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- a qualitative study of Lean Lantbruk in a Swedish context

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Carl Johnsson *Ellen Weidman*

Abstract

Higher competition and lower profitability has forced Swedish farm enterprises to adapt new market strategies. A machinery sharing collaboration between farms may increase competitiveness, reduce costs and increase shared knowledge. Since 2010 the multi-dimensional management strategy Lean Management has been adopted within Swedish farm enterprises through the project Lean Lantbruk. Lean Management implies an awareness of goal achievement and practical process tools in order to minimize costs and maximize efficiency. Further, the management strategy encourages development of relationships within the supply chain in order to fully achieve collaborative benefits. According to previous research there is need for further evaluation of the Lean Management theory in an agricultural collaboration context. The focus of this study is Lean Management in a horizontal Supply Chain Collaboration in a Swedish agricultural context with respect to machinery sharing arrangements. This study aims to increase the understanding of business culture within a collaboration between farms in Swedish agriculture where Lean Management has been implemented.

A qualitative multiple case study has been conducted through in-depth interviews with three pairs of collaborating farms where Lean Management has been implemented. Interviews have also been conducted with three pairs of reference collaborations that have not implemented Lean Management. The gathered data has been analyzed through the theoretical framework which consists of theories regarding Lean Management and Supply Chain Collaboration. The results indicate a high level of perceived trust and mutuality among all collaborative parties. Hence, Lean Management does not seem to be crucial for a well functioning machinery sharing arrangement. The influence of Lean Management is perceived as low within the collaboration which may be due to a non-holistic implementation of the management strategy within the individual farm, or due to a lack of deeper relation between the collaborating parties. By recognizing the collaborating party as a part of the own business strategy a long-term partnership could be developed, which may enhance the implementation of Lean Management.

Sammanfattning

Högre konkurrens och lägre lönsamhet har tvingat svenska lantbruksföretag att anpassa sig till nya marknadsstrategier. Ett maskinsamarbete mellan gårdar kan ge ökad konkurrenskraft, minskade kostnader och ett ökat kunskapsutbyte. Sedan 2010 har multidimensionella ledningssystemet Lean Management implementerats inom svenska lantbruksföretag genom projektet Lean Lantbruk. Lean Management innebär en medvetenhet om måluppfyllelse och användandet av praktiska processverktyg för att minimera kostnader och för maximerad effektivitet. Strategin uppmuntrar även utvecklingen av relationer inom värdekedjan för att fullt tillgodogöra sig de fördelar ett samarbete kan medföra. Enligt tidigare forskning finns det ett behov av ytterligare utvärdering av Lean Management-teorin i ett jordbruks perspektiv med avseende på samarbete. Fokus i denna studie är Lean Management i en horisontell värdekedja inom svenskts jordbruk vad gäller maskinsamarbeten. Denna studie syftar till att öka förståelsen för företagskulturen inom ett samarbete mellan gårdar inom svenskt jordbruk där Lean Management har implementerats.

En kvalitativ multipel fallstudie har genomförts genom djupintervjuer med tre par av samarbetande gårdar där Lean Management har implementerats. Intervjuer har också utförts med tre par av referenssamarbeten som inte har implementerat Lean Management. Det empiriska materialet har analyserats med hjälp av det teoretiska ramverket som består av teorierna Lean Management och Supply Chain Collaboration. Resultaten indikerar en hög upplevd tillit och ömsesidighet inom alla samarbetsparter. Därmed verkar Lean Management inte vara avgörande för ett väl fungerande maskinsamarbete. Inom samarbetet uppfattas graden av Lean Management som låg vilket kan bero på att implementering av managementstrategin inte har skett till sin helhet inom den enskilda gården, eller att det saknas en djupare relation mellan de samarbetande parterna. Genom att se samarbetspartnern som en del av den egna affärsstrategin kan ett långsiktigt partnerskap utvecklas som kan förbättra implementeringen av Lean Management.

Table of Contents

Table of Figures

Table of Tables

1 Introduction

This chapter presents challenges in Swedish agriculture, how the challenges may be handled through collaboration and how Lean Management potentially may enhance the collaboration. This is followed by the aim of the study as well as delimitations and an outline of following chapters.

Swedish farm enterprises are facing a strained profitability due to several challenges during recent years. Farmers are increasingly exposed to markets with higher competition, resulting in lower product prices (Lantbrukets lönsamhet, 2015; Ekman & Gullstrand, 2006). Prices for intermediate goods as well as products have become more volatile, which has accelerated the need for farmers to adapt new market strategies in order to obtain sustainable margins. According to Lantbruksbarometern (2015), 70 percent of the Swedish farmers state they have quite low or very low profitability. This is in line with Konkurrenskraftsutredningen (2015) that argues that the profitability among Swedish farms is low, especially within the livestock sector. In addition, it investigates that competitiveness is weak and weakens in considerable parts of the primary production. Low profitability has caused 7 percent of Swedish farmers to reduce their mortgage payments in comparison to 2014 (Lantbruksbarometern, 2015).

Although Swedish farmers seem to face higher costs than other European countries due to, in some respects, more challenging regulations and less favorable climate, that can only partly explain why Swedish farmers are facing higher costs than other European countries (Ekman & Gullstrand, 2006). Thus, the cost level for Swedish farmers should be able to be lowered. One reason for the cost difference is that the development of other sectors in Sweden influence the agricultural sector. When the Swedish business community is achieving success, salaries rise which in the long-run increases the costs of buildings and intermediate goods. Konkurrenskraftsutredningen (2015) shows that labor costs for Swedish farms are among the highest in Europe. In addition, competition from other sectors within the country implies that resources such as labor and capital move from the agricultural sector to other sectors which lowers the growth in the agricultural sector. Therefore, lower production costs are required in order to maintain Swedish farmers' competitiveness. All these challenges demand new perspectives and ways of thinking to be able to retain and develop a long-term profitability. One measure to improve competitiveness and profitability is the structural development occurring among Swedish farms (Ekman & Gullstrand, 2006). It implies that farmers with better conditions expand while those with insufficient profitability are closing down their businesses. According to Konkurrenskraftsutredningen (2015), this is a trend that will continue to benefit the competitiveness.

Another way of reaching the benefits of structural development and lower production costs is to increase the degree of collaboration between farms. To collaborate with a neighbor farm could increase the competitiveness and may enable the farmers to be more prepared when facing new challenges (Larsén, 2010). The share of Swedish farmers that planned to start a collaboration between farmers was 37 percent during 2015, which is an increase of four percentage points compared to last year (Lantbrukets lönsamhet, 2015). Konkurrenskraftsutredningen (2015) argues that different types of collaborative arrangements such as "share farming" can enhance the competitiveness in the Swedish agricultural sector. Other important measures are continued learning through new knowledge, sharing of existing knowledge and technological development. These measures can improve competitiveness and profitability through increased productivity (Ekman & Gullstrand, 2006). This study focuses on improvements through knowledge by examining the abilities of a management tool in a context of machinery sharing collaborations between Swedish farms.

Lean is a multi-dimensional management strategy (Shah & Ward, 2003) developed in Japan after the Second World War when the country suffered resource shortages (Liker, 2004). According to Warnecke and Hüser (1995), a more appropriate and slightly broader name is Lean Management (**LM**) which is why this term is used throughout the thesis. LM is usually described from two perspectives, either the philosophical perspective with guiding principles and overall goals (Womack & Jones, 1996; Spear & Bowen, 1999), or from the practical perspective that is related to management practices and tools that may be utilized immediately (Shah & Ward, 2003). The main reason to implement LM is to maximize efficiency by minimizing costs and reducing waste to a minimum (Moyano-Fuentes *et al.*, 2012).

1.1 Problem background

According to the LM philosophy, suppliers are expected to work actively in reducing waste but at the same time remain independent (Womack *et al*., 1990). Simpson and Power (2005) argue that collaboration between the supplier and the customer is the answer in order to combine these requirements. A natural step in implementing LM is to integrate or cooperate with suppliers and customers in the supply chain (Panizzolo, 1998). This is in order to affect quality of the product, services and delivery details to a higher extent. Simpson and Power (2005) argue that a big part of a successful LM adoption is the ability to share profits from joint investments between supplier and customer. The most beneficial way is to collaborate and influence LM adoption within the already existing supply chain (Lamming, 1993). However, to achieve success, information sharing is crucial in combination with a shared interest in the performance of improvement investments.

Collaboration between firms is not a new phenomenon. Weaver (2008) discusses collaboration as an important factor for innovation growth where innovations may develop through knowledge sharing between enterprises. The knowledge can be related to an actual product but also be valuable tacit knowledge. It is crucial to consider knowledge as an asset that can be shared with others. Hence, knowledge sharing is one of the most important factors for the development of collaboration (Weaver, 2008). According to Dyer and Nobeoka (2000), research shows that learning between organizations is important in order to achieve higher competitiveness. The authors also point out that collaboration leads to an exchange of practices.

In order to examine if the Swedish agricultural sector could benefit from LM thinking, a joint project was launched in 2010. The project is carried out by, among others, Hushållningssällskapet Halland and the Federation of Swedish Farmers (LRF) and labelled Lean Lantbruk. The strategic goal for the project is to implement LM and its philosophy in a larger scale, to develop more efficient working procedures and to improve leadership within Swedish agriculture. The purpose of the project is to educate and coach Swedish farmers about improvement work that is in line with four basic principles of LM. The principles are client focus, reduction of waste, creation of long-term systems and commitment between manager and employees (www, Lean Lantbruk, 2015a). As a result of the project, the promoters hope to develop more resource efficient Swedish agricultural businesses, which are characterized by stronger competitiveness at the world market and a greater ability to constantly seek new improvements.

According to Konkurrenskraftsutredningen (2015), profitability among Swedish farms vary considerably, even within the same sector despite similar conditions. A large portion of this phenomenon can possibly be explained by the manager's ability to manage and lead a business. To date, Lean Lantbruk shows that farms which have been part of the project, have a slightly higher profit margin compared to the reference farms that have not participated in Lean

Lantbruk (Lantbrukets lönsamhet, 2015). The results also indicate that farms that have participated in Lean Lantbruk since the beginning of the project, and thereby have had access to the program for a longer period of time, show the highest profitability.

1.2 Problem

The spectrum of different arrangements between businesses is wide and through collaboration with neighboring farms, benefits can be realized. Samuelsson *et al*. (2008) argue that there may be considerable benefits from full mergers between farms. The full mergers in the study obtain higher profitability through diversification in production activities, crop rotation and access to better technology. However, the benefits largely depend on the structure of the farm, its size and the farmer's risk aversion. The authors stress that a reason for why not all collaborations are characterized by full mergers is that collaborating farms may receive substantial benefits even without full mergers. According to Larsén (2010), farms who collaborate through machinery-sharing arrangements, are more likely to increase their efficiency. Although the collaboration does not lead to lower capital cost per hectare, the collaborating farms are able to increase their yield. This is a result of the ability to develop the technology and machinery system within the collaborative arrangement.

Evaluations of LM within the automotive industry have shown considerable improvements (Shah & Ward, 2003). However, Panizzolo (1998) stresses the need for research in other industries. This is in order to analyze how LM can be interpreted in industries where differences in organization and structure occur. Evaluation of LM within Swedish farms is making further progress (Melin *et al.,* 2013). However, studies regarding farms who have implemented LM and in addition are collaborating with other farms are rare. Larsén (2010) stresses the need of research regarding machinery-sharing arrangements and the effects on farm performance. Thus, a study regarding machinery-sharing collaborations where LM has been implemented is desirable.

Previous studies show that subcontractors within the automobile industry tends to apply LM strategies when having a successful relationship with their head manufacturer, who has already adopted LM thinking (Simpson & Power, 2005; Jayaram *et al.,* 2008). Hence, it is of interest to examine how a farm that has implemented LM influences the collaboration with another farm within the Swedish agricultural business.

1.3 Aim and Research Question

This study aims to increase the understanding of business culture within a collaboration between farms in Swedish agriculture where Lean Management has been implemented.

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

- How does Lean Management influence a horizontal supply chain collaboration between Swedish farms, in terms of machinery sharing and business culture in a situation when Lean Lantbruk is applied?

1.4 Delimitations

This thesis concentrates on collaboration between farms where one of the farms is part of the LM evaluation project Lean Lantbruk. The chosen farms for the study are farmers with traditional enterprises such as crop, dairy, pig, beef and egg production. In order to answer the research question and achieve the aim, the geographical location of the studied farms is of less interest. The case farms are based on the amount of interested Lean Lantbruk farms who are having a stated collaboration with another farm. Due to the approach and method of this study, the results cannot be generalized to all Swedish collaborating firms within the agricultural sector.

The definition of collaboration is of great importance in order to narrow down and select case farms. In this thesis, the definition of collaboration between farms is based on some kind of machinery-sharing agreement. It is defined as an active and stated recurrent collaboration, e.g. owning machinery together, operating own machinery for each other, having a mutual exchange of machinery, cultivating land together or having labor in common or an exchange of information. Farms that hire services from a machinery station are excluded from the study since that agreement is only considered as a purchase of a service and not a mutual exchange of contribution. Agreements regarding marketing of products and/or buying production factors are also excluded.

1.5 Outline

The following illustration in figure 1 describes the outline of this thesis. An introduction to the problem background and problem is given in chapter one (1). The chapter also contains the aim for the thesis, research question and delimitations. Chapter two (2) presents the literature review with previous research regarding LM, supply chain collaboration and collaboration between firms. The content in chapter two leads to the chosen theoretical framework in chapter three (3). In chapter four (4) the approach and design of the thesis is presented. Furthermore, the procedure regarding data collection, presentation, analysis and ethical considerations are given in the chapter. A presentation of Lean Lantbruk, the interviewed collaborations and the results of the thesis is given in chapter five (5). Further, the analysis and discussion are presented in chapter six (6) and the conclusions are presented in chapter seven (7).

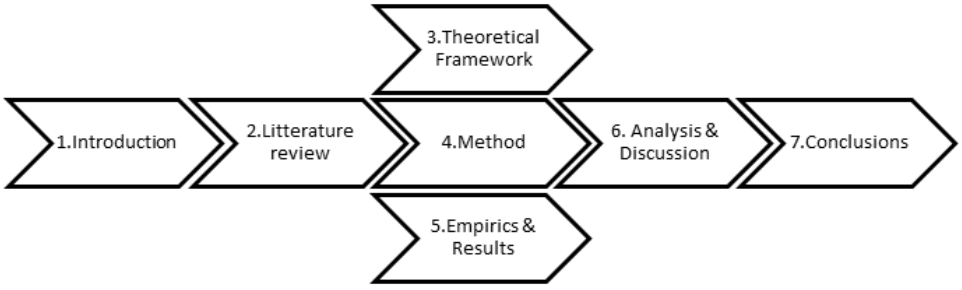

Figure 1. *The outline of this thesis (own illustration).*

2 Literature Review

Chapter two consists of a description of previous research conducted in the field. Initially, a background of LM is described with an emphasis on application in agriculture as well as some criticism of LM. Thereafter, supply chain collaboration is presented and how LM may enhance it. Finally, potential outcomes of collaboration in agricultural enterprises are mentioned.

2.1 Lean Management

Several definitions of LM and its components are used. According to Shah and Ward (2007), the most important concepts and precursors to LM are the Toyota Production System (TPS), Just-in-Time (JIT) and Total Quality Management (TQM) or Built-in quality. LM can be described as a system of methods that, when used together, provides potential to develop a more competitive company, not only within the production facility but the entire company (Warnecke & Hüser, 1995). Within LM, Warnecke and Hüser (1995) argue that four aspects can be described: product development, chain of supply, shop floor management and after-sales service. Womack and Jones (1996) state that by using LM strategies, companies aim to integrate all functions and activities needed to deliver sufficient products and services to customers, regardless of whether they are delivered by the companies themselves or by their suppliers. According to Simpson and Power (2005), a handful of empirical studies also show that LM helps improve human resources and increase services directed to customers. Shah and Ward (2007) describe several factors that characterize a LM system, arguing that all of these factors can contribute to better performance through their synergistic effects. However, to achieve sustainable advantages of LM it is necessary to implement several of these factors at the same time. In addition, research by Shah and Ward (2003) show that older manufacturing plants are less likely to implement the practices than younger plants. Moreover, a factor that could have an impact on LM adoption is the plant size. Shah and Ward (2003) argue that bigger manufacturing plants are more likely to implement the practices of LM than smaller plants. According to the authors, this result might be an effect of the assumption that larger manufacture plants are more likely to have access to resources, which allow greater structural changes.

2.1.1 Lean Management in an Agrarian Context

LM has become an interesting management system even within the agricultural sector in order to improve productivity. Andersson and Andersson (2014) explain how LM can improve leadership by evaluating indicators that may have an impact on the success of leadership. Their study shows that LM enhances communication between employees and managers of the farms, as well as work procedure and working environment. Surprisingly, LM does not increase motivation to go to work although employees who are convinced of the benefits of LM become more interested in working with it. Samuelsson and Strid (2015) examine whether LM may improve sustainable development in Swedish agricultural firms. They argue that LM increases efficiency through improved routines and that this has a positive effect on climate efficiency. However, LM did not appear to affect the awareness of sustainability since the main objective among the interviewed farms were to use LM in order to improve profitability. Dyrendahl and Granath (2011) built a model of how LM can be implemented on farm level. The authors argue that LM may improve profitability since their cases show an improved return on assets of about 1,5 percentage points. They also mention that skilled farmers already apply some principles of LM, although they are not familiar with the concept. Colgan *et al.* (2013) conducted a case study of a British farm in order to evaluate potential benefits of LM. The study shows that

farmers may receive improved competitiveness by minimizing waste and improve supply chain quality with a focus on delivering consumer value. They emphasize the need of mapping the supply chain to understand which operations that are essential for value creation and how they affect each other. The study is based on five principles of LM: value, value stream, flow, pull and perfection.

2.1.2 A critical perspective of Lean Management

It should be mentioned that even though many companies have tried, few have reached the same degree of advantages through LM as Toyota (Womack *et al.,* 1990). This may be because many companies implement LM strategies in the way Toyota uses it instead of adapting it to the company's specific circumstances using scientific methods or basic principles (Spear & Bowen, 1999). This is in line with Panizzolo (1998) who argues that managing supply chain relationships are more crucial for LM success than internal operations. Panizzolo (1998) also points out that the main problem when implementing LM is how to handle external relationships. Problems occur when trying to integrate different organizations in a supply chain, which are in the process of creating added value to high quality products, and customers. The fact that the principles of LM may appear simple and obvious may be a disadvantage. The simplicity may imply that a required, deeper understanding never is obtained (Dyrendahl & Granath, 2011). In order to develop a successful use of LM, Colgan *et al.* (2013) argues that farmers have to be acquainted with the purpose and principles of LM. Another challenge is to locate data in order to calculate added value from a process.

