Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Faculty of Landscape Architecture,
Horticulture and Crop Production Science

Introducing lean production process model for the horse business sector in Sweden

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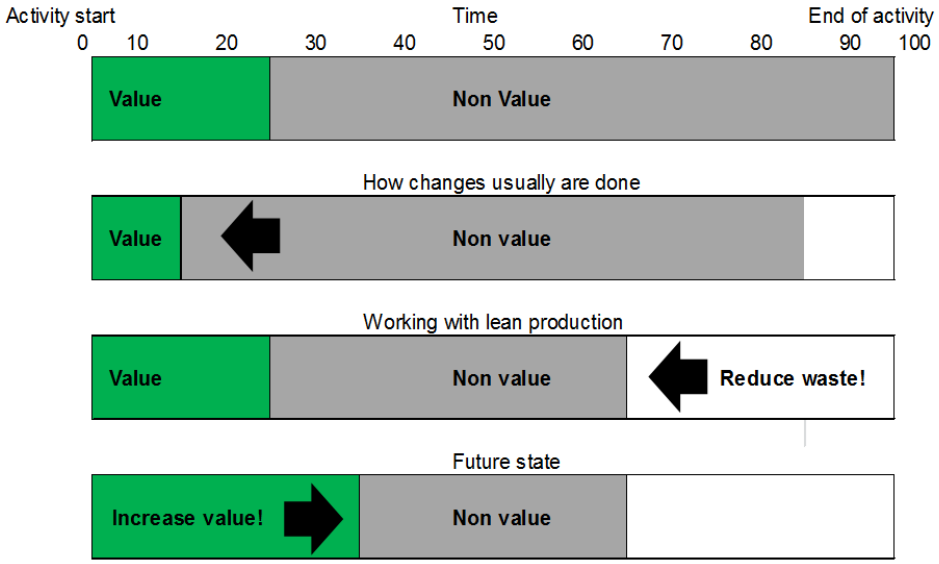
Johanna Öwall



(Modified from Melin, 2014)

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Abstract

Methods of improving business operation and competiveness are essentially unknown and rarely described in the horse sector. However, many horse businesses struggle because of e.g. high costs, accident risks, difficulty of attracting skilled personnel on long term, traditional ways of management impeding a progressive development in the everyday operation and business model. There is a need to make the operations cost effective and safer. By streamlining everyday processes, introducing mechanisation and the lean production process model, benefits in economics and working conditions can be obtained. The objectives of the study were: a) Investigate whether lean production is applicable to the horse business sector, b) Examine which work processes that can be streamlined and c) Examine the interest in work efficiency. A total of six horse businesses were studied; three riding schools and three racehorse trainers respectively. The operations were studied by the use of semi structured interviews, observations and the lean production tool value stream mapping exercise. These were used to study the tasks mucking out, sweeping aisles, preparation of feed and walking of horses to and from paddocks. The results indicate that the core value of the businesses, contact with customers, horse owners and business development could be increased and given better focus with more work time efficient routines and housing conditions. Streamlining the processes mucking out, distributing feed and sweeping aisles and optimise the logistics of horses, feed and manure will save time. However, interest in methods to improve work efficiency was low and there is a sceptic attitude concerning new ideas and technology. Businesses working with lean production are suggested to benefit by having less time spent on non-horse activities, more on staff development, the staff staying longer in the occupation, having fewer accidents and fewer days off. The value stream mapping exercise needs interested and enthusiastic participants to be successful. Changes must be considered as an opportunity, not a threat in order to improve businesses and their profitability.

Sammanfattning

I hästsektorn är metoder för förbättrad konkurrenskraft och affärsverksamhet i mångt och mycket okända. Många hästföretag kämpar med låg lönsamhet på grund av t.ex. höga kostnader för arbete, olycksrisker och svårigheten att attrahera kompetent personal på lång sikt. Traditionell hästhållning och skötsel konserverar dagens läge och hindrar dessutom en progressiv utveckling både i den dagliga driften och i affärsmodellen. Det finns ett behov att göra hästverksamhet kostnadseffektiv och säker. Genom att effektivisera vardagliga processer, mekanisera stallen och införa produktions processmodellen LEAN, kan arbetsförhållandena förbättras samtidigt som lönsamheten kan höjas. Målen för studien var: a) undersöka om lean kan tillämpas på hästföretag, b) undersöka vilka arbetsprocesser som kan effektiviseras och c) undersöka intresset för arbetseffektivitet. Totalt sex hästföretag studeras; tre ridskolor och tre travtränare. Verksamheten studerades med hjälp av semistrukturerade intervjuer, observationer och lean-verktyget värdeflödesanalys. Dessa användes för att studera de dagliga arbetsuppgifterna mocka, sopa stallgångar, förberedelse av foder och promenader med hästar till och från hagar. Resultaten indikerar att företagens kärnvärden, kontakt med kunder, hästägare samt affärsutveckling, kunde ökas och ges bättre fokus med mer tidseffektiva arbetsrutiner och inhysningsförhållanden. Genom att effektivisera processerna mockning, distribution av foder och gödsel, sopning av stallgångar samt optimera logistiken för hästar, foder och gödsel kan mycket arbetstid sparas. Intresset för att effektivisera arbetet och använda sig av metoder för detta var över lag lågt och attityden skeptisk. Fördelarna med att arbeta med lean i hästsektorn föreslås vara att mindre tid tas upp av icke-hästaktiviteter, mer tid för personalutveckling, att personalen stannar längre i yrket samt färre olyckor och färre sjukdagar. För att förbättra hästföretagen och dess lönsamhet måste förändringar betraktas som en möjlighet, inte ett hot.

Preface

My interest in horses began early in life with a love for the animal, this amazing creature. After many years of traditional horse keeping, without reflecting on time consumption or workload, the agronomist studies opened my eyes. All the sudden I was wondering of why horses needed so much physical and time consuming care, when other domesticated animals nowadays are kept in rational systems. I thought quite a lot about this topic. When I came across lean production designed for agriculture I had a feeling that this could be a way of altering today's idea of keeping horses.

I cannot imagine any dream about keeping horses include spending hours and hours on doing tasks in the stable, often without contact with those beloved horses. Despite this reflection perhaps it is fairly okay that the care for leisure horses takes a lot of time. Horse businesses on the other hand have to be profitmaking and cannot afford to involve unnecessary parts in the everyday work. Techniques to make production efficient are developed by the agricultural sector, giving the horse sector the pleasure to choose solutions they want to practice. I do not think it gets more beneficial than so.

I would like to express my gratitude to the businesses involved in the study and to Annika Larelius, Agricultural Society in Halland, for providing contact with them.

My supervisors Anders Herlin and Martin Melin both contributed with many wise reflections and help during the process, I am truly grateful. Bengt Öwall and Sara Öwall provided helpful assistance reading the study, thank you.

In order to get inspired in the beginning of the study a horse business was contacted and visited. A commissioner at the department of domestic violence at the Police Authority Skåne was also interviewed in order to see how other sectors apply lean production. Thank you both for sharing your experiences with me.

Ett jävlar anamma har odlats i mig sedan många år. Utan det hade jag inte provat mina vingar, vilket jag har Kristina, Staffan, Sara och Hilda att tacka för. Jag är er evigt tacksam. Jag vill även tacka Markus, för att du är du.

Uppsala, december 2014

Johanna Öwall

1. Introduction

The horse sector in Sweden is rather complex since it comprises a variety of activities and sports, all having their own culture as well as identity (Fyrberg, 2012). The sector involves people in different ages, where horseback riding, as an example, attracts those ranging from only a few years old to people past their 60s or 70s (Pugh and Bolin, 2004). The sector also includes of commercial as well as non-profit operators. Elites and amateurs co-act as well as sports and betting do. Since the interaction of the operators and their respective motivators often are the foundation of each other's conditions, they are all dependent on the dynamic and interaction between them (Fyrberg, 2012). Considering these facts there is a need to define the horse business sector, and this thesis uses the definition by Johansson et al. (2004) "*Those businesses and individuals that use the horse in the production of commodities that are requested by the society.*"

The main part of the horse business sector involved in breeding, training, racing and competing horses had a negative operating result in the year 2013 (SCB, 2014b). Many horse businesses have in common that they and their businesses want to be considered professional (Svala, 2008). To become profitable it is suggested that the horse sector as a whole is in need of a change towards future- as well as growth-related analyses (Fyrberg, 2012).

Keeping horses include a variety of chores with risk of human health and safety. The horses have to be fed and the stables have to be cleaned which include transport and distribution of manure and feed. The workload of these chores are described as heavy, dangerous, poorly mechanised and in need of improvement (Bendroth and Adolfsson, 2008; Löfqvist, 2012a). Fyrberg (2012) stated a need to improve horse stables, adapting them for the people working there and making them more resource effective. The time needed to run the daily operations has to be lowered.

Lean production has been introduced in dairy and pig production in order to create new ways of working and running the businesses (Rydberg et al., 2011; Melin et al., 2013). Businesses that altered their business model and production according to lean production made changes that improved their profitability (Barth, 2012). Since part of the horse sector is struggling economically one of the causes for introducing lean production is there.

The study is based on the idea that lean production can be applied to the horse business sector in Sweden. It is the first study on this topic with the aim of providing a base for further research.

1.1. Aim

The aim of this study is to investigate whether the method of lean production is applicable to the horse business sector. In this context, lean production in the horse business sector is to achieve safer work environment, higher work time efficiency, an increased job satisfaction and ultimately increased profitability.

