been operating the family business since the early 1990s. The farmer had a university degree (3 year program) within agricultural sciences, focusing on business management. In terms of the business structure the operation was run in a form of sole proprietorship, being a conventional milk production, delivering milk to Arla Foods.

The dairy operation was conducted with 100 cows, with space to house 140 animals in total. Two milking robots were installed and used and the heifer calves born on the farm were kept within the operation in order to replace cows taken out of production. In terms of land management the farmer cultivated approximately 300 hectares of land where 100 hectares was used for production of grains. 1, 5- fulltime worker/-s were required in the business venture to conduct production and extra labor was brought in during the summer and fall (harvest) if needed. The farm owner/farm manager had the ability to get additional help from a farmer in the geographical area in terms of machinery use. The farm owner/farm manager also had a side business, within the energy sector.

[1] *Whenever the farm owner/farm manager did have help from a family member in production wasn't discussed at the time of the interview.*

4.4.2 Farmer 2

The farm owner/farm manager[2] a woman born in the late 1950s was operating production together with her husband and son (successor). It was a family farm, passed down from generation to generation, focusing on the dairy production. In terms of the business structure the operation was run in a form of a sole proprietorship. There were plans of restructuring the business in the future, creating a joint-stock company if further investing in and expanding production. The barn currently used for dairy production was remodeled five years ago. A milking robot was used in production. Approximately 160 hectares of land was cultivated, where the majority of land was rented. It was a conventional milk production and the milk produced was delivered to Arla Foods. The number of cows on farm level was approximately 60 to 70 animals.

[2] *The farmer's level of education wasn't discussed at the time of the interview.*

4.4.3 Farmer 3

The farm owner/farm manager operating production was a male born in the early 1980s. He had been conducting production since the year 2010, together with his wife and a sibling. The farm had been in the family for many years. The farm owner/farm manager had completed secondary education (3 years) together with additional trainings. The business structure was a joint-stock company.

The dairy operation was carried out with approximately 60 animals, and a milking robot was used in production. It was a conventional milk production and the milk produced was delivered to the Arla Foods. A total of 130 hectares of land was cultivated, where approximately 40 hectares were owned and the remaining land area was rented. Production of whole grain and ley was conducted. In terms of labor the operation required approximately 1, 5 full-time workers. Some machinery used in the farming operation was partially used to conduct various off-farm jobs.

4.4.4 Farmer 4

The farm owner/farm manager a woman born in the very early 1980s had been running the dairy production since the year 2010 together with her husband. The farm had been in the family for many years. In terms of education the farmer had completed a university education (a program longer than 3 years). The business was run in a form of a sole proprietorship and conventional dairy production was conducted delivering milk to Arla Foods.

The dairy operation was conducted with a number of 40 cows in production and 45 animals (heifer calves that could replace cows in production). The cows were kept in a tied production system, and as a result production required a lot of manual labor. In terms of labor force, two people (the farmer and her husband) were running production, with the ability to hire workers during 4-5 days per month. Forest management was conducted on 250-300 hectares of land. 110 hectares of agricultural land was cultivated, used for production of grains and ley.

4.5 Findings from the case studies

The main findings from the case studies/interviews are presented in the following table, see table 11.

Table 12. Presentation of the questions and answers from the case studies (interviews)

Question 1: Do you have a vision whereupon you run your dairy operation? If so, what do you expect your business to be like in five years from now?			
Farmer 1	**Farmer 2**	**Farmer 3**	**Farmer 4**
The farm owner/farm manager stated that he wanted to further develop and improve his dairy production. He found it vital to strive towards such goal, since if not doing so the only reasonable option would be to exit dairy production entirely finding a job elsewhere in the economy. The farm owner/farm manager said that he operated his business according to a five-year plan with respect to investments, a plan that could become revised if necessary.	The farm owner/farm managers' vision for the dairy operation was for production remain the same, within a time period of five years from now. She hoped that her son (successor) would be running the business by then. A business that most likely would have changed in structure into a joint-stock company from its current form.	According to the farm owner/farm manager it was always important to continuously improve the dairy production. The farm owner/farm manager was at the time of the interview considering a business restructure, dividing the current company into two separate businesses (dairy and beef- production and construction).	The farm owner/farm manager had a vision to improve animal welfare, the working environment and to increase profit in her dairy business. According to the farm owner/farm manager it was important to maintain production as the business created job opportunities in the area and kept the landscape open. The farm owner/farm manager said that she was faced two options, to either expand production further investing in a new barn, technology, increasing the herd size and merging into a joint-stock company or exit dairy production for good. The farm owner/farm manager stated that she would be able to improve animal welfare even further if investing in a new barn and corresponding new technology. She found such investment necessary if aiming to maintain production, as the current production system was holding her back with respect to the goals she wished to achieve. The farm owner/farm manager added by saying that she could face difficulties finding a job off the farm, a qualified job in line with her education. This aspect that made maintain dairy production.
Question 2: Do you consider any of the following factors when making a decision with respect to your dairy operation, natural resources, financial capital, social structures, human capital, technology or politics? [1]			
Farmer 1	**Farmer 2**	**Farmer 3**	**Farmer 4**[2]
The farm owner/farm manager stated that it was important to have a balance in-between the amount of land cultivated and the herd size in relation to the driving distance between the estates. The farm owner/farm manager said that if he was ought to expand the business further additional labor would be required. He added by saying that management of additional labor could be stressful and time consuming and therefore he at the time of the interview didn't feel the urge to expand the business further. The farm owner/farm manager also found it important to be attentive to the various regulations applicable to the business as they tended to change constantly.	The farm owner/farm manager stated that aspects such as, availability of credit and the overall financial status of the firm were important to consider when making a business related decision. She added by saying that she and her husband probably wouldn't have invested in a new barn if their son (successor) hadn't been involved in the decision-making process.	The farm owner/farm manager found it important to always strive to improve and to some extent expand the business. The farm owner/farm manager exchanged agricultural related business information and knowledge with a neighboring farmer. An action taken to support one and other, making it possible to maintain agricultural production in the region.	The farm owner/farm manager said that financial aspects as well as availability of land have to be considered when making a business related decision with respect to further dairy farm maintenance. She mentioned that if expanding the business further, additional labor most likely would be needed, which required knowledge in terms leadership and management, knowledge that she didn't fully have but desired. The farm manager/farm owner wished that she at times could be more of a regular business owner only considering the financial aspects when it came to making a decisions with regards to further investments. According to the farm owner/farm manager the farm was her life and that there was more to it than just a regular business. The farm owner/farm manager wanted to be more flexible in terms of time spent with her family, as she found it difficult to find time for such activities due to a time consuming production.