2.2 Supply Chain Collaboration

Naesens *et al.* (2007) argue that within the supply chain there are mainly three types of collaborations: vertical, lateral and horizontal. A vertical collaboration is defined as "a collaboration between parties sharing their responsibilities and resources to serve similar end customers such as manufacturers, distributors, carriers, and retailers." (Naesens *et al.,* 2007, p.32). Simatupang and Sridharan (2002) shares this definition in their research regarding supply chain collaboration. The lateral collaboration is a combination of vertical and horizontal collaboration (Simatupang & Sridharan, 2002; Naesens *et al.*, 2007), where the horizontal is described as a "collaboration between parties performing the same type of activities." (Naesens *et al.*, 2007, p. 32). Further definition of the horizontal collaboration is "a business agreement between two or more companies at the same level in the supply chain or network in order to allow greater ease of work and cooperation to achieve a common objective." (Bahinipati *et al*., 2009, p. 880). A relationship between two parties can be described as an agency relationship (Fayezi *et al.*, 2012). Synonymous with this relationship is that one party, the principal, delegates tasks or work to a second party, the agent. In an article by Fayezi *et al.* (2012), which aims to understand the features of supply chain relationships by applying agency theory, it is explained that the agency theory can give guidance when transaction cost dilemmas occur. Further, by applying the theory, trust can be developed within business relationships (Fayezi *et al*., 2012). However, this type of business relationship implies a vertical top-down perspective within the supply chain rather than horizontal. A difference between the vertical and horizontal collaboration is the degree of exchange of private information, which is highly associated with the horizontal collaboration (Simatupang & Sridharan, 2002). Previous experiences in vertical supply chain reveals collaborative difficulties when a large number of actors are included (Barratt, 2004). Another issue, raised by Simatupang and Sridhara (2004), is how to maintain efforts so that benefits are continuously realized within the own business but also within the business of the collaborative partner.

Collaboration within a supply chain has been defined as a business strategy with the intention of creating mutual benefits between one or more parties (Simatupang & Sridharan, 2008). Through the years, the idea of collaboration within a supply chain has moved from a more theoretical phenomenon to a wide spread real world practice (Wiengarten *et al.,* 2010). A case study conducted by Simatupang and Sridharan (2008) contributes to the understanding of supply chain collaboration through a five-element design. The elements are reminiscent of the key factors Barratt (2004) illustrates in his study regarding the basic foundations of supply chain collaboration. The design of supply chain collaboration by Simatupang and Sridharan (2008) is based on the following concepts: collaborative performance system, information sharing, decision synchronization, incentive alignment and innovative supply chain processes. According to the authors, the five elements must be in balance in order to maintain a sustainable and long-term collaboration.

Simatupang and Sridharan (2002) point out that the participants have to be involved in the developing process of a collaborative supply chain. The involvement will create joint initiatives among the members and raise their share in success, which in turn may improve profitability. By reconciliation of the different elements, a progress report may reveal how the collaboration progresses (Simatupang and Sridharan, 2008). If these elements are not well maintained, Simatupang and Sridharan (2002) argue that it may cause opportunistic behavior among collaborative members leading to a greater risk of conflicts within the supply chain. Research based on the same concepts within the German automotive industry, by Wiengarten *et al.* (2010), confirms increased performance as a result of the collaborative practices. However, the practices do not improve performance equally. The importance of high information quality plays a crucial role. The quality is determined by timeliness, added value, relevance and accuracy. Furthermore, Wiengarten *et al.* (2010) emphasizes the importance of improved information sharing to obtain a high information quality.

2.2.1 Adopting Lean Management in Supply Chain Collaboration

To reach success in LM manufacturing, it is important to have a satisfactory coordination of the supply chain, which in turn is affected by the structure of the supply relationship (Simpson & Power, 2005). MacDuffie and Helper (1997) argue that companies using LM make large demands on their suppliers in terms of quality and delivery. However, there are difficulties in changing suppliers in order to find a supplier who has already implemented LM. Instead of cost minimizing, changing suppliers can result in the opposite effect. It can also be difficult to find a suitable supplier due to a competitive market. A better alternative according to Lamming (1993) is to develop LM within existing suppliers. Moyano-Fuentes *et al.* (2012) describe how cooperation with chain suppliers within the automotive industry can enhance LM adoption. According to the study, the intensity of adopting LM is positively related to cooperation with customers. The authors also show that information integration with cooperating customers strengthens the intensity of LM adoption even more. Even Jayram *et al.* (2008) emphasize the need of relationship building in order to enhance LM strategies. Cagliano *et al.* (2006) emphasize that by adopting LM, internal information and product flows influence interactions even externally in a supply chain. However, in order to be successful there must be a coherency between LM and the adoption strategy (Cagliano *et al.,* 2006).

According to Moyano-Fuentes *et al.* (2012), a greater level of cooperation with suppliers do not necessarily imply an improved adoption of LM. This is due to the fact that the earlier we look into the value chain, the more customers a supplier has, and the less important it is to maintain good relationships and thereby less important to adopt LM. However, this is not consistent with Jayram *et al.* (2008) who argue that developed relations have a positive effect on LM adoption

even with suppliers. This is consistent with Lamming (1993) who argues that even the suppliers may observe positive effects in sharing information and knowledge with their customer. Jayram *et al.* (2008) emphasize that a win-win situation between two partners can only occur if the primary producer takes a long-term relationship and trust building approach with their first-tier suppliers, instead of having a competitive stance by playing the suppliers against each other. This is in line with Moyano-Fuentes *et al.* (2012) arguing that support and coaching is necessary to achieve a successful implementation of LM. Even Inderfurth *et al.* (2013) argue that the implementation of LM in a supply chain is dependent on trust and truth telling since much of the shared information in the supply chain is sensitive and to some extent even private. Otherwise, the relationship between parties can be harmed when one part in the supply chain acts strategic and withholds or only provides a small part of the information. As a result of trust, truth telling, fairness and other social norms that are followed, Inderfurth *et al.* (2013) argue that the efficiency within the collaboration increases. In order to develop business improvements Lamming (1993) argues that the supplier and customer must share and involve each other in both economic and personal questions as well as in more delicate information and knowledge. Panizzolo (1998) raises the need of shifting focus from operational management to a more holistic relationship management.

2.3 Agricultural Firm Collaboration

Collaborative arrangements or partnerships between farms may be a way to enhance profitability and conditions for a long-term and successful agriculture (Andersson *et al*., 2005). The authors show that several categories of farms can reach substantial benefits through a collaborative arrangement and that it leads to a more efficient resource use. Some major factors are diversification, crop rotation and lower risk. The potential is much higher if the collaboration consists of advanced technology and reduction of labor and machinery use. A study by De Toro and Hansson (2004) confirms that cooperation with respect to machinery use can reduce total costs, and they argue that more cooperative arrangements should take place, although the advantage may vary greatly between farms. Weaver (2008) describes and evaluates the potential of three strategies necessary to maintain firm survival and economic growth. The food industry has through system innovations successfully gone from a push system to a pull system. A key factor to this system development is, according to Weaver (2008), considerable collaboration between firms. Within the collaboration, important knowledge and information regarding technology, institutions and strategic reorientation have been transferred between the parties, which have led to innovative and economic growth. Experienced advantages among collaborating farms in a study conducted by Larsén (2007) were access to better technology and a more pleasant work environment. The most common types of collaboration among these farms were mutually owned machinery and hiring of services. De Toro and Hansson (2004) confirm benefits such as teamwork and lower risk of production shortage since more people are engaged in the business.

According to Larsén (2007), those who are most likely to collaborate with other farmers are younger, have a high degree of hired labor and are specialized in livestock production. Lagerkvist and Hansson (2012) reveal that the farmers who most quickly developed collaborations were those who regarded farming as a way of life and not those whose goal were to maximize profit. This may be explained by an already sufficient level of profitability. However, the authors argue that even these farms may benefit from a collaboration agreement. Samuelsson *et al.* (2008) argue that there may be considerable economic benefits from full mergers between dairy farms and crop farms. The full mergers in their study gained higher profitability through diversification in production activities, crop rotation and access to

improved technology. However, Larsén (2010) who studied machinery-sharing arrangements argues that the collaboration and the new technology did not imply lower capital costs per hectare. This can be explained by the opportunities the collaboration enabled, to invest in machinery and technology with higher productivity (Larsén, 2010). Thereby, the capital cost per hectare remained the same but with enhanced productivity. In addition, the more partners that are collaborating, the greater extent of collaboration (Larsén, 2007) and the more cooperation the companies practice, the more efficient they are (Larsén, 2010). However, according to Andersson *et al*. (2005), the initial conditions have a great impact on the potential benefits of collaboration. The benefits largely depend on the structure of the firm, its size and the farmer's risk aversion (Andersson *et al*., 2005; Samuelsson *et al.*, 2008).

When establishing a collaboration agreement, there may exist a conflict between economic risk reduction and ambiguity aversion; i.e. that people in decision making under uncertainty prefer to assume risks based on known instead of unknown probabilities (Lagerkvist & Hansson, 2012). In addition, Aurbacher *et al.* (2011) argue that although a collaboration with respect to machinery use might be profitable as a whole, it might not be profitable for each single member, which may imply that an arrangement never is established. This applies, according to Aurbacher *et al.* (2011), even if there are no transaction costs, no moral hazard problems or additional waiting times for an individual farmer. Larsén (2010) confirms that farm size has an impact on the degree of collaboration. The author argues that collaborating farms are larger than farms not included in any partnership. This is not consistent with the general idea that smaller farms are those who benefit the most from collaboration. Larsén (2010) stresses that a reason for this might be that larger farms use the partnership arrangement in a more efficient way and to their own advantage, compared to smaller farms. According to Larsén (2007), many collaborating farmers only use verbal contracts. However, problems with moral hazard were shown to be non-existing or very low which is explained through a high degree of mutual trust. This is, according to the author, inconsistent with a lot of the literature in agency theory, which suggests that there are incentives to evade responsibility in contracts. Moreover, Larsén (2007) argues that social norms reduce opportunistic behavior among collaborating farmers but they also reduce overuse or misuse of inputs that are shared.

2.4 Summary of the Literature Review

Theories used in this thesis are based on the literature review conducted by the authors. A review of existing literature has provided a starting point in defining LM as well as relevant areas of collaborations in a supply chain and between agricultural firms. The conducted literature review highlights the theory of vertical and horizontal supply chain collaboration and the importance of good relations. The literature review reveals a theoretical gap regarding LM implementation within a horizontal supply chain collaboration in a Swedish Agricultural context. Hence, the theories that forms the foundation of this thesis are based on LM theory and theory regarding collaboration within a supply chain. The theoretical framework is presented in chapter 3.

3 Theoretical Framework

This chapter contains the theoretical framework for this study. Initially, the background of Lean Management is presented followed by a description of the 4P-model. Further, the supply chain collaboration theory is presented with its two components: cultural elements and key factors. Finally, there is a description of the linkage between the two theories.

3.1 Lean Management

As a result of the Second World War and the resource shortage, a more efficient automotive industry was developed in Japan (Liker, 2004). According to Liker (2004), the Toyota Company developed the Toyota Production System (TPS), an overall manufacturing system that aims to eliminate waste and add value to the internal and external end customer. The focus is not to produce high volumes with low costs per piece but to simultaneously produce high quality products by short lead times, continuous material flows, and high flexibility (Liker, 2004). One of the first things to define is what the customer values are and the price they are willing to pay (Liker, 2004). When TPS is adopted into all parts of the manufacture, the business can be seen as a "lean enterprise" (Liker, 2004). The foundation of TPS consists of two pillars, Just-in-Time (JIT) and Built-in quality. JIT is a composition of strategies, techniques and tools in order to maintain and synchronize the flow of small quantities of material through the manufacture (Liker, 2004). At the same time, quality is maintained through Built-in quality where errors are detected directly as they occur (Liker, 2004). When an error is detected, it is important to find the source to the problem (Liker, 2004).

3.1.1 Thinking in terms of Lean

Even though the TPS was developed by Toyota, The Toyota Way and LM includes more than just a production system. Liker (2004) stresses that it is the business culture of continuous motivation and improvements within Toyota that is summarized as LM, which makes the company successful as well as enables and develops TPS. TPS is a tool in order to improve and develop the work and production as a whole (Liker, 2004). In the implementation of LM, it is important to involve the employees and people within the organization in order to, not just implement the TPS, but also understand the culture behind the system (Liker, 2004). The TPS and efficiency is maintained because of engaged employees and their way of work (Liker, 2004). Furthermore, the employees and people within the organization makes the system more alive, which affects the business culture (Liker, 2004). This is achieved by communication, problem solving and working as a team (Shah & Ward, 2007). The individual is encouraged to participate in open discussions before changes or implementation of e.g. new routines (Liker, 2004). Decision-making is pushed down in the organization as a result of problem solving, improving processes and self-managing on a lower organizational level (Liker, 2004).

There is always a customer, both internal and external, and it is the added value for the customer that is important. Liker (2004, p.89) defines added value as "work that ends up actually shaping the final product". A big part of LM is to reduce waste, and thereby costs, which do not add additional value to the customer (Liker, 2004). The usual improvement processes in other businesses are to slim the production in every step of the production chain, regardless of whether the steps contribute to added value or not (Liker, 2004). Companies should instead identify and eliminate non-value-adding steps and thereby reduce waste and non-compensated costs (Liker, 2004).

3.1.2 The 4P-model

Behind the implementation of TPS, there are 14 principles (Liker, 2004). The principles are divided into four different categories, by Liker (2004), in order to simplify the understanding of the principles and the implementation process, see figure 2. The categories are labeled the 4Ps, which stands for Philosophy, Process, People/Partners and Problem Solving (Liker, 2004). It is intended that all 4Ps should be implemented in order to maintain a sustainable LM within the company. It is not uncommon for businesses to stagnate in the implementing process that makes the LM development slow down and, in some cases, evolving into old habits and work (Liker, 2004). The LM thinking process must continue and develop throughout the entire organization and even outside of the organizational borders, with business partners and partnerships (Liker, 2004).

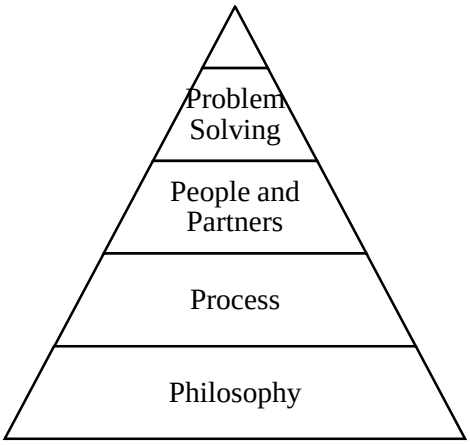

Figure 2. *The 4P-model describing LM. (Liker, 2004 p. 13; own modification).*

3.1.2.1 Philosophy

The philosophy of LM is difficult to measure and hard to grasp at first sight (Shah & Ward, 2007). LM and the principles of LM implementation starts by identifying the greater purpose of every individual action and not focus on short-term benefits or payments (Liker, 2004). The vision and goals function as guidelines and define the direction of each managing decision and handling. This means that short-term profits can be overlooked in order to reach long-term goals and future benefits (Liker, 2004). The 14 principles are founded on the commitment to the company, employees and society. The philosophical foundation is the key to the understanding and development of LM (Liker, 2004). The philosophy involves the employees as one of the most important resources whose trust and mutual respect is important to cherish (Liker, 2004). Also, one fundamental part of the LM philosophy is to add value, reduce waste and produce in line with what the customer demands, regardless of whether the customer is the next step in the internal production process, in the supply chain or the end customer (Liker, 2004).

3.1.2.2 Process

In the Process category, parts of the TPS tools, routines and strategies are presented (Liker, 2004). As mentioned earlier, it is not only the implementation of the TPS tools that constitutes LM, but also an implementation of the environment of LM philosophy. However, if the process is well designed and functions correctly, it will be reflected in high quality products and services (Liker, 2004). The process is based on creating material and/or informational flows throughout the production, a so called one-piece flow (Liker, 2004). Through the one-piece flow time shortening, quality increasing and cost reduction will appear, and at the same time

overproduction and inventories are minimized (Liker, 2004). When creating a LM flow non-value-adding steps in the production are eliminated since these steps are considered as waste; e.g. overproduction, waiting, unnecessary transport and movement, unused employee creativity and excess inventory (Liker, 2004). Overproduction is one of the greater wastes, since unnecessary resources (e.g. raw material, time, space) are demanded, consumed and is of no use to the customer (Liker, 2004). A practical way of working with waste reduction, engaged employees and dynamic routine developments is the 5S program – Sort, Straighten, Shine, Standardize and Sustain (Liker, 2004). It all is based on visual control and an active working role. The program implies sorting out unnecessary items; put everything in its right place, machinery inspections and cleaning, creating rules for the three first actions, and maintaining routines with continuous improvements and developments (Liker, 2004).

Another part of the process of LM is standardization. It is not just the way of completing a task that is standardized, but it permeates the entire organization (Liker, 2004). Once standardization and consistency is implemented, it can be improved, developed and result in higher product and service quality (Liker, 2004). In order to stay flexible as an organization, the company must enable and allow the employees taking initiative to be involved in decision-making and communication (Liker, 2004). Standardization and empowered employees enables an organization to be adaptable to changes and at the same time maintain a high quality production. However, it is a challenge to find a balance between empowered employees and standardizations, i.e. allowing innovation freedom but at the same time maintain procedures and routines (Liker, 2004).

3.1.2.3 People and Partners

In order to maintain and develop the philosophy and direction of LM, it is important to have long-term thinking even when it comes to leaders and leadership. Until 2004, no Toyota president had been found outside of the organization. This is a result of, according to Liker (2004), learning, understanding and invaluable knowledge of the LM culture. If the leader does not understand LM, he or she cannot teach the staff, which creates uncertainty, inconsistency and resource waste (Liker, 2004).

It is a part of LM to encourage learning and implementation of LM and TPS in the supply chain (Liker, 2004). The encouragement is carried out by learning-by-doing in ongoing projects where information and practice sharing is crucial. Toyota develops long-term relationships, consisting of mutual benefits, respect and common goals, in order to maintain high quality parts (Liker, 2004). It is in line with LM to have high expectations of the suppliers but also teach the philosophy and way of work of LM through TPS (Liker, 2004). It is also important to mention that the long-term thinking also pervades this course of action. Short-term benefits such as cost reduction is not a reason to suspend the relationship, and is not in line with the philosophy of LM (Liker, 2004). With that said, it is not in the LM's interest to outsource knowledge and responsibility to a second party, but to create stable and reliable processes by fair business relationships (Liker, 2004). In the end, this will lead to well defined expectations, enabling systems and a learning enterprise (Liker, 2004).