1.1.1. Objectives

The work is divided into the following objectives.

1. Investigate whether lean production is applicable to the horse business sector.
2. Examine which work processes that can be streamlined in six selected horse businesses.
3. Examine the interest in work efficiency in the six studied businesses.

2. Methods

This study was conducted using a qualitative method for collecting primary data using semistructured interviews, participating observations and value stream mapping exercises at six businesses active in the horse sector in Sweden. The method is corresponding with the interdisciplinary method described by Nordström Källström (2008). The businesses consisted of three harness racing businesses and three riding schools, all located in Halland. The inclusion criteria used when choosing businesses were that the business should aiming for profit in the businesses and have a minimum of two employees. The businesses are described in more detail in table 1.

2.1. Characterisation of the businesses in the study

Table 1. Characterisation of the businesses in the study including business orientation, business form, number of employees and horses and activities

Business	Orientation	Business form	No of emplo-yees	No of horses	Activities
A	Harness racing	Private enterprise	2	15	Training and competing horses in harness racing
B	Harness racing	Private enterprise	22	150	Training and competing horses in harness racing
C	Harness racing	Private enterprise	10	60	Training and competing horses in harness racing
D	Riding school	Non-profit riding club	9	25	Riding school, boarder stable, riding competitions
E	Riding school	Non-profit riding club	6	20	Riding school, boarder stable, riding competitions, clinics with external trainers
F	Riding school	Non-profit riding club	6	25	Riding school, boarder stable, leasing of facilities to external arrangements

2.2. Semi-structured interviews and observations

The semi-structured interview method was chosen in order to assimilate an ordinary conversation. Some questions were asked to all of the owners or managers in order to collect facts concerning each business. Except for those questions the interview took the direction favoured by the informant, which is consistent with Nordström Källström (2008). The interviews were tape recorded. Only certain parts were transcribed in order to emphasise areas of special interest for the study. During the interviews notes were made and photos were taken. The participants were anonymised, which they had been informed of beforehand. The researcher observed routines and behaviour in the stables meanwhile open questions were asked. Notes were made and photos were taken.

2.3. Value stream mapping exercise

The value stream mapping exercise (appendix) was conducted with the chore mucking out, in order to introduce the lean production philosophy to the businesses. The flow of a chore was mapped and waste in the process was discussed (Petersson et al., 2009). Post-it-notes were used to map the chore in two of the businesses, in the others the exercise consisted of a discussion concerning waste in the process.

2.4. Tasks studied

A number of tasks were chosen to be studied at the businesses and the results are to be compared in between businesses. The tasks were: mucking out, sweeping aisles, preparation of feed and walking horses to and from paddocks. The frequency of which tasks are performed differ between businesses (Löfqvist, 2012a), tasks were chosen since they can be compared in both performance and efficiency in between businesses.

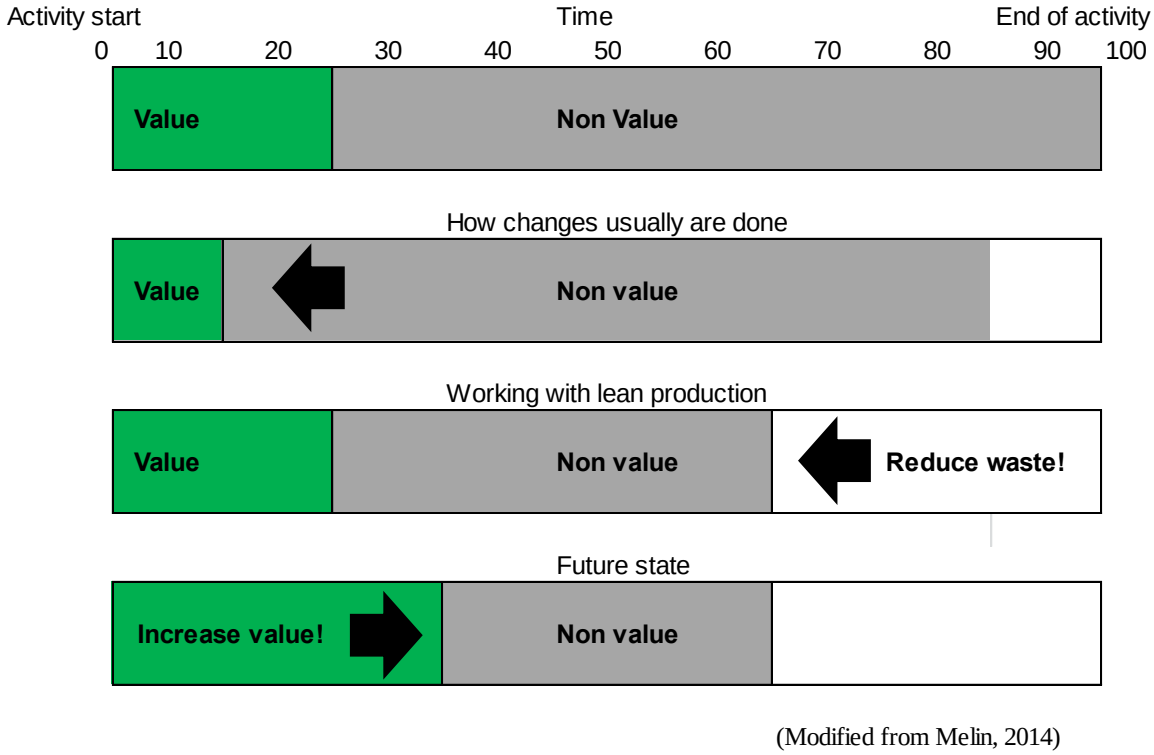
3. Literature review

3.1. Lean production

Lean production has not yet had any input in the Swedish horse business sector. In the agricultural sector on the other hand it has been successful why a detailed analysis of its philosophy seems relevant to be able to evaluate its use in the horse business sector.

3.1.1 .The philosophy of lean production

The foundation of lean philosophy is to measure the time from receiving an order until it is delivered and paid by the customer. The part of the process that does not add value to the product should be eliminated, or at least reduced (Ohno, 1988), which is illustrated in figure 1. Lean production originates from the Japanese vehicle manufacturers, and is a way of describing the work philosophy and practices of the Toyota Production System (TPS). The overall philosophy of lean production provides an approach encouraging continuous improvements, and how to bring about such improvements by using a variety of tools. Applying this way of thinking and working, the elimination of waste and unnecessary actions as well as linkage of the steps that create value, makes a business competitive (Womack et al., 1990). The key principles of lean production is; to specify value, identify value streams, make value flow, let the customer pull value and pursuing perfection. In a traditional manufacturing system only seven types of waste were identified; overproduction, waiting, transport, extra processing, inventory, motion, defects. On top of that underutilisation of people and their ideas was put forward (Womack and Jones, 1996).



(Modified from Melin, 2014)

Figure 1. Making changes using lean production reduces the non value part of the product, eliminating waste in the process.

Lean production should not be seen as a state that will be reached after a certain amount of time. It should rather be looked upon as a continuing process or a direction of how to think and work (Karlsson and Åhlström, 1996). The businesses that introduced lean production did so since they needed to compete with the dominating model of mass production. Lean production was preferred when given the opportunity to choose between mass production and lean production. When applied successfully lean production contributes to the advantage of high quality and diversified products that meet the requirements of an observant customer. Even though lean production has been applied successfully for decades, the impact on work demand, energiser profiles and the health of the workers has, however, not been evaluated. Human competence was stated to be the only way of long-term great achievement, saying that lean production cannot function without engagement of the workers (Genaidy, 2003).

3.2. Areas of attention in the horse business sector

3.2.1. Economic situation

The horse sector as a whole is multifaceted and difficult to analyse since hardly any stables or businesses are alike. Most sites have more than one orientation, and combinations of different orientations are common (Svala, 2008). Considering the economics, it is hard to get an overall picture of the horse sector. Betting on horses is a steady business implying that the business model for this part of the sector stays strong even at times when the world-economy is struggling. At the same time the part of the sector considered to be the base and width of the sport, is claimed to be in a crisis. Riding schools having financial problems as well as the decreasing number of coverings which indicates that the horse sector is facing a change. But even though organisations experience and even highlight the decreasing parts, other parts have a positive development (Fyrberg, 2012). Many businesses involved in breeding and providing a boarder stable for horses had in common that they could not afford hired staff. These sites were run by family members or by the horse owners themselves. The businesses that have employed staff are either specialised or in large scales. Other horse businesses that have employed staff are riding schools and businesses focused on sales (Svala, 2008).

Diversification of agricultural businesses is considered to be a common way for economic survival. The diversification per se is, however, not to be understood as a desire of being an entrepreneur (Vesala et al., 2007). Considering economic stress in an agricultural business it was likely that low variable costs in combination with higher valued output would reduce the economic stress (Franks, 1998).

3.2.2. Safety aspects

Working with horses could mean an increased risk for work related injuries, both acute injuries caused by direct contact with the animal (Bixby-Hammett and Brooks, 1990; Watt and Finch, 1996; Fleming et al., 2001) and overload injuries related to work in stables (Walker-Bone and Palmer, 2002; Thelin et al., 2004; Pinzke and Lundqvist, 2007, Kotowski et al., 2009).