[1] *All farm owner/farm managers stated that there were possibilities to co-operate with other farmers in the geographical area. Collaboration was carried out in a way where farmers purchase agricultural related services from one-and other. According to one farm owner/farm manager*[2] *it used to be common to have all machinery needed for the daily tasks on farm level, whereas todays farmers rather had one or a few of the machines needed and instead purchased services from other producers who owned the additional technical equipment.*

Question 3: What are your thoughts on expanding your dairy business?			
Farmer 1	**Farmer 2**	**Farmer 3**	**Farmer 4**
The farm owner/farm manager strived to improve and further develop his dairy business continuously. The farm owner/farm manager said that the salary often didn't justify the time spent and risk associated with production, which could be troublesome. Furthermore he believed that it was important to manage an operation that was larger than average, dairy production in the region, in order to maintain production at a low cost.	The farm owner/farm manager believed that her future dairy production most likely would take the same form as it did at this present day.	The farm owner/farm manager was currently in the position of considering an expansion of the business. He would however not like to expand the business to such an extent were additional labor was needed, as such action required additional management skills and time. The farm owner/farm manager found it difficult to conduct small-scale production, since it was more expensive to run such production regionally compared to a business venture of larger scale.	The farm owner/farm was currently in the position of making a decision to either expand the business or simply exit dairy production. The farm owner/farm manager wanted to improve animal welfare, the working environment and add additional units of labor within the operation. The farm owner/farm manager mentioned that the entrepreneurship in the region was strong.
Question 4: What are your thoughts on the new CAP reform and agricultural policies in general?			
Farmer 1	**Farmer 2**	**Farmer 3**	**Farmer 4**
The farm owner/farm manager didn't think that there was going to be such difference for him as a producer with the new reform in place compared to the previous situation. The farm owner/farm manager found the regulations related to production concerning, questioning if all regulations implemented were needed.	The farm owner/farm manager stated that she would like to get a reasonable payment for the products produced on farm level, instead having to depend on financial support from the EU and the Swedish Government. The farm owner/farm manager said that she had the option of renting agricultural land from a neighboring farm but decided to not do so, as the commitment would have lowered her compensatory aid, receive annually. In terms of the milk quota abolishment the farm owner/farm manager said that even though such development potentially would make it possible for all producers to increase profit by producing more milk. This assumption wouldn't hold as the total quantity of milk on the world market most likely would increase, leading to a decrease in the world market price of milk.	The farm owner/farm manager found it difficult to predict the actual outcome of the new policy. According to him it was concerning that information in terms of new regulations sometimes weren't available until the day were ought to be implemented, making it difficult to adjust production accordingly.	The farm owner/farm manager believed that the new CAP reform wouldn't affect her business financials negatively. The farm owner/farm managers however found it worrying not knowing what was going to happen to the financial support being set aside for certain investments within agricultural sector. This since the availability of such financial support played an important role as she was going to make a decision to either further invest in the business or simply exit dairy production.

Question 5: What are your thoughts on the current market price of milk, how does this price affect your way of making business related decisions? [3]			
Farmer 1	**Farmer 2**	**Farmer 3**	**Farmer 4**
The farm owner/farm manager thought that the milk prices were ought to fluctuate as the milk quotas were abolished. The producer therefore strived to have financial means in place in order to be able to cope with such fluctuations.	The farm owner/farm manager had a feeling that the market price of milk would fluctuate with time and therefore she found it important to be prepared for such development. The farm owner/farm manager mentioned that investments related to production potentially could be placed on hold when the market price of milk was low.	The farm owner/farm manager found it important to operate a production in such way making it possible to cope with a fluctuating market price of milk.	According to the farm owner/farm manager it was important to be aware of the costs associated with production, especially as the current market price of milk was low. Additionally she strived to cut costs in production without compromising on animal welfare and an acceptable working environment.

[3] *All farm owners/farm managers at the time of the interviews delivered their milk produced to Arla Foods. All producers were positive towards Arla Foods in a sense that even though the market price of milk was low Arla Foods still collected the milk produced on farm level.*

5- Analysis and discussion

This chapter includes an analysis and a discussion of the empirical findings from the quantitative (survey)-and qualitative (case studies with interviews) study with respect to the research questions presented in chapter one and the theoretical framework from chapter two. The findings from the two methodological approaches are analyzed and discussed separately. The discussion is ought to create an understanding on why certain factors, influence and are of importance for farm owners/farm managers as they make a decision with respect to further dairy farm maintenance.

5.1 Survey analysis

In order to determine which ones of the explanatory variables presented in chapter three, having an impact on a dairy producer's decision-making process with respect to further dairy farm maintenance within a time period of five years from now a number of estimations were conducted.

The results from the ordered probit model confirmed that four factors were considered as these variables had so-called explanatory power, being statistically significant at the 90 % level or better. These factors were the number of employees on farm level, a producer's year of birth ultimately determining his/her age, the parameter uncertainty and a farms geographical location (municipality) Åre. It's important to remember that the actual sample of farm owners/farm manager responding to the survey was rather small, meaning that all aspects considered by a producer when making the previously stated decision may not have been captured in the estimations conducted.

As previously stated Swedish farms have increased in size all since the 1950s (The Swedish Board of Agriculture, 2012:MacDonald *et al.*, 2000). According to the findings from the ordered probit model, the dairy farm owners/farm managers considered the number of employees on farm level when making a business related decision with respect to further farm maintenance. A factor that ultimately referred to the theoretical concepts of (dis) economies of scale and size, defined by Pindyk & Rubinfield (2009), as it can determine the scale/size of an actual operation.

Pindyck & Rubinfeld (2009) stated that a firm's average cost of production is likely to decline when the level of output increases, as the overall efficiency on farm level improves. They showed that such development requires for the producer to have access to inputs (skilled labor) in production in order to avoid an increase in the average cost of production as the business enlarges. The empirical findings from the ordered probit model support the statement by Pindyck & Rubinfield (2009). The number of employees on farm level could be considered in two ways, given the fact that the producer strived to cut costs in production. The producer could choose to expand the business a development requiring for additional labor to be hired in order to carry out the daily tasks or he/she could let production stay intact avoiding a scenario where unskilled labor is employed, as such could affect the overall farm performance in a negative way. According to the findings from the ordered probit model, as expected a producer who hires additional labor, ultimately expanding production are more likely to stay in business over time.

Gale (1994) found that farm owners/farm managers will consider the aspect of age when making a decision with respect to further dairy farm maintenance. An older producer is more likely to exit production compared to a younger one. It's evident that the farming occupation is associated with substantially higher risks of injury and mortality compared to other professions, especially when considering producers over the age of 55 (Amshoff & Reed, 2005). There's ultimately a linkage in-between age and health. The statements by Gale (1994) and Amshoff & Reed (2005) are supported by findings from the quantitative study, as the aspect of age was considered as a producer made a decision with respect dairy farm maintenance. The average age of the farm owners/farm managers responding to the survey subject to this research were 53. From the researcher point of view it wasn't surprising that the aspect of age was considered in this context. Farming as an occupation is physically demanding, meaning that a farmer of a higher age (often in a poorer physical shape compared to a younger producer) may be forced to exit production as he/she may find it difficult to handle the workload. Furthermore given the findings from the ordered probit model, as predicted a dairy farmer with a higher age is more likely to exit production compared to a younger one.