3.1.2.4 Problem Solving

The last "P" in the 4P-model is Problem solving, which starts by observing and understanding the problem (Liker, 2004). In LM, it is important that the manager can answer questions about the production, even when problems occur. When solving a problem, it is important to ask "why", e.g., why did this fault occur (Liker, 2004). By correcting the core of the problem, it

prevents similar faults, maintains quality and makes the employees work as a problem solving team instead of blaming the faults on each other (Liker, 2004). If the efficiency is threatened by an interruption in the flow, it motivates all involved to find a solution to the problem and remedy it directly (Liker, 2004). This increases the product quality since the error is identified at once and the risk of similar problems with other parts is small (Liker, 2004).

An important part of problem solving is decision-making, and the quality of the decision is just as important (Liker, 2004). The decision should be made based on planning, understanding, rejected alternatives, employee involvement and, if they are affected, the input from suppliers (Liker, 2004). The process might take a longer time than a more spontaneous decision but the outcome of the decision cannot be the result of chance (Liker, 2004). In the meantime, information collection from other parties, both internal and external, leads to decision support and continuous learning (Liker, 2004). A factor to base decisions on is different metrics, both operational performance measures and metrics identifying improvements in units or groups (Liker, 2004). The metrics are based on process or result oriented intermediate targets and specified for each process or project in order to reach the long-term goals (Liker, 2004).

3.2 Supply Chain Collaboration

The general idea of a supply chain is to gather independent firms into a single network where they can work together in order to achieve a goal, e.g. create value to end customers and increase profitability on a dynamic market (Simatupang *et al*., 2002; Liker, 2004). Collaboration between firms is a process with one or more individual parties who work for a mutual goal but for their own benefit and survival (Simatupang & Sridharan, 2002). The level of horizontal integration in the collaboration depends on how deepened the relation is between the parties (Naesens *et al.*, 2007). Sharing of resources and knowledge within a network on a long-term basis is one way to define a supply chain collaboration (Bahinipati *et al*., 2009). By sharing resources, such as machinery, labor and knowledge, benefits can be achieved such as lower prices on purchased quantities, lowered administration costs and reduced supply risk that cannot be achieved alone (Simatupang & Sridharan, 2002; Bahinipati *et al*., 2009). Cooperation with other firms also enables flexibility and tools for the firms to better adopt to new market challenges (Simatupang *et al*., 2002). On the other hand, a dysfunctional collaboration causes negative effects such as higher logistic costs, losses, damages and longer delivery times (Simatupang *et al*., 2002).

Collaboration in a supply chain context can be described by five enabling elements: Trust, Mutuality, Information Exchange, Openness and Communication (Barratt, 2004). The presented elements play an important role in both vertical and horizontal collaboration (Barratt, 2004; Naesens *et al.*, 2007) and forms the ability to enter and develop a collaborative arrangement (Barratt, 2004). Within the collaboration, there are a few key factors needed in order to develop a successful exchange between the businesses: Information sharing, Decision synchronization and Incentive alignment (Simatupang & Sridharan, 2004; Barratt, 2004). How the cultural elements and key factors are connected is defined in figure 3.

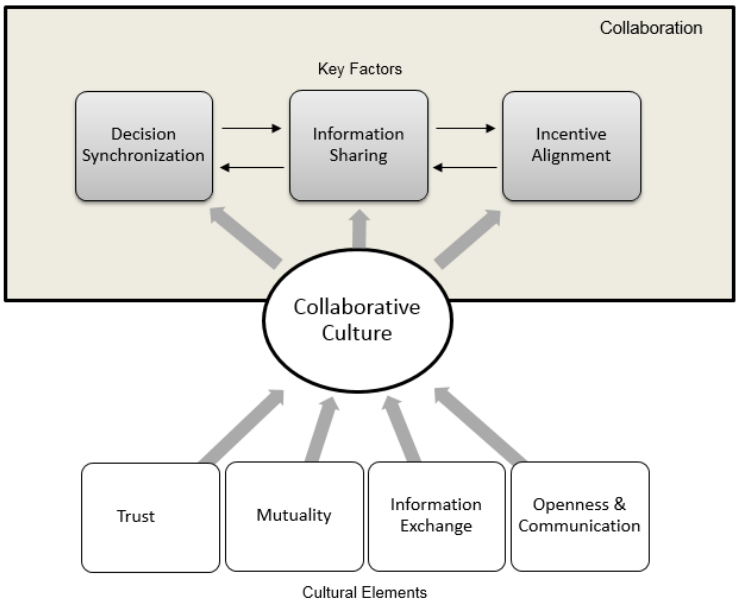

Figure 3. *A framework over the cultural elements and collaborative key factors (Barratt, 2004 p. 36; Simatupang & Sridharan, 2004 p. 488; own modification).*

3.2.1 Cultural Elements

Collaboration within a supply chain has been difficult to implement due to its complexity (Barratt, 2004). One of the most important elements that affect the culture of collaboration is trust (Barratt, 2004; Naesens *et al.*, 2007). The lack of trust is also one fundamental reason why collaborations fail (Bahinipati *et al*., 2009). It is established that without trust there is no functioning relationship (Barratt, 2004; Naesens *et al.*, 2007). In order to achieve trust, the parties need to show vulnerability towards each other, and by that allow risking the collaboration (Naesens *et al.*, 2007). Admitting shortcomings among the collaborative parties may affect the collaboration positively by increasing the transparency and credibility between the parties (Barratt, 2004). According to Fawcett *et al*. (2012), collaborating parties have to make an effort in order to develop trust and confidence between each other. This is facilitated by acting honestly, keeping promises, sharing information and resources, and creating mutuality (Fawcett *et al*., 2012). In line with trust, mutuality is a way to join achievements and performances between one or more independent firms through unity and mutual consensus (Simatupang *et al*., 2002). A sustainable relationship is built on value creating responsibility founded on values and principles, e.g. fairness and liability (Simatupang *et al*., 2002). It is important that all collaborative parties benefit from the arrangement (Barratt, 2004). If one part is feeling too risk exposed in comparison with the other part, the collaboration cannot function (Barratt, 2004). This also applies for mutual risk sharing (Barratt, 2004). Mutuality enables the collaborative parties to come together in an overall understanding and focus on operational commitments (Simatupang *et al*., 2002).

Information exchange is strongly relevant for operational performance (Wiengarten *et al*., 2010). Exchanging information between parties is crucial in order to develop a collaboration (Barratt, 2004). It is not just the transparency and the flow of information that need to reach a high quality in order to obtain a successful information exchange (Barratt, 2004). According to Wiengarten *et al.* (2010), it is also important to develop high information quality. The information quality is dependent on timeliness, accuracy, relevance and the added value to the information (Wiengarten *et al.*, 2010). When the information has a high quality, the key factors

incentive alignment and joint decision-making are enabled, which leads to improved collaborative performances (Wiengarten *et al.,* 2010).

According to Naesens *et al.* (2007), contracts are necessary for a well functional collaboration. These contracts can function as reference in times of stress and uncertainty. There should also be informal decisions made, including e.g. communication strategies. In order to encourage information sharing and overcome boundaries for mutual understanding, communication is important (Barratt, 2004). If no agreements have been made in advance the relation risks becoming slowed down and more vulnerable to conflicts (Simatupang & Sridharan, 2002). Trust, openness and communication enable the parties to share sometimes sensitive information. By sharing performance data, an overall evaluation of the collaboration can be made. Performance data can be linked to the quality of products produced or process flows (Barratt, 2004). The principles for communication have to be clear and be designed to minimize misconceptions. Moreover, it is important to establish which actors are included in the collaboration, and which are the outspoken boundaries and delimitations for the collaboration (Barratt, 2004). Delays or logistical issues are important to notify in advance and not at the time an exchange of goods or other resources will take place. This also allows the collaborative arrangement to function flexible and less sensitive to stress.

3.2.2 Collaborative Key Factors

In order to allow trust to grow as well as knowledge and information sharing, it is important to stimulate initiatives and activities over the organizational boarders (Barratt, 2004). The information that flows between the organizations encompasses both functional and organizational aspects and is often associated with resources, performance status, process status and contract status (Simatupang & Sridharan, 2002)**.** Asymmetric information is a result of when different parties in the supply chain lack information regarding its respective cooperating partner. The information lacking can consist of private information, products and services, plans and intentions etc. (Simatupang & Sridharan, 2002). This can lead to opportunistic behavior, such as moral hazard, and wrongfully decisions within the supply chain. Instead of making decisions out of accurate performances, they are based on estimations or educated guesses (Simatupang & Sridharan, 2002). In an efficient supply chain collaboration, a system for performance measures is preferred (Simatupang & Sridharan, 2002). This to link the overall vision, goals and decisions with individual performance of each collaborating party to the supply chain objectives. In addition, by measuring the performances the individual contribution is identified in order to achieve the mutual goals for the collaboration (Simatupang & Sridharan, 2002). The information sharing also opens up opportunities for decision synchronization (Simatupang & Sridharan, 2004).

To plan and execute decisions between collaborating parties is defined as decision synchronization (Simatupang *et al*., 2002). Coordination of actions and processes by decision synchronization can lead to lower costs and higher profitability for the participating members (Simatupang & Sridharan, 2008). Depending on available information and to what cost the information is accessible, the level of synchronization increases (Simatupang & Sridharan, 2008). However, in order to synchronize the decision-making, it must be established how the decision process is supposed to be implemented (Simatupang & Sridharan, 2008). This concerns how distribution and access of information should be handled and who that is entitled to use the information in the best way (Simatupang & Sridharan, 2008). All members have the right to make their own decisions when it comes to the own business, but it is difficult for one single member to have knowledge of the whole supply chain and how the chain may be affected by the own decision (Simatupang & Sridharan, 2008). Decision synchronization is a balance

between the own right to make decisions, delegation of decision-making and knowledge (Simatupang & Sridharan, 2008). When actions are made by and for the benefits of an individual part, it can result in higher costs for the other parties within the supply chain. This is costs for which they are not compensated (Simatupang & Sridharan, 2002).

Incentive alignments can function as a mechanism for the collaboration to cope with changes in the market and internal and external processes in line with the mutual understandings. The intention is to increase the commitment among the collaborating parties and to motivate the parties to work along with the joint goals and visions (Simatupang & Sridharan, 2002). There are mainly three types of incentive alignments based on behavior, performance or equitable compensation (Simatupang & Sridharan, 2002). The behavior-based incentive focuses on actions made in steps towards the mutual agreements and goals and not necessary the goal itself (Simatupang & Sridharan, 2002). It is the effort itself and not just the performance that is being rewarded and the reward leads to motivation and recognition. In opposite of the behavior-based incentive the performance-based incentive increases the effort for a completion of the work (Simatupang & Sridharan, 2002). This can be measured by performance metrics and can be motivation to cost efficiency. The equitable compensation incentive aims to identify each participating party's costs and benefits the collaboration yields (Simatupang & Sridharan, 2002).

3.3 Description of the Theoretical Framework

The theoretical framework in this thesis consists of LM theory based on Liker (2004) and the experience from the automobile manufacturer Toyota as well as supply chain collaboration theory. The LM theory basis is the understanding of the philosophy and implementation of continuous processes, standardized work procedures and routines. In addition to an internal adjustment to the LM-thinking, it is also in line with LM theory to involve external factors such as supply chain partners in the own LM implementation. This is in order to create a long-term relationship with benefits such as flexibility and lowered costs. This goes hand in hand with the second theory of this thesis, supply chain collaboration. In this theory, cultural elements and key factors enable and develop collaborations in the supply chain through e.g. trust, mutuality, shared knowledge, exchanged information, motivation and synchronized decisions. The supply chain collaboration theory provides a deeper understanding and a holistic view of the complexity that a collaboration between two independent companies imply. Thus, these two theories complement each other regarding perspectives of what is needed for a well functioning collaboration, which is illustrated in figure 4.

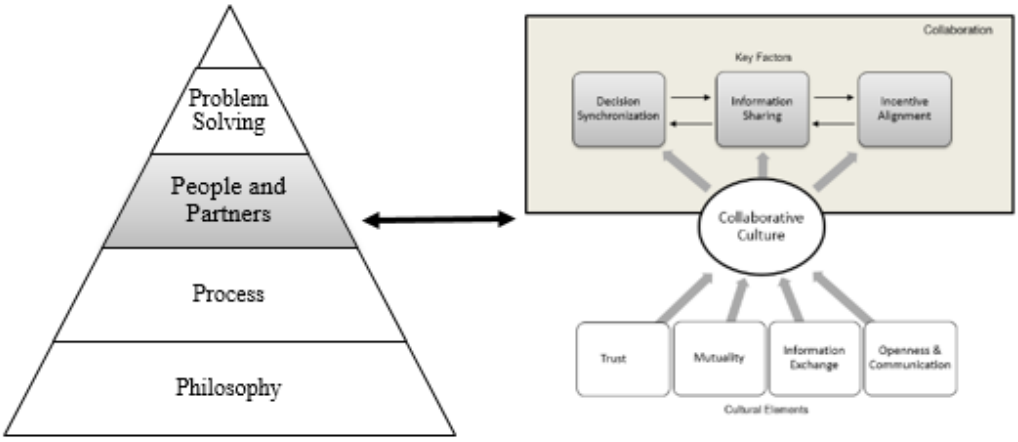

Figure 4. *A description of the theoretical framework for the thesis (Liker, 2004; Barratt, 2004; Simatupang & Sridharan, 2004; own modification).*

4 Method

This chapter presents and motivates the chosen research methodology needed in order to fulfil the aim. The chosen way of collecting, presenting and analyzing data as well as ethical considerations is presented in this chapter.

4.1 Research Approach

In order to fulfil the aim of the study and answer the research question it is of interest to use an approach that makes it possible to come closer to the individuals in order to obtain a deeper understanding of their perspectives. Therefore, this thesis is based on a qualitative approach. A qualitative approach is usually based on empirical non-numerical data and has a focus of understanding a phenomenon in its specific setting (Robson, 2011). Therefore, it is common to use when conducting research of few cases or situations. According to Bryman and Bell (2013), qualitative social research tends to be used in order to explain how processes and strategies develop over time depending on underlying history and activities. The approach is an inductive research strategy implying that observations and results generate new theory. However, this thesis is based on already known theories and used in another context than in the one they were developed. This way of using a qualitative approach is supported by some researchers who argue that a qualitative approach does not necessarily mean theory generation but can function as theory examination by specifying theory before analyzing collected data (Bryman & Bell, 2013). More about this in section 4.2.2 Theoretical Foundation.

In order to persuade the readers about the findings of the study it is important to show awareness of validity, generalizability and reliability (Robson, 2011). Validity concerns if the study answers or addresses what it says it will answer or address. This is discussed further through the method chapter. Generalizability implies to what extent the findings of a study are applicable to a context outside the studied setting. It is important to note that a qualitative approach does not function as generalizable since the relatively small amount of non-randomly chosen cases do not generate a statistical statement (Bryman & Bell, 2013; Robson, 2011). However, by conducting the study as a multiple case study some analytical or theoretical generalization may be done (Robson, 2011). An additional concept is reliability, which concerns the stability of a measure and whether it is possible to perform the study again with the same result as an outcome. Critics argue that less structured research is more subjective and difficult to replicate since researchers' perceptions unconsciously influence choices and actions along the research process (Bryman & Bell, 2013). Even though the researcher has good intentions, there is always a risk of being biased and using selective information (Robson, 2011). It is not possible to entirely eliminate these hazard factors. However, by ensuring that the authors are aware of this criticism, it can be handled. When conducting qualitative research, the researcher is often described as an instrument (Robson, 2011). This requires that he/she understands the chosen strategy and sets up own routines and procedures. Thus, it demands an awareness of how he/she may influence the study.

4.2 Creating the Theoretical Framework

4.2.1 Literature Review

A literature review was conducted in the beginning of the writing process. This is in order to increase the understanding of previous research and to enable the identification of the theoretical and empirical gap this thesis is intended to fill. In order to find relevant literature databases such as Google Scholar, Web of Science and Primo were used. A combination of search words, presented in table 1, detected peer reviewed articles and books through the databases.

Table 1. *Search words in order to conduct a literature review.*

Search words			
Lean +	***Supply chain +***	***Collaboration +***	***Farm +***
Collaboration	Relationship	Farm	Management
Supply Chain	Collaboration	Lean	Lean
	Management	Horizontal	

4.2.2 Theoretical Foundation

Theories regarding LM and supply chain collaboration constitute the base of this thesis' theoretical foundation. By using theory triangulation, the validity and rigor of the research can be enhanced (Robson, 2011). The LM theory is well developed within the automotive industry. However, in order to understand the core of the theory a more thoroughly presentation is needed which is why the LM theory is presented in figure 2. This is to enable the application of LM within the Swedish agriculture and grasp the work regarding the Swedish project Lean Lantbruk. Theory about LM is developed within the automobile industry and adapted in the agricultural sector. Hence, research from both sectors have been of interest for the literature review in this thesis.

In addition, theory explaining adoption of different strategic thinking such as LM in the supply chain is useful for understanding of the complexity in different types of exchanges between enterprises and their long-term relations. Although the core of a supply chain is to work together, there has not been a highlighted focus on the relationship between parties earlier (Simatupang *et al.*, 2002). Previous research, again within the automobile industry, indicates development in the supply chain area between customer and supplier, their relationship and implementation of LM. A progress in collaboration between Swedish farms, as a result of LM, can be explained by the same phenomenon, which is why it is important to describe this theory. The relation between customer and supplier is often perceived as vertical (Barratt, 2004) when the relationship between Swedish farmers is usually perceived as horizontal. These differences are important to reflect on when using theory about supply chain relations. The top down perspective in agency theory (Fayezi *et al.*, 2012) is not advocated by the LM theory and is not applicable on the horizontal supply chain collaboration this thesis addresses, why agency theory is disregarded. Research concerning Swedish farms, which have adopted LM, are rare and the effect this might have on collaborating non-lean farms is, what the authors experience, nonexistent why development in this area is needful. By defining collaboration in a number of key concepts based on supply chain collaboration theory, which is described in figure 3, the authors intend to contribute to the concept of collaboration in a Swedish agricultural context.

4.3 Empirical Data

4.3.1 Choice of Collaborating Farms

A multiple case study is a suitable design for a qualitative research approach, when the focus is to increase understanding of unique contexts (Bryman & Bell, 2013). This study includes six pairs of collaborating farms; three pairs where one farm in each pair is a LM farm and three pairs that are non-LM farms acting as reference pairs, which is illustrated in figure 5. This is a sufficient number of cases since the conclusions will be more sustainable and give a deeper understanding of the studied context. (Yin, 2007).