Large animals like horses can sometimes act unpredictable which creates a risk of injuries for people working with them. Work with animals is considered one of the most hazardous within agriculture (Watt and Finch, 1996; Fleming et al., 2001; Walker-Bone and Palmer, 2002; Thelin et al., 2004; Pinzke and Lundqvist, 2007). There is no such thing as a totally safe horse. Some horses are considered safer than others, but they still have the ability to cause lethal injuries (Bixby-Hammett and Brooks, 1990). Among equestrians the most common

injuries are related to the legs and arms followed by the head or spine (Bixby-Hammett and Brooks, 1990; Lim et al., 2003).

3.3. The horse business sector

In 2004 the horse industry in Sweden had a turnover of 20 billion SEK, including turnover of betting in horse races (Johansson et al., 2004; HNS, 2004). There were also an indirect turnover of 10 billion SEK and an induced turnover of 16 billion SEK, giving a total turnover of 46 billion SEK per year. Horses in Sweden also had economic effects on the societal level by their need for feed, housing, purchase of equipment and services such as veterinarians, insurance services and farriers. The value added to the product per full-time job and year in the horse sector was in 2004 on average 484 000 SEK (Johansson et al., 2004).

The horse industry provide work corresponding to 10 000 full-time jobs and generates another 18 000 full-time jobs indirectly in society (HNS, 2004; Johansson et al., 2004; HNS, 2010). These 10 000 fulltime jobs are occupied by approximately 25 000 part time workers. Depending on the estimation of full time workers, the horse industry provide work opportunities ranging between 19 000 and 28 000 (Johansson et al., 2004; HNS, 2010). In 2010, 360 000 horses were estimated to live in Sweden. Almost 16 600 horse businesses were registered in 2013 (SCB, 2014a). A total of 450 riding schools are registered in Sweden (SvRF, 2014).

3.3.1. Harness racing

Harness racing is a major spectator sport in Sweden. During the 20th century, the sport developed from being a breeding promotion activity and hobby to an entertainment industry with professional actors. Breeding activity in the small scale today is in most cases not profitable for the owner of mares (Greiff, 2004).

Harness racing yards have generally a masculine culture, where the work load in the stables is considered too heavy for women (Greiff, 2004). The northern working horse breed, which was used in the forest industry, mainly logging timber, a masculine cultured was formed (Johansson, 1994). The culture associated with today's harness racing is built upon these masculine cultures (Greiff, 2004).

Greiff (2004) pointed out that the work as a groom often is a profession most people only do for a relatively short period. This is considered to imply that the workforce of grooms is quite young, 18-30 years of age. One of the reasons for this is the heavy workload in combination with uncomfortable working hours and low payment. Horse-associated work often begins early in a person's life, and to be learned by doing and not taught in an education (Greiff and Hedenborg, 2006). In total, harness racing had more than 1.3 million spectators in both 2012 and 2013 (Svensk Travsport, 2013). In the year 2014 trainers having ten or more horses in training were 276 in total, training altogether 7464 horses (Svensk Travsport, 2014).

3.3.2. Riding schools

The sport of horseback riding has its origin from military environments (Greiff, 2004), where the horse environment according to Sörensen (1997) was an enclosed male world with a typically masculine hussar using the horse. Before the 1950s, horse riding was a sport mainly for the military (Sörensen, 1997; Greiff, 2004; Forsberg and Tebelius, 2005) and for the upper classes. In the 1950s Swedish government proclaimed that from a health perspective riding should be available for a large part of the population. Since then, the keeping of horses has

changed from being a military matter to become recreational. The riding practice was altered as well as the breeding of the riding horse itself. After this change the majority of riders are girls and women. The girls attending to riding schools learned their skills of horse keeping by experience. A professional horse life and its challenges were not something they were trained for. Respondents in a study stated that they did the chores they were told and it was not questioned if they were physically able to do so or not (Forsberg and Tebelius, 2005).

Löfqvist et al. (2009) found that some riding instructors employed by riding schools only taught riding while some also performed stable tasks. When the time spent on different tasks was measured, the riding instructors spent most time on riding lessons, both per week as per day. Löfqvist also found that the average age among female riding instructors was lower compared to the entire female working population in Sweden in 2004. It seems that most riding instructors leave the profession before the age of 40. Possible reasons for doing so are suggested to be low payment, poor working conditions and health problems. The work was considered as both physically and psychologically hard by the instructors themselves. Most of them, however, enjoyed their work even though it was considered hard.

3.4. Lean in practice

This section describes lean production applied to different business fields as well as a further developed part of lean production, which have relevance for the horse business sector.

3.4.1. Lean production applied to information management

The principles of lean production could be applied to any production where there is a flow to meet the demand of the user or consumer. The elimination of waste and pursuit of perfection is especially applicable to systems which include information management and where work is undertaken to add value to the information. To successfully apply lean production, it is fundamental to be able to identify waste, to understand the flow in the production and characterise the waste. Regarding information management, waste is not always easily identified and generally not visible. In the manufacturing industry detection of waste could be easier since manufacturing systems are visible and physical. The culture in manufacturing industries is also to measure performance, which could reveal waste. When applying lean to information management, detection and making of possible improvements in order to eliminate waste and improve the flow of value is important. Improvements could also result in improvements in quality in the overall process, as well as improvements in efficiency and productivity. Lean production is considered to be a way for a business or organisation to sustain its long-term competitiveness (Hicks, 2007).

Hicks (2007) identified the key principles of how to approach lean production in the field of information management to be: value, value stream, flow, pull and continuous improvement. These are discussed below.

Value

Value is described as the information and functionality that is valuable to the customer or end user. To be able to deliver strictly valuable information it is important that only valuable information is managed, meaning the information that necessarily has to be managed and contributed to the core of the business activities (Hicks, 2007).

Value stream

In order to enable a flow of value, a so called value stream, which benefits the final product or customer it is important to map the series of processes that provided the information. The processes included are the capture, representation, exchange, organisation, retrieval and visualisation of information. Also the sequences in the processes should be included in the map (Hicks, 2007).

Flow

In order to enable a value stream there has to be a flow between the steps that creates value for the customer. In order to enable this, information should be available in real time and all of the information and support processes should be performed in the simplest possible way. Duplication of information, out-of-date information, unnecessary information and duplication of effort within the business or organisation, across departments and between customer and supplier should be minimised (Hicks, 2007).

Pull

The producer should only produce what the customer wants, and when he wants it. To be able to transfer this way of working to information management, information should only be delivered when demanded by the customer. To conduct the idea of pull transitions, methods and procedures must be consistent across the business or organisation (Hicks, 2007).

Continuous improvement

The information management system should constantly improve. To be able to do so the infrastructure and processes should regularly be reviewed. Quick implementation and training should be supported and the business should minimise the dependency of information technology (IT) staff and programmers (Hicks, 2007).

3.4.2. Lean production in agriculture

Ulvenblad et al. (2014) state that there is a need for the businesses in the agricultural sector to assimilate new ways of working and thinking. New ways of creating value should be found, meanwhile as the existing value is retained during the alterations. It is suggested that by studying successful working fields, in particular industries, agricultural businesses could take advantage of their experiences. When farms are expanding a need for leadership is emerging.

When lean production is applied to agriculture changes are made within the businesses which in the long run make them more profitable. By using lean production tools such as continuous improvements (appendix), standardised routines (appendix) and the so called hunt for waste (appendix) the chores at the farm are made less time and cost consuming providing an improved profitability. Farms using lean production experienced for example shortened transports and new solutions in the facilities which resulted in saved time and a smoother quality level (Barth, 2012).

3.4.3. Six sigma

Lean six sigma is a method for accomplishing effective communication and a responding supply chain. It may lead to better visibility and strategic alliances. If lean production is introduced to a company without applying six sigma, the business or improvement team will lack a set of tools, resulting in not improving to their full potential. If introducing six sigma without lean production philosophy, the business or improvers would have a stack of tools to

work with but no strategy to connect the tools or build a system. Lean production and six sigma are two different models, which can co-act beneficially (Pepper and Spedding, 2009).

Schön et al. (2010) suggest that there are differences on job satisfaction depending on how long six sigma have been applied in a business, but also on how the application is launched. When six sigma is integrated with the process managers the results were better than when it was run as a separate initiative. Also the level of and the honest commitment from the management explained to the level of job satisfaction.

The philosophy of lean production and the six sigma steps are by Dahlgaard and Dahlgaard-Park (2006) claimed to be in its essence the same, both having the origin from the Japanese practise total quality control (TQM). TQM was described as a constantly developing management philosophy, where continuous improvements are the most important principle of management. Lean and six sigma are to be considered as alternatives when TQM already is implemented in a business.

The most crucial part of TQM is suggested to be the human factor. Focus on six sigma for training people in using techniques and tools, not on building a business culture, are people's basic needs to be understood and respected. It is stated that a company culture should be build focusing on making a quality strategy satisfying people's spiritual and mental needs. It is suggested that by balancing the development of people's core competence and core values quality is built into the people. Core values are not to be ignored in favour of professional competencies (Dahlgaard and Dahlgaard-Park, 2006).