Debertin (2012) stated that farm owners/farm managers will consider the aspect of uncertainty when making a decision with respect to further dairy farm maintenance. He defined uncertainty as a factor constituting for changes in weather conditions and outbreaks of various diseases and pests. Uncertainty as a factor was defined according to Debertin (2012) in the survey. Given the results from the ordered probit model, uncertainty as an aspect came out as significant meaning that it was considered by the producers as they made a decision with respect to further dairy farm maintenance. This empirical finding ultimately supports the notion by Debertin (2012). Furthermore it's evident that the growing season in this region is short compared to other areas in Sweden, meaning that the producers regionally would have to operate their production in an effective way when possible in order to remain profitable. Given such information, it wasn't surprising that the aspect of uncertainty in this sense was considered by the farm owners/farm managers as they formed a strategy with respect to further dairy farm maintenance. It seems as if an unpredicted event would occur, such as rapid changes in terms of weather conditions or serious outbreak of diseases and pests affecting production over time, a producer was more likely to exit- in favor or maintaining dairy production.

The last factor that was significant given the estimations from the ordered probit model, having an impact on a dairy farmer as he/she makes a decision to further maintain production was the geographical location of a farm (municipality) Åre.

Given the information from the survey the majority of the producers answering the survey was currently operating production in Krokom, Bergs or Östersund municipality. In these counties the land is fertile according to Jämtland County Administrative Board (2011), as it's located around the lake Storsjön which is beneficial when conducting production. Furthermore the producers also have the chance of co-operating with one and other locally as the concentration of dairy farms in high, a parameter that according to previous research seem to stimulate further dairy farm maintenance, Stam (1991). The producers may also be able to share knowledge among each other, which motivates producers to further farm maintenance, proven by Källström & Ljung (2005). Additionally the producers also can benefit from social services available in the area as these farms are located within close range from the city Östersund, an aspect that also may constitute for further dairy farm maintenance, according to Skarelius Lille (2015). This is however not the case for Åre municipality as its located further

north in the County, with a long driving distance to the city of Östersund and small number of producers, which explains why a producer operating production in the area, as shown according to the estimations from the ordered probit model is less likely to maintain production over time.

The following paragraphs include a summarizing analysis and discussion of the additional material found in the survey and not necessarily linked to the findings from the ordered probit model, observations that potentially could be linked to the decision making process of a dairy producer with respect to his/her further dairy farm maintenance.

Jones (1999) showed that a dairy producer who invests in new technology is more likely to maintain production. In terms of the respondents of the survey, a majority of the producers (43 %) conducted production with modern technology on farm level, a milking robot. In this case it's possible to say that there's a linkage in-between the level of technology used on farm level and the willingness of maintaining production, especially since investing in new technology is costly and if a farmer isn't interested in maintaining production he/she would not carry the burden of such investment. He/she would then instead prior to an investment decide to exit production entirely. Its however important to remember that the sample subject to this research is fairly small, meaning that the producers answering the survey may be more willing to further maintain production as many of them already had adopted to new technology.

Tauer (2001) showed that the number of cows on farm level often corresponds to a farm owners/farm manager's general farm performance. He showed that a producer who operates production on a larger size/scale is more likely to maintain production. According to findings from the survey, the average number of cows in production were 58, a number that could be compared to the average herd size on national level which was 77 according to the Swedish Board of Agriculture (2013). In this sense it's evident that the producers regionally on average operate production on a smaller-scale which potentially should make them exit production, given the information from the literature. One could wonder why this isn't the case for the dairy producers in the region, as they tend to maintain production on a smaller scale. Information provided by officials at the County Administrative Board in Jämtland County may be used to understand such thing. According to Engström (2015) the level of entrepreneurship on County level is strong, and there's a willingness to live and work in these areas. Many of the producers regionally conducted production in other sectors either strictly or partially linked to the dairy production. Activities that according to Dalton & Bragg (2004) should constitute for a farm exit. This however doesn't seem to be the case for producers in Jämtland County, as many of them conduct off farm activities and still maintain dairy production.

The level of diversification in production and further dairy farm maintenance in Jämtland County could also be related to the aspect of family farm legacy. A majority of the dairy farmers responding to the survey witnessed that their farm had been passed down from generation to generation, as 32 % stated that the farm had been business for more than 31 years. Given such information as it's evident that there's more to a family farm than just a business, it's a lifestyle, producers will find other income lucrative activities within close range of the farm making it possible for them to carry out the main on farm activity and keeping the estate in the family. Ultimately in this case according to the findings from the survey it doesn't seem exist a correlation in-between the level of specialization and further farm maintenance.

5.2 Case study analysis

According to Pindyck & Rubinfeld (2009) and Allen *et al.* (2011) a farm owner/farm manager is likely to benefit from the concept of economies of scale/size and comparative advantage when operating on a larger scale. Empirical findings from the qualitative study (case studies entailing interviews) support their notions, as two of the farm owners/farm managers (1 and 3) found it important to manage a production larger than the average operation in the sector regionally. They expressed that such business management made it possible to cut costs in production. On the same note farmer 4 who currently operated production on a smaller scale compared to the County average felt the need to increase the size/scale, investing in new technology and increase the herd size cutting costs in production all in all to stay in business.

Bragg & Dalton (2004) and Goetz & Debertin (2001) showed that a producer specializing in production is more likely to maintain production as he/she can utilize the concept of comparative advantage (Allen *et al*. 2009) focusing production on activities in which he/she is most efficient (Pindyck & Rubinfeld, 2009). Empirical findings from the qualitative study supports the notions by Bragg & Dalton (2004), Goetz & Debertin (2001) and Allen *et al*. (2009) as a majority of the farm owners/farm managers (1, 2 and 3) focused exclusively on dairy production. An additional argument provided by farmer 4 supported the notion by Allen *et al*. (2009) and Pindyck & Rubinfield (2009). Farmer 4 stated that it had become more common for farmers to depend on other producers in the geographical area in order to get various agricultural tasks done. This especially since every single farmer didn't own all machinery needed to perform the daily tasks on farm level, as machinery was associated with large investments and costs of maintenance.

According to Debertin (2012) and Pindyck & Rubinfield (2009) a producer at some point is likely to encounter the concept of diseconomies of scale/size when conducting production. In reality diseconomies of scale/size may occur when the extra labor hired (a result of a business expansion) is lacking the same skillset or knowledge as the farm owner/farm manager, making production inefficient. Two of the farmers (1 and 3) considered this aspect in relation to the concept of diseconomies of scale/size when conducting production. Both producers expressed their skepticism on such business expansion where additional labor was needed as they found it troublesome managing such workers.

5.2.1 Strategic management

Internal environment

Debertin (2012) stated that a producer in the agricultural sector would make business related decisions with respect to a number of constraints such as available land, capital and labor. The farm owner/farm manager will also strive to maximize profit under such constraints. Empirical findings from the qualitative study supports such arguments, as farmer 1 considered the amount of land cultivated, with respect to the size of a herd when making business related decisions and farmer 4 found it vital to consider animal welfare and the overall working environment when conducting production.

According to Gloy *et al*. (2002) and Jones (1999) a producer investing in new technology is more likely to maintain production. This notion can be confirmed by the findings from the qualitative study, as three out of four farm owners/farm managers (1, 2 and 3) conducted

production with a new technology on farm level, using a milking robot. The forth producer was currently contemplating an investment in new technology and stated that if she weren't to follow through with such decision a farm exit would be her only option.

