

Equine manure as a sustainable solution

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Preface

This bachelor thesis contains a research for a final graduation project. It has been written by a 4th year student International Equine Business Management at the Aeres University of Applied Sciences in the Netherlands. The original task came from the module AAFWi (graduation project P1), to be able to write a thesis and show all the required skills obtained throughout the entire bachelor's degree.

This basis of this research originally came from my passion for developing better methods of sustainable use of equine manure and preservation of the climate. As the world moves further into sustainability, preservation of natural resources and changing the ecological footprint, will need input from every sector in order to make a greater change. How will we do this? It is not only my passion to find out, but also provide tools to break down barriers for the equine sector.

This thesis could not have been written without a strong support group. First, I would like to thank my family and partner, who supported me and always provided me with advice. Second, I would like to thank my thesis advisor for his patience and guidance throughout the process.

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Summary

English

The aim of this research was to find out in how far the Netherlands could learn from Sweden regarding the use of manure, in order to create awareness within the equine sector on sustainable solutions. The number of horses in Europe exceeds 5 million and keeps increasing, therefore contributes to greenhouse gas emissions. Each horse produces about 20kg of manure every day, containing nitrogen and ammonia, which could be handled in a more sustainable way. Research institutes in Sweden have researched sustainability, concluding that incinerating manure is the best possible solution. Unfortunately incineration is expensive and can't be done at a small scale with the current technology, therefore solutions are sought to cooperate with larger scale farms. Incineration is environmentally friendly due to its full use of material and gases that are converted into energy and digestates. The willingness to change and pay for sustainable solutions is more complicated. A survey that was spread in the Dutch equine sector amongst 20 stable owners showed that a three quarter of the respondents was unwilling to change towards more sustainable solutions, money and time are big factors that are holding them back. In this case incineration would be too big of an investment, but it could provide them with heat and electricity. The Swedish equine sector lacked research on willingness, but stables have already implemented sustainable solutions, which showed a more active attitude than the Netherlands. Culture is part of the willingness, values and beliefs influence how people act and think. Sweden scores an 8th place on the environmental performance index as a very feminine country and hold a positive and optimistic attitude towards the future. However they not assertive to start something new or innovate. The Netherlands scores an 11th place on the environmental performance index and has a less feminine society than Sweden. They are independent and entrepreneurial, but lack willingness to pay and are pragmatic about the future. The Dutch society resists towards climate policies and their pragmatic attitude holds them back from changing. In conclusion the Netherlands could learn from Sweden to hold a more optimistic attitude towards the future and towards sustainable solutions. It is recommended to investigate how to make incineration of manure a more viable solution in the Netherlands by doing research and by forming cooperations with larger farms or landfills.

Dutch

Het doel van dit onderzoek was om na te gaan in hoeverre Nederland kan leren van Zweden met betrekking tot het gebruik van mest, om zo binnen de paardensector bewustwording te creëren over duurzamere oplossingen. Het aantal paarden in Europa groeit over 5 miljoen en draagt daarom bij aan de uitstoot van broeikasgassen. Elk paard produceert dagelijks zo'n 20 kg mest met stikstof en ammoniak, dat op een duurzamere manier verwerkt kan worden. Onderzoeksinstituten in Zweden hebben onderzoek gedaan naar duurzaamheid en kwamen met het verbranden van mest als de beste oplossing. Helaas is het duur en kan het met de huidige technologie niet op kleine schaal gebruikt worden, samenwerken met grote bedrijven kan een oplossing zijn. Verbranding is milieuvriendelijk door het volledige gebruik van de mest die omgezet wordt in energie en vergistingsgassen. De bereidheid om te veranderen en te betalen voor duurzame oplossingen is gecompliceerd. Uit een onderzoek dat in de Nederlandse paardensector is verspreid over 20 paardenstallen blijkt dat driekwart van de respondenten niet bereid is te veranderen naar duurzamere oplossingen, geld en tijd zijn grote factoren die hen in de weg staan. Verbranding zou in dit geval een te grote investering zijn, maar het zou hen wel kunnen voorzien van warmte en elektriciteit. Het ontbrak de Zweedse paardensector aan onderzoek naar de bereidheid, maar de stallen hebben al duurzame oplossingen geïmplementeerd, wat een actievere houding aantoont dan Nederland. Cultuur maakt deel uit van deze bereidheid, waarden en overtuigingen zijn van invloed op het handelen en denken van mensen. Zweden scoort als een zeer vrouwelijk land een 8^{ste} plaats op de milieuprestatie-index en heeft een positieve en optimistische houding ten opzichte van de toekomst. Ze zijn echter niet assertief om iets nieuws te beginnen of te innoveren. Nederland scoort een 11^{de} plaats op de milieuprestatie-index en heeft minder vrouwelijke samenleving dan Zweden. Ze zijn onafhankelijk en ondernemend, maar zijn minder bereid om te betalen en zijn pragmatisch over de toekomst. De Nederlandse samenleving verzet zich tegen het klimaatbeleid en de pragmatische houding weerhoudt hen ervan om te veranderen. Concluderend kan Nederland leren van Zweden door een meer optimistische houding aan te nemen ten opzichte van de toekomst en duurzame oplossingen. Het is aanbevolen om te gaan onderzoeken hoe verbranding van mest in Nederland een meer haalbare oplossing kan worden door onderzoek te doen en door samenwerkingen aan te gaan met grotere boerderijen of stortplaatsen.