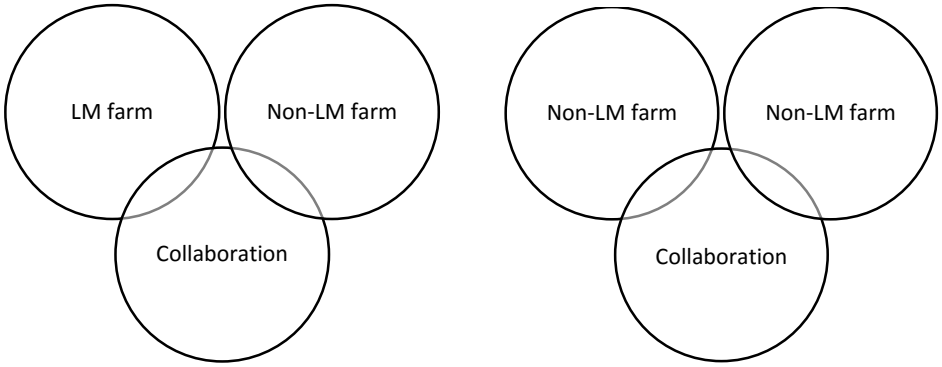

Figure 5. *Composition of the two interviewed groups of collaborating farms in this study (own illustration).*

By carrying out a multiple case study it is possible to compare findings from each case and the researcher can find what is unique about a certain case and what they have in common (Bryman & Bell, 2013). The comparison gives a better base in order to determine under what conditions a theory does or does not hold (Bryman & Bell, 2013). This often promotes theoretical reflections about the findings. Multiple case studies can function as a complement between the cases in order to cover various areas of the research (Robson, 2011). Researchers stress the possibilities in using a qualitative approach and a multiple case study when investigating an empirically observed phenomenon (Naesens *et al.*, 2007). Robson (2011) also argues that it is a strategy, evolving during the study, rather than an approach.

The initial selection of objects focused on finding farms that had participated in the project Lean Lantbruk learning about LM. The sample was restricted to farms starting their education in 2013 or earlier. This is in order to narrow the sample to farms that had completed their 18-months in the program, but also to get farms with more experience of LM. In order to find farms that were participating in a collaborative agreement with another farm, information was collected from two sources. By scanning a list of LM farms around Sweden gathered from a Swedish farming advisory organization, and by getting suggestions from LM coaches around Sweden, the choice of case collaborations started with an initial sample of 31 farms. Out of these, 15 farms were interested in participating together with their collaborating party. Among these farms, several types of collaborations were represented. Seven farms were collaborating with another farm, which is the type of agreement this thesis focuses on. Three of these farms had a more extensive machinery-sharing agreement, which is what the thesis specifically focuses on, and they were willing to participate in the study. The collaborations represent three regions in Sweden: Västergötland, Östergötland and Halland.

It should be noted that there is a risk that subjective perceptions by lean coaches have affected the sample of LM farmers, since the coaches may have suggested farmers that have had a better experience of LM or are more socially open minded. Due to the consultants' experience of some

farmers' willingness to participate in interviews, they risk to be excluded from the consultants' suggestions and thereby from this study. Although the farmers may have agreed on participation if they were asked. These risks may imply less representative results and conclusions.

In order to understand how LM influences a collaboration between Swedish farms, the study also consists of a group of reference collaborations. Wiengarten *et al.* (2010), who conducted a study based on data of the buyer's perspective within a supply chain, argue that a study should be conducted from both parties' perspectives to minimize the risk of partiality. The reference group in this thesis enhances the validity of the study since it clarifies in a better way how and if LM affects collaboration. These three pairs are located in Östergötland and selected by an agricultural advisor from the same area. Stated requirements were that they had to have a similar production as the LM pairs, be in a similar size and have a collaboration with respect to machinery similar to the LM pairs. This selection is strongly influenced by the advisor's ability and willingness to do an objective creation of reference farms.

4.3.2 Data Collection

The data collection is based on semi-structured, in-depth face-to-face interviews where questions are developed through themes used to guide the informants. This interview strategy allows the respondent to reflect over previous processes and events resulting in current circumstances (Bryman & Bell, 2013). This also allows the conversation to continue more fluidly, flexibly and enables to develop reasoning depending on how the interview evolves (Bryman & Bell, 2013; Robson, 2011). In addition, this type of interview enhances the chances of ensuring a high degree of conformity between theoretical concepts and empirical answers (Bryman & Bell, 2013). However, the entire process of data collection requires flexible researchers who understand that they are the most important tool for the thesis (Robson, 2011). The authors of this study have tried to work with a high consciousness regarding this throughout the entire study. The method for data collection with broad and open questions may imply less reliable results since questions may be asked incorrectly, be misinterpreted and thereby result in unique findings.

One week prior to the gathering of empirical data, a pilot interview was conducted by telephone with a farm that collaborates with another farm. This was carried out for ensuring the feasibility of the interview guide: that relevant data could be collected through the questions and that they were formulated in a clear manner and easy to understand (Robson, 2011). An adjustment of the questions were made as a result of the pilot interview. Further, the interviews were carried out between March 21st and March 31st 2016. The questions were sent to the respondents prior to the interview to ensure more thoughtful answers. These questions are presented in Appendix 1. In order to accomplish a calm and comfortable environment for the respondents (Bryman & Bell, 2013), each interview took place at the respective farm and took approximately 40 to 110 minutes. The interviews were conducted with the business owner of each farm, except for farm R3a. That interview was conducted with the business owner's son. Although he is employed at the farm and is well informed about the company, his perspectives and answers may differ from his father's. The farmers within each collaboration were interviewed separately in order to obtain their own perspective of the collaboration and minimize the risk of one farmer affecting the other. However, a mutual interview may have implied that a farmer could have reminded the other one about important details or situations concerning the collaboration. When asking questions about the parties' relation to each other it can never be guaranteed that they answer the questions in the way they act but even this risk was reduced by interviewing the parties separately. Both of the authors did participate during all twelve interviews to ensure that all questions were asked and answered in a clear manner in order to obtain a valid data collection.

Except for the three LM questions, the reference farms were asked the same questions. In order to supplement the primary collected empirical data, secondary data has been collected and used through literature, articles, websites and reports.

4.3.3 Data Presentation

Initially, a more thorough review of the project Lean Lantbruk is presented followed by a description of each farm within the six collaborations in order to get a sense of their different conditions. In order to strengthen the validity of the study it is of importance to show transparency regarding the process of interpreting the data (Mason, 1996). The recorded interviews were transcribed and the empirical data from the transcriptions was categorized based on which theoretical key concept it could be derived from, within respective theory, see figure 2 and 3. In total, there are four key concepts within the LM theory and eight key concepts within the supply chain collaboration theory. The categorization implies a more manageable data, but it is also a way to map the characteristics of the key concepts (Bryman & Bell, 2013). This is a crucial part of the coding process according to Bryman and Bell (2013), since there is a risk of losing the social context when picking out a certain paragraph of text from a transcription. Within each key concept, the answers from each collaboration were summarized and translated into English. This is conducted in order to provide a clearer view of the reasoning from each farm and collaboration within a certain theoretical key concept. There is an awareness that not only the transcriptions but also the translation to English may have affected the interpretation of collected empirical data. The translation was carried out as late as possible in the process in order to keep the respondent's descriptions in a better way. Particularly since each author transcribed half of the interviews each, although the following steps have been controlled by both authors. LM and reference collaborations are presented separately within each key concept in order to make it easier to identify differences in the collaborations' arguments. Results related to the theories are complemented with tables in order to clarify and highlight important results. The general structure of the results is based on the theoretical key concepts from the LM theory and the supply chain collaboration theory.

4.3.4 Data Analysis

The analysis of empirical data is crucial when conducting research (Robson, 2011). The aim of the analysis is to link empirical findings with the theoretical framework. Throughout this process, similarities and differences between the LM collaborations and the reference collaborations are distinguished with respect to the LM theory and the supply chain collaboration theory. In order to create an analysis understandable for the reader, the analysis is structured in accordance with concepts from these two theories.

4.4 Ethical Considerations

When conducting a study that includes stakeholders, it is important to be aware of ethical considerations (Robson, 2011). Therefore, ethical rules set by Bryman and Bell (2013) have been followed. The applied rules imply that the respondents have been informed about the aim of the study in order to avoid misunderstandings, that the participation was voluntary and that they could refuse the recording of the interview, that gathered information is confidential and only used for research purposes. There has been an effort throughout the entire thesis to achieve these obligations as far as possible. For instance, each farm is described with a randomly chosen numeric coding and the farms and collaborations are described without details in order to reduce the risk of recognition. However, this issue concerns a tradeoff since the context is often important for a qualitative study's findings (Robson, 2011).

5 Empirics and Results

This chapter consists of the empirics of this thesis. In order to give the reader a better understanding, it provides a short description of how LM has been implemented in Swedish agricultural businesses through Lean Lantbruk. Further, a description of the participating collaborative cases is presented. The last part of the chapter presents the empirical results generated from the interviews, and is divided by the two theories.

5.1 Lean Management through Lean Lantbruk

Lean Lantbruk is an organization with the purpose of making Swedish agricultural businesses more resource efficient and competitive, and to allow for continual development (www, Lean Lantbruk, 2015a). The defining traits of competitiveness, according to Lean Lantbruk (2015a) are:

- Profitability
- Long-term sustainability
- Climate efficiency
- Environmentally efficiency
- Maintaining high animal welfare
- Developing leaders and employees
- By improved methods absorbing new knowledge and technology

The organization is managed by a steering committee with representatives from several different national organizations and businesses within the Swedish agriculture, but even outside of the steering committee the range of supporting organizations is wide (www, Lean Lantbruk, 2015a). The organization strives toward a LM implementation on, in total, 500 businesses in the sector of Swedish agriculture between the years of 2012 and 2020 (www, Lean Lantbruk, 2015a).

During a period of 18 months, each company participating in Lean Lantbruk is provided tools and understanding of the LM philosophy (www, Lean Lantbruk, 2015b). This is so that the company can continue with the LM development on their own in the future. Each company is also provided with a LM coach who visits the firm regularly and supports the changing process by guiding the manager and employees through the LM implementation. (www, Lean Lantbruk, 2015b). One of the initial steps is to identify where waste is occurring within the company and to take advantage of the knowledge and thoughts from the employees (www, Lean Lantbruk, 2015b). Thereafter, the principles, tools and understanding of the philosophy are introduced and implemented. The 17 principles and modules of Lean lantbruk are presented in Appendix 2.

5.2 Description of Collaborative Cases

The interviewed farmers have different enterprise structures. In order to obtain a better understanding and background of the studied case collaborations, a description of each of the twelve farms is presented in table 2. The chosen parameters consist of the main enterprise, number of employees, total amount of hours including owners, type of collaboration, first year of collaboration and the year in which the LM farms started their LM education. The farms are ordered by partnership. The paragraphs below table 2 describe each collaboration more thoroughly.

Table 2. *A description of the interviewed case farms (farmer 1-3, farmer R1-R3).*

Farm	Production	Employees	Hours	Content of collaboration	Start year	LM-year
1a LM	Dairy	7-8	15700	Forage chain	1976	2012
1b	Dairy	1	7200	Forage chain	1976	
2a LM	Egg, crop	3	9500	Combine	2008	2012
2b	Crop	0-1	1500	Combine	2008	
3a LM	Potato, crop	6-7	12000	Potato chain, tractor, labor	1987	2013
3b	Potato, crop	1	4200	Potato chain, tractor, labor	1987	
R1a	Potato, crop	0-3	4500	Combine, plough, harrow	2013	
R1b	Potato, crop	1	2400	Combine, plough, harrow	2013	
R2a	Crop	0-1	2300	Combine, 4 other machines	2008	
R2b	Crop	0-1	1400	Combine, 4 other machines	2008	
R3a	Beef	1	4000	Forage chain, combine, seeder	2006	
R3b	Dairy	10	20000	Forage chain, combine, seeder	2006	

LM Collaboration 1
Collaboration 1 consists of farmer 1a and 1b, where farmer 1a has implemented LM within the entire dairy enterprise. Within the collaboration, mutually owned forage machinery is shared. Although the ownership is mutual, each farmer has a greater responsibility for a certain machine regarding operating, annual maintenance and storage. The current owners' parents initiated the collaboration. At that time, each farmer operated all the shared machinery by themselves, which has developed into a more machinery specific responsibility today. A third member of collaboration 1 does not participate in this thesis.

LM Collaboration 2
Within collaboration 2, the farmers 2a and 2b own a combine (harvester) together. Farmer 2b and the earlier generation of farmer 2a initiated the collaboration. Since one party has worked at the other party's farm, they knew each other before the collaboration was initiated. The structure and the total area of tillable land of the collaboration is the same since 2008 but less land is harvested for other customers than before. The owner of the farm is usually the one who operates the combine; although most important thing is that the combine is operating somewhere. Maintenance that is more extensive is carried out mutually. So far, farmer 2a has implemented LM within one enterprise unit, egg production.

LM Collaboration 3
Within collaboration 3, consisting of farmer 3a and 3b, one tractor and machinery for potato production are owned in a mutual firm. Earlier, a plough was also owned mutually but since both parties have expanded their farms, they have their own today. Farmer 3a is continuously implementing LM within all business units on the farm. The collaboration was initiated by the previous generations since they knew each other, but even the current generations have known each other since younger years. The collaboration has been extensive for many years since many machines are mutually owned. However, initially, the parties mostly collaborated a few weeks during season. During the last years, even labor has been shared more frequently between the farms. The farmer who has time performs regular maintenance of machinery. One party owns a machine with a third party as well, who is not participating in this study.

Reference Collaboration R1
Farmer R1a and R1b constitutes collaboration R1, which started with a mutually owned plough. This worked well and the parties felt that they could expand the collaboration. Today, it also includes a combine and a harrow. The collaborating parties have a written contract where

storage, service, usage and an eventual termination of the agreement are regulated. However, many practical issues concerning the collaboration are carried out by experience. The contract is more of a safety mechanism in order to have a plan to stick to if they eventually are unable to agree.

Reference Collaboration R2
Collaboration R2, consisting of farmer R2a and R2b, was initiated by the earlier generation of one of the two parties. At that time, it was one mutually owned machine. Today, most of the machinery is mutually owned. It has been discussed whether they should form a joint company for both farms but the current constellation has proven to be adequate. A written contract regulates service, responsibility and an eventual break up. However, much of daily issues are determined through experience. Someone is always responsible for a specific machine but maintenance that is more extensive is performed together. Even labor is shared to some extent.

Reference Collaboration R3
In arrangement R3, consisting of farmer R3a and R3b, the collaboration was initiated with shared use of forage machinery but without owning them together. The collaboration has developed to include combine and a seeder. All machines are still owned separately but used mutually. It is usually the owner who operates his own machines. The farmers have known each other for a long time and have worked together earlier. They are discussing whether they should reduce the extent of the collaboration to include only forage machinery. Collaboration R3 consists of a third party, however not included in this thesis. A clarification is that the owner of farm R3a was not interviewed for this study but his son, who is also an employee on the farm.

5.3 Results - Degree of Lean Management

This section describes how each farmer individually handles issues that can be related to the LM theory presented in chapter 3. The description is made in order to highlight if each farmer acts different in the collaboration compared to when they work independently.

5.3.1 Philosophy

LM Collaborations
When questioned if the farmer has any written and/or verbally communicated goals for one's business, the majority of the LM collaborating parties answered that even though they have goals, they are not formulated in writing. There are also differences to what extent that the goals are communicated to the employees on the farm, see table 3.

Table 3. *Presentation of LM characteristics related to philosophy (farmer 1a-3b).*

Farm	Goals	Written goals	Communicated goals	Future development	Expected customer
1a LM	Profitability, Production	No	No	Expand, processing	End
1b	Production	No	Yes	Expand, processing	Intermediator
2a LM	Profitability	Yes	No	Not specified	End, Intermediator
2b	No specific goals	No	No	Not specified	End, Intermediator
3a LM	Constant development	No	No	Still entrepreneurs	End
3b	Financial, Production	No	No	Not specified	End

Farmer 1a and 1b mention that they may increase beef production in the future in combination with more land and more dairy cows. Further, farmer 1a explains that the goals are not explicitly shared among employees. However, the employees for whom the goals concern the most may be aware of them. Farmer 3a does not express any specific goals, but a vision of constant development exists. Farmer 2a explains that he is not satisfied with the profitability today and wants to improve it. The goal is not communicated to employees although they are aware of the current financial situation. Although the goals are unwritten, farmer 1b states that all committed people are aware of the goals, since they are referred to regularly in the production process. Farmer 3b argues that he does not have any written goals because the company is so dependent on external factors, such as weather. Farmer 2b argues that there are no specific business goals that he strives to satisfy, besides to financially manage the farm. However, a sizable amount of land has recently been acquired.

In terms of for whom they produce, the farmers that produce cereals argue that it is more of a bulk production with contracts for large volumes. Hence, the distance to end customer is longer. However, for other products such as milk and potatoes, many farmers argue that there is a closer relation to end customers, see table 3 above. Farmer 1a argues that he produces for the end customer by offering food and energy needed for survival. This is in line with farmer 2a who argues that he produces for both retail and wholesalers and therefore perceives that he operates in a quite short supply chain. Farmer 3a feels that they have a close relation to the end customer and a good understanding of their processes, which is good in order to offer good services. He also explains that they have different strategies for different types of customers. He describes himself as a food producer rather than a farmer. "If we are farmers, then we just cost money and block the traffic on the roads … We are essential to life". Farmer 2b shows an awareness of the customers' needs by alluding to that he receives feedback from the end customers regarding potato quality. Farmer 3b perceives that he produces potatoes for the end customer through wholesalers, "It is fun to get positive response from the buyers", he says. However, farmer 1b wishes production was more direct to the end customer than it is.

Reference Collaborations

The majority of the reference farms describe that they have financial and production-oriented goals, noted in table 4. One goal for farmer R2a is to transfer a financially healthy company to the next generation. In order to achieve the goals, the farmer has developed a yearly long-term guideline containing strategies shared with all concerned within the company. Farmer R3b emphasizes the need for balance between different goals.

Table 4. *Presentation of LM characteristics related to philosophy (farmer R1a-R3b).*

Farm	Goals	Written goals	Communicated goals	Future development	Expected customer
R1a	None	No	No	Business transfer	End, Intermediator
R1b	Production	No	No	Business transfer	Intermediator
R2a	Financial	Yes	Yes	Expand	Intermediator
R2b	Financial, Production	No	No	Expand, cattle prod.	Intermediator
R3a	Financial	No	Yes	No plans	End
R3b	Financial, Production	No	Yes	Processing, tourism	End

According to table 4, several farmers' goals are not verbally communicated or shared with employees, nor written. The farmers may have goals for their business but they are not

communicated to others. However, farmer R3b frequently communicates current farm performance and has a few meetings per year together with employees where they follow up goals. Some farms want to expand their enterprises in order to develop the financial basis and secure production for the future. Farmer R3a does not believe that the farm will expand in the near future due to an uncertain beef market and a lack of space. Others expect to reduce their workload and transfer the farm to a younger generation.