Micro-social environment

Gale (1994) showed that producers are ought to consider the aspect of age when making business related decisions with respect to further farm maintenance. This notion was supported by the empirical findings from the interviews, as 3 out of 4 farm owners/farm managers (1, 3 and 4) was born later than the year 1960, being fairly young and healthy was all set on maintaining production.

Viira *et al.* (2009) showed that producers with mental and physical support from family members are more likely to maintain production. Empirical findings from the interviews support such notion, as three out of four producers (2, 3 and 4) stated that they currently got help from their family members on a daily basis when conducting production. The same farm owners/farm managers found such assistance to be a necessity, where many of them expressed that they probably wouldn't be able to maintain production if it wasn't for such help and support.

According to Calus & Van Huylenbroeck (2008) producers with a successor are more likely to further maintain and investment in their operation instead of exiting production entirely. Such notion is supported by an argument from farmer 2. This since the farm owner/farm manager at the time of the interview considered passing on her business a successor (her son). Additionally the same producer had invested in the business over the years adding that if it wasn't for her son and his willingness to inherit the family business such investments probably wouldn't have been taken place.

Bragg & Dalton (2004) and Stam (1991) stated that farm owners/farm managers with the ability to co-operate with other producers in the geographical area are more likely to maintain production. During the interviews all farm owners/farm managers said that they collaborated with neighboring enterprises in one way or another. They also found it important to do so as machinery (investments and maintenance) was costly and by hiring entrepreneurs to conduct various tasks it was possible to cut costs in production.

Kimhi & Bollman (1999) showed that a farmer with a high level of education is more likely to exit agricultural production in favor for other job opportunities elsewhere in the economy. This since such positions might provide an increased level of utility in comparison with the farming occupation. The empirical findings from this study however didn't support such notion, as the majority of the farm owners/farm managers (1, 3 and 4) had completed a considerably high level of education compared to the County average and still maintained dairy production. Furthermore the findings from the empirical study rather showed the opposite as one of the producers, farmer 4 expressed that she most likely would have difficulties finding a job within the County in line with her university degree and therefore she preferred maintaining her dairy production.

Källström & Ljung (2005) showed that farm owners/farm managers with the ability to exchange knowledge so-called collaborative learning were more likely to maintain production compared to producers lacking such option. Farmer 3 provided a statement, supporting such notion as he at times shared knowledge about best business practices with a neighboring

farmer. Furthermore he found it important to share such knowledge as it potentially could help other producers regionally to stay in business. Given such information it's clear that a linkage in-between the option of sharing knowledge, potential success and further dairy farm maintenance.

External environment

Debertin (2012) stated that agricultural production is conducted under uncertainty, defined as changes in weather conditions and outbreaks of various diseases and pests. Meaning that it's difficult for a farmer to predict the actual outcome of production as these aspects that can't be controlled have an impact on the level of output produced. Farmer 1 stressed the fact that agricultural production is associated with such uncertainty and found it important to be compensated financially for this aspect, in order to be able to continuously run the operation.

Pietola & Lansink (2001) showed that a constant change in the number of regulations related to a certain production sector might make it difficult for managers to adjust production accordingly, having a negative impact on a firm's profitability. Empirical findings from the qualitative study support such statement, as farmer 2 found the EU and Swedish Governmental financial support system troublesome to understand at times. The farm owner/farm manager stated that she had decided not to take on rented land from a neighboring farm as such action would have lowered the compensatory aid obtained through the EU, an economic loss she wasn't willing to face. Furthermore the same producer expressed that she rather get a reasonable payment for the products produced instead of having to rely financial support from the EU and the Swedish Government.

According to Hansson (2007) producers may experience that they have limited means in terms of influencing public policies. Farmer 3 provided evidence for such notion, when mentioning that information on new policies often becomes available too late, at the time when ought to being followed making it difficult to adjust production accordingly.

Abraham (2013), Bentley *et al.* (1990) and Gale (2003) showed that an increased set of regulations in an agricultural production sector might constitute for a farm exit. Its common knowledge that many regulations as such has to be fulfilled in order for the individual producer to receive financial support from the EU and the Swedish Government. It's evident that producers within the agricultural sector in Jämtland County to a large extent rely on financial support from the EU and the Swedish Government (pers., com., Persson, 2015). Meaning that if regulations and standards aren't met, a loss in terms of financial support ultimately may constitute for a farm exit.

Many of the farm owners/farm managers interviewed witness that they are highly dependent on the option of receiving these financial supports to maintain production, and without such access a farm exit will be their only choice.

Financial support is distributed to farm owners/farm managers through the CAP. Currently one of the most significant changes in terms of the CAP policy affecting dairy producers is the dairy quota abolishment. Svensson (2015) predicted that the future market price of milk was likely to decline even further compared to today's measures, as a result of the quota abolishment. This as all producers in the EU would have the option of producing more milk, a development that with an unchanged market demand of milk would lead to a price drop per liter milk produced.

Two out of four farm owners/farm managers interviewed had contemplated on the quota abolishment. Farmer 1 and 2 believed that the fluctuations in terms of market price of milk were going to be even more significant as the quotas were abolished. Furthermore farmer 2 agreed to the notion by Svensson (2015) who believed in a price drop per liter milk produced as the overall quantity produced would increase.

Given the current relatively low market price of milk it's obvious that producers most likely will become even more dependent on financial support from the EU and the Swedish Government in the future to maintain production. This especially in a region as Jämtland County where dairy farmers already often experience a constrained financial situation, with a substantially high costly production compared to producers in the EU given circumstances such as a short growing season and an increased number of regulations with respect to the agricultural production.

Operational environment

Rahelizatovo & Gillespie (1999) stated that as agricultural production is capital intensive it's associated with large investments. All farm owners/farm managers interviewed were well aware of the costs associated with production and the investments necessary in order to run a successful business. Empirical findings ultimately supporting the notion by Rahelizatovo & Gillespie (1999).

According to Bragg & Dalton (2004) farm owners/farm managers are ought to consider in- and output prices of goods and services in production when making business related decisions. Arguments provided by three out of four producers supports such notion. Farmer 1 strived to have financial means available that could cover increased costs of production when the market output price of milk was low. Farmer 3 found it important to conduct business management in a way where fluctuations in terms of in-and output prices could be handled. Additionally farmer 4 mentioned that it was necessary to have the ability of improving production to such an extent where costs associated with the operation could be cut continuously, especially at times when the output price of milk was low.

6- Conclusions

The aim of this study was to identify factors, if any, influencing dairy farm owners/farm managers in Jämtland County when making a business related decisions with respect to further dairy farm maintenance. The objective of the study was also given the findings to comment on the future of Jämtland County's dairy sector.

In order to fulfill the aim, the study addressed the following research questions:

2) If a farm owner/farm managers is ought to continue his/her dairy production in a time period of five years from now, what factors, if any, will he/she consider when making such decision?

3) If a farm owner/farm manager considers a certain factor when making a business related decision with respect to further dairy farm maintenance, why is such factor of importance?