Chapter 1 – Introduction

The Research Topic

With the world covered in urban areas, it is key to transform especially those dense areas towards sustainability. As written by Elmqvist et al. (2019) urban cities are responsible for 70 of global greenhouse gas emissions. Equine enterprises, according to Elgåker (2012), are based in peri-urban areas, right outside of expanding cities. This rises environmental issues, as the distances between residential areas and equine enterprises grow smaller, intensifying the use of smaller pieces of land and causing odour nuisance¹. As the number of equines in Europe keeps increasing, the amount of manure they produce increases as well. Each horse can produce up to 20 kg of manure every day (Liljenstolpe, 2009). The manure from the stables is often collected to be used as a fertilizer, but part of it is left outside in the paddocks and pastures. Because the manure contains a lot of nitrogen and organic matter, the paddocks and pastures can be a significant source of greenhouse gases (GHG), such as nitrous oxide (N₂O), carbon dioxide (CO₂) or methane (CH₄) (Maljanen & Martilla, 2019).

The question that rises within the equine sector is how they can handle manure in a more sustainable way and in what length. Equine businesses and private stable owners struggle to find their place in a more sustainable world. Not everyone is willing to invest and change their business in order to help the environment. Pressure rises from the government as more laws and regulations arise, causing more resistance from not only equine, but other livestock enterprises as well. For example, in 2019 the council of state in the Netherlands discovered that the nitrogen policy was incorrect and that 75 percent of the Dutch land area contains too much nitrogen and ammonia. In order to change this, the number of livestock has to be reduced and stricter requirements have been put in place for keeping livestock and spreading manure, putting more pressure on livestock businesses. (Nagtzaam, 2019)

Sweden, however, embraces sustainability and was the most sustainable country in the world for several years, at the moment they still hold an honourable 8th place (Yale, 2018). It was the first country in the world that passed an environmental protection act and they are now the focus for leading environmental research and want to show the world that they can build a modern welfare state within nature's limits. This resonates in every sector, including the equine sector. Many researches have been performed on a more sustainable equine sector. In 2016 at the Goteborg Horse Show, a complete report was presented with an overview of the challenges regarding to keeping horses and how they envision to create a sustainable sector (Lovsta, 2016). (Sweden, 2020)

The reason therefore to conduct this research is to learn from Sweden and to find out multiple sustainable solutions for manure, how Sweden is already applying these methods, and how willingly Dutch Equine stable owners are to change towards more sustainable solutions. Because sooner or later, with all the developments and changes regarding climate change, Dutch equine businesses will have to adapt. The adaptation will have to be on a local level, because the stables directly impact their local surroundings. This research can be useful for regional land-use planning and for writing policies on a national level to assure that all equine businesses handle manure in the same sustainable way. The European Commission (2020) is already planning their 2050 long-term strategy, where they will aim to become climate-neutral with zero

¹ Odour nuisance = a bad smell that is offensive and interferes with the enjoyment of the affected property (Eden, 2020)

greenhouse gas emissions. This means that all parts of society and economic sectors will have to play a role, big or small, from industries, to agriculture and forestry.

Theoretical Framework

In contrast to the agricultural sector, the equine sector is one of the few sectors that is promising and that continues to grow. The number of horses in the European Union is estimated to exceed 5 million, with Sweden having the highest number of horses per capita and the Netherlands & Belgium having the highest density of horses per 1.000 acres land (Liljenstolpe, 2009). Horses started out as useful instruments in agriculture but have grown to be an important part of modern life with a purpose in leisure and sports. The sector has highly diversified with activities on a business-scale such as breeding, sports, recreation, trade and slaughtering. The number of horses and horse related activities have increased, with equestrian games becoming an important part of rural economies. But not only the sector has changed, the consumer too, who nowadays pays more attention to environment and welfare, and with that change comes the responsibility to help preserve our climate. (Hägglom, Rantamäki-Lahtinen and Vihinen, 2015)

Worldwide, a transition towards an improved and more sustainable future can be seen, with 2015 declared as a super environmental year (Leonard, 2015). With the number of horses rising, so does the impact on the environment. Some equine activities give a negative contribution to climate change, such as degradation of farmland, eutrophication of water and more toxic chemicals in our environment. According to Brundtland (1987) “sustainable development meets the needs of the present generation without compromising the ability of future generations to meet their needs”. Meaning, not exceeding the planet’s limits, respect human rights and caring for our domesticated animals. If horses would graze on natural pastures, they could contribute to more biodiversity and capture more carbon. Unfortunately, horses graze mostly on cultivated (ploughed, fertilized and planted) land, therefore grazing needs to be planned so that the land is not exhausted. Manure is a great source for sustainable agriculture because it contains valuable nutrients like nitrogen, potassium, phosphorus and micro-nutrients. Besides that, it also contains bedding material useful to structure and fertilize the land. But too much manure used on the soil can hurt the surface water and groundwater, this is mainly due to the amount nitrogen and phosphate (Rijksdienst, 2020). In case of big stables (+100 horses), this proposes a problem. The production of manure per individual horse every day is around 20kg. This can contribute to a runoff of Nitrogen and Phosphorous. The total European equine manure production reaches nearly 100.000 tons. Most of it goes to waste disposals or combustion plants in urban areas instead of being used as fertilizer for the land. There is too much manure to only spread on the land, therefore, other sustainable solutions for manure must be sought. (Liljenstolpe, 2009)

Universities in Sweden have researched sustainability in the equine sector, discovering new methods and applying them in current equine businesses. The Dutch equine business owners’, however, are still behind. The question rises if they are unaware of sustainable possibilities, if they are unwilling or if it is simply too expensive for them to change. Without change, they will keep contributing to a negative climate change effect. The quantities are limited compared to other branches of livestock farming, but since stables are often located in or around suburban areas and nature reserves, the released ammonia from the stables can pose as a problem in those areas (Van der Peet, 2018).