3.5. Aspects for improving work efficiency

3.5.1. Leadership

In riding schools structure and discipline are important. Planning, responsibility and precision are skills taught to ensure control in the business as well as its environment. This approach encourages determination, clarity and leadership to those attending. The characteristics of horse stables are the traditional male structures combined with almost exclusively female practitioners (Forsberg and Tebelius, 2005; Nikku, 2005). Similarities to the military way of teaching leadership can be found within riding schools, having the effect that leaders communicate with a clear message (Forsberg, 2007). Since the interest for horses often begins early in life it provides an opportunity for lifelong learning. Developing important social values early in life is considered the most important contribution from the horse sector to society. In the relationship with horses, people learn responsibility, organisation and cooperation (HNS, 2004).

3.5.2. Workload

Agriculture is as an environment containing a variety of operations where work related injuries are common (Walker-Bone and Palmer, 2002; Thelin et al., 2004; Pinzke and Lundqvist, 2007). Adult farmers have a high incidence of musculoskeletal disorders. Early exposure to biomechanical stress seems to be one of the reasons for such disorders. The agricultural sector employs many young people, who perform chores with enlarged risks of work-related musculoskeletal disorders in the short- as well as in the long-term perspective. Examples of disorders are pain or discomfort affecting muscles, joints, nerves, shoulders, back and neck. Tasks that involve high risk of developing musculoskeletal disorders are feeding and watering animals, cleaning stalls, harvesting and planting (Kotowski et al., 2009).

A common complaint among riders is low back pain resulting in lost riding days and competitions as well as training problems (Pugh and Bolin, 2004).

The development of musculoskeletal disorders is related to psychosocial, physical and individual factors. Low-back disorders are strongly associated with work-related lifting and forceful movements. Psychosocial factors related to the work environment and the work have been a part of the development of musculoskeletal disorders of the back and upper extremities. It has been suggested that the perception of intensified workload, monotonous work, limited job control, low job clarity and low social support are associated with different types of work-related musculoskeletal disorder. Those factors were not dependent on the physical factors connected to the work environment. The studies are not easily evaluated as psychosocial factors were recorded at an individual level and physical factors at a group level interactions between those two groups of factors could not be verified (Bernard, 1997). Exposure to cold environments could as well be involved in musculoskeletal disorders (Pienimäki, 2000).

The posture when performing a work task is of importance considering risk of fatigue, pain and injuries. Awkward postures such as bending, flexing or extension, increase the risk of fatigue, pain or injury. If an awkward posture is used for long periods or used repetitively the risk of fatigue, pain and injuries increase (Keyserling et al., 1992). In a study of female riding instructors the majority of those who performed tasks in the stables showed a high prevalence of musculoskeletal problems in the shoulders, low back and neck. The participants in the survey pointed out that shoulders and lower back were the regions that were most at risk when performing their chores (Löfqvist et al., 2009).

Löfqvist and Pinzke (2010) presented a few suggestions on how to reduce the workload in horse stables; the risk of a lopsided working posture could be limited by dividing a bucket weight into two buckets. The usage of a water hose could decrease the amount of water carried out by hand to fill water buckets in box stalls and tie stall. Moving of the feet when mucking out would reduce twisting movement of the back. Adaptation of the tools could be made to be consistent with the size of the workers hands. A respirator should be used when dusty work is carried out. Tools and equipment should be placed at an appropriate working level. Riding arenas should be isolated against heat, cold and drafts. To avoid repetitive strain one should alternate between work tasks. It is suggested that automation and machines are used to a greater extent in horse stables.

3.5.3. Work efficiency and mechanisation

Most horse stables in Sweden are traditionally run without mechanisation. The stables and facilities used in the horse sector were stated to be old fashioned and not adapted for today's standards. The staff or owner of a horse business was found to spend most of their time doing everyday work around the horses instead of developing their business. It was concluded that a change was needed for businesses to be run sustainable, to provide an attractive workplace and offer clients, members and visitors positive experiences (Bendroth and Wallertz, 2009; Fyrberg, 2012).

When a horse business is run traditionally there are no profits to be expected scaling up the business, since the time spent per horse is the same regardless the numbers of horses. These observations are compared with observations of other parts of agriculture where production in large scale, result in timesaving advantages. Since employed staff is one of the biggest costs in agricultural businesses the use of mechanical solutions is high. Tools and machines are

used for heavy duty workloads, while the farmer and staff engaged only in operations that the machines cannot perform. In agriculture, different types of optimisation programs are, as an example, often used for calculating feed and manure handling. It has been put forward that owners of horse businesses should embrace already adapted mechanisation to come closer to a regular business model. Mechanisation of a horse stable can probably result in economical savings, however, the lay-out of the stable for both horses and staff needed to be improved. Even if mechanisation has no time saving effect on a particular site, the staff is encouraged by the feeling that somebody cares about their work environment (Bendroth and Wallertz, 2009).

For horses used in competition in dressage, jumping, eventing, harness racing and hobby horses in livery yards, box stalls is the most common way to keep them. Other types of horse businesses often have a combination of ways to keep their horses. The motives for using box stalls in horse farms were several, for example that they were already there when the facilities were bought or hired and the claimed lowered risk of injuries to the horses. Box stalls were considered safer than a loose house system for the handler of the horses and box stalls were also considered the most time efficient way of keeping horses because of the ease of accessibility. Another argument for using box stalls was that, by tradition, it is not possible to keep horses intended for competitions in some other system. It is also, by the managers, considered easier to make staff work in conventional stables rather than altering the way of keeping the horses. The welfare of the horses has been mentioned since box stalls are considered to lower the risk of injuries to the horses. It is considered important to lower the amount of injuries of the horses, and having healthy horses is of great importance for good economy. For horses in competition kept individually both in the stable and in the outside pen a big proportion of horse owners claim this to be for the best of the horses. Competition horses represent a big economic value, and the risk of them being injured need to be kept as low as possible. Representatives for different competition organisations share the concept of keeping horses individually (Svala, 2008).

The motives for keeping horses in a loose housing system was that this is considered natural since herd animals as horses were thought to prefer this system if given the opportunity. The usage of tie-stalls was motivated with that it was suitable for riding schools, and sometimes it was mentioned as a cheap way since the need of space is lower and less straw is needed (Svala, 2008).

When horses were kept in box stalls the time needed to care of each horse and year was found to vary between 50.4-117.2 hours, with a mean of 102.2 (SD 39.8). Time included; management and organisation, placing of feed, feeding, replace bedding, walking horses to paddocks, mucking out, care of riding facility, maintenance and repair work and miscellaneous services. When only the categories feeding, mucking out, providing litter and walking of horses were summarised a box stall had an average need for 71.8 hours per horse and year (Schön, 1999). Keeping of horses in box stables was found to be more expensive than necessary. Keeping of horses in a loose housing system would be preferable from an economic point of view as well as for the horse's welfare since their needs are met prior to handling (Wennerberg, 2011).

The time needed to maintain a loose house system was to a large extent dependent on the environment, the placing of facilities and the distance between them and the frequency of manual operations. When horses were kept in a loose house system, the number of hours needed per horse and year varied between 45.7-197.9 hours, with a mean of 93.1 (SD 56.7). This number included time for; management and organisation, placing of feed, feeding,

replace bedding, walking of horse to paddocks, mucking out, care of riding facility, maintenance and repair work and miscellaneous services. When only the categories feeding, mucking out, providing litter and walking of horses were summarised a loose house system had an average need for 60.4 hours per horse and year (Schön, 1999). A loose house system was also found to have the advantage that anyone can provide water, feed and service for the horses and facilities without interacting with the horses (Svala, 2008).

Mucking out was found to be an activity occupying a big proportion of the time per day in horse keeping. It was also the work with the highest amount of ergonomically risky postures. Considering this, mucking out was suggested to be given most attention for preventive measures (Pinzke and Löfqvist, 2009). Horse stables were considered to be in need for effective technical solutions for the handling of manure and feed, roughage in particular. Manual handling of manure and feed already have stopped in other sectors of agriculture. The horse sector was recommended by Schön (1999) as well as Bendroth and Wallertz (2009) to use mechanisation in their stables, in order to manage many horses per person, be cost effective and competitive.

3.5.3.1. Procedures in horse stables

Work procedures in horse stables are described as being manually, repetitive and physically demanding, including frequent heavy manual lifts (Holmberg et al., 2003; Rosecrane et al., 2006).

The everyday work tasks in horse stables are described by Mellberg (1998) as mucking out, feeding horses, preparation of feed, sweeping stable aisles and replacing bedding. When mucking out box stalls and tie stall a pitchfork or a manure fork in combination with a shavings fork and a wheelbarrow are used. When mucking out the urine together with used bedding material and droppings are picked up with a fork and placed in the wheelbarrow. The manure is then transferred to the manure heap, where the wheelbarrow is emptied and the muck heap is levelled and shaped. Stable aisles are swept using a broom to clear it from straw and dust. Bedding is replaced by bringing fresh straw or shavings from the loft or barn and distributed. Horses are fed hay or silage, which is often weighed out using a big plastic bag, wheelbarrow or basket in combination with a scale. Some horses are also fed concentrates, minerals or cereals which are distributing by a bucket or a scoop. Löfqvist (2012a) pointed out that the frequencies of how often the tasks, described as daily by Mellberg, are performed differ between businesses.

Mucking out and disposal of bedding is considered to be an ergonomic problem. A long-shafted tool or a wheelbarrow is used in almost all tasks in horse stables and considered to be at a high risk level, considering ergonomics. This indicates that these tools should be exchanged for ergonomic reasons. The emptying of a wheelbarrow is also considered a high risk operation, where mechanisation is suggested as an improvement of the daily work. The work tasks that have the highest work load are mucking out, removal of manure and handling straw, shavings and hay. The back and the shoulders are here exposed to the highest amount of stress. During the cold season it was found that many of the riding instructors worked in an unheated environment, and most of them considered this to be a health problem (Löfqvist et al., 2009).