The results from the quantitative study (surveys) showed:

Empirical findings from the quantitative study (surveys) showed that the farm owners/farm managers in Jämtland County considered factors such as their year of birth (age), number of employees on farm level, the aspect of uncertainty and the geographical location of a farm (municipality) Åre when making a decision with respect to further dairy farm maintenance.

Previous research conducted within the field had shown that the aspect of age (a farmer's year of birth) was ought to be considered as a farmer made a decision with respect to further farm maintenance. Given such information, it wasn't surprising that the farmers in Jämtland County would contemplate the same factor. This especially since being a farmer is physically demanding, meaning that a higher age (often associated with a poorer health) would constitute for a farm exit. The number of employees on farm level came to be significant which suggests that the producers consider the concept of (dis) economies of scale/size when making business related decisions. This the aspect indicates the actual scale/size of an enterprise. Furthermore the producers would consider the aspect of uncertainty meaning that they kept potential changes in weather conditions, outbreaks of diseases and pests in mind when forming a strategy for their future business management. This since changes in weather conditions and outbreaks of diseases and pests could affect production in a way where the output produced declines, constituting for an economic loss. Additionally the geographical location of a farm was considered (municipality) Åre, in a sense where a producer conducting production in Åre region was more likely to exit production over time.

The results of the qualitative study (case studies with interviews) showed:

Empirical findings from the qualitative study (case studies with interviews) showed that the farm owners/farm managers tried to cut costs in production by managing an operation larger in size than the average dairy production regionally. They aimed to utilize the concept of economies of scale/size as well as comparative advantage to a certain extent, in order to remain profitable.

Furthermore the producers considered factors such as access to new technology (robot) within production, the number of employees in on farm level, the possibility of co-operating with other producers in the area and the option of getting support from immediate family, when making business related decisions with respect to further dairy farm maintenance.

The same producers considered the number of regulations related to production, access to financial support and in-and output prices of goods needed in the operation when making business related decisions. As these factors had an impact on the financial situation of the firm. Additionally the credit aspect seemed to be of great importance. This as all dairy farmers found it important to conduct production in a modern facility. Meaning that credit was needed for investment and maintenance of such facility.

It's evident that Jämtland County has great potential for future dairy production, both when it comes to the availability of agricultural land and the strong level of entrepreneurship regionally. Furthermore according to previous research the future demand for organic dairy products is likely to increase, given the fact that climate in the region is appropriate for such production producers also have the option to start producing organic milk if struggling when maintaining a conventional dairy production. Also given the fact that raw milk are troublesome to transport over a large distance, a suggestion may be for producers if aiming to stay in business to produce a refined product such as cheese since it has a longer shelf life, could provide a higher rate of return and is easier to transport compared to raw milk. As a concluding thought it's clear that the quantitative (surveys)-and qualitative (case studies with interviews) study demonstrates a strong willingness and motivation from the dairy farm owners/farm managers to further conduct dairy production in the region.

6.1 Data quality

The sample studied in this research was rather small when considering both the number of survey respondents as well as producers interviewed. The farm owners/farm managers interviewed were selected through a selection process from a small sample, which potentially influenced the final result as the producers might have had similar opinions on further dairy farm maintenance. It's clear that the overall level of generalizability would have been higher if data had been gathered from a greater number of dairy producers. There is also a risk of the researcher by not being objective enough when processing, affecting analysis negatively as she might have developed a positive view towards further dairy production in Jämtland County.

6.2 Recommendations for future research

This study provides information on the factors being considered by farm owners/farm managers in Jämtland County at this present time when making business related decisions with respect to further dairy production. It's evident that agricultural production is conducted on a world market that constantly evolves, meaning that producers have to adjust their production accordingly in order to make a profit. Furthermore as production conditions changes with time numerous of areas related to dairy farmers' strategic management are of interest for further research.

Studies modeling numerically to what extent farm owners/farm managers potentially are affected by changes in terms of in-and output market prices as well as public policies (taxes, subsidies, regulations and financial supports) when making business related decisions might

be of interest. It would also be possible to research the dairy farmers' willingness to maintain or expand production given the opportunity of delivering milk to a local dairy plant compared to the current processing companies operating in the area, a strive to produce refined products such as cheese or a will of conversion to organic- instead of conventional dairy production, studying if such courses of action would enhance the overall dairy production on County level.

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E-mail correspondence with Helena Eriksson, 24th of July, 2015

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Eva Engström, through a meeting in person 5th of May, 2015

Jöran Hägglund, through a meeting in person 5th of May, 2015

Margareta Persson, through a meeting in person, 5th of May, 2015

Appendix 1. Cover letter 1

Address:

Östersund 4th of May 2015

Hi,

This letter has been sent to you since you have been selected to participate in a study focusing on dairy farmers' decision- making process. The study aims to identify the factors, if any influencing individual dairy producers in Jämtland County when making business related decisions.

This study constitutes for a thesis work at the Department of Economics, Swedish University of Agricultural Sciences in Uppsala. Student Linnea Högberg supervised by Professor Yves Surry together with assistant supervisor Margareta Persson conducts the work.

The project is initiated and carried out on commission by the County Administrative Board in Jämtland since a large number of dairy producers have decided to exit production during the past couple of years. The purpose of this project is therefore to obtain information that could be used by the County Administrative Board in Jämtland when creating an action plan with the purpose of strengthening the dairy producers' possibilities of maintaining production regionally.

This envelope included a questionnaire and a self- addressed envelope. It's of course optional to participate in the study, but in order for the answers to be used for the final analysis the questionnaire must be filled out completely. The responses will be treated confidentially and it won't take more than 20 minutes to answer all the questions. When the survey/questionnaire is completed, please put it in the self- addressed envelope and send it by postal-mail.

The finished thesis work will be presented in August 2015. Last of response and sending it by postal mail will be June 29th 2015.

Thanks in advance for your participation,

Best,
Linnea Högberg

If having questions or concerns you are more than welcome to contact anyone according to the contact information listed on the next page.
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Appendix 2: Survey

Active dairy producers

A farmer's decision-making process
Dairy farming in Jämtland County
May- 2015

The survey is divided into six different sections A, B, C, D, E (part 1 and part 2) and F.

A. Background

Please check the one box that matches your opinion.

1. Are you?

- ☐ Female
- ☐ Male

2. When were you born?
Please state the year on the line below.

Year: _____

3. What is your level of education?

- ☐ University degree (longer than 3 years)
- ☐ University degree (3 years exact)
- ☐ University degree (shorter than 3 years)
- ☐ Secondary education (3 years)
- ☐ Secondary education (2 years)
- ☐ Primary education

4. What alternative describes your family situation?

- ☐ A household with two or more adults, one or more children (over the age of 18)
- ☐ A household with two or more adults, one or more children (under the age of 18)
- ☐ A household with two or more adults, no children
- ☐ Single, one or more children (over the age of 18)
- ☐ Single, one or more children (under the age of 18)
- ☐ Single, no children

5. Are you a full-time farmer?

- ☐ No
- ☐ Yes

6. Where is your dairy operation located?

- ☐ Berg County

- ☐ Bräcke County
- ☐ Krokom County
- ☐ Härjedalen County
- ☐ Strömsund County
- ☐ Ragunda County
- ☐ Östersund County
- ☐ Åre County
- ☐ Östersund County

- ☐ If other, where? _____

B. General features

Please check the one box that matches your opinion.