Those who produce cereals express that they do not sell to end customers, but rather to the next step in the supply chain. However, farmer R3a answers that they produce for the end customer when it comes to beef and cereal production, although, the cereals are sold to an intermediator. Farmer R2a argues that additional steps in the supply chain tend to further separate him from the end customer since he produces more energy and less bread grain than before. Farmer R2b expresses that he is not fully comfortable with producing bioenergy on high quality land, although the market price affects his strategy. Farmer R1a argues that his potato production is closer to the end customer than cereal production. According to farmer R3b, the company produces a product for the end customer even though a substantial share of the milk is sold to a dairy as an intermediary.

5.3.2 Process

LM Collaborations
When asked whether the farmer's current enterprise units operate even without the owner in place, most farmers argue that their farms are independent, which can be noted in table 5. Being on vacation is usually not a problem since the employees know their responsibilities. Farmer 3a mentions that they usually work jointly with the employees to prepare process development. Farmer 1b mentions that they used to depend on insemination services, but today employees have that knowledge as well. Farmer 2b mentions that people could replace him when he had pig production but today he only has crop production. Farmer 3b argues that the company is quite dependent on him, and the season decides when vacation is feasible.

Table 5. *Presentation of LM characteristics related to processes (farmer 1a-3b).*

Farm	Dependency of management	Routines for operational work	Updates of routines
1a LM	Lower	Few written	When needed, If new employees
1b	Lower	Not written, Frequent discussions	-
2a LM	Lower	Many written	When needed
2b	Higher	Not written, Not communicated	-
3a LM	Lower	Not written, Communicated, Value stream thinking	-
3b	Higher	Not written, Communicated	When required by authority

As can be noted in table 5, although most farms do not have written routines, a few of them do. Some routines at farm 1a regarding dairy production are written and the farm uses tables in order to inform employees. Farmer 1a argues they could be better at using and updating the routines though. The farmer also clarifies that organizational restructuring issues interrupted the LM implementation process. Farmer 1a is aware of that this could have affected the holistic implementation of the LM principles on the farm. Farmer 1b argues that they do not have any

routines written, but they think quite similarly and they do discuss which way is most appropriate to use, mostly regarding dairy production.

According to farmer 2a, they work a lot with written routines and he argues that is an important part of LM. His intention is that the routines will enable new employees to operate the production for the most part without extra help. They have descriptions of the routines, manuals and systems for monitoring. He mentions that the routines will be implemented in other enterprise units on the farm over time. If someone is helping farmer 2b they have a discussion and supplementary questions are communicated by telephone. Regarding routines, farmer 3a argues that if new employees are hired, they are introduced mostly by verbal explanations. Some weekly routines exist. However, he mentions that the current number of employees is at a maximum of what they can handle without developing additional written routines.

Concerning information sharing, it is more of an individual responsibility to inform others. There are some checklists but farmer 3a talks more about how they all sit down together discussing the seasonal processes. He states that the value stream is visualized in order to identify risks and to describe how to allocate recources. There exists a mutual responsibility to keep machinery up to date since there is often more than one user. For the operations conducted by employees, there are only verbally communicated routines that are learned by experience, especially with new employees, according to farmer 3b. However, he follows a required standard for potato production and states that he dislikes the paperwork with checklists. Even if the routines are written in a folder, they may not be read or updated until the next audit. This system is updated on a regular basis when new guidelines are defined. Farmer 3b also stresses that there is always an openness to ask questions.

Reference Collaborations

Most farmers argue that their enterprise cannot operate if they are not present during the season, as can be noted in table 6. The younger generation on farm R3a explains that production is terminated if the owner is not working, although the business can be managed in case of illness. Farmer R1a is needed since employees mostly work part-time and with tasks that are more extensive. According to farmer R1b, the production demands the owner to contribute with his time during the season and therefor vacations are planned during the winter. However, farmer R3b argues that it is a deliberate strategy to develop a farm that is independent of himself.

Table 6. *Presentation of LM characteristics related to processes (farmer R1a-R3b).*

Farm	Dependency of management	Routines for operational work	Updates of routines
R1a	Higher	Not written, Communicated	When required by authority
R1b	Medium	Not written, Communicated	When required by authority
R2a	Lower	Not written, Experience, but no need for	-
R2b	Higher	Not written, Not communicated	-
R3a	Higher	Not written, Not communicated	-
R3b	Lower	Not written, Communicated	Regularly reminded

Most farmers argue that they work with individual verbal instructions if they recruit new staff and extensive written routines are rare. However, farmer R1a and R1b face required routines from authorities regarding the potato production in order to maintain high food quality and in order to have a plan for emergencies. These guidelines are posted in the workshop, farmer R1b explains. When questioned about checklists, farmer R1a stresses that it might be a good idea to summarize a list of work tasks that should be completed regarding machinery maintenance and regular yearly service. According to farmer R2b, no checklists are used except for machinery service manuals. Farmer R2b also mentions that to do-lists have been used but has not fully

succeeded. Even though farmer R2a has experience of checklists and standardized work procedures he does not perceive the need for this structure on the own farm. The farmer stresses the need for checklists in a start-up-phase and in order to provide a holistic perspective of processes in need of a longer time perspective, flow or if there is a higher amount of employees.

Farmer R2a raises difficulties with creating streamlined processes within the agricultural business due to a higher degree of irregularity in the processes. Instead of using a to do-list, farmer R3a keeps a diary as daily feedback. According to farmer R3b, written routines are required for parts of the production by different authorities who makes periodic inspections in order to ensure that the procedures are followed. How often these routines are updated is presented in table 6. Other units of the business do not have as detailed routines and written procedures and they are not updated as frequently. Farmer R3b emphasizes that the routines are verbally communicated to the employees and they are regularly reminded of e.g. safety procedures. According to farmer R2a, more operative strategies are discussed verbally between the younger generation of the farm and the collaborative party farmer R2b. More strategically oriented yearly routines are developed by the owner of farm R2a for the own company.

5.3.3 People and Partners

LM Collaborations

The characteristics of meetings within their own farms and perceived goals between the collaborating parties are presented in table 7. The table also reveals differences in the degree of information exchange between the collaborating parties as expressed by each party. A majority of the farms mention flexibility and the fact that the collaboration releases time that can be allocated to other parts of one's business as benefits of the collaboration.

Table 7. *Presentation of LM characteristics related to people and partners (farmer 1a-3b).*

Farm	Regular meetings	Perceived partner-ship goals	Degree of information exchange	Benefits
1a LM	Weekly	High quality product	Not specified	Quality, Social
1b	Breakfast	High quality product	Lower	Flexibility, Quality, Good machinery
2a LM	Weekly	Not communicated	Medium	Flexibility
2b	None	Not communicated	Medium	Flexibility, Capacity, Social
3a LM	Daily	Efficient production, Social	Higher	Flexibility, Efficiency, Social, Economical
3b	Breakfast	Reduce costs, Labor efficiency	Higher	Flexibility, Efficiency, Social, Economical

The majority of the LM collaboration parties schedule regular meetings to some extent, as can be noted in table 7. During the weekly meeting on farm 1a they discuss upcoming tasks and if someone has something to share. However, it is quite a challenge to make the staff talk and to follow through with suggestions and ideas. Farmer 1a argues that they could have more professional meetings and staff appraisals since the regular meetings concern everyone. According to farmer 1b, except for the mutual breakfast a couple of times a week no regular meetings occur, although they raise issues during the work. This might be an older culture where meetings have not been considered as important, farmer 1b mentions. Farmer 2a raises that even though a written agenda is followed the weekly meetings are often too long. Initially, the idea was to have a specific LM meeting every month but they have not found time to initiate

it. Farmer 2a tries to collect new information during the week and communicate it to everyone during the meeting instead. Farmer 2b does not have any meetings since he mostly works alone. There is a sufficient communication with employees, according to farmer 3a. Therefore, he argues that he has not focused on creating weekly meetings. However, they do have informal morning meetings where most things for the daily agenda are covered. He states that they need to work more with communication within a new enterprise unit in order to get people to talk about problems. Farmer 3b describes that they do not have any specific meetings but a regular discussion since they both work and have breaks together.

When asked if there are any goals within the collaboration, farmer 3a stresses that performing work rationally and efficiently, and to have more fun are important goals. Farmer 3b stresses that the aim of the collaboration is to reduce costs and to get access to labor at the right time. Farmer 2a mentions that our questions regarding verbally communicated goals are interesting. He explains that the collaboration has worked well since it was initiated but since then, the farms have developed. He thinks they should discuss the future more. The mutual goal with the collaboration is to produce a silage with high quality according to both farmer 1a and 1b. None of the LM collaborations has signed contracts regarding their machinery sharing arrangements. However, all parties perceive that the collaboration functions well. Farmer 1b mentions that they have a few discussions regarding where they should start harvesting. This is in line with collaboration 2 where both parties stress that many questions were initially discussed but some things have been settled over time. Farmer 2b mentions that it is clear that it does not matter who operates the combine as long as it is functioning. A requirement of collaboration 2 is to deliver a machine that is clean and fueled. These guidelines have been developed over time.

Regarding exchange of information within the collaboration, collaboration 2 argues that it does exchange quantitative and qualitative production data but on a more informal basis. Farmer 2b argues that an exchange of information such as data may result in exchange of experience and further development within the own farm. Farmer 2a stresses that it is natural to exchange crop data between farmers during harvest although they do not exchange data in a more careful manner. Collaboration 3 emphasizes their intercom system as time efficient when communicating during operational work. Due to a need of management of several enterprise units farmer 3a is mostly stationed at his own farm. Collaboration 3 argues that immediate communication is not only to ask for help, but also in order to allocate the workforce to other tasks. Farmer 1b argues that the forward planning sometimes could be better from both parties, although he realizes that they are both dependent on the weather. Farmer 3b stresses difficulties in comparing the two farms' respective potato cropping system since they produce different types of potato even though data exchange occur. Farmer 3a on the other hand, argues that an exchange of data strengthens the two farms and data is exchanged more than before. Farmer 1b stresses that the need for exchanging quantitative data between the parties is unnecessary since their dairy herds represent different specializations and sizes. However, none of the farmers who collaborate with a LM farm express that an in-depth dialogue about the LM farms' implementation has occurred. Farmer 3b mentions that he has spoken to the employees on farm 3a about the strategic and operational changes but farmer 3b emphasizes that no conversation has occurred with farmer 3a.

Farmer 3a perceives that mutually owned machinery is rational and beneficial, in terms of both time and efficiency in the processes. The social aspects of the collaboration are important, as well as the economic aspects, which was the reason to collaborate from the very beginning, according to farmer 3b. Furthermore, working together creates a more positive atmosphere and social environment where participants are encouraged to promote asking questions. Both farmers in collaboration 2 point to the social benefits of having a collaboration and using

machinery together. Farmer 2b argues that it often results in an exchange of experiences and new perspectives.

Reference Collaborations

In table 8, the perceived goals and benefits for the reference collaborations are displayed. The table also highlights if any meetings are held within each farm and the degree of exchange of data between the collaborating parties.

Table 8. *Presentation of LM characteristics related to people and partners (farmer R1a-R3b).*

Farm	Regular meetings	Perceived partner-ship goals	Regular meetings	Degree of information exchange	Benefits
R1a	Weekly	Capacity, Economical	Daily	Lower	Economical, Flexibility
R1b	Breakfast	Capacity, Economical	Daily	Lower	Economical, Flexibility, Help
R2a	Weekly	Capacity, Economical	Unspecified	Higher	Economical, Informational
R2b	None	Economical	Unspecified	Higher	Economical, Flexibility, Informational
R3a	Daily	Capacity, Economical, Social	None	Medium	Economical, Employment
R3b	Breakfast	Capacity, Economical, Social	Daily	Medium	Economical, Social

According to farmer R1a, during the harvest season no regular meetings occur where the entire workforce gather before a shift begins. However, a short gathering may occur as a start on the harvest season for each production process. Farmer R1a also mentions breaks during the day as an opportunity for questions, work related briefings and suggestions. Ideas are welcome to be raised during the breaks; “one can get stuck in old habits” (Farmer R1a). In line with farmer R1a, farmer R1b explains that breaks function as a way to inform everyone involved in work tasks, information etc., see table 8. A small briefing might occur if temporary workers are employed during the more hectic parts of the season, farmer R1b says. The communication between the owner and employee on farm R3a is frequent during the day over telephone and a weekly plan is developed continuously. On farm R3b, daily morning meetings are held. During these meetings, the employees may ask questions about the day-to-day routines and the owner informs them about farm activities. Farmer R3b states that it is essential to gather all employees, that they feel they are important and that they get the opportunity to be involved in the business. "Everyone's work is equally valuable", farmer R3b says. More extensive meetings than the daily morning breaks are held, however not frequently, in order to update and provide information regarding more strategic issues, according to farmer R3b.

According to the majority of the reference farms, high machinery capacity and lower machinery costs are vital goals for the machinery sharing arrangements. According to farmer R3a, goals regarding the collaboration have been verbally communicated from the start of the collaboration. The goals are to reduce the machinery costs, improve machinery capacity and contribute to a more social environment. Even though the perceived goals for collaboration R1 and R2 are not explicitly stated, all parties stress that the underlying understanding is that the purpose of the arrangement is to invest in high capacity machinery and reduce machinery costs. Even though no goals are verbally communicated regarding collaboration R1 and R2 the two

collaborations have signed contracts regarding machinery usage, guidelines, ownership, work procedures etc. The contracts are not used frequently but function to secure the basis for the collaboration, according to R2.

During an activity, both parties in collaboration R1 and R2 agree that they do not have a frequent information sharing. However, collaboration R1 argues that the parties update each other throughout the process if there are any disruptions. The updates may pertain both to operational and strategic matters. Farmer R1b argues that the differences in cultivation strategy between the parties form the need for regular communication. Even though farmer R2a does not perceive a more thorough information sharing during the season a deeper operational dialogue and information sharing occurs between farmer R2b and the younger generation of farm R2a. During forage harvest farmer R3a has regular contact with the employees at farm R3b regarding operational questions. Most of the planning is done over telephone a few days prior to the process. During those conversations, even the owner of farm R3b is involved. Farmer R3b stresses that the parties share information regularly over the year. Collaboration R1 and R3 emphasize that they only maintain verbal discussions regarding the subject and no written or exchange of data exists. Farmer R3b stresses that it is not possible to compare all parts of the different enterprise units in the collaboration since the parties have diverging business focus. Collaboration R2 views the exchange of qualitative and quantitative data as an exchange of experiences, knowledge and a possibility to develop new strategies in order to improve production. During the interview, farmer R2b acknowledged he realizes that the farms could exchange more numerical data since the farms are quite similar.

The majority of the parties in the reference collaborations reap the economic benefits due to lower machinery costs. In addition, many farmers mention released time and flexibility as beneficial. Both parties of collaboration R2 also stress information exchange and an expanded network as benefits of the collaboration. Farmer R3a and R3b stress that it is very beneficial that the parties encourage each other to maintain work even if a partner faces a difficulty. Further, farmer R2b view the social aspect of the collaboration as beneficial: "You have the time to exchange a few words about how the process is progressing, it results in a more pleasant agribusiness" (Farmer R2b). Farmer R1b stresses that he feels confident in asking farmer R1a for help if necessary, which is perceived as beneficial. In terms of the machinery, according to farmer R3a it is beneficial that each farm does not need to possess all machinery needed for forage production and that the collaboration results in a high degree of employment. However, even though the arrangement has resulted in a number of benefits, farmer R3b does not perceive that the collaboration has resulted in more spare time since each party contributes time when helping the other party during the forage harvest. This is an aspect he believes should be acknowledged more often in collaborations.

5.3.4 Problem Solving

LM Collaborations

Most farmers argue that if someone is not adhering to expectations or if they do not follow instructions, they discuss it and try to raise the problem before it becomes more serious, which can be seen in table 9. Farmer 2a mentions, that if someone notices a problem the entire workforce tries to update the routines and set a reminder on it in order to avoid the problem in the future. Although, this is not a common occurrence. However, farmer 1b mentions those new types of issues are not a problem since all parties know their commitments and how to fulfill them. According to farmer 3a, it is up to him to raise issues if processes are not carried out in an expected manner. Many issues and ideas are discussed between the employees without farmer 3a. This is a result of LM according to farmer 3a. Farmer 3b emphasizes that openness

is very important and that employees are encouraged to ask questions if there is something they do not understand or if something happens.

Table 9. *Presentation of LM characteristics related to problem solving (farmer 1a-3b).*

Farm	Handling of shortcomings	Time perspective when solving problems
1a LM	Openness and discussion	Mutual agreement, urgent things first
1b	Usually not necessary	It should not happen again
2a LM	Discussion, update of routine, rare	Long-term, proactive, prioritize
2b	Discussion	Not specified
3a LM	Owners responsibility	Long-term
3b	Openness, ask friendly environment	Prioritize, proactivity, flexibility, discussion

Most of the farmers state that they try to solve problems with a long-term perspective although it depends a lot on the urgency of the problem and therefor prioritizing is vital. When problems arise at farm 1a, they try to agree about when adjustments have to be done, otherwise they solve the most urgent problems first. Farmer 1b argues that they try to solve an issue so they know it will not arise again. Farmer 2a argues that they try to solve problems with a long-term perspective, but that problems always have to be prioritized. However, temporary solutions do exist if something is urgent. In order to prevent and avoid similar problems in the future they create and develop new routines on a regular basis. Farmer 3a mentions that they hopefully and usually solve problems in advance so they never become bigger issues. They often have access to labor from the collaborating farm, which, according to farmer 3a, implies that tasks can be performed in a skilled manner from the beginning. Farmer 3b argues that it depends on how urgent it is and that the farm during season usually is given priority to private events. Flexibility and discussion are important tools when deciding how to tackle a problem. Being proactive and conducting maintenance in advance is also important according to farmer 3b.

Regarding decisions, farmer 1a mentions that no party has more impact than any other does and that they agree about most things. Both parties in collaboration 1 mention that the farm owner where the parties work for at the moment decides how procedures should be implemented even if this is not an outspoken rule. The weather decides and everyone is allowed to say where they want to start first. Farmer 1b stresses that within the other farm it is rare to operate a process before decisions are made. He tries to inform the other part during an operation if something cannot be done in the expected manner. Most decisions in collaboration 2 are based on experience and discussions with short decision-making. Storage of the combine was determined by available space at the farms. Farmer 3b explains that decisions regarding the production processes are based on mutual discussions. According to both parties in collaboration 3, there is a high degree of flexibility in terms of planning new investments.