When routines of work tasks or tools were changed people working with them needed time to adapt. This made evaluation of new tools difficult, since scepticism against new tools was

perceived. Thus it was suggested that the staff should be trained to handle a new tool and use it in their everyday work for a period of time before evaluation (Kotowski et al., 2009).

3.5.3.2. Tools used in horse stables

Common tools used in horse stables are shavings forks, manure forks, brooms, shovels and rakes which have been developed only to a small extent since launched on the market. When attempting to reduce work load it was important to consider both shaft length of the tool and the handling technique (Löfqvist et al., 2012b).

Mostly women are working in horse stables (HNS, 2004; Nikku, 2005; HNS, 2010). However, most of the tools used in agriculture are designed for the average male. Differences in anatomy and physiology, based upon gender, was claimed to make it hard to design tools that suits individual persons. Tools designed for men were stated not to be optimal for most women. Tools designed for individual body types would be the best choice. It was stated that there is a need for tools suited for different populations (Pinzke and Löfqvist, 2009; Bendroth and Adolfsson, 2008; Yoder et al. 2010). Freivalds (1986) considered a long shaft to be better than a short one for shovelling. The shovel should also be designed to balance weight as much as possible. Snook and Ciriello (1991) stated that when performing manual tasks, females have lower tolerance for differences in weight than males. In order to improve tools used in stables Löfqvist et al. (2012b) suggested that long-shafted tools should be adjustable in length to better fit individual users. Bendroth and Adolfsson (2008) highlighted that the increased costs of healthy working environment need to be accepted.

3.5.4. Safety

Working with large animals is one of the most hazardous tasks in agriculture (Walker-Bone and Palmer, 2002; Thelin et al., 2004; Pinzke and Lundqvist, 2007). Common safety precautions among horses are mentioned to be; deepened knowledge of the horse, suitable equipment and clothing when handling horses and use of a helmet, safety stirrups and body protectors. Though this could be part of preventing accidents, the environment for riding and handling of horses are considered to be a big part in preventing injuries (Watt and Finch, 1996). Some stable holders refer to a box stall to be the best choice concerning human safety. On the other hand a loose house system could be managed without contact with the horses (Svala, 2008). Bixby-Hammett and Brooks (1990) suggest that horse organisations should perform studies to identify how accidents happen, and how they can be prevented. Prevention may involve changing of routines, ways of training and equipment or clothes worn when engaged in horse related activities.

Grandin (1999) provided a few tips on handling horses in order to improve safety. The handler should move slowly around the horse, since sudden movements could scare the horse and cause an accident. Horses should be handled gently. Anxious individuals are more likely to frighten the horse and cause an accident. Shoes with heels should be used when riding, and while handling horses, protective foot wear with steel toes should be used to reduce injuries if a horse steps on the feet. Grandin (1999) as well as Jagadzinski and DeMuri (2005) emphasised the importance of not tying horses to people. If a rope is tied or wrapped around the hand injuries may occur if the horse suddenly flees from the handler. Ropes should always be held so they can be released if necessary.

People engaged in training horses should be calm and have great knowledge of the horse and its behaviour. When a horse succeeds to escape from its handler or the stable, it is considered very important that a calm person is sent to fetch it (Grandin, 1999).

Some of the lean production tools are used to guarantee a high quality through the entire process. By controlling the process as a whole and not only the product, inadequacies and accidents are prevented. Staff is allowed to stop the process, and if possible adjust, when faults in the process are detected (Karlsson and Åhlström, 1996; Bhasin and Burcher, 2005; Liker, 2009).

3.5.5. Introducing lean production in a business

The most important thing when introducing an alteration in a business is that the staffs are involved and encouraged. If not, a change is not likely to be successful (Bendroth and Wallertz, 2009). The method of lean production is coherent and to successfully apply it, it is important to fully understand, apply and view the method in total and not as independent single parts (Pepper and Spedding, 2009). A good starting point for applying lean production is to identify value-adding as well as non-value adding processes for the specific business. A tool for doing so in a simple way is the value stream mapping exercise (appendix) (Rother and Shook, 1999). By the value stream mapping exercise, the business creates a clear picture on the present situation and a preferred situation for the future. The map for the future could then be used to set up strategies for improvement to be expected by lean production (Pepper and Spedding, 2009).

A barrier for introducing lean production and improvement of information management is a reluctance to understand waste and the concept of value. For a business to successfully apply lean production it should view the philosophy of lean as a journey for a longer period, not as a strategy to be considered for a short period of time (Karlsson and Åhlström, 1996; Bhasin and Burcher, 2005). The business should also choose five or more of the available tools and apply them simultaneously at the beginning. Continuous improvements should be a part of the mind set in the business and changes should be made in the culture which supports and emphasises the principles of lean production. Every change should be evaluated keeping the whole value chain in mind. Businesses that had to struggle when trying to apply lean production often had a lack of direction, their planning was insufficient and sequencing of projects was inadequate. Knowledge of techniques and tools are mostly an advantage when applying lean production (Bhasin and Burcher, 2005).

The method of lean production has a variety of tools to be used and transferred to different types of productions or businesses. All tools are, however, not suited for all productions, and those not suited should not be used. The tool called 5S (appendix) was only found successful when implemented as a part of the journey of becoming lean. 5S is used to apply structure and placing in the workplace, where every tool or equipment has a place of its own. Signs are an important part of structuring the workplace, in order to make the workplace clearly arranged. If 5S was implemented before other parts of lean, there was a risk that the business would only do 5S, which was not a way to make sustainable changes within a system (Pepper and Spedding, 2009).

3.5.6. Introducing lean production to the horse business sector

To successfully apply lean production for improvements in a business, clear communication and leadership training is of great importance (Karlsson and Åhlström, 1996; Liker, 2009). A way of assimilating new ways of working and thinking in the horse business sector could be as suggested by Fyrberg (2012) to show best practice by using a few good examples within or outside the sector.

4. Results

In this part the results from the interviews, the observations and the value stream mapping exercises from the businesses are described.

4.1. Business model

4.1.1. Goals and visions

4.1.1.1. Performance goals

Business A has the goal to win as many races as possible and earn money for the horse owners, focusing a lot on the horse owners in their daily strategy. While discussing the goal of the business the owner said that "*most clients entering this knows that it will cost a lot of money, but then there is the chance of finding that special horse that earns enough to make the hobby run itself. So there is a value if the clients have, well, an interest in the sport and so on.*" At business B the goal is to be the best business in harness racing and always one step ahead of their competitors. Business C has the vision to become as good as possible in harness racing. The manager described it as "try to establish ourselves as one of Halmstads best harness racing businesses, and in the long run on both a national and international level as well."

4.1.1.2. Financial goals

The vision at business D was at the time of the interview outdated and a revision of it was alerted to the staff, the board members and the youth section in the club. According to the manager the new vision probably would be formulated to give the club the goal of being one of the leading riding clubs in Sweden concerning the riding school itself as well as the arranging of riding competitions. The riding school should be altered to make it profitable in contrast to the current situation *"the idea is to make the riding school a part of the foundation in the club, so that it can support the club financially*." The goal of business F is to provide an education that is financially healthy. As the manager of the riding school puts it *"you can not only focus on educating every child to be the next Malin Baryard, the economics are very important.*" The vision for the riding club is to have and maintain a riding school quality labelled by the Swedish Equestrian Federation.

4.1.1.3. Staying alive

At business E the situation was a bit harsh, *"at the moment the goal for the business is just to survive.*" The facilities are old and in need of maintenance and restoration meanwhile the club does not have the funds to do so.

4.1.2. Achieving and monitoring goals

4.1.2.1. Performance goals

In order to achieve the goals in business A the focus is put on the training of the horses and the contact with the horse owners. The owner comments "*in reality it is by training and well, being curious and embracing new knowledge. In addition, concerning the customers (the horse owners) we work a lot with contact, personal contact, as well as arranging happenings for the customers.*" At business B *"nothing is to be left at chance*". They work with routines and time labelled instructions for everyday training as well as preparations prior to races. The groom comments on the routines *"I cannot understand people working without them. Some are warming the horses a few races ahead. And for the driver it is quite nice as well, you can look at the list to see what you are supposed to do and when.*" Business F has a great interest in further education of the employees in riding performance. This is done in order to have

happy and satisfied employees that enjoy their work, as well as their colleagues. The manager said *"I try to find things that they are interested in. I try to find things and they are eager to learn so nowadays it feels quite good actually.*"

4.1.2.2. Financial goals

Business C have meetings on a regular basis to supervise mostly the economy, since training and racing performance is monitored and adjusted as an ongoing process on daily basis. Business D has increased the number of activities and increased marketing of beginners groups in order to make the riding school profitable. The marketing resulted in starting seven new groups and having a queue equivalent with two full groups to start when opportunity is given.