7. How many dairy cows do you have in your operation?
Please state the number of dairy cows on the line below.

Number of dairy cows: _____

8. Are heifer calves that are born on farm level kept on the farm in order to replace cows that has to be taken out of production?

- ☐ No
- ☐ Yes

9. Do you consider increasing the number of dairy cows in your operation?

- ☐ No
- ☐ Yes
- ☐ Do not know

10. Which production system is used in the dairy operation?

- ☐ Pit
- ☐ Robot
- ☐ Tied

- ☐ If other, what? _____

11. For how many years have you been running your dairy operation?

- ☐ Less than 5
- ☐ 5- 10
- ☐ 11- 20
- ☐ 21- 30
- ☐ More than 31

12. For how many generations have the farm been in the family?

Please note the number of generations on the line below.

Number of generations: _____

13. What is the name of the company that you deliver milk to?

- ☐ Arla
- ☐ Norrmejerier

- ☐ If other, which one? _____

14. Are you running an organic dairy operation?

- ☐ No
- ☐ Yes
- ☐ No, but I´m/ we´re planning to do so in the future

C. The business structure

Please check the one box that matches your opinion.

15. What type of structure does your business have?

- ☐ Joint- stock company
- ☐ Sole trader
- ☐ Sole proprietorship
- ☐ Partnerships

- ☐ If other, what? _____

16. How many people work full-time in your dairy operation (you included)?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ More than 5

17. A. If not all adults in the household are working full-time in the dairy operation, in what other sector does that person/ people work?

If all adults in the household are working full-time in the dairy operation proceed to question 18.

- ☐ Retail sector
- ☐ Health and social care sector
- ☐ Forestry sector
- ☐ Production (manufacturing) industry
- ☐ Tourism sector

☐ Educational sector

☐ If other, which one? _____

B. If not all adults in the household are working full-time in the dairy operation, in what other sector does that person/ people work?

☐ Public sector
☐ Private sector

18. Do you currently run any operations within the following categories on your farm apart from the dairy operation?
You may choose more than one answer.

☐ Tourism (conference activities, hotel, bed and breakfast, etc.)
☐ Beekeeping
☐ Farm store (located on the farm)
☐ Poultry production
☐ Food processing
☐ Pork production
☐ Bordering horses
☐ Beef production
☐ Outsourcing projects (non- food production, such as: roadwork, plowing snow, road construction)
☐ Outsourcing projects (missions from other farmers such as: harvest, plowing etc.)

☐ If other, what? _____

19. What is the average annual turnover in your dairy operation (incl. additional activities/ services)?

☐ Up to 500 000 SEK
☐ 500 001- 1 000 000 SEK
☐ 1 000 001- 1 500 000 SEK
☐ 1 500 001- 2 000 000 SEK
☐ 2 000 001- 5 000 000 SEK
☐ More than 5 000 000 SEK

20. To what extent is your property mortgaged?

☐ 0 %
☐ 1- 20 %
☐ 21- 40 %
☐ 41- 60 %
☐ More than 61%
☐ Do not know

21. Do you currently take advice from a professional advisor/-s (from for instance LRF-consultant)?

- ☐ No
- ☐ Yes
- ☐ No, but I/ we plan to hire one

22. What motivates you to run your dairy operation?
You may choose more than one answer.

- ☐ Work with different things (tasks)
- ☐ Work close to the nature
- ☐ Make my own decisions in terms of when and where to work
- ☐ Preserve natural and cultural values
- ☐ Contribute to preservation and development of Swedish food production
- ☐ Family traditions
- ☐ Make a living for me/- and my family (financial support)
- ☐ Keep an open landscape (enhancing biodiversity)
- ☐ Personal interest in dairy farming
- ☐ Create jobs in rural areas

- ☐ If other, what? _____

D. Land management

Please check the one box that matches your opinion.

23. How many hectares of agricultural land do you currently operate (land rented included)?
Please state the number of hectares on the line below.

Number of hectares: _____

24. Out of the hectares you currently operate, how many do you own?
Please state the number of hectares on the line below.

Number of hectares: _____

25. Out of the hectares you currently operate, how many do you rent?
Please state the number of hectares on the line below.

Number of hectares: _____

26. For what purpose are you currently using your agricultural land?
You may choose more than one answer.

Please indicate by checking off the box/ -es which crops that are grown. If checking off a box/ -es please state approximately how many hectares of each crop that is cultivated.

☐ Cultivation of crops

	Number of hectares (ha)
☐ Oats	
☐ Grains (*helsäd*)	
☐ Winter wheat	
☐ Potatoes	
☐ Rapeseed	
☐ Turnip	
☐ Spring barley	
☐ Peas and field beans	
☐ If other, what? _____	

☐ Cultivation of ley
Number of hectares: _____

☐ Pastureland
Number of hectares: _____

☐ Fallow land
Number of hectares: _____

☐ Wetland
Number of hectares: _____

☐ If other, what? _____

27. A. Do you own forestland?
If answering no please go to question number 28.

☐ No
☐ Yes
☐ No, but I / we plan to invest in forest land

B. How many hectares of forestland do you own?
Please state the number of hectares on the line below.

Number of hectares: _____

28. To what extent is the farm self-sufficient on feed intended for the dairy operation?

☐ 0 %
☐ 1- 20 %
☐ 21- 40 %
☐ 41- 60 %
☐ 61- 80 %

- ☐ More than 81 %
- ☐ Do not know

29. Do you currently run any other type of livestock operation on your farm a part from your dairy operation?

- ☐ No
- ☐ Yes
- ☐ No, but I am/ we are planning on doing so in the future

E. Decision- making

Part 1

Please check the one box that matches your opinion.

30. *On a scale of 1-5, where 1 corresponds to (very likely), 2 correspond to (likely), 3 correspond to (indifferent/ no opinion), 4 correspond to (very unlikely) and 5 correspond to (extremely unlikely).*

How likely are you to be running your dairy operation in five years from now?

- ☐ 1 (very likely)
- ☐ 2 (very likely to happen)
- ☐ 3 (likely to happen)
- ☐ 4 (might happen)
- ☐ 5 (won't happen)

31. *On a scale of 1-5, where 1 corresponds to (very large extent), 2 correspond to (large extent), 3 correspond to (indifferent/ no opinion), 4 correspond to (small extent) and 5 correspond to (no extent).*

To what extent would you say that you are in need of financial support from the Swedish Government and the EU in order to run your dairy operation?

- ☐ 1 (very large extent)
- ☐ 2 (large extent)
- ☐ 3 (indifferent/ no opinion)
- ☐ 4 (small extent)
- ☐ 5 (no extent)

32. *On a scale of 1-5, where 1 corresponds to (strongly agree), 2 correspond to (partially agree), 3 correspond to (indifferent/ no opinion), 4 correspond to (partially disagree) and 5 correspond to (strongly disagree).*

Would you say that you are in need of expanding your business in order to survive financially in the long run?