Sustainability is a cultural issue, because cultures are essential to create a sustainable planet. Every piece of scientific evidence that describes the issues around climate change are filtered through each person’s own world-views. That resonates in the Cross-Cultural Kaleidoscope from Jenny Plaister-Ten (2014) which describes how culture is build up from an outer and inner lens. The outer lens representing the external aspects (history, economy, politics, education, religion, family, geography) with the impact of cultural norms,

and the inner lens which represents a person's inner world (personality, emotions, thoughts, values and beliefs). As stated by Andrew J. Hoffman (2015) people filter incoming information through motivated reasoning, and the information is analysed through prior preferences, personal experiences, and knowledge. Each person searches in his/her own way for more information and reaches his/her own conclusions about complex issues that will lead them to discover supportive evidence to their pre-existing beliefs. The world-views people develop are a direct result of the values held by their cultural identity. When sustainable issues are introduced, they are valued differently depending on how people's friends, colleagues, trusted sources, or respected leaders' value and frame these issues. People identify themselves with people that gravitate towards the same opinions. The GLOBE project from Robert J. House (Barmeyer & Franklin, 2016) shows how culture is defined as "shared motives, values, beliefs, identities, and interpretations or meanings of significant events that result from common experiences of members of collectives that are transmitted across generations". GLOBE uses that information to focus on understanding, describing and predicting the impact of cultural variables, in this case it will help describe the influence of culture on sustainability. Also, Geert Hofstede (2010) explains that there are different levels of culture, the first of them being culture at a national level according to one's country. The Dutch and the Swedish national culture are described by him in 6 different dimensions: power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, and indulgence. Each dimension has its own deep embedded drivers which describes how the Dutch culture is different from the Swedish culture. One of the main reasons that Sweden is ahead of the Netherlands and other countries regarding sustainability, is due to the country's femininity. Hofstede describes a feminine society as "one where quality of life is the sign of success and standing out from the crowd is not admirable". The Swedes value quality of life and are motivated by liking what they do, with that attitude they manage to grow their economy while reducing carbon emissions and pollution. It remains the question if these drivers can give an indication towards the willingness to adapt to more sustainable solutions within each culture or that further research needs to be done.

Main question and sub-questions

The reason therefore to conduct this analysis and presenting the findings in a formal manner was to create a vision of sustainable solutions regarding manure towards equine enterprises. Furthermore, another reason was to connect the willingness to change towards more sustainable solutions and how culture plays a role in this matter. There has been little research in the Netherlands on the willingness of using sustainable solutions for manure and how culture plays an influence on this topic. To investigate how willing Dutch equine riding stables are to adapt sustainable solutions for manure, it is important to determine several questions for this research. The main question will be:

"IN HOW FAR CAN THE NETHERLANDS LEARN FROM SWEDEN REGARDING THE USE OF MANURE AS A SUSTAINABLE SOLUTION IN THE EQUINE SECTOR?"

Sub questions in order to answer the main question will be:

1. What kind of approaches to sustainable solutions for manure are there in the equine sector?
2. How willing are Dutch and Swedish equine businesses to exploit sustainable solutions of manure in their organization?

3. How does culture in both countries influence the adaptation towards more sustainable solutions of equine manure?

By answering these questions, the knowledge gap will be closed.

Objectives

The objectives to answer the main question are as followed:

- To create an overview of all the different possible solutions for the processing of manure.
- To find out the willingness of equine enterprises in the Netherlands to adapt more sustainable solutions.
- To find out the differences between the Dutch and Swedish equine sector based on culture.
- To create awareness within the Dutch equine sector on how to be more sustainable.

Chapter 2 – Methodology

This chapter describes the material and methods that were used in order to write the final bachelor thesis. For substantiation of this research the method of desk research (also known as secondary research) was used. First of all, studies, research papers and literature were reviewed with the focus on current problems in handling equine manure, sustainable solutions for equine manure and development in Sweden. Swedish institutions had already performed a number of researches on sustainability in the equine sector. The second method was a qualitative survey in the Netherlands focusing on equine enterprises and their current manure solutions, their willingness to change to more sustainable solutions and how all of that is influenced by culture. The setting of the research was “Horse manure as a sustainable solution in the Netherlands compared to Sweden”, with the intention of increasing the awareness towards sustainable solutions, providing more information on which different sustainable solutions there are and to explain the influence of culture with sustainability. The outcomes were sustainable solutions for horse manure, the willingness to change towards more sustainable solutions, and how the decision-making process can be influenced by culture.

Collection of data

The data needed in order to write this thesis was obtained with the help of the following databases: GREEN-I, Science Direct, Google Scholar, Wiley, Springer and Taylor & Francis. They were searched for peer-reviewed articles, i.e. relevant scientific articles posted in journals, reports from recognised research institutes, conference proceedings, or books written by multiple authors and containing references. The peer-reviewed articles were the primary source of information. As a secondary source non peer-reviewed references were used, such as reports from renowned institutes, magazines and publications of governmental institutions. This search was complemented with different combinations of the search terms: “equine manure”, “horse manure”, “sustainable/sustainability equine”, “sustainable/sustainability horse”, “equine sector”, “Sweden equine”, “paardenmest”, “sustainability”, “climate change”, “government sustainability”, and “culture influence”. The literature search was conducted in the months January, February, March, April, May and June of 2020.