4.1.2.3. Funds

Business E is trying to get the local politicians concerned about their situation since the facilities are owned by the municipality. In addition different funds are applied for in order to adapt the facilities to be disability friendly. The manager commented on the clubs expectation to get funding from the municipality "*unfortunately the municipality is only interested in soccer. Now the regional team succeeded to remain in their league so a new soccer facility has to be built. That is what they spend their money at.*"

4.1.3. Employees

4.1.3.1. Responsibilities

In all businesses the employees have areas of responsibility. The extent, border between areas and presence of specified work descriptions differed between businesses. In business A the owner states that he is the one with the entire responsibility for the business. Caring and training of the horses is however divided on the employees, giving each employee responsibility for a group of horses. Even though the owner is clear about the main responsibility he comments on the delegation to the staff as *"I would say that my staffs have a lot of responsibility for their horses.*" The owner is planning all of the training for the horses, providing a list for the employees on a weekly basis. In business B every employee is responsible for a certain number of horses. If anything unexpected would occur they should have a discussion with the owner of the enterprise. If a situation is acute the employee will make the decision, reasoning that "*we work with animals and that has to be the main priority.*"

At business C the employee has the responsibility for their horses in training, which would be seven or eight horses per person. The owner of the enterprise has the main responsibility and when he is not present the manager is the one in charge. Business D and E are quite alike, where every employee has an area of responsibility. The groom has responsibility of the horses and a riding instructor has the responsibility for the activities for disabled riders, as an example. All of the employees have a list of work tasks that they are expected to do. In business D the work areas, and responsibility, are made clearer than in business E. In business F the manager has had the responsibility for the entire business until the time of the interview. The manager is going to divide the business into areas of responsibility in the future, simulating the approach in businesses D and E.

4.1.3.2. Communication strategies

All businesses provide information to employees, customers and visitors on numerous places in the facilities and in different ways, depending on the nature of the information. Mistakes

made due to lack of information was, however, identified by all of the businesses and considered a weakness. The communication within the businesses is managed in different ways. Whiteboards were found in almost every facility at all businesses, but used differently and with different focus. Some had information for the customers visiting on a whiteboard and some used whiteboards for communicating the gear needed for each horse.

Business D has a goal only to have one place for information in order to eliminate mistakes due to lack of information. It is the only business having a defined goal concerning information management in the business. When asked about how they communicate within the business businesses A, B, E and F directly answered that they talked to each other. They did not see the relevance of the question, since the employees most of the time met during the days. Scheduled meetings were held in different extent in businesses B, C, D and F. The interval of the meetings differed, with business D having the most, once a week. Joint coffee breaks were a common way of interacting at businesses A, B, C and F. The application for communication for smart phones called *What's app* are used at business C and D. Both appreciated that everybody could be informed simultaneously.

4.1.3.3. Age, staff turnover and introduction

Only business E had a mean age of over 30. All of the businesses had a wide range of employees, however most people were in their twenties. All, except for one person, were either younger than 35 or older than 50. None of the businesses experienced any considerable circulation of employees. Business B increased number of employees due to expansion of the business. Most of the businesses, A, B, C and F, emphasised personal qualities when employing new employees considering the time required for introduction. All of the riding schools, businesses D, E and F, made separation of the riding instructors and the grooms when estimating the time required for introduction. Grooms did not need as much time as riding instructors to be completely introduced. Relations to the horses as well as the students were emphasised as time consuming. Business A, B, C and F estimated the time required for introduction of new employees to a few weeks and business D and E, to a few months.

4.1.4. Work efficiency

4.1.4.1. Occupational and repetitive strain injuries

Businesses D and F did not have neither occupational nor repetitive injuries among the employees. All other businesses reported that injuries seldom occurred, but when it did happen it was usually due to a response of a frightened horse. The injuries that had occurred due to contact with horses were broken fingers and toes. When pain in the back was asked about specifically in business C a groom answered "*you get that when working with horses, it is a pretty heavy job, so. But other people also have it, so…*"

In order to prevent both occupational and repetitive strain injuries, business C has a massage-chair in the lunch room, offers the staff to see a physiotherapist and a wellness account at a gym to be used free of charge for the employees. Business D has a safety representative and evaluates the risk of different tasks when given a reason to do so. Business A, E and F talk to the employees about how heavy lifting should be performed and how mucking out could be done in a good way. Business B emphasised the safety when handling horses, as well as the importance to educate the horses to be handled in a proper way.

4.1.4.2. Housing system

All businesses engaged in harness racing have a box stall for each horse. Business A and C also have loose housing for some of the horses. Business A uses them mostly during the summer while business C has some horses in the loose housing system every night all year round. The riding schools all had both tie stalls and box stalls. Business D were about to build a loose housing system as well as a new stable with box stalls for all horses.

4.1.4.3. Mechanisation

Some automation and mechanisation was used in the yards. A hay shredder to open big silage bales were used in business D. Concentrate dispensers were used by business A and B, automatic water cups in the box or tie stalls were used in business B, D, E and F. Business C and A have water buckets in each box. Business A also has water hoses in each box in order to fill the water buckets and damper the pelleted wood shavings.

4.1.5. Areas of improvement

4.1.5.1. Stable tasks

While observing the daily work at all businesses it was noted that the work contained a large proportion of walking between tasks and stations as well as fetching equipment. The planning of the facilities and workstations seems to be made with concern for the wellbeing of the horses, not the efficiency or time optimisation of the work performed.

The overall reaction at the businesses concerning new technology and new ways of working caused a lot of scepticism from mostly the employees. There are a few exceptions though. The manager at business C said *"It feels as if the horse sector is quite conservative. You often hear that something should be performed in a way since it has always been done that way. There was probably a reason for doing something in a certain way from the beginning, but that is probably a reason not current today.*" One of the grooms in business C said *"if you look at a dairy cattle facility where everything is computer controlled with wagons hanging in the ceiling and stuff. When people working with the cows visited the stable they asked why we did it the way we did. But it is hard to make time for such things, you do not have time to go and fetch the tractor so you transport the wood shaving by hand.*" The manager at business D *"I think that pretty much everything could be made more efficient, including the tasks we already have altered.*" The manager continuous "*It is hard for the employees to make changes in the routines.*" The sceptical attitude towards changes in routines was made visible when performing value stream mapping exercises at the businesses. Many of the grooms and managers were determined that their way of working was the best alternative and did not understand why to question their routine.

Business A would prefer spill water sewage outside each box to be able to empty water buckets close to each box instead of carrying them to the sink. Mucking out was mentioned as a task that preferably would be eliminated or at least made easier in businesses A, C and E. Sweeping of stable aisles was mentioned by business E and F to be areas in need of improvement. Handling of silage bales on a rail in the ceiling could be a way of simplifying feed handling at business E. In business D the hay shredder only can operate one bale at a time, so when the bale is finished during the weekend the extra staffs are not able to replace it. Heavy lifting in general could be improved in business C. Examples of heavy lifting on a daily basis was mucking out and transportation of wood shavings and silage. Concentrate dispensers were mentioned by the staff to make the job easier on a holistic level. Mucking out in the pens was a chore that could be easier by using a four wheeled motorcycle with a trailer.

4.1.5.2. Business

The contact with the horse owners was mentioned to be a constant area for improvement by business A. Information management providing information on a daily basis was mentioned as a way of doing so. The attitude at business B and D was that probably everything could be improved.

4.1.5.3. Cost efficiency

Businesses A, C, D and F consider their businesses to be cost efficient. The manager at business E does not consider the business cost efficient since they lose money on days horses are not used.

4.1.5.4. Variation

When asked about the variation in result over a year businesses A and B said that there is always a down period during the winter. If some sort of infection enters the stable will also affects the economics. Business C emphasised that the effect of a small change could influence the results for a long period, and that you never know beforehand which changes that are positive or negative. Business D and E mentioned the payment by the students which was traditionally paid once per semester, being a problematic variation in liquidity. Business D had introduced a new program which offered a variety of different payment possibilities.
Business F did not notice any variations over the year.

4.2. Value stream mapping exercise

The meaning of the value stream mapping exercise was more or less questioned in combination with a shown lack of interest from the majority of the employees and managers. Time was not reserved in any of the businesses to carry out the exercise, in two of the businesses the exercise could be conducted during a break. In the other businesses it had to be reduced to discussions with the employees during the observations meanwhile the employees performed their daily tasks. During the two exercises the owners of the businesses received phone calls and did not return to the exercise. The discussions during the exercises were few and the exercises were considered waste of time among the majority of the employees. Discussions concerning waste were problematic during the discussions and exercises and the understanding of waste in the daily processes were not easily digested.

4.3. Tasks studied

All tasks were, more or less, performed manually in a traditional way in all businesses. Mucking out was performed using a shavings fork and wheelbarrow and aisles were swept using brooms. Logistics concerning feed and manure handling were not optimized in order to diminish time consumption for tasks such as mucking out, preparation and distribution of feed. The employees often had a fix routine for mucking out, preparation of feed and water as an altogether task, lowering the time needed for these tasks. However, there is a limit for how much the wheelbarrow can carry and how much the employees can lift. Placing of feed, tools and manure heap combined with the tools provided required the employees to adjust their routine to the yard instead of optimizing the routine. The riding schools let the horses walk themselves to and from paddocks using temporary fences, in order to save time meanwhile the harness racing businesses walked all horses by hand. All tasks in all businesses included a large proportion of walking.

5. Discussion

5.1. Method

Recorded interviews, participating observations as well as the value stream mapping exercise were all ways of collecting data in order to identify the way businesses were working and thinking in terms of work efficiency, business models and communication.