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent/ no opinion)

☐ 4 (partially disagree)
☐ 5 (strongly disagree)

33. *On a scale of 1-5, where 1 corresponds to (strongly agree), 2 correspond to (partially agree), 3 correspond to (indifferent/ no opinion), 4 correspond to (partially disagree) and 5 correspond to (strongly disagree).*

Do believe that a reduction in the number of regulations related to the dairy operation would make it easier for you to run the business efficiently?

☐ 1 (strongly agree)
☐ 2 (partially agree)
☐ 3 (indifferent/ no opinion)
☐ 4 (partially disagree)
☐ 5 (strongly disagree)

34. Do you believe that the milk price will increase in the future?

☐ No
☐ Yes
☐ Do not know

35. Would you deliver milk to a local dairy plant if you had the chance?

☐ No
☐ Yes
☐ Do not know

36. A. Would you join a business association like Sju Gårdar in Mälardalen if you could?
If answering no to question 36, please go to question 37.

☐ No
☐ Yes
☐ Do not know

B. What would you say is your main reason for not being willing to participating in such business venture?
You may choose more than one answer.

☐ I/ we will lose the focus of the primary production
☐ I am/ we are faced with a lack of knowledge on how to run such business (in terms of marketing, dairy plant operational processes etc.)
☐ I am/ we are not interested in the increased responsibility
☐ I am/ we are worried that it would not be possible to sell all milk that is produced
☐ I am/ we are not interested in increasing the number of employers which will be needed in order to join such venture

☐ If other, what? _____

Part 2

*This part aims to find out what factors affect / influence you when making decisions in your dairy operation. Question 37 is a statement that is linked to the factors (option) **a** to **u**. It is read for option a: **"When I make decisions in my dairy operation I consider the following factor ... the availability of natural resources (land and water)".***

On a scale of 1-5, where 1 corresponds to (strongly agree), 2 correspond to (partially agree), 3 correspond to (indifferent/ no opinion), 4 correspond to (partially disagree) and 5 correspond to (strongly disagree).

Then proceed to answer the question by taking into account the option b, c, d, etc.

37. When I make decisions in my dairy operation I consider the following factor...
Please check the one box that matches your opinion.

a. … the availability of natural resources (for example: land and water)

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

b. … the current market price of milk

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

c. … the future market price of milk

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

d. … the current prices of inputs needed in the operation

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

e. … the future prices of inputs needed in the operation

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

f. … the possibility to collaborate with other farmers in my/ our geographical area

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

g. … the decisions made by other farmers in my/ our geographical area

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

h. … the advice from my/ our professional advisor/ -s (for instance LRF- consultant)

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

i. … the amount of capital available in the agricultural business (for investments or equivalent)

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

j. … the option to borrow money from the bank/ other financial institute to further invest in the dairy operation (for example: increase the herd, farm larger areas or purchasing new technical equipment)

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

k. ... the chances of having somebody of the following generation willing/ wanting to inherit my agricultural business

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

l. … the goal to increase future firm profit

- ☐ 1 (strongly agree)

- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

m. … uncertainty and risk (for example: weather conditions, diseases and pests)

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

n. … structural changes in terms of the financial support that can be obtained through CAP (EU)

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

o. … changes in terms of the regulations on how to keep animals

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

p. … changes in terms of regulations on how to manage land

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

q. … changes in terms of regulations on how to apply nutrients and pesticides

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

r. … the level of taxes and subsidies that are related to the agricultural business

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

s. … the access to infrastructure and services in rural areas

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

t. … changes in public consumption

- ☐ 1 (strongly agree)
- ☐ 2 (partially agree)
- ☐ 3 (indifferent)
- ☐ 4 (partially disagree)
- ☐ 5 (strongly disagree)

If you feel like there are other factors that may influence your decision-making process, factors that have not been covered in the previous questions please state such factors below (u).

u. … If other, what? _____

_____

_____

F. The business climate

38. What do you believe is needed in terms of political actions (regionally, nationally and EU-level) in order to make dairy operators in Jämtland County staying in business?
You may choose more than one answer.

- ☐ Subsidize the possibility for farmers to hire a personal professional advisor
- ☐ Compensate Swedish farmers financially for a stricter animal welfare regulation compared to other countries within the EU
- ☐ Improve the way food is labeled (country of origin)
- ☐ Improve trade barriers in order to guarantee a certain market price of milk
- ☐ Simplify the SAM application process
- ☐ Make it easier for a family member/ other person to take over the farm (generational shift)
- ☐ Reduce the number of external controls (land, livestock)
- ☐ Reduce the number of regulations related to farm production
- ☐ Strengthen regulation on what can be said in food ads
- ☐ Increase the financial support (from the Swedish Government and EU)
- ☐ Provide additional information to the general public on how food production is conducted on farm level (nationally and internationally)

- ☐ If other, what? _____

_____

_____

39. What actions can the County Administrative Board in Jämtland take in order to strengthen the dairy operation sector?
You may choose more than one answer.

- ☐ Provide additional support throughout the SAM application process
- ☐ Provide additional information about the various financial supports that can be obtained through CAP
- ☐ Streamline external controls (land, livestock)

- ☐ If other, what? _____

Thanks again for participating!

Appendix 3. Cover letter 2

Address:

Östersund 29th of May 2015

Hi,

In the beginning of the month you received a letter by postal mail that included a survey/questionnaire as well as a self- addressed envelope from the County Administrative Board in Jämtland County. This since you had been selected to participate in a study focusing on the factors, if any influencing a farmer's decision-making process when making a decision with regards to future dairy farm maintenance.

The survey/questionnaire is a part of a study conducted by student Linnea Högberg at the Department of Economics at the Swedish University of Agricultural Sciences together with the County Administrative Board in Jämtland County were Margareta Persson is the assistant supervisor. The aim of this study is to provide the County Administrative Board in Jämtland with knowledge about individual dairy farmers' decision-making process, information that could be used when conducting work in order to support and strengthen the sector.

It's of course optional to participate in the study, but your opinions are valuable and so take the chance and participate. The survey/questionnaire is confidential and the final work will be presented in August 2015. If you have not received the survey/questionnaire prior to this letter, let us know.

The last day of response is July 29th 2015.

A great thanks to you, if you've already responded to the survey/questionnaire!

For questions or concerns don't hesitate to contact anyone listed below.

Best,
Linnea Högberg

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Appendix 4. Interview guide

Section A

1) Can you tell me about your background (incl. level of education, previous work experiences and family situation etc.)?

2) Can you tell me about your agricultural business venture (incl. the aspects listed below)?
    - Number of years running production
    - Number of hectares of land cultivated
    - Size of herd
    - Level of technology used on farm level
    - Business structure
    - Labor force
    - On/ off farm employment
    - Organic vs. conventional production
    - Access/ no access to an advisor
    - Social structures (potential co-operation with other farmers)
    - Company processing the milk produced

Section B

3) Do you have a vision for your future dairy production? If so, where do you think you are within a period of five years from now?

4) What are your thoughts on the current market price of milk? How does it affect your way of making decisions with regards to production?