Furthermore, data was collected by performing a survey focusing on the willingness of equine business owners to adapt to more sustainable solutions. The survey showed the current situation in regard to handling horse manure and what is holding the businesses back to step towards sustainable solutions. It gave an indication on the reasoning behind the chosen solution for manure, such as financial investment, the influence of culture and the pressure from the government.

Before reviewing (non) peer-reviewed articles, the current situation and willingness to change and/or influence of culture to a more sustainable solution for horse manure in Sweden were studied. As well as the culture in both countries and their view on sustainability. At the same time an online survey was spread among Dutch riding stable owners. After the survey’s answers were obtained, the current situation/willingness to change/influence of culture in the Netherlands compared with Sweden was thoroughly assessed.

Unpublished literature, reviews and publications in other languages than English, Dutch, German and Swedish were excluded. Scientific papers older than 10 years and on an experimental basis were not used to substantiate this research. As well as websites that were not from renowned institutes (bias) or unpublished literature were excluded.

Reliability

This desk research was qualitative; therefore, the reliability of the collected data was reviewed. This means that the research results should be able to be reproduced when the research is conducted under the same conditions. Most of the research can be reproduced by using the same theoretical data. Working with the same articles that are written in the reference list of the research, will provide the same pieces and background of information, and is therefore reproducible. This means that when collecting data, the same method needs to be used.

The survey is more difficult to reproduce due to the open questions. The respondents were asked for their personal opinion and for their companies' current situation regarding manure. This means that if the research is reproduced 5 years from now, the respondents most likely will have different answers to those questions. If, however, the survey is repeated within weeks or a year, there is a greater chance of the same result which will indicate a higher test-retest reliability.

The results of the research may be reproducible, but that does not automatically mean that they are valid, as validity is about the accuracy of a measure.

Analysis

The answers to sub-question 1 and 3 were formed by combining theoretical data from several different sources and provided with information about the immediate group of data (equine business owners). It tried to make connections between different pieces of information and provided one summarized answer.

The second part of the research and the answer to sub-question 2 were substantiated by performing a survey. The survey showed the willingness to adapt, the influence of culture and the influence of the government. Since there was no possibility to approach every equine business owner in the Netherlands, a smaller sample size of the population was approached. This sample of Dutch equine business owners gave an indication on the current situation regarding sustainability in the Dutch equine sector.

The conclusion of this research is usable/applicable for Dutch equine business owners and private horse owners, they formed the units of the analysis. There were no restrictions in regard to age or type of equine business. The construct in this research, also known as the characteristic, was the measurement of the willingness to change towards more sustainable solutions in the Netherlands.

Evaluation criteria

All the used studies and articles were individually assessed regarding study design, potential bias or confounding. However, no study was excluded based on these criteria, any limitations will be discussed in the research text.

The results of the analysed data and information were evaluated on 5 different criteria as designed with the OECD² model (OECD, 2020). The first criterion was relevance, checking if the outcome of the research consists with the theme of the document and if the outcome can actually be used in practice. The second criterion was efficiency, did the outcome provide the desired results, did it give a clear answer to the main- and sub-questions? The third criterion was effectiveness, did the research achieve all the objectives written in chapter 1? The fourth criterion was the impact of the research, this analysed if the outcome provided a

² OECD = Organisation for Economic Cooperation and Development (OECD, 2020)

positive impact on the equine sector, if the results were as expected and if the results were beneficial for Dutch equine business owners with information on sustainable solutions. The last criterion was the sustainability of the research, this analysed if the outcome of the research was beneficial for the equine sector and if it is likely that this research will continue in some sort of form in the future.

Survey

To discover the current situation regarding manure in the Netherlands, the willingness of equine enterprises to invest in more sustainable solutions and the influence of culture and/or the government, a survey was filled out by the owners/managers of riding stables. The respondents were asked for their personal opinion and for their companies' current situation regarding manure. The written questionnaire was a qualitative research with open-ended questions and a limited number of respondents. The survey results were split into two different sections: topic specific questions and open opinion questions. The outcome provided the current manure solutions of Dutch equine enterprises, their willingness to change towards more sustainable solutions and how all of that is influenced by culture.

The aim of the survey was to talk to 20 stable owners. The survey was held in the month June and took approximately 15 minutes to fill in, the survey was spread by contacting the riding stables by email. The specific questions that are to be asked in the survey can be found in appendix I.

The answers to the survey were not measured with the program SPSS, since this survey was qualitative and not quantitative. Instead the answers were individually evaluated and were searched for common grounds. The results were written in text form and provided an indication on the awareness of sustainable solutions, if they are willing to change and how they are influenced by external factors.

The following definitions were used in the survey to clarify certain subjects:

Sustainability – According to Brundtland (1987) “sustainable development meets the needs of the present generation without compromising the ability of future generations to meet their needs”. Meaning, not exceeding the planet's limits, respect human rights and caring for our domesticated animals. It is formed by three pillars: economic, environmental, and social – also known as profits, planet, and people.

Sustainable solutions – According to Liljenstolpe (2009) is the production of manure per individual horse every day around 20kg. This can contribute to a runoff of Nitrogen and Phosphorous. The total European equine manure production reaches nearly 100.000 tons. Not only does that manure cause nuisance, it also impacts the soil and groundwater, contributing to pollution and therefore has a negative impact on the climate. To change that, a sustainable solution for manure must be sought. The manure must be used in a way that it can be recycled without harming the environment. Cultural influence on sustainability – As stated by Andrew J. Hoffman (2015) sustainability is a cultural issue, because cultures are essential to create a sustainable planet. Every piece of scientific evidence that describes the issues around climate change are filtered through each person's own world-views. When sustainable issues are introduced, they are valued differently depending on how people's friends, colleagues, trusted sources, or respected leaders' value and frame these issues.