The observation method with open questions was chosen since it is a common way of studying social behaviour, where the researcher makes direct observations instead of putting pre-prepared questions that may limit the openness and thus the type of answers. The method has the advantage of not being dependent on neither former behaviours nor the intentions for the future since the researcher observes the current situation (Kothari, 2004). The value stream mapping exercise was used since it is a tool used to identify processes that are adding value, as well as those that do not and thus are burden to the business. By doing this the business could create a clear picture of the present situation as well as a desired state for the future (Rother and Shook, 1999). The questions were asked and observations were made in an aim to minimise the influence of the interviewer. It cannot, however, be ruled out that there was some impact on the answers as well as on the working routines observed.

The contact with the businesses by interviewer turned out to be somewhat of a challenge. It was hard to get in touch with the businesses both over email and telephone. The material in the study is for practical and time related reasons small, since the study is conducted as a degree project. The study thus will have to be considered a first exploration of the introduction of lean production for horse business sector, which can give rise to more detailed studies in the future.

5.2. Lean production

Lean production is a way of working that can, when used properly, improve efficiency and productivity (Hicks, 2007). The core of lean philosophy seems to be the understanding of value in order to eliminate waste in a process. To be able to detect the value as well as the waste practical experience has shown that it is important to be open-minded, and that it can be hard for a business itself to detect and categorise actions and processes. In order to constantly evaluate the process and detect waste as well as value continuous improvements are encouraged. Another important factor is involving everyone in the business and making sure they understand the purpose of the changes that are made. Without the understanding and pursuit from the staff lean production is said to not earn great achievements (Pepper and Spedding, 2009). The human factor cannot be precluded when evaluating the impact of lean production in the horse business sector. If the person doing the everyday chores are not included in the process or even worse does not believe in lean production or understand it, there will be no success.

The seven types of waste are said to be; overproduction, waiting, transport, extra processing, inventory, motion and defects (Pepper and Spedding, 2009). In the horse businesses these could be identified in different extent. The lean tools continuous improvements, standardised routines, value stream mapping, 5S and the hunt for waste are transferrable to the conditions in horse businesses. When a business is forced to compete, lean production has proved to be a successful way of approaching new ways of working and development, since lean production makes ways of creating high quality and diversified products for the customer (Genaidy,

2003). Since the horse sector as a whole has financial struggles (Fyrberg, 2012) new ways of working, as well as meeting the needs and wishes of the customer should be developed. By using lean production, that has proven to be successful in other parts of agriculture, the horse sector could be developed in terms of working conditions and business management.

5.3. The horse business sector

The horse business sector is in large extent in the need of both efficiency and productivity, since the sector is labour dependent. Mechanisation could improve horse facilities concerning manual labour and in the long run improve profitability. Most riding schools have employed staff (Svala, 2008). However staff is expensive and the business is dependent on profitability in order to afford hired staff. A riding school that is not profitable has a hard time paying the hired staff, which is the case in business E. In this case where the riding school is not profitable in combination with facilities in need of restoration as well as competition classes that are not filled the profitability of the entire riding club is unstable. There is also a constant need of financial support from the municipality. In order to achieve a sustainable improvement, all aspects of the business need to be revised in order to be economically healthy. Contact with customers is important implying a communication strategy has to be developed at all businesses in order to meet potential customers in a professional way.

A great proportion of the sector seems to be struggling economically, implying that there is a need for a change. When lean production has been introduced to dairy producers as well as pig producers, the philosophy, as in ways of working and thinking, has contributed with changes that in the long run have increased the profitability. By studying other parts of agriculture the horse business sector can take advantage of former experiences and mistakes from those very similar businesses. There are certainly benefits of streamlining a business, for example does an investment pay off lowers the cost of the everyday operations. A business can invest 146 000 SEK in mechanisation if it lowers the amount of paid hours by 100 a year, which equals to less than 20 minutes per day, given that a paid hour cost 180 SEK, the interest rate is 4 % and the longevity of the investment is 10 years. Not including maintenance (Larsson, 2015).

5.3.1. Business model

Development of the businesses and their business model is emphasised by Bendroth and Wallertz (2009) as well as Fyrberg (2012). In order to develop profitmaking the business has to identify the value for the customer and as far as possible eliminate waste in the processes. Continuous improvements and marketing are other parts that lean production comprises, which the horse business sector could benefit from. By having an ongoing evaluation of the process and the tasks a person is doing well will guarantee the quality.

Riding schools have hired staff. The riding school at business E is not profitable and has never been, but is still dependent on employed staff. The riding club is struggling economically since the facilities are in need of restoration and maintenance. Earlier, other parts of the riding club could fund the lacking profit of riding school, but today this is no longer a steady solution. Business E has not an economic output large enough to cover their expenses, creating a lot of financial stress. Today, there is no overall plan to alter the club to be profitable.

For a business to be profitable it seems that it needs to be constantly improving and competitive. Business D is evolving into a business that is constantly questioning their way of

working and acting. This business is improving in profitability and is now in the position to hire one more riding instructor. Businesses in other trades that alter into lean production do so in order to compete with the dominating model of mass production. Parallels to business D could be made here. The business had to change in order to stay alive, and did so by rearranging their entire philosophy. The manager at Business C is starting to question traditional ways of working in stables (4.1.5.1. Stable tasks). If these thoughts are put into action and the routines and equipment are revised the business will probably be more efficient and less time consuming which in the long run will improve their profitability.

5.3.2. Safety

The literature as well as the managers of the businesses emphasised the importance of the personality of the handler of the horses. The only business that put more effort on the environment of the workplace than on the person started working were business D. Perhaps it is time for the horse business sector to at least put emphasis on the work environment in order to prevent accidents and benefit from the workers full potential.

Grandin (1999) points out that people working with horses should wear robust shoes in order to diminish the injuries if a horse steps on the feet. When visiting the business only a few of the people handling the horses had robust shoes.

The perception of poor work situations could lead to musculoskeletal disorders (Bernard, 1997). In lean production overview of the amount of work as well as the current state are important parts. If introduced to the horse business sector it would provide an opportunity to lower the amount of musculoskeletal disorders, which could result in staff being employed for a longer time period. Horses are unpredictable animals and can cause severe injuries to persons involved with them. This is consistent with the result of this study. When accidents occurred in the businesses they were a result of a frightened horse. In order to diminish these accidents standardisation of the handling routines could benefit the businesses. All processes involving handling of horses should be considered a safety risk, and the routines should be standardised to minimise the risk of accidents. Examples of routines performed daily are walking of horses, releasing and fetching horses in paddocks and entering boxes. In addition to these tasks all the different orientations within the horse sector have additional tasks, which also could benefit by standardisation.

5.3.3. Leadership

In the horse sector, leadership is trained both in the contact with the horse and in the stable culture when handling the horses and communicating routines. The communication strategies when working with lean production is to make it simple and easy to do chores in the correct way. The horse sector has an advantage if introducing lean production since leadership training is already established.

5.3.4. Attitude

The attitude is rather sceptical about working conditions and new technology in the horse business sector. Grooms in the harness racing businesses are supposed to work more hours than they are paid for if they do not have time for all of their tasks during the shift. A quote from business A shows the attitude, which was also indicated by other grooms in the harness racing sector; *"That (intensified workload during the winter) can never affect the training of the horses. Here you then have to work longer or come here earlier in the morning. I mean*

that is how it works." If the employees do not get paid for all the hours they work it is not surprising that there is no interest in changing the working conditions.

All harness racing workers were positive to new training methods, and all put effort on the importance to stay curious and try new methods and approaches constantly. This implies that the idea of making constant improvement in order to stay competitive already exist but is not applied to the business as a whole. Enthusiasm about the core of the work, training of horses, is in a way a good thing but heavy load from other parts of the work may in the long run reduce the total efficiency. It may indicate that there is a genuine interest that can be exploited.

Economy, profitability and cost efficiency were topics that the riding schools, in contrary to the harness racing businesses, were concerned about. Business D and F had established economy and offered a variety of services to their customers. Business D and F had, or were going to set, goals concerning the profitability of the businesses. The difference is noteworthy and needs attention when evaluating the whole sector of horse businesses.

In order to improve working conditions as well as profitability the horse business sector needs to be open for changes. A neglect of safety precautions could be risky for the entire business. In all of the businesses the horses were prioritised more than the persons working with them. The equipment for the horses was sorted and well taken care of while equipment used for daily maintenance was neglected. The riding schools seemed better in this respect: had certain places for most of the equipment, which often was marked. In general the employees did not have work clothes or shoes. The businesses should provide the staff with proper clothes and shoes. Proper clothing could also be a way of marketing. By applying lean production the businesses could free up time which could be used for the core of the businesses: the horses and the customers.

5.3.5. Employees

Even though the businesses in the study experienced a low staff turnover, the low mean age implies that new employees need to be introduced on a regular basis. When introducing new employees, easy instructions should be preferred. Set and printed routines are another way of making the introduction easy. Using pictures to describe routines could be a way of easily introduce both employees and students, having the advantage that pictures are not dependent on language skills.