5) Do you consider any of the following factors listed below, when making business related decisions?
    - Land
    - Capital
    - Labor
    - Politics
    - Social structures

6) Are you considering expanding your dairy production?

7) What are your thoughts on the new CAP reform and politics in general?

Appendix 5. Estimations from the ordered probit model

Table 13. Ordered probit estimates from equation 20
y=”further dairy farm maintenance within a time period of five years from now”

Variables		Coefficients	Standard errors	t-statistics	P-values
Constant**		79.4161	31.2623	2.54031	0.011
Number of employees on farm level**	x_2	-0.370248	0.174997	-2.11574	0.034
Geographical location of the farm (municipality) Åre**	x_4	0.977894	0.452061	2.16319	0.031
Year of birth (age)**	x_5	-0.039327	0.015849	-2.48141	0.013
Level of education	x_7	-0.144758	0.121489	-1.19153	0.233
Future market price of milk	x_{14}	0.170307	0.175439	0.97075	0.332
/cut 1 (μ_1)		1.17891	0.223534	5.27394	0.000
/cut 2 (μ_2)		1.37103	0.238380	5.75144	0.000
/cut 3 (μ_3)		2.29492	0.331688	6.91892	0.000

Log likelihood: -66.1503
N: 52
Scaled R-squared: 0.327307
Mean of dependent variable: 1.61538
Std. dev. Of dependent variable: 1.38838
***, **, * represent statistical significance at five-and ten percent level, respectively
A factor without a prefix isn’t significant at any of the previous given levels

Table 14. Ordered probit estimates from equation 42
y=”further dairy farm maintenance within a time period of five years from now”

Variables		Coefficients	Standard errors	t-statistics	P-values
Constant**		80.2076	32.3893	2.47636	0.013
Number of employees on farm level***	x_2	-0.455667	0.175301	-2.59935	0.009
Geographical location of the farm (municipality) Åre***	x_4	1.59722	0.486193	3.28515	0.001
Year of birth (age)**	x_5	-0.040026	0.016461	-2.43157	0.015
Availability of financial support (subsidy)	x_{11}	0.447001	0.305429	1.46352	0.143
Uncertainty (weather/outbreaks pests)***	x_{12}	-0.460439	0.152245	-3.02433	0.002
Option to receive credit from financial institutes	x_{13}	0.346722	0.224733	1.54282	0.123
Future market price of milk	x_{14}	0.262144	0.184205	1.42311	0.155
/cut 1 (μ_1)		1.25497	0.244081	5.14162	0.000
/cut 2 (μ_2)		1.47647	0.261817	5.63930	0.000
/cut 3 (μ_3)		2.57118	0.384726	6.68314	0.000

Log likelihood: -60.2704
N: 51
Scaled R-squared: 0.469711
Mean of dependent variable: 1.62745
Std. dev. Of dependent variable: 1.39944
***, **, * represent statistical significance at five-and ten percent level, respectively
A factor without a prefix isn’t significant at any of the previous given levels

Table 15. Ordered probit estimates from equation 3

y=”further dairy farm maintenance within a time period of five years from now”

Variables		Coefficients	Standard errors	t-statistics	P-values
Constant **		72.3607	32.8979	2.19955	0.028
Size of herd	x_3	-0.00625	0.00638	-0.97867	0.328
Geographical location of the farm (municipality) Åre*	x_4	-0.00325	0.00171	-1.89384	0.058
Year of birth (age) **	x_5	-0.03610	0.01676	-2.15410	0.031
/cut 1 (μ_1)		1.22349	0.23190	5.27592	0.000
/cut 2 (μ_2)		1.34659	0.24039	5.60171	0.000
/cut 3 (μ_3)		2.11699	0.30188	7.01260	0.000

Log likelihood: -65.5006
N: 51
Scaled R-squared: 0.25898
Mean of dependent variable: 1.60784
Std. dev. Of dependent variable: 1.40112
***, **, * represent statistical significance at five-and ten percent level, respectively
A factor without a prefix isn’t significant at any of the previous given levels

Table 16. Ordered probit estimates from equation 40

y=”further dairy farm maintenance within a time period of five years from now”

Variables		Coefficients	Standard errors	t-statistics	P-values
Constant**		73.5728	32.1325	2.28967	0.022
Number of employees on farm level***	x_2	-0.47719	0.17428	-2.73806	0.006
Geographical location of the farm (municipality) Åre***	x_4	1.41300	0.46919	3.01157	0.003
Year of birth (age)**	x_5	-0.03642	0.01631	-2.23354	0.026
Availability of financial support (subsidy)	x_{11}	0.42410	0.30606	1.38568	0.166
Uncertainty (weather/outbreaks pests)***	x_{12}	-0.35376	0.13434	-2.63334	0.008
Future market price of milk	x_{14}	0.27078	0.18252	1.48352	0.138
/cut 1 (μ_1)		1.21627	0.23640	5.14496	0.000
/cut 2 (μ_2)		1.43062	0.25360	5.64117	0.000
/cut 3 (μ_3)		2.49052	0.37073	6.71779	0.000

Log likelihood: -61.4731
N: 51
Scaled R-squared: 0.43806
Mean of dependent variable: 1.62745
Std. dev. Of dependent variable: 1.39944
***, **, * represent statistical significance at five-and ten percent level, respectively
A factor without a prefix isn’t significant at any of the previous given levels

Table 17. Ordered probit estimates from equation 72

y="further dairy farm maintenance within a time period of five years from now"

Variables		Coefficients	Standard errors	t-statistics	P-values
Constant**		79.4635	35.1076	2.26342	0.024
Geographical location of the farm (municipality) Åre***	x_4	1.61815	0.50303	3.21679	0.001
Year of birth (age)**	x_2	-0.03983	0.01786	-2.23096	0.026
Level of technology on farm level (robot)	x_1	-0.40400	0.37111	-1.08861	0.276
Level of education	x_7	-0.12764	0.15156	-0.84218	0.400
Number of employees on farm level**	x_2	-.472637	0.19611	-2.41003	0.016
Future market price of milk	x_{14}	-0.41950	0.50051	-0.83815	0.402
Option to co-operate with neighboring farms	x_8	0.01963	0.15058	0.13038	0.896
Level of specialization	x_9	0.27396	0.37354	0.73341	0.463
Regulations (with respect to animal welfare)	x_{10}	-0.36122	0.24890	-1.45126	0.147
Option to receive credit (financial institutes)	x_{13}	0.28246	0.31281	0.90299	0.367
Uncertainty***	x_{12}	1.32982	0.44307	3.00137	0.003
Subsidy	x_{11}	0.66228	0.41528	1.59479	0.111
/cut 1 (μ_1)		1.34434	0.26340	5.10373	0.000
/cut 2 (μ_2)		1.57875	0.28214	5.59556	0.000
/cut 3 (μ_3)		2.70614	0.40291	6.71654	0.000

Log likelihood: -57.9679
N: 51
Scaled R-squared: 0.52698
Mean of dependent variable: 1.62745
Std. dev. Of dependent variable: 1.39944
***, **, * represent statistical significance at five-and ten percent level, respectively
A factor without a prefix isn't significant at any of the previous given levels