Governmental influence on sustainability – The Dutch government is taking measures to protect the country against the consequences of climate change. According to Rijksoverheid (2020) global warming can be limited to reduce greenhouse gas emissions. They have set national and international targets with agreements about how the Netherlands will achieve these goals. Among other things, this is how the standard for phosphate use in agriculture came into being, influencing how much manure you are allowed to spread on your land.

Chapter 3 – Results

3.1. What kind of approaches to sustainable solutions for manure are there in the equine sector?

The equine population worldwide has grown with more than sixty million, with five million horses in Europe today (Clarkson, 2017). European data showed that in higher consuming regions, there are higher levels of education and low unemployment rates, and the density of the equine population is much larger. This is caused by today's urban consumer interest in the equine sector. At the same time, equine operations struggle to be accepted by local citizens and with environmentally acceptable practices. Citizens mostly show concerns about surface run-off from paddocks and manure storage that enters the groundwater, as well as aesthetic questions, smells, and the attraction of insects and rodents. Equine enterprises occasionally lack capacity or infrastructure when it comes to the treatment of manure. As a result, disposal problems arise and can entail considerable costs. Managing equine manure faces challenges, not only cost-wise, but also in sewage sludge³ or biowaste⁴. Due to the main activities in the modern equine sector (horse riding), a majority of the horses are now being stabled, those horses can spend up to 23 hours per day being inside (Casey, 2002). However, the time in the stable can depend on what time of the year it is, in northern countries such as Sweden, horses spend more time in the stable during colder seasons such as autumn and winter (Lundvall, 2013). Horses in warmer climates usually spent more months outside on the fields. Bedding material for the stable should be carefully chosen due to the horses' sensitive respiratory tract. It should be easily available, low in cost, easy to use/clean, dust free, needs a high water binding capacity, and the manure waste should be fit for biodegradation⁵. Straw is a bedding material that is used most frequently worldwide, it can be used directly or as pellets. Other materials such as wood shavings, hemp, and linen are usually more expensive and the waste disposal causes more issues. The bedding material, along with the horse manure, needs to be removed on a regular basis to manage a hygienic environment both for the animals and the people. This mixture of manure and bedding is becoming more problematic, not only in costs, but also environmentally. Manure has a great potential to be used as energy generator, but this requires more knowledge. (Kusch, 2014)

Removing the waste out of the stables creates a pile of organic material. Removal depends on stable management, for some stables this is even multiple times a day, for other stables it is a deep clean every two weeks, where new bedding is added everyday without removing the old and every two weeks the stable is completely mucked out. Daily mucking generates more spent material compared to two-weekly mucking. In most cases the solid manure is removed everyday to reduce odour nuisances and ammonia gasses. Each horse can produce up to 20 kg of manure and 9 litres of urine per day (Liljenstolpe, 2009). In Europe, the annual equine stall waste generation can be up to 40 to 70 kg per 100 square metres. About 1/3 of the total wet weight in the equine stable waste comes from the bedding material. Looking at volume, one horse produces manure and bedding waste every day of around 0,06 m³. But in case straw is used as a bedding, this

3 Sewage sludge = “defined as any solid, semisolid, or liquid residue generated during the municipal wastewater and sewage treatment process” (Twardowska, Schramm and Berg, 2004)

4 Biowaste = “waste (such as manure, sawdust, or food scraps) that is composed chiefly of organic matter” (Webster, 2020)

5 Biodegradation = “the gradual breakdown of a material mediated by specific biological activity” (Azevado, Santos and Reis, 2008)

volume can double to 0,12m³ per day. Table 1 has created an overview on the different volumes of horse manure with different kinds of bedding. (Airaksinen, Heinonen-Tanski and Heiskanen, 2001)

How the stable waste is managed after removal, depends on the storage and purpose. Different conditions and how long the manure is stored, can influence dry matter and weight content. However, the nutrients (e.g. phosphorus, potassium) usually do not change that much. Storage can cost a significant amount of money and it can have a larger environmental influence, therefore, the time manure is stored should be kept as short as possible. In reality the duration of manure storage is considerable, for example in Sweden, they sometimes have to store the manure for nine months in order to sustain the chain of manure to agricultural fields. (Airaksinen, Heinonen-Tanski and Heiskanen, 2001)

TABLE 1: Amount of horse manure when different bedding materials were used in box stalls (daily mucking) (Airaksinen, Heinonen-Tanski and Heiskanen, 2001)

Bedding material	Annual amount of manure [m³/(horse*a)]	Dry matter [%]	Total content weight [kg/m³]
Long straw (cut to 10 cm strips)	19,5	36,8	170
Wood chips	12,4	27,0	480
Peat with sawdust (mixture 3:1)	12,4	26,4	440
Shredded newspaper	11,7	32,5	410
Peat with straw (mixture 3:1)	11,7	28,9	410
Peat	9,8	23,7	600
Peat with wood chips (mixture 3:1)	9,1	28,8	440
Hemp	9,1	35,3	340

3.1.1. Different solutions for equine manure

As mentioned earlier, horses can produce a significant amount of manure annually. There are a number of options for handling manure depending on the number of horses, labour, equipment, locations of streams, depth of groundwater, runoff/drainage, and soil type. All of the options have advantages and disadvantages, some are better for the environment than other options. In each option where manure is stored on location, attention has to be paid that the surface is watertight, with a drainage system for rainwater, if possible a roof or tarp to protect the storage, and it should be kept away from any creeks or wells. Attention also needs to be paid to protect the surrounding water resources. (Shere, 2012)

The following solutions were found and will be discussed below:

1. Spreading equine waste to agricultural land
2. Composting
3. Biogas plants (liljenstolpe)
4. Combustion

5. Delivery to landfill⁶
6. Specific purposes: delivery to cultivation sites
7. Collaboration with other farmers

Preferably the waste would be treated/used on location, this reduces transportation, which is expensive and bad for the environment. Unfortunately many stable owners do not have enough available land to spread the manure because most horses are found in areas with little agricultural land, and they mostly do not have the equipment to alternatively process the manure. Therefore, they have to get rid of the waste in another way that is cost-efficient. Many countries have legislatively restricted the delivery of manure to landfills, or the high taxes have made the option economically not interesting. This leads to disposal of manure in dumpsters or stockpiling it to allow decomposition on its own.