Reference Collaborations

All farmers raise the importance of showing a willingness to discuss problems and being open if any issues occur, which is also revealed in table 10. Discussions regarding routines and if a procedure is not followed are raised when the occasion arises, according to farmer R1b. The farmer also emphasizes that these type of discussions have been rare. Farmer R2a stresses the need of informing each other if mutual agreements and routines are not followed as agreed. He emphasizes that "New mistakes are always allowed but the same mistake again is not accepted, since you have not learned anything", farmer R2a explains. Even machinery interruptions are communicated immediately, farmer R2a explains. Farmer R3a stresses that they have a continuous dialogue regarding verbally shared routines and how those are supposed to be implemented. The perception is that all questions can be asked. Farmer R3b, who mentions the

breaks in the morning as an opportunity for routine discussions and questions, suggests an open dialogue and an open atmosphere for suggestions.

Table 10. *Presentation of LM characteristics related to problem solving (farmer R1a-R3b).*

Farm	Handling of shortcomings	Time perspective when solving problems
R1a	Not specified	Long-term, repairs performed immediately
1b	Discussions when occurring, rare	Long-term, depends on the problem
R2a	Informing each other	Striving for better solutions
2b	Not specified	Long-term
R3a	Continuous dialog about shared routines	Depends on the character of the problem
R3b	Open dialog, routine discussions	Long-term, prevent provisional solutions, depends on the problem

Half of the reference farms state that the character of a problem, and the process where it occurs, decides how urgent it is to solve. A broken machine has to be attended to immediately while more provisional solutions can be done on e.g. interior in the barn farmer R3a explains. Even farmer R3b expresses that although maintenance is carried out continuously, quick fixes do occur. A common view among most of the reference farms is that they strive to have a long-term perspective regarding machinery repairs, and acting pro-active to prevent mechanical breakdowns. According to farmer R3b, this is also a way to prevent provisional solutions. In case of a breakdown, R1a stresses that it is important to start production as soon as possible and therefor a repair is carried out immediately. “In case of an interruption, one cannot wait until the next day”, farmer R1a explains. A continuous way of work in farm R2a is to find better solutions in order to solve different problems. Farmer R2a stresses the need for having several plans in case of an interruption due to external factors. The motivation in problem solving should be “Whatever we do there is a better way to do it, we just have not figured it out yet”, farmer R2a explains. Farmer R2b mentions that he has not been in a situation where machinery has broken down.

Farmer R1a stresses the mutual decision in signing machinery-sharing contracts since the parties did not know each other that well in the beginning of the collaboration. Both farmers in R1 agree that decisions made within the collaboration are mutual. Farmer R1a mentions that alternative actions, e.g. in case of bad weather, are discussed before a decision is made in order to reach a mutual agreement. Long-term decisions within collaboration R2 are subject to a more thorough process, both parties express. The decisions are based on discussions, price offers and mutual agreements. Operational decisions on a more short-term basis take less time to agree upon and can be taken directly without further information gathering. Farmer R3a explains that decisions are based on mutual agreements as a result of consultations between the parties. Farmer R3b argues that many decisions are based on routines and the need for high forage quality and strategic preferences. The farmer also explains that as of today, it is more common that questions of more operational character are communicated directly between employees instead of through himself.

5.4 Results - Supply Chain Collaboration

Following results are presented in line with the supply chain collaboration theory. The cultural elements that enable a collaboration to evolve are presented in 5.4.1 and is followed by 5.4.2 Key factors.

5.4.1 Cultural Elements

LM Collaborations

All LM collaboration parties perceive a high degree of trust within each arrangement, as shown in table 11. Farmer 1b stresses that they can trust the other party since they feel an obligation of doing a satisfying work regardless of at which farm forage production is temporary located. Although the forage process is addressed with short notice, farmer 1a emphasizes. Farmer 3b also stresses the need for mutual strategic and systematic thinking as well as equal economic priorities and preferences. Further, farmer 3a argues that both parties are "at the same level and the same wavelength" (Farmer 3a).

Table 11. S*upply chain collaboration characteristics related to cultural elements (farmer 1a-3b).*

Collaboration	Perceived trust	Perceived contribution	Perceived risk	Written contracts	Perceived Openness
1	Higher	Mutual	Drift apart (1a)	No	High
2	Higher	Mutual	Disagreements (2a) Quality (2b)	No	High
3	Higher	Mutual	Potato diseases (3a) Drift apart (3b)	No	High

All LM collaborating parties stress the importance of contributing to the collaboration. Farmer 1a stresses the importance to support each other and the mutual responsibility for the joint production. Furthermore, farmer 1a highlights the importance of the farms' own contribution in the collaboration; "If we deny because we cannot help them, then they can deny us. It is about that everyone's grass is just as important" (Farmer 1a). Farmer 2a argues that it is important to compromise and, not always be in full control. It is vital to envision the whole picture and not just focus on the details. Farmer 3b states that the parties meet each other at half way in the collaboration. Farmer 3b also mentions that he has to recruit extra employees if he wants to do something else since he has promised to contribute with his two ordinary employees to the work within the collaboration. Farmer 2b stresses that it is natural to repair and to contribute so the combine is ready for work, no matter of who will use the combine next. The administrative part, as mentioned above, is primarily done by 2a, which is shown as one example of how the farmer contributes to the collaboration.

Along with benefits, the collaboration might also lead to higher risks. Table 11 illustrates some perceived risks the collaboration implies. Farmer 1b does not perceive that collaboration may imply risks for his own farm. The farmer argues that the risk would have been higher if the service were bought from a machinery station since the machinery station's benefits are strictly economical. Farmer 2b identifies a risk concerning the quality on harvested cereal due to late harvest and unfavorable weather. However, it is not for sure that it would have been less risky if the farmer had a combine for himself since the farmer most likely would have owned a combine with lower capacity, according to farmer 2b. Farmer 3a says that the risk of timeliness effects is minimized since both parties in collaboration 3 are equipped with their own machinery when it comes to work where time is more crucial. The effects occur when external factors, such as bad weather, reduces the ability to harvest at a predetermined time. According to farmer 3a, a risk that may occur in a collaboration regarding potato production is that diseases may be transferred between the farms. Both parties in the arrangement 3 express their willingness to compromise when facing external risk factors, such as weather. An obvious risk, according to farmer 2a, is if they do not reach agreements within the collaboration. This is in line with farmer 1a and 3b who point out the risk that the farmers may drift apart as a result of not sharing similar opinions, a shift in preferences or economic situation. Farmer 1a further develops the reasoning

regarding risk by stating that the collaborative benefits exceed any potential risks. In addition, most of the potential risks would exist even without the collaboration according to farmer 1a.

The majority of the LM parties frequently socialize during non-working hours and private conversations occur just as frequent as work related matters. However, both parties of collaboration 2 agree that most of the interaction is work related and that questions of more personal matter are rare, although the parties have frequent contacts. All LM collaborations express that there exists an openness within their arrangement and they feel comfortable in discussing deeper and more sensitive information. However, the depth in each relation varies. All parties feel confident in having the possibility to share sensitive information, although not very often. However, farmer 3a provides a more colorful description by expressing that mutual respect, a high knowledge in the area of production and a strive forward has deepened the relationship within the collaboration. Farmer 3a stresses the advantage of having a non-agricultural education. It provides a new perspective and opens up the possibility to raise new questions. At the same time, the farmer perceives a high degree of unpretentiousness within the collaboration, which is unusual and beneficial for the agricultural branch. By not having a high prestige or withholding information regarding one's own company, it is possible to open up for a more open and educating environment, according to farmer 3a. He also emphasizes that farmer 3b has a good relation with the employees of farmer 3a.

None of the LM collaborations has signed a written contract concerning the shared machinery. However, mutual agreements and underlying understandings have been developed over time through experiences, verbally communicated routines, responsibilities, circumstances and compromises, according to all parties. Farmer 3a emphasizes that a more structured and repeated form of meeting would be beneficial for their collaboration. One important part of the joint agreement is to keep notes on machinery use and involved employees, according to collaboration 2 and 3. However, farmer 2a expresses difficulties in formulating a written contract. Collaboration 1 emphasizes that external factors such as weather and seasonal length affect the collaborative framework. The parties of collaboration 3 express their willingness to compromise if such an event occurs.

Reference Collaborations

Similar to the LM collaborations, the reference collaboration parties perceive a high degree of trust in the collaborating partner and that the partner contributes at its best ability, noted in table 12. Farmer R1a believes that machinery stations do not always stick to their promises. Hence, the farmer regards the collaboration between two farms as more successful. A high level of trust is necessary and crucial in order to maintain a successful collaboration, according to farmer R2a. However, farmer R3a raises the issue of not completely trusting the other party in terms of punctuality and available employees at the right time.

Table 12. S*upply chain collaboration characteristics related to cultural elements (farmer R1a-R3b).*

Collaboration	Perceived trust	Perceived contribution	Perceived risk	Written contracts	Perceived Openness
R1	Higher	Mutual	Not specified	Yes	Medium
R2	Higher	Mutual	Timeliness effects	Yes	Higher
R3	Medium	Differ	Broken agreements (R3a), Worse timing	No	Medium (R3a), High (R3b)

When questioned if the parties perceive that the other party contributes to the collaboration to the best of his ability both R1 and R2 agree that this is the case, as can be seen in table 12. Farmer R1b continues the reasoning by stating that it is not likely that farmer R1a is hiding anything. The parties of collaboration R1 mention that it is important to understand that the

accuracy and justice has to be reasonable. Farmer R2a stresses the need for self-contribution and argues that a long-term perspective is crucial to make it work. The farmer also says that parties in a collaboration must help each other and see beyond the needs of their own farm. Otherwise, the collaboration may not function over a longer period of time. Farmer R3a responds with a more restrictive answer. The farmer develops the reasoning by once again stressing the difficulties farmer R3b has in fulfilling the obligations, based on their mutual agreements. Farmer R3a raises the importance of doing their own part of the collaboration in order to avoid being criticized for not doing so. Farmer R3b confirms the critique by saying that they sometimes struggle to provide designated drivers and machinery when needed. However, farmer R3b argues that they strongly believe that the other party carries out its obligations.

Concerning risks with the collaboration, farmer R3b emphasizes the risk that the other party cannot fulfil its part of the agreement, although there are other farmers who can contribute in such a case. Moreover, the farmer describes timing as a risk, although he mentions that the farm may have operated smaller machinery if they were not collaborating. In the event of no collaboration farmer R1a would either have had an older or smaller combine. This implies that the capacity would have been lower and/or the risk of high maintenance costs would increase compared to today, farmer R1a argues. Farmer R3a stresses the risk of not being able to thoroughly carry out a task, within the collaboration as well as at the own farm. The farmer mentions that this has caused the parties to try to lower risks within the collaboration by reducing the joint engagements. The reduction does not affect forage production but tillage and cereal harvest. In line with collaboration R3, R2 identifies negative timeliness effects as a risk. Timeliness effects have affected the water content in the produced goods but has not resulted in any economic losses, farmer R2b says. According to farmer R1b, production today is not as sensitive to quality losses and therefor farmer does not see the risk of timeliness effects as very likely.

Each reference collaboration has a mutual perception that the parties can trust each other in terms of information exchange. According to farmer R3a, exchange of information mostly concerns how to improve economical performance and how to manage operational work. He says that all parties can grow what they want and they do not share crop strategies in order to facilitate coordination of the harvest.

Within all reference collaborations, important information regarding the production process is exchanged frequently during the season and the mutual perception is that the parties can trust each other in terms of information exchange. When questioned if the collaborating parties discuss even private matters during their conversations the majority of the reference collaborations answer that most of the conversations are work related. However, small talk does occur. In collaboration R3, the two interviewed parties have different perceptions of on which level their conversations are. Farmer R3a argues that their communication is more work related. However, farmer R3b stresses that private conversations and sensitive matters are commonly discussed. According to farmer R3b there is a friendship relation between the parties even though they do not spend their spare time together. Both parties in collaboration R3 agree that the relationship between the parties are mostly work related even if they socialize on common events and festive occasions in their spare time. Both collaboration R1 and R2 emphasize that a deeper relation within the collaboration may be developed as a result of involving the younger generation and their more private relation to the collaboration. The exchange of information between the parties in collaboration R1 may contain some sensitive information although it is not shared very often. However, there is no insight in the other party's financial situation, according to R1. For collaboration R1, the important information contains both the potato

production and economic strategies, which are of value for the two businesses. Farmer R2a expresses that shared information is of importance. Strategies concerning, economy and intergenerational transfer are examples of topics that are of more sensitive nature.

As shown in table 12, reference collaboration R1 and R2 have established written contracts regarding shared machinery. Both collaborations emphasize that they realized the importance of having a written contract although their first contracts were developed together with their external business advisor. The contracts regulate storage and service of the machinery, how long time a party can use a machine before they switch user and guidelines regarding a potential end of a collaboration. Even though the contracts for collaboration R1 and R2 are not being read that often, since usually the current conditions decide who can use the machines, they still function as a security if any issues would occur in the future. Collaboration R3 does not have any written contracts but verbal agreements. Despite the fact that the circumstances for the collaboration have changed since the parties have grown, the focus is still to maintain an economic balance between the parties and be able to provide not only machinery but also employees when needed.

5.4.2 Key Factors

The empirical results in this section are based on theory regarding the collaborative key factors, which is a part of the theory supply chain collaboration, as presented in section 3.2.2.

LM Collaborations
If a business interruption occurs during season, everyone is informed at an early stage, according to all LM collaborations. Collaboration 1 and 2 argue that they often help each other if bigger interruptions occur since both parties have an incentive to reduce downtime. According to farmer 3a, his employees or the other farm solves more extended interruptions since they have more knowledge and time.

Table 13. S*upply chain collaboration characteristics related to key factors (farmer 1a-3b).*

Collaboration	Sharing key indicators	Communicated performance requirements	Continuous feedback	Economic reconciliation meeting	Motivation for further collaboration
1	No	No	Through operational work	Once/year	Access to labor, Economical, Better machines
2	Yes	No	Through operational work	Once/year, No meeting	Access to labor, Economical
3	Yes	Yes (3a), No (3b)	Through operational work	Three/year	Access to labor, Economical, Better machines, Social

As shown in table 13, two out of three LM collaborations share key performance indicators with each other. Collaboration 2 and 3 follow up performance data such as capacity and labor use, although they use it more as a starting point to assess the need of time and not as a regular key performance indicator. However, it provides motivation. Both farmers of collaboration 2 and 3 argue that it is interesting to follow the performance indicators. Nevertheless, farmer 3b argues that the benefit of key performance indicators are limited since their enterprises depend on the weather. Collaboration 1, on the other hand, may collect data regarding capacity but it is not specifically shared within the collaboration, farmer 1b explains. They keep a continued

dialogue within the collaboration during season about quality and similar feedback, according to farmer 1a. Performance requirements are not communicated among any of the LM collaborations. However, farmer 1b stresses that potential investments within the collaboration are discussed mutually and that machinery usually is replaced every third year to keep a high machinery standard. Farmer 3a describes how they try to minimize waste, for instance by securing the seeding process. Farmer 3b explains that if they follow the requirements they would probably reduce the quality of the potato.

All LM collaborations express that they conduct an annual compilation where they compare use of mutually owned machinery and expenses in order to even out costs within the collaboration. Collaboration 1 and 3 also discuss reinvestments. Farmer 1a argues that the parties do not discuss the collaboration specifically during season. However, farmer 1b raises the daily breaks during the season as a moment when they discuss operational issues within the collaboration. One of the parties carries out the compilation in collaboration 2 but information is shared through email and telephone. There are no other meetings regarding the collaboration. Information concerning the operational part is exchanged frequently during season according to both parties of collaboration 2. The parties of collaboration 3 distinguish themselves since they discuss the collaborative arrangement more carefully with each other up to two times per year, except for regular discussions during season, according to farmer 3a. Farmer 3a argues that they are a little more pro-active in these meetings compared to before they entered Lean Lantbruk.

When questioned how suggestions for improvement are discussed within the collaboration all LM collaborations reveal an open atmosphere where ideas and suggestions can be raised. Farmer 3b argues that he is responsive to new thoughts from employees, no matter if the thoughts are expressed by his own employees or by the other farmer's. Both farmers strive towards the same goals, harvesting the potatoes fast and in a good way. Farmer 1a argues that they usually raise ideas during breaks, or by telephone. Further, farmer 1b mentions that the parties in collaboration 1 think quite similarly. However, farmer 1b and 2b argue that ideas may not be implemented immediately and hint that it is easy to fall back into old habits and a potential change is sometimes not implemented until someone else sets forward the idea again. Farmer 2a emphasizes his employees have a good relationship with the other party, which reinforces the possibility to influence the decision-making. Farmer 3a argues that the employees are involved in the collaboration and in the operational processes. He lets the employees decide a lot of the detailed work.

Table 13 shows that all LM collaborations express motivating factors with the collaboration. Collaboration 1, farmer 2a and 3b mention the benefit of access to more employees that motivates further collaboration. Farmer 1a, 2a and 3b raise the economic benefits through improved cost efficiency. Collaboration 3 emphasizes that it creates a more fun working environment when they work together with great people. Farmer 1a and 3a relate the benefit of better machinery that is more reliable as motivating. According to farmer 2a, further collaboration is also motivated by more available time when the combine is at the other farm and that the collaboration has worked well so far. Even if both farmers have increased farm size, he does not see why they could not continue to collaborate. Farmer 1a also mentions improved efficiency. As long as they want to collaborate it is worth a lot, farmer 1a mentions. Farmer 1b stresses that the collaboration implies higher capacity, time efficiency and a higher quality of the forage. He argues that they would not afford as high capacity if they were not collaborating.

Reference Collaborations

All reference collaborations stress the need for having a direct contact with the collaborating partner in case of a process interruption. According to R3, an interruption in the forage chain is reported immediately since it affects all involved employees. Farmer R3b clarifies that he is not necessarily informed himself but the employees involved in the process. In case of a less crucial breakdown in collaboration R3, a decision is made whether the machine can be repaired immediately or if other measures need to be taken. Both collaboration 1 and 2 express that they do not hesitate to ask the other party for help if a disruption occurs. Farmer R1a argues that this may occur even if he is capable of solving the problem himself. Collaboration 2 argues that long-term maintenance on the machinery is performed together. Farmer R2b stresses that a long-term perspective permeates the collaboration in order to prevent machinery breakdowns.