5.3.6. Housing system

In the horse business sector, most horses are today kept in boxes, which is a time consuming and expensive way (Schön, 1999; Svala, 2008). In the riding schools the most costly area in the businesses is the hired staff. Two out of three riding schools in this study were not profitable. One way of becoming more efficient and in the long run more profitable, even though the horses would still be in box stables, would be to mechanise as much of the feeding, cleaning and walking of horses as possible. Either the businesses could have fewer hours of hired staff, which would be a way of preserving the state of the business, or the same amount of hours would be used, but used in another way in order to develop the business. By streamlining the tasks in the stable the time consumed for the tasks would diminish, making the work more efficient. When streamlining the tasks the logistics within and between tasks are important to consider. Equipment should be placed and tasks should be performed in a way making the work become more stationary in order to eliminate waste. Waste in the task

mucking out is exemplified as walking to fetch equipment, pushing the wheelbarrow between boxes and walking back and forth to the manure heap. All this walking is time consuming and should be considered a waste in the process.

The timesaving effect of keeping horses in a loose housing system depends heavily on the location and design of the system (Schön, 1999). In order to become more time efficient than the box stall model the planning and construction of the loose housing system is of great importance. An analysis of the logistics, as in time, distances and flow of material combined with the processes in the business in order to systematise would be preferable.

5.4. Introducing lean production

The most important thing when introducing new business philosophies is the mental attitude of the people rather than the absolute working strategy that is most important. The attitude in the sector towards changes and improvements probably is more crucial than deciding on applying TQM or six sigma.

Introduction of new technologies and thinking into the horse business sector is often met with a lot of scepticism (Kotowski et al., 2009). The results of this study supports that statement. The attitude is critical when changes are carried out. Figure 2 shows the problems that currently exist within the horse business sector. The changes needed, which can be provided by using lean production, are all important. However, without changing the attitude towards working conditions, customer satisfaction, and business development the desired future state will not be reached and the changes will not be as great as desired.

Current state	Changes needed	Future state
Working conditions:	Attitude	↑ Time management
Wearing & unsafe	Mechnization	↑ Staff development
	Streamlining	↓ Staff circulation
Low profitability		↓ Accidents
		↓ Days off

Result Focus and delvelopment of main business:
training horses, contact with customers

Figure 2. Illustrating the current state in the horse business sector and the changes needed to reach a desired future state.

5.4.1. Success factors

The horse sector is difficult to interpret since every business works in its own way. The businesses included in this study are, however, surprisingly alike, given the description as a whole. However, each business has got its own prerequisites as well as its way of working and thinking. In the businesses studied it was not the way of keeping the horses nor the basic idea of training that separated the businesses, it was the way of thinking and the business culture.

All of the businesses have a variety of orientations in order to make them run profitable which is consistent with findings of Vesala et al. (2007). The successes of the orientations were, however, blended. Business D arranged competitions successfully in terms of economics and

the competitions that were held at business E were nowadays not as successful as they used to be since the facilities were considered outdated by the contestant riders. Business A, B and C all had a flow of horses in their businesses and arranged different events in order to attract customers.

Business D is quite similar to the other riding schools from an outside perspective, but has a way of working that makes it stand out. Their finances are today good after doing some changes to improve their approach. They are working in a way to make continuous improvements in their approach and business model. The management of the riding club is committed on evolving the riding club, which is seen as a success factor. In business D the entire working process as well as their routines is in constant development. The business is forward thinking and has healthy finances.

There seems to be an urgent need for many agricultural businesses and the horse business sector in particular to adopt a new way of thinking in both small and great perspectives. Tools and work regulations in the stable and emphasising on ergonomics and use of mechanical equipment are some examples. Focus on riding school safety and introduction of lean production methodology are other areas that need to be considered on a broader basis.

6. Conclusions

There is an urgent need to question traditional working conditions in the horse business sector. Many businesses are struggling financially implying a need for change in both small and great perspectives. Lean production could be a way of altering businesses, making it possible for them to be long-term competitive and profitable.

The work performed in many horse businesses today are wearing and often unsafe which makes them expensive, risky and unsustainable to run. By altering routines, housing conditions and equipment the time saved could be used to develop the business, increasing the value for both the business and the customer. Tasks studied that can be streamlined are: mucking out, distribution of feed and sweeping aisles. The logistics of horses, feed and manure are important to consider when improving efficiency.

The benefits of lean production in horse businesses are: less time spent on non-horse activities, staff development, staff staying longer in the occupation, fewer accidents and fewer days off. This results in a better focus on the main business development and performed tasks such as training, contact with owners and riding school pupils resulting in a higher customer satisfaction.

The interest in work efficiency in the businesses was overall low and the attitude concerning new ideas and technology is sceptical. The value stream mapping exercises were not successful in this study since there was a lack of interest at the businesses. The exercise needs interested and enthusiastic participants to be successful. In order to improve businesses as well as their profitability changes must be considered as an opportunity, not a threat. The successful businesses in this study were eager to evaluate their routines and business models in order to improve the business continuously.

This study opens up for further research and the detailed presentation of different types of horse sector businesses and the different problems found, discussed and analysed will help to direct coming specialised studies.

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Appendix

Lean tools

Continuous improvements

By constantly improving the business in both small and great perspectives improves all part of a business. In order to do so measuring, analyses and control of the improved process are necessary (Dahlgaard and Dahlgaard-Park, 2006).

Standardised routines

Setting standards is a way of describing the normal turn-out of a process, in order to establish the normal outcome of a process. When setting a standard the persons involved agree on the best way of working, storage of material and communication in all processes. This is current until a better way of working is established. The underlying cause for creating standards are to be able to quick and easy detect deviations, make it possible to predict the outcome as well as create an opportunity for learning. Safety and ergonomics as well as quality and efficiency are the main reasons for applying standards. No one should risk their health at a workplace, why both safety and ergonomics are emphasised. By setting an ergonomic standard the staff is confident in doing the chores in a proper way even though it may be time consuming. When a chore is done in the same way every time it creates a quality standard, assuring that the product always is properly done minimizing the variation in results. By setting a standard the best now known way of working is used, making the process more efficient. In order to be efficient the time required needs to be determined (Petersson et al., 2009).

Value stream mapping

A value stream comprises all parts of the production at a business, all part from the raw materials until the product that meet the customer. It also comprises both those parts that are value adding and those not. When performing a value stream mapping exercise the goal is to look at the great perspectives in the business in order to detect processes that impair the flow as in creating a bottle neck. In order to make a business effective in the great perspective as well as in the long run it is important to look at the effectiveness at the flow for the whole business instead of looking at the flow at single processes. When the flow of the entire business is established the flow of the single processes can be investigated. The value stream mapping exercise is divided into two parts, the existing state and a wanted future state in order to make improvement strategies (Pepper and Spedding, 2009; Petersson et al., 2009). The value stream mapping exercise should be performed before other lean tools are introduced in the business. A benefit of the exercise is the provision of a common language of the different part of the processes (Pepper and Spedding, 2009).

5S

The abbreviation of 5S stands for sort, straighten, shine, standardize and sustain.

Sort In order to make the workplace perspicuous the tools and gears at the workplace should be sorted. The goal is to separate tools and gear that is used on a daily basis from the ones used seldom. The ones used on a daily basis should be available.

Straighten The next step in making the workplace perspicuous is to make sure that every tool has a place of its own. The tools should be placed in a way so that the staff does not have to look for them and if something is missing it should be revealed.

Shine By cleaning and looking after the workplace equipment and tools are reviewed. When a good structure is achieved time spent on cleaning will be quite short and reviewing of the workplace will be take more time.

Standardize When the previous steps are achieved the staff should agree on certain standards for the workplace, for example where the tools should be stored as well as how the cleaning of the workplace should be performed.

Sustain To make sure that the agreed standards are used it is important to have a constant reminder of the standard and encourage the usage of it.

(Petersson et al., 2009).

Hunt for waste

When suggestions for improvement are fulfilled the hunt for waste could be used in order to find new ways of improving the value stream (Melin et al., 2013). The exercise starts by discussing the seven types of waste; overproduction, waiting, transport, extra processing, inventory, motion and defects (Pepper and Spedding, 2009). By walking around in the business different types of waste can be detected and the impact of the waste could be discussed (Melin et al., 2013).

Intervjuguide

Jag gör detta som en del i mitt examensarbete för agronomprogrammet. I exjobbet undersöker jag arbetseffektivitet i hästföretag, samt hur man kan tillämpa filosofin lean production (från tillverkningsindustrin) på hästverksamhet. Lean production handlar i mångt och mycket om att hela tiden se helheten i produktionskedjan och däri utkristallisera vad som skapar värde på produkten, och sedan plocka bort det som inte skapar värde.

Affärsmodell
Hur länge har företaget funnits?

Vilken typ av verksamhet har ni?

Vilka mål finns för verksamheten?

Hur jobbar ni för att följa upp målen?

Personal och arbetseffektivitet
Hur många jobbar inom företaget?

Hur ser ansvarsfördelningen ut?

Hur kommunicerar ni inom företaget?

Vilket inhysningssystem har ni för hästarna?

Har ni någon form av mekanisering i stallet?
Vilken grad?

Hur stor är omsättningen på personal?

Personalens medelålder?

Hur lång tid tar det att helt skola in ny personal?

I vilken utsträckning förekommer arbetsskador?

Arbetar ni för att förebygga arbetsskador?

Förbättringsområden
Ser du några områden i stallarbetet som kan effektiviseras?

Ser du några områden i företaget som helhet som kan effektiviseras?

Tycker du att din verksamhet är kostnadseffektiv?

Ser du några variationer över året i prestationsresultat i din verksamhet?

Värdeflödesanalys
Först nuläge för att se vad som är värdeskapande och inte
Sedan framtidsläge – hur skulle en optimal lösning se ut för oss?