Figure 1 shows a systematic overview from different manure solutions which will be explained below.

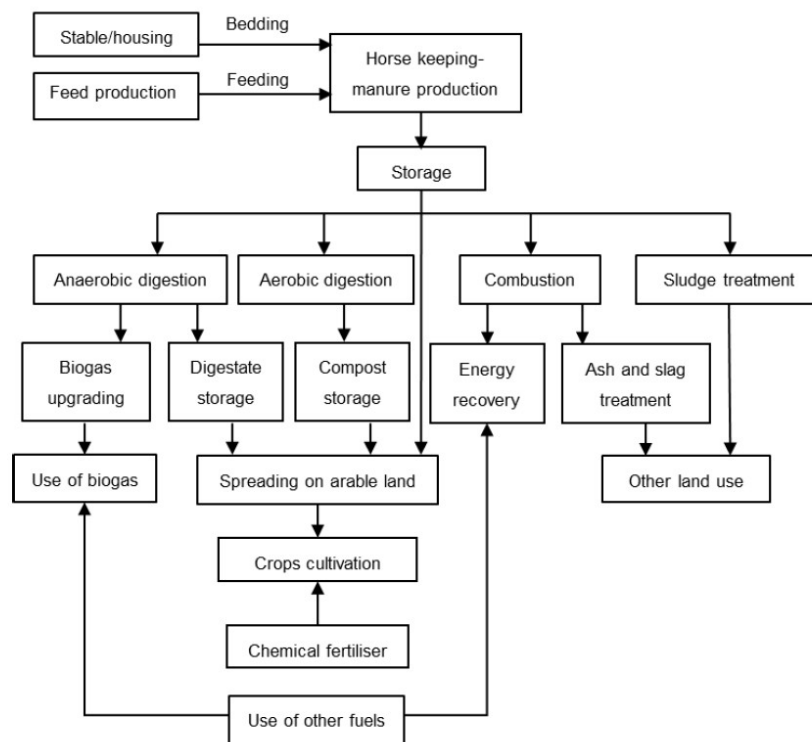


FIGURE 1: Systematic overview manure solutions (Hennessy & Eriksson, 2015)

1. Spreading equine waste to agricultural land

The most common option, is to use manure directly on agricultural land. Advantages of this method are that the sunlight and the drying process on the land kills pathogens (organism that can cause diseases). It can also be very beneficial for crop production. The manure supplies nutrients, improves physical soil conditions, restores organic matter, improves the capacity to hold water, and it is good for microbial activity. Compared with other animals' manure, equine manure has less amounts of carbon and nitrogen, and it contains more fibre. Most small stable owners, however, lack the equipment to load, handle, haul, and spread the manure (Mesner, 2006). Purchasing this equipment can be a big investment, another option is to ask neighbours to hire or borrow equipment.

⁶ Landfill = waste disposal site

How it works:

- Test the soil in multiple places to find out the nutrient level
- Spread thinly and only spread what is needed to improve the land (based on the soil tests)
- Don't spread manure on fields where horses will graze soon, the fresh manure can contain parasites and contaminate the land
- Don't spread manure on fields surrounded by water
- Optionally apply a nitrogen fertilizer if the used bedding material is sawdust or wood shavings, this will counteract that the microbes from those bedding materials will draw nitrogen from the soil

(Pascoe, 2020)

Spreading manure on the land limits short-term environmental influence, but it does not eliminate the possible burden on the long-term. Substances like nitrate, nitrite and ammonia pose risks on the ecosystems in the soil and can be a pollution hazard. The substances run-off into the soil and can pollute the groundwater, can make the soil acid and can cause eutrophication⁷. In figure 2 an overview is seen that shows the substance release of a farm, every form of manure that is put on the land releases ammonia in the air and nitrate into the soil. Equine manure can also contain parasites, if not properly handled it will contaminate the pastures, feed and water. In the Netherlands no permit is needed if the amount of manure that is spread on the fields stays under 170kg of nitrogen per hectare per year, if it rises above this amount, than a so called derogation permit needs to be obtained (RVO, 2020). The Swedish government does not require a permit, but has other rules for spreading manure: the organic substance should contain less than twenty percent organic matter, less than two viable seeds and plant pieces per litre, and cannot contain more than fifty percent water (EU Commission, 2001). Therefore, in the last two years, composting has gained popularity due to environmental concerns.

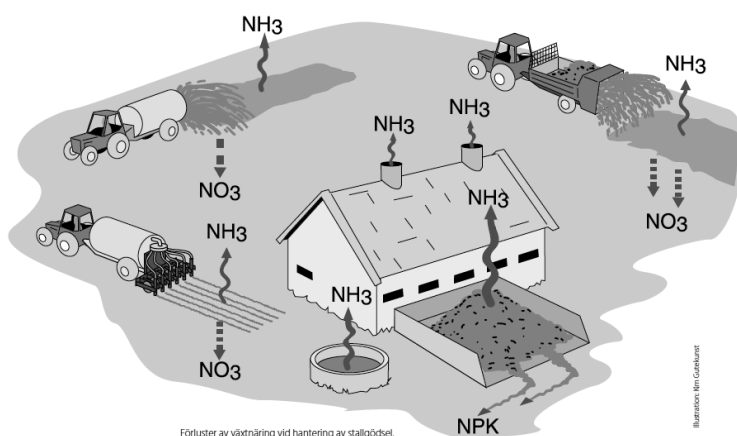


FIGURE 2: Substance output farm (Jordbruks, 2015)

2. Composting (aerobic digestion)

Some stables put significant effort into composting, others just create a stockpile and let the manure decompose on its own. The process of composting is very beneficial due to the cut downs of environmental

⁷ Eutrophication = “an accelerated growth of algae on higher forms of plant life caused by the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus and inducing an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned” (WHO, 2002).

effects and it can transform the waste into a product that is solid, has no odour and has no pathogens. Simultaneously it reduces the mass of manure that has piled up and kills parasitic eggs and larvae. Nowadays composting has gained popularity and is a familiar and accepted method to convert manure. There are two different ways of composting; mono-composting and co-composting. Mono-composting means that only the stable waste is being composted. When combining that with other organic matter (such as waste from the garden) it is called co-composting. No matter what sort of composting is used, information needs to be gained on the carbon:nitrogen ratio (C:N). In order to compost successfully, the microorganisms need food, water, air and the right temperature. (Amherst, 2020)

Moisture: the composting material should contain fifty to sixty percent moisture. Due to the heat within the compost, most of the moisture evaporates. Therefore it has to be manually wet with each load as you fill the compost bin or pile. (Amherst, 2020)

Air: oxygen is an important part of the process for the microbes when breaking down the material. E.g. sawdust can compost so compact that it becomes anaerobic. To provide oxygen in the middle of the compost pile, a perforated PVC pipe can be inserted into the pile. (Amherst, 2020)

C:N ratio: ideally in composting this would be a ratio of 25:1 to 30:1. Horse manure alone has the perfect ratio for composting, however, it is mostly mixed with bedding material and that mostly lacks nitrogen. How the stable is managed can influence the quality of the compost, e.g. by mucking the stalls daily, more bedding is collected and that results in a too high C:N ratio. Stable management should strive to collect the manure with as little bedding as possible. Additionally the stable should collect the manure from other areas such as paddocks, arena's and fields to have a better C:N ratio. Grass waste provides to be beneficial to the composting process as well, other waste should be avoided because it can cause excessive compaction. (Amherst, 2020)

Temperature: the decomposition process creates heat, which creates the ideal environment for microorganisms. They operate best in an environment with a temperature between 55-65°C, any temperatures above that can lead to the death of the microorganisms. To prevent the temperature from becoming too high, the pile should be turned about once a week. Fresh materials that are added (from mucking the stalls) need approximately 24 hours to heat up. After turning the compost pile, it needs around 48 hours to regain its temperature. (Amherst, 2020)

Compost piles: composting does not require special structures for storage. A simple structure is a free standing pile, this pile grows by adding manure from the top or the sides. The pile can be covered with a tarp to prevent too much moisture from heavy rainfall and it speeds up the process of composting. However, the pile takes up a big space (depending on the stable size) and needs to be on solid ground (such as concrete) to prevent the runoff of nutrients and harmful substances into the soil or groundwater. (Amherst, 2020)

Multiple pile/bin system: by using this system, the composting process can be sped up and it takes up less space. For small stables, three bins are recommended. The first bin contains the fresh collected waste until it is full. Then it can be moved to the second pile/bin, here it will start to compost. Again, when the second one is full, it can be moved to the third pile/bin. Moving the material from one pile/bin to the next, serves as part of the turning process. In the ideal situation, when pile/bin one reaches its capacity, the third one will be completely composted. (Amherst, 2020)

3. Biogas (anaerobic digestion)

Over the last few years, horse manure is seen more and more as a resource in biogas plants. The method however can be expensive due to the fact that these large plants require cooperation from multiple farms. The manure can be digested by a biogas plant and results in biogas as a product, biogas can then be transformed

into energy. It leaves a waste digestate with organic matter and nutrients, which can be returned to the fields. In order to digest the horse manure to become biogas, it needs material with more water, usually liquid manure from other animals is used. The costs for this process are slowly declining, so it could be a viable option for stables in the future. (Airaksinen, Heinonen-Tanski and Heiskanen, 2001)

Equine manure has a high-energy biomass and can generate enough energy to provide for the stables' space heating and hot water facilities. This of course would decrease energy costs and can in time decrease the ecological footprint of the stable. The manure of one horse, combined with bedding material, provides for 30 kWh energy or three litres of fuel oil (Ojajarju, 2020). This option has high potential, but proves to be challenging. First of all, equine waste has very different components, secondly, it already composts itself during storage or transport. In order to incinerate the waste, the stable would have to install a special plant with gauges and continuous measuring, but the stable would also have to apply for a special licence, because in some countries incinerating manure is illegal due to the exposed gases, incinerators would contain these gases. Finland and Sweden have started developing this method, by utilizing all the manure produced at FEI⁸ events and transforming it as an energy source to provide the equine events with electricity (Reuters, 2019).