Table 14. S*upply chain collaboration characteristics related to key factors (farmer R1a-R3b).*

Collaboration	Sharing key indicators	Communicated performance requirements	Continuous feedback	Economic reconciliation meeting	Motivation for further collaboration
R1	No	No	Through operational work	Once/year, no regular meeting	Economical, Social, Exchange of experience
R2	No	No	Through operational work	Once/year, No meeting	Economical, Good machines, Labor, Social
R3	No	Yes (R3a)	Through operational work	Once/year	Employment, Social

No reference collaborations exchange key performance indicators in order to measure performance, as can be noted in table 14. Farmer R2b argues that it is more of operational goals for the own farm, such as hectares per hour, and nothing that is shared or measured within the collaboration. Farmer R3b argues that capacity discussions are raised but no data are shared in order to evaluate their performances. The machinery must have the capacity the process requires, farmer R3a explains. Farmer R3a points out that e.g. forage quantity is consumed internally at each farm and therefore is each farm's own responsibility. Further, he stresses that it is up to each party to define performance goals and strive to reach them.

Table 14 shows that the majority of the reference collaborations do not define any performance requirements. According to farmer R1a, it is more of operational production goals that are being shared. This is in order to plan further use of machinery. Farmer R2a stresses the difficulties in defining performance requirements since external factors may affect production and obstruct the work. Hence, this type of requirements does not lead to further development. Instead, the philosophy is to use the machines fully and not allow them to remain idled more than necessary, which is a philosophy farmer R2b agrees upon. According to farmer R3a, the communicated performance requirement for collaboration 3 is that new machinery should enable the capacity that the forage production process requires.

An economic summary is conducted yearly by all reference collaborations in order to allocate costs regarding the mutually owned or shared machinery and to discuss reinvestments. The majority of the collaborations do not have regular meetings during the year. Farmer R1b argues that feedback is exchanged during harvest season when they use the combine. Regular meetings have not been carried out since the machinery contracts were signed, farmer R1a explains. Although he stresses the need for a meeting where future questions regarding the collaboration

can be discussed. A deeper dialogue concerning the operational work occurs within the collaboration during season, according to farmer R2a. Farmer R2a explains that the parties conclude among themselves briefly how the recent year has past. He does not think regular meetings are necessary since most of the collaborative framework is formulated between the parties through previous understandings. Further, farmer R2a acknowledges that since he does not attend any meetings, he does not know if the younger generation discusses the collaboration with farmer R2b. According to R2b, the collaborating parties discuss the collaboration strategically even more than once a year. However, farmer R2b does not recognize that he discusses the framework for the collaboration if farmer R2a is not present. Operational planning is carried out in close proximity to the forage production process and it involves both farm owners as well as employees, according to collaboration R3. Farmer R3b argues that the yearly meeting may occupy a number of hours because of poor preparation. Hence, a second meeting is often suggested but is never carried out.

When questioned if suggestions for improvements are, and can be, shared within the collaboration, all collaborating parties agree that an open atmosphere characterizes each collaboration where advices and work procedures discussed. Farmer R2a mentions that differences in opinions do occur regarding strategic investments but stresses that the collaboration is open for discussion. Farmer R3a argues that it is more up to each person if they have anything to contribute with. A personal incentive can affect the willingness to bring up ideas. Further, farmer R3b emphasizes that although many ideas are brought up to discussion, many are not undertaken.

In table 14, it is revealed that all reference collaborations mention the social aspect as a motivation factor to further collaboration. However, farmer R1b explains that the social aspects are more important for his employee than for himself. The economic aspects are mentioned by collaboration R1 and R2. Farmer R1a stresses that the exchange of experience and advice is appreciated. The ability to operate as good machinery as the collaboration allows and the possibility to get access to more employees during the harvest season is mentioned by farmer R2b. Today, collaboration R3 is facing some forthcoming changes due to reduced engagement of all arrangements except for forage production. However, what still motivates farmer R3a to continue the collaboration is a high number of operating hours per year.

6 Analysis and Discussion

In this chapter, the analysis is presented in the two first paragraphs and is based on previous presented theory, empirics and results. Finally, the chapter also contains a discussion based on the analysis and the previously presented literature review.

6.1 Individual Implementation of LM Philosophy

A foundation of the LM principles and philosophy is utilized to formulate a guiding vision and goals in order to reach long-term benefits for one's company (Liker, 2014). The empirics in this thesis show that the majority of the LM implemented farms have a view for the future of the business. However, it is only farmer 3a who expresses this in terms of a vision. Among the farms collaborating with a LM farm, it is only one farmer (1b) who has a vision for the company's future. Further, only one of the LM farms (2a) has written goals for the business and none of the LM farms has any verbally communicated goals shared with their employees. Note that none of the parties in any LM collaboration has both written and verbally communicated goals. Since none of the LM implemented farms has any shared goals within the business it shows a lack of understanding of the LM philosophy, according to theory by Liker (2004). This also suggests that farmer 2b and 3b represent a lower degree of understanding of the LM philosophy than farmer 1b does. When comparing the LM collaborating parties with the reference collaboration parties, all farmers but one (R3a) have a clear vision for the company's future. This may depend on that the son of farmer R3a was interviewed. Among the reference collaborating parties, only R2a has both written and verbally communicated goals for the company. However, three of six reference collaborating parties have verbally communicated goals within their farm. Of all interviewed farmers, it is only the parties of collaboration R3 that have verbally communicated goals within the company. Furthermore, there is no collaboration where both parties have written goals.

According to Liker (2004), the philosophy of LM is to add value to the product produced and to produce in line with customer demand. All LM implemented farms express that their main product (potatoes and milk) is produced with the end customer in mind. The interviewed farmers who are within a LM collaboration mention that the chain to end customers is more extensive for cereals than for potatoes and milk. In line with the LM farms, the majority of the LM collaborating parties (1b, 2b, 3b) state that they produce for the end customer. Among the reference collaborating parties three out of six farmers express that they produce for the end customer. Both parties of collaboration R2 argue that they have made an active choice only to produce cereals for the next party, the intermediator, in the vertical supply chain. All interviewed farmers show an awareness of the LM philosophy and a willingness to adjust the production processes and thereby reduce waste. The interviewed farmers have reflected upon for whom they are producing and not just for the sake of production.

With the philosophy as a base, Liker (2004) emphasizes the importance of having well functioning working processes in order to be able to deliver high quality products and services. A way of achieving this is by creating informational flows where non-value creating working steps are eliminated. Reducing waste of resources has to be carried out through routines and standardization that are continuously updated. An issue raised by Liker (2004), it is not unusual for the LM implementation process to stagnate in this second part of the 4p-model. Only LM farm 1a and 2a have some written routines regarding the operational work. However, verbally communicated routines are common within both LM farms and reference farms. Although, they are mostly communicated as instructions when needed, usually if new staff is hired. Thus, the LM farms use written routines to a quite low degree and all farmers show an awareness that the

employees have to understand what they are supposed to do. Unlike the other farms, farmer 3a expresses how he tries to portray the entire value stream for the employees in order to locate potential risks and allocate resources. This is consistent with Liker (2004) who argues that a one-piece flow may increase product quality and reduce time and costs. Regarding the reference collaboration farms, none of them has written routines for the operational work. Collaboration R1 and farmer R3b stress that some routines are written since it is required by the authorities, but they are not used in the daily work. Collaboration R1 and farmer R3b are also the only reference collaborating parties that have verbally communicated and instructed routines to the employees. These are, according to farmer R3b, mainly referring to a safe work environment and frequently repeated to the employees. The routines demanded by authority are mainly updated when required, which shows a lower degree of LM thinking, according to Liker (2004).

Allowing and encouraging the employees to affect decisions in order to keep the company flexible characterizes LM processes (Liker, 2004). It also shows a philosophical awareness of how important the employees are as a resource. Encouraging the employees is in line with practices and mindsets within the larger LM farms and reference farms with more employees. They argue that their employees take responsibility and are able to manage the farm even if the farm owner, for instance, is on vacation. Although the owners try to be available during season, farmer 3a for instance argues that the company is quite dependent on him. Since some farms do not have any employees, they automatically become very dependent on their owners, regardless of whether the farm has implemented LM or not.

The understanding of the LM philosophy and intention of standardization and routines is crucial for the business leadership in order to pass on the business culture within the organization (Liker, 2004). By involving and educating the employees about the LM philosophy, the internal leadership structure evolves (Liker, 2004). The results in this thesis show that two out of three LM implemented farmers mention that they have weekly meetings with the employees. Farmer 2a mentions the intention of implementing a meeting where preferably questions concerning LM are to be raised. Even though no such meeting has occurred, it shows an understanding of the importance of continuously developing the LM thinking and way of work. Farmer 3a mentions that they have informal daily meetings instead of a more formal weekly meeting. Two out of three farmers that collaborate with a LM farm express that the work task agenda is discussed during breakfast breaks. The need for a meeting is minor according to farmer 2b since he mostly works alone. Reference collaboration R1 is the only collaboration were both parties express that daily meetings occur within each company. Besides them, only one reference collaborative farm (R3b) frequently organizes daily meetings. Farmer R3b is also the only farmer who has regular follow-up meetings where the employees are involved and informed about the current economic and production situation.

6.2 LM within horizontal Supply Chain Collaboration

6.2.1 The Importance of Trust and Mutuality

In order to take fully advantage of the benefits of LM, it is important to proceed the implementation not only within the organization, but also with business partners by encouraging learning and implementation of LM philosophy and its practices (Liker, 2005). By involving the partners in the supply chain, long-term relationships are developed (Liker, 2004). The long-term relationship is built upon mutual goals, perceived benefits as well as information and practice sharing. This is in line with Fawcett *et al.* (2012) who argue that collaborating parties must develop trust between each other through mutuality. Mutuality can be reached by unity and mutual agreements which enables the parties to reach a mutual understanding e.g.

through mutual goals (Simatupang *et al.*, 2002). The empirical results in this thesis show that the perceived partnership goals are mutually shared between the farmers of collaboration 1 but differ between the parties in collaboration 3. None of the parties in collaboration 2 perceives any verbally communicated goals for the collaboration. This differs compared to the reference collaborations where all reference collaboration parties over all perceive mutual partnership goals within the collaboration. This implies a higher degree of involvement and mutuality within the reference collaborations compared to the collaborative arrangements were one party has implemented LM.

A partnership based on fairness and liability is more sustainable in the long-run, according to Simatupang *et al.* (2002). Liker (2004), who stresses that it is in line with LM theory to strive towards a fair business relationship through reliability in order to achieve mutual goals and expectations, supports this. The behavior-based part of the key factor incentive alignment focuses on a partner's effort to carry out actions in order to achieve mutual goals, rather than the goal itself. Simatupang and Sridharan (2002) argue that this promotes motivation within a collaboration. All collaborating parties mention factors that motivate to further collaboration. The empirics show that the social factor is motivating to a higher extent according to the reference collaborations, while the LM collaboration parties highlight economy and access to labor as a motivating factor. This indicates a higher degree of performance-based incentive alignment among the LM collaborations (Simatupang & Sridharan, 2002).

In line with theory, the interviewed collaborating parties argue that mutual responsibility, compromises and a high level of own contribution is crucial for a functioning collaboration. In addition, the level of contribution from the other party is perceived to be high according to most collaborations. Several farmers describe that they see it as natural to help each other if a machine breaks down during urgent times. This is also consistent with the equitable compensation incentive, which aims at finding each party's benefits and costs from the collaboration in order to create a fair collaboration (Simatupang & Sridharan, 2002). However, farmer R3a stresses the importance of contributing to the best ability in order to avoid criticism from other collaborative parties, this as a result of not perceiving a total fulfilment of previous agreements by farmer R3b. This strategy is implemented primarily in order to reduce any risk of accusations and thereby minimizing the risk of conflicts within arrangement. The argument raised by R3a can also indicate a lower degree of trust within the collaboration. This can, according to Barratt (2004) and Naesens *et al.* (2007), have resulted in the reduced engagement of machinery sharing arrangement that constitutes collaboration R3. Further, Simatupang *et al.* (2002) emphasize that a dysfunctional collaboration can result in losses and prolonged delivery. Collaboration R3 stresses the issue with worse timing during spring planting as a result of the collaboration as why adjustments have been made in order to reduce these timeliness effects.

The need of transparency and credibility in order to achieve trust between to collaborating parties is brought up by Barratt (2004). In addition, Fawcett *et al.* (2012) argue that there must be an atmosphere of honesty, information and resource sharing and that the collaborating parties keep their promises. Fawcett *et al.* (2012) emphasizes that both parties have to make an effort in order to develop a trust-building atmosphere. This reduces the risk of developing a relation with opportunistic behavior. (Simatupang & Sridharan, 2002). All LM collaboration parties perceive a high degree of trust in their partner. Two (1, 3) out of three socialize outside work. This is in line with the reference collaborations where only one party of collaboration R3 raises the issue of punctuality and reliability regarding the collaboration party. The other party agrees with this criticism. In line with Naesens *et al.* (2007) and Barratt (2004) farmer R2a argues that trust is the basis for a successful collaboration. The majority of the reference collaboration

parties mention that the relationship to the collaborating party is mostly work related. This reveals a difference between the reference collaborations and the LM collaborations.

Two out of six reference collaborating farmers face an intergenerational transfer, which may affect the future relationship to the collaborative party. The LM collaborations also feel more comfortable in sharing sensitive information with each other. However, the depth in the relations differ among the collaborations. All parties feel confident in sharing sensitive information although collaboration 1 and 2 do not do it very often. Farmer 3a argues that unpretentiousness and openness within the collaboration has resulted in shared knowledge, which is consistent with Fawcett *et al.* (2012). Even the reference collaborations stress that they share more sensitive information, although collaboration 2 does it relatively more than collaboration 1 and 3.

6.2.2 Exchange of Information and Information Quality

According to Barratt (2004), exchanging information is strongly relevant in order to develop a collaboration. In order to promote a sufficient exchange of information there has to be transparency and a flow of information between the parties (Barratt, 2004). Even Liker (2004) raises the importance of information and practice sharing within a supply chain in order to encourage learning and implementation of LM culture and TPS within another cooperation. Although all the LM collaborations do exchange information during season, the level of exchange differs among them. Collaboration 3 is the only one that reaches a high level of exchange and farmer 3a indicates that their intercom system is making communication efficient. Even farmer 2a mentions that it is a natural thing to do. Two of the LM collaboration farmers (1b, 3b) stress difficulties in comparing data with their LM implemented party since the enterprise specialization differs between the two farms. Further, most of the reference collaborations exchange information during season, but even among these, only one collaboration perceives having a higher degree of information sharing (R2). Farmer R3b even thinks they share information regularly during the entire year. Collaboration R1 mostly does it if any of them face any issues during a process. Thus, there is a flow of shared information during the season between all collaborating parties.

The quality of the information is also important in order to obtain a successful information exchange that consists of timeliness, relevance and adding value to the information (Wiengarten *et al*., 2010). The information exchanged among the LM collaborations is mostly through informal discussions. Farmer 1b expresses that information is not always exchanged in time, although a reason may be that they are dependent on the weather. Thus, the accuracy of the information may be improved. All LM collaborations argue that information that may affect the other collaborative party is exchanged immediately. This is a crucial part of maintaining a good information quality (Wiengarten *et al*., 2010). If a process is interrupted, all parties involved need to know that as fast as possible in order to prevent unbeneficial work, farmer 1b argues. This is in line with the LM thinking since unused employee creativity and excess production is characterized as waste (Liker, 2004). Collaboration R2 views the exchange of information as a possibility to obtain knowledge through shared experiences and improve the production, which shows that they are aware of the added value of the information shared. This is important according to Wiengarten *et al*. (2010). This is consistent with the LM philosophy where shared information and practices are crucial (Liker, 2004). Farmer R3a expresses that they try to be proactive when planning the next process, which is a sign of that they try to be accurate in their information sharing. Thus, almost all collaborating parties have a sufficient level of information quality and the differences between LM and non-LM collaborations are minor.

Information sharing is a key factor needed in order to achieve efficient supply chain collaboration and should be measured through key performance indicators (Simatupang & Sridharan, 2002). By measuring each individual's performance, it motivates to achieve the long-term decisions and goals within the collaboration. This is consistent with Liker (2004) who argues that measurement of processes is a basis for decision-making and a tool to reach long-term goals. Measuring goals is in line with another key factor, incentive alignment, which implies that performance measuring is a way to keep the collaborative partners motivated. This may also prevent the risk of moral hazard and wrongly made decisions (Simatupang & Sridharan, 2002). LM collaboration 2 and 3 follow up some performance data but it is used mostly for estimating needed time and because it is interesting. The weather is mentioned as a reason for why the benefits of key performance indicators is limited (3b). None of the reference collaborations is comparing any performance measurements within the collaboration. Farmer R2b defines some performance measures on the own farm but they are not shared with the partner. Farmer R3a argues that it is up to each party to define their own performance goals. Thus, even if some of the LM collaborations collect performance measurements, they are not used as a tool to achieve goals. Further, none of the collaborations stipulates performance requirements within their collaboration. Both types of collaborations express the difficulty in introducing performance requirements since their production is quite dependent on the weather. Farmer R3a emphasizes the importance of using machinery with a sufficient capacity for the task.

Regarding problem solving, Liker (2004) argues that it is important to ask oneself why a problem has occurred and the core of a problem has to be found in order to prevent similar interruptions. This long-term thinking improves quality and ensures that employees work as a problem solving team instead of blaming faults on each other. On an individual basis, most of the farmers in both types of collaborations argue that they have open discussions concerning any major issues that occur, or if employees do not follow instructions as intended. They also try to locate and raise problems before they increase. However, all farmers argue that prioritizing is vital. Farmer 2a distinguishes himself by expressing that they try to develop a new routine if anyone finds new problems, although it is an unusual occurrence. Farmer 3a emphasizes that the employees often discuss problems and ideas by themselves and this procedure has been developed through LM. Several reference farms show an awareness of the benefits of being proactive in order to prevent provisional solutions, which is consistent with the theory of LM. Farmer R2a stresses that it is allowed to make mistakes. However, you must learn from them and ensure that they do not happen again. The farmers also explain that it is important that the machinery functions during season. This is necessary in order to prevent the collaboration to be affected by breakdowns or other machinery related interruptions. All collaborating parties stress that it is important to inform directly if any interruptions or breakdowns occur. This shows an awareness of waste reduction since direct communication lowers the risk of excess production and waste of non-value adding time. The proactive machinery service also shows the farmers culture in terms of a long-term perspective and thinking.

Decision synchronization is a key factor needed to enhance collaboration. It focuses on the coordination of actions and processes and may lead to higher profits for the collaborating parties (Simatupang & Sridharan, 2008). An important part is to know how to distribute and get access to information (Simatupang & Sridharan, 2008). Both LM collaborations and reference collaborations make most decisions regarding operational work through discussions, experiences and mutual agreements. A common unspoken rule is that the owner of the farm where the parties are working makes the decisions. Farmer R1a mentions that alternative work is planned in advance in case of a disruption. Farmer R3a explains that many operational

questions within collaboration R3 are discussed directly between the collaborating parties without the owner of farm R3a.