Figure 3 shows an overview of the possible bioenergy system (seen on the right side). The manure is most likely transported to a biogas plant and there starts the anaerobic digestion which creates a digestate and biogas. The digestate can then be stored and later be spread on the land to help for example with the cultivation of crops. The transport to the biogas plants should be done with vehicles that run on energy efficient engines or with sustainable fuels in order to make this process as environmentally friendly as possible. The produced biogas could be used in houses, businesses and in transportation. If all fossil fuels in transportation vehicles would be replaced by biogas made from manure, a decrease of almost 75 percent of greenhouse gas emissions could be reached. (Hadin, Hillman and Eriksson, 2017)

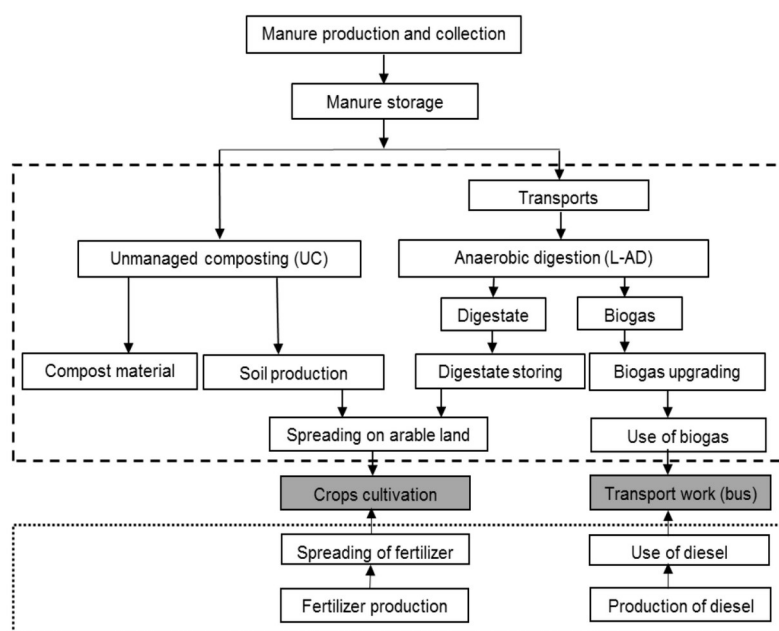


FIGURE 3: System description. Dashed line is the core system, dotted line the compensatory system (Hadin, Hillman and Eriksson, 2017)

4. Combustion

8 FEI = Federation Equestre International

Combustion is a great option to produce heat and electricity according to Liljenstolpe (2009), here you could use the manure as fuel in a boiler or convert the manure into pellets before burning. However, the valuable nutrients from the waste are lost and can therefore no longer be used on the fields. All the organic matter and nitrogen disappear during the process of combustion. Only minerals like phosphor and potassium are saved. Besides that, the process is a bit complicated. The manure cannot be used directly in the boiler because it consists of a high moisture level. Therefore the manure first needs to be dried in order to lower the moist percentage from 57.4 percent to only 9.7 percent. The drying equipment unfortunately also decreases the amount of carbon and nitrogen because the manure starts to compost during the drying process. (Hennessy & Eriksson, 2015)

5. Delivery to landfills (sludge treatment)

Choosing to dispose the manure in a landfill might be the easiest solution but can be costly according to Pascoe (2020), due to trucking costs and drop-off charges at the disposal site. Therefore, this option is only incidentally used by small stables or private horse owners. At the landfill the manure is mixed with sewage sludge and it is composted to be used as a soil cover on a landfill. In Sweden this used to be a relatively normal practice, but will no longer be an option in the future due to a reduction in landfills (Hennessy & Eriksson, 2015). This option is probably the least sustainable option because the waste in the landfill degrades and produces run-off and gases. These gases mainly consist methane and carbon dioxide, some other gases are produced but in lower concentrations, but some of them are toxic for humans. The run-off can go into the groundwater and into surface water, contaminating water for both humans and animals. Thus, landfills have an ecological impact that can lead to the change of landscapes, loss of habitats and fauna, and they have a socio-economic impact since they can pose a risk for public health. Besides that, landfills cause odour nuisance that make the surrounding areas very unpleasant to live in. (Danthurebandara, Van Passel, Nelen, Tielemans and Van Acker, 2013)

6. Specific purposes: delivery to cultivation sites

The first option is to deliver the equine manure to mushroom cultivation sites. The mushroom cultivation sites use waste products such as chicken manure, horse manure, straw, and waste water. They combine these waste products into a high-quality substrate to create the ideal environment for mushrooms to grow. The gases that are released during this process are removed from ammonia before they go into nature. That ammonia is then used as a nitrogen source in composting. The mushrooms use the compost as a source of energy and utilize it to grow faster. (Office, 2019)

The second option is delivering the equine manure to pepper cultivation sites. Sweet peppers need sunlight, good soil and nutrients to grow healthy. Manure from cows, horses, chickens and sheep provide a high level of nitrogen and improves the soil texture. This makes the soil fertile and helps to produce healthy and thick fruits/vegetables. When adding the manure to a soil mixture of sand and clay, it allows the soil to use water more efficiently. However, the manure is high in ammonia and when it decomposes, it can burn the plant leaves, roots and stems. It therefore has to be carefully planted into the soil. (Chirstensen, 2019)

The third option is to utilize equine manure in the soil production for lawns. The manure can either be delivered to a production site that produces lawn fertilizer, or the manure can be used as a fertilizer for private lawns. If the manure is used for private lawns, it first needs to be composted. If the manure is mixed with the bedding material straw and it is composted in the way described above, then it becomes dark and crumbly. This waste material is rich of nitrogen, phosphorus and potassium. The option has two downsides, one it can kill young plants due to the high nitrogen levels and two it can get harmful bacterias onto