6.2.3 Collaborative Benefits and Risk Management

All interviewed farmers perceive that the collaboration is beneficial for the farm business. Liker (2004) emphasizes that Toyota's long-term relationships with suppliers consists of, among other, mutual benefits. The majority of the LM collaborating parties share, in part, the perceptions of their partner. In addition, among the reference collaboration farmers only minor different perceptions can be identified regarding the beneficial aspects the parties experience. Overall, the most beneficial aspects of the collaboration are flexibility, ability to socialize and reduced machinery costs for each farm. Further, Simatupang and Sridharan (2002) and Bahinipati *et al.* (2009) mention that resource sharing, such as machinery, labor and knowledge, gives economical benefits, which are mentioned by the interviewed farmers as obvious benefits. Further, Simatupang *et al*. (2002) argue that a collaboration with another firm in a supply chain enables flexibility, which is consistent with the expressed flexibility benefits raised by the interviewed farmers. However, operating a forage machinery sharing arrangement is non-flexible according to farmer R3b, which he perceives as non-beneficial. All parties' arable land in collaboration R3 is harvested as one unit. This implies that all farmers are committed to help each other throughout the whole process.

All LM collaborations express that a risk with the collaboration is that the parties might drift apart due to disagreements. However, none of the LM collaborations has signed any contract for their mutually owned machinery. This is in contrast to the reference collaborations where two (R1, R2) out of three collaborations do have contracts that regulate an eventual termination of the collaboration. Barratt (2004) emphasizes that the collaboration can be affected if one party feels more risk exposed than the other did, which is a reason for having written mutual understanding documents, as suggested by Simatupang *et al.* (2002) and Naesens *et al.* (2007).

6.2.4 Summary of Analysis

In order to provide the characteristics of the analyzed collaborations, an overview is presented in table 15. The characteristics are divided into each theory. First the LM characteristics are presented, followed by characteristics of the supply chain collaboration theory. The highlighted characteristics emphasize differences between LM collaborations and reference collaborations.

Table 15. *Concluding summary of analyzed results and characteristics of collaborations.*

Key Concepts	Factor	LM Collaboration	Reference Collaboration
Lean Management			
Philosophy	Goals	Lower	Lower
Process	Standardization	Lower	Lower
People & **Partner**	Perceived mutual goals Exchanging information Perceived benefits	**Lower conformity** Medium Higher	**Higher conformity** Medium Higher
Problem Solving	Proactiveness	Higher	Higher
Supply Chain Collaboration			
Cultural Elements	Trust Mutuality Openness	**Higher (no contracts)** Higher **Higher**	**Higher (contracts)** Higher **Medium**
Key Factors	Performance indicators Incentive Alignment	**Medium** **Economy & Labor**	**Lower** **Social**

6.3 Discussion

In order to take full advantage of the possibilities a LM implementation can have on a firm, a holistic and complete adoption of philosophy and principles must be achieved (Warnecke & Hüser, 1995; Shah & Ward, 2007). As the empirics and analysis of this thesis show, the LM implementation on the LM farms is not performed fully within the farm business. This might be partly due to a non-holistic implementation focus on two of three farms and the third farmer stresses interruptions during the implementation process as a distraction. The lack of written and verbally expressed goals show that the LM philosophy is currently only embraced to a lower extent within the LM farms. This may be compared to the reference farms where three out of six farms have verbally communicated goals. Thus, among the studied farmers in this thesis other factors than LM determines whether goals are verbally communicated or not. Shah and Ward (2003) argue that larger companies tend to implement practices of LM to a higher extent than smaller firms as a result of access to more resources. This reasoning is partly supported by the empirical results in this thesis since more employees at some farms enable practices such as regular formal or informal meetings where open discussions are held. A higher number of employees also accentuate the need of communicated routines – verbally communicated and/or written.

Studies by Moyano-Fuentes *et al.* (2012) and Jayram *et al*. (2008) show that relationship building and satisfactory information integration implies better implementation of LM. This is somewhat consistent with the empirical results of this thesis showing that two of three LM collaborations mostly exchange information during operational work within the collaboration while collaboration 3 is also defined by a deeper private relation. This may have an effect on the degree of LM implementation. However, collaboration 3 does not maintain a continuous discussion regarding LM principles or its practices within the collaboration. It seems as if they have many conditions fulfilled in order to have a LM collaboration even if they could share more data with each other and have a written contract.

The farmers often argue that the collaboration works well. Although, they might benefit by discussing LM with their collaborative partner to a higher extent. A reason to the low degree of LM related conversations might be a combination of lack of LM philosophy within the LM farm but also, as suggested by Panizzolo (1998), a perception by the implementing business that the LM theory is simple in its design and therefore underestimated as a strategic business tool. A shift from the more operational collaboration focus to a relationship management is needed in order to reach a higher degree of LM influence (Panizzolo, 1998).

Colgan *et al*. (2013) argue that LM may improve a farm's supply chain quality and emphasizes the need for mapping the supply chain to understand what processes create value. However, in this thesis only one of the LM farmers mentions that he discusses the value stream with his employees. An exchange of experiences from the Lean Lantbruk project between the collaborating parties might imply that a deeper knowledge of the principles of LM may lead to more clear common goals and visions for further collaboration, which is supported by Colgan *et al.* (2013) and Lamming (1993). A more holistic view of the firm and LM may lead to improved understanding of the philosophy and its processes. This may imply extended opportunities for benefits even within a collaboration. Benefits such as more structured and written routines as well as regular meetings involving managers and employees. LM may influence the collaborating farms to be more synchronized with each other and the managers may be more rational and professional in their business thinking. However, it is of importance to be aware that LM is just one factor among others that affects how well a collaboration works.

Despite all LM collaborations and one of the reference collaborations in this thesis mention broken agreements and that their collaborations may fall apart as a risk, none of the LM collaborations apart from two of the reference collaborations has written contracts describing how an exit is handled. However, all collaborations but one express a high degree of trust in their collaborative partner. Thereby, they perceive the need for written contracts as low. This is consistent with a study conducted by Larsén (2007) arguing that problems with moral hazard were non-existing or very low among Swedish farmers, which is explained by a high degree of trust in the other party. Since there are no written contracts within LM collaborations but within two reference collaborations, the risk of a potential partnership termination is not more thoroughly addressed even if LM has been implemented in a farm. The reference collaborations with written contracts have collaborated a shorter period of time in relation to the other collaborations. A perception by the authors is that the level of trust is not fully developed between these parties, in combination with a lower degree of interaction during spare time, which may be a reason for why contracts were established when the collaborations were initiated. Written contracts between the collaborative parties might indicate a long-term perspective regarding the collaboration even though it does not directly affect the own farm. Even Jayram *et al.* (2008) emphasizes trust as a basis for a successful collaboration and the need for parties in a supply chain to recognize each other as partners instead of competitors.

7 Conclusions

This study aims to increase the understanding of business culture within a collaboration between farms in Swedish agriculture where Lean Management has been implemented. With the analysis as a basis, this chapter aims to answer the research question stated in chapter one: How does Lean Management influence a horizontal supply chain collaboration between Swedish farms, in terms of machinery sharing and business culture in a situation when Lean Lantbruk is applied?

Both the LM-collaborations and the reference collaborations have as of today a functioning collaboration, in terms of machinery sharing. Trust in the other party is perceived as high and the farmers are keen that both parties benefit of the collaboration. Thus, LM does not appear to be crucial for establishing a functioning machinery sharing collaboration.

No distinguishing differences have been identified between the LM collaborations and the reference collaborations regarding the degree of LM influence within each collaboration. However, consistent with the supply chain collaboration theory by Simatupang and Sridharan (2002), perceived openness and use of shared key performance indicators within the collaboration is higher among the LM collaborations. The empirical results of this thesis also show a lack of written agreements and understandings in signed contracts within the LM collaborations. This is different to the majority of the reference collaborations, which have taken account for the potential risk of need to terminate the collaboration due to disagreements.

None of the LM-collaborations in this study have adapted the LM philosophy and its practices to a higher extent within their collaboration. A lack of understanding of LM within the own company, and/or a lack of a thorough exchange of information as a result of lack of a deeper relation between the parties may be a reason for this (Simatupang & Sridharan, 2002; Liker, 2004, Colgan *et al*., 2013). However, the analysis in this thesis reveals that the more human resources a farm possesses, the higher are the perceived advantages of an implementation of LM principles and its practices. This was the case among both LM collaboration parties and reference collaboration parties.

Therefore, the thesis reveals the importance of having a holistic mindset of LM when implementing its principles, which is in line with Sha and Ward (2003). It is also of importance to recognize the collaborating party as a part of the own business strategy in order to strengthen the long-term business relationship and to share LM thinking. The thesis shows that how well LM is implemented within a farm depends a lot on the farmer's personality, interest in learning and ability to communicate the philosophy to employees in order to make them enthusiastic. This is consistent with Dyrendahl and Granat (2011) who argue that skilled farmers already apply some of the LM-principles without really being familiar with the concept.

LM education may need to emphasize the importance of implementing LM not only within the own company but with collaborating partners as well. Therefore, a future research topic could be to investigate the possibilities for Lean Lantbruk to expand its LM education to include a greater focus on implementation of LM within collaborating partners. Further, since neither this study nor earlier studies have addressed the employees' perspective of the Lean Lantbruk implementation it would be of interest to investigate the employees' thoughts and perceived benefits of LM and compare with the time prior to when LM was implemented. This is interesting to examine both within individual LM farms and within LM collaborations.

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Personal Messages

Farm1a,
Owner/Manager, Dairy producer
Personal meeting, 2016-03-21

Farm 1b,
Owner/Manager, Dairy producer
Personal meeting, 2016-03-21

Farm 2a,
Owner/Manager, Egg and crop producer
Personal meeting, 2016-03-22

Farm 2b,
Owner/Manager, Crop producer
Personal meeting, 2016-03-22

Farm 3a,
Owner/Manager, Potato and crop producer
Personal meeting, 2016-03-23

Farm 3b,
Owner/Manager, Potato and crop producer
Personal meeting, 2016-03-23

Farm R1a,
Owner/Manager, Potato and crop producer,
Personal meeting, 2016-03-29

Farm R1b,
Owner/Manager, Potato and crop producer,
Personal meeting, 2016-03-29

Farm R2a,
Owner/Manager, Crop producer,
Personal meeting, 2016-03-30

Farm R2b,
Owner/Manager, Crop producer,
Personal meeting, 2016-03-30

Farm R3a,
Employee, Beef producer,
Personal meeting, 2016-03-31

Farm R3b,
Owner/Manager, Dairy producer,
Personal meeting, 2016-03-31

Appendix 1: Interview Questions

1. Background

1.1 Name and age?
1.2 For how long have you had the company?
1.3 Are any family members involved in the company? If yes; to whet extent?
1.4 Is any kind of advising used? If yes; which kind?
1.5 Have you had other assignments/employments outside of the business?
1.6 What educational background do you have?

1. A. Only LM companies

1.a.a During which period did you conduct the 18-month education through Lean Lantbruk?
1.a.b Briefly, what do you think has been most positively and negatively with Lean Lantbruk?
1.a.c Do you have any examples of how Lean Lantbruk has affected our business?

2. The business

2.1 Which are the company's production sectors?
2.2 How many hours per year does the business require?
2.3 How many employed does the business have?
2.4 Do you perceive that the ongoing operations works without you being directly present/are in place?
2.5 Do you use any standardized work procedures and/or checklists of some kind?

For example:

- In situations and way of work in routine work/workstation/machinery
- When handing over information
- When educating new employees

2.6 If standardized work/checklists are used, how often are they updated?
2.7 In the event of deficiencies in procedures / working, how is it handled?
2.8 What is your time perspective when solving problems?
2.9 Do you have regular meetings with your employees? If yes; how often does these meeting occur and what type of questions are raised?
2.10 Are any long-term goals of the company stated (economic, productive, social)? If yes; does the employees take part of these goals ant its presentation/formulation?
2.11 Do you return to the long-term goals in decision making?
2.12 How do you see the business develop in the future (5-10 years)?
2.13 For whom would you say you produce your products/goods for today?

3. The collaboration

The farmer you are considered having an explicit collaboration with, will hereinafter be referred to as "the collaboration partner".

3.1 To what extent do you/your business collaborate with the collaboration partner today?
3.2 How and when dis the collaboration with the collaboration partner start??
3.3 Did you know each other before the collaboration?
3.4 How would you say your collaboration has changed/evolved over time?
3.5 Do you/your business collaborate with other farmers than the collaboration partner?
3.6 Have any collaborations ended the within the last two years? If yes; for what reason?

4. Cultural elements

4.1 Are any long-term goals of the collaboration stated (economic, productive, social)?
4.2 Have you established any type of contract on the framework for the collaboration?
4.3 With whom within the collaboration would you say you collaborate the most?
4.4 Do you share important information with your collaboration partner? If yes; do you even share confidential/sensitive information between you?
4.5 Do you have a regular exchange of data (such as quantity, quality, order number)?
4.6 In a conversation with the collaboration partner, does it consist of only work collaborative and work related matters or for more personal reasons?
4.7 Do you trust that your collaboration partner contributes his part of the collaboration in a satisfactory manner?
4.8 Do you experience that your collaboration partner contributes his part of the collaboration in a satisfactory manner?
4.9 Do you experience that you contribute your part of the collaboration in a satisfactory manner?
4.10 What would you say your company earns/benefits from the collaboration?
4.11 Do you experience that your collaboration likely to risk your own production?
4.12 Does it occur that you and your collaboration partner meet outside of working ours?

5. Key factors

5.1 Do you have regular meetings were you discuss the collaboration? If yes; how often does these meeting occur and what type of questions are raised?
5.2 How are improvement suggestions by employees handled by the management and other employees?
5.3 Do you have frequent follow-ups on how the collaboration is functioning? If no; is it something that is brought up to discussion?
5.4 How would you say that decisions are made within the collaboration?
5.5 During an activity, how much continuous contact does you and the collaboration partner have?
5.6 At what point would you say that any failures or delays are announced (continuous, at an early stage, when the problem is solved etc.)?
5.7 How is a shutdown (or similar) handled in the collaboration?
5.8 Are there any explicit performance requirements between you and the collaboration partner in order to achieve any long-term goals?
5.9 Do you use any type of guiding strategic tools (e.g. Balance Score Card) within the collaboration?
5.10 Do you use any key indicators to measure the achievements of the collaboration?
5.11 What motivates to continuation of the collaboration with the collaboration partner?

Finally, have the interview questions led to further reflection on business development, new ideas or improvement opportunity regarding the collaboration?

Appendix 2: The 17 principles of Lean Lantbruk

17 modules of the programme		
1.	**Introductory meeting**	A two-day theoretical introduction to Lean by the Lean coach with the business leader/ leaders and employees. The philosophy and practical tools are presented.
2.	**Coach visit at the farm**	Leaders and employees meet and describe the current state at the farm and formulate future values and principles needed to reach the defined goal. Presentation of Lean-thinking: customer focus, reduction of resource waste, solid systems and engagement. Farms are offered a company visit at an industrial company in a different sector that has implemented Lean.
3.	**Philosophy**	The philosophical fundament of a long-term with four dimensions; values, principles, methods and results are presented and the principles are the central characteristic of Lean described as Liker's 14 principles (modified to the agrarian setting).
4.	**Current state**	*Value stream mapping* is used to chart processes and flows of information and material. Captures current state at the farm and questions activities, e.g. unused creativity, communication and routines, focusing on various processes, such as leadership and production sectors.
5.	**Action plan**	A PDCA-cycle *(Plan, Do, Check* and *Act)* is used for structuring action plans. Employees need to be integrated in the implementation and practical tools for how to act are constructive problem solving, dialogues, prioritizing, identifying the cause of problems and continuously improvements.
6.	**Visualization**	A vital part and a tool to highlight problems and detect areas with potential for improvement. Displaying clear, relevant information also simplifies the work with other tools and stabilizes systems. Simple, creative solutions such as boards and color schemes makes for example follow-ups easier (e.g. machines, cow fertility or workforce planning). It also promotes meetings by the board, creating an open environment for dialogues and team building.
7.	**5S**	The 5S (*Sort, Standardize, Systematic Arrangement, Shine* and *Sustain)* organizes the workplace and requires time and support from the manager. Aims at reducing waste of time, labor and material by organizing and ensuring that everything is placed properly. It enables continuous improvements and follow-ups with inspections as well as displaying good examples.
8.	**Waste identification**	Checklists are used to find slack or risks, with different lists for different areas of the firm. Environment & energy is divided into different segments such as production flow and machines, occupational health and safety etc. Signals indicating waste are unclear communication, overburden, overspill, unused creativity, waiting etc.
9.	**Logistics**	Identify all transportation and driving on the farm to be able to optimize these operations.
10.	**Standards**	Annual activities are outlined and strive to balance heavy workload and establish systems for less frequently performed tasks. Standards involve distributing areas of responsibilities with for example lists and other type of tools that are used as reminders. The aim is to secure quality, safety for employees and efficient introduction for new employees. However, some processes involving work with animals and crop production are limited in the extent to which they can be standardized.

11.	**Preventive support**	Another part of thinking long-term and being a learning organization is working proactively with maintenance and prevention. Main focus is on machinery and technology used on the farm, such as tractors and milking equipment. Proactive work for structuring operator maintenance and monitoring operating time is promoted, and for this the OEE-formula (Overall Equipment Effectiveness) is used in order to oversee and compare key indicators of the utilization of machinery and equipment.
12.	**Setup times**	Lean Lantbruk intends to reduce set up times and increase the portion of time that creates actual value. The method used in this step is called SMED (*Single-Minute Exchange of Die*), it fosters a rapid changeover one of the keys for reducing bottleneck and time waste and improve the workflow.
13.	**Set goals**	SMART-goals are used, meaning that a goal must be *Specific, Measurable, Accepted, Realistic* and *Time limited*. Setting goals should encourage and stimulate the workers and ensure that everyone is pulling in the same direction. Measurable and achieved goals are tangible that can be a useful argument for farmers in the contact with external stakeholders for example at a bank meeting related to new investments.
14.	**Appraisal**	Individual appraisal between the manager and the employees discusses for example the performance of the company, future planning, the employees' personal goals and ambitions, as well as the managers' expectations of the employee. The purpose of the dialogue is to encourage openness, transparency, commitment and involvement among the people at the farm.
15.	**Tools and tips**	Tools and tips
16.	**Material for new employees**	Introduction material for new employees.
17.	**Administration**	Administration improvements.

(Samuelsson & Strid, 2015; own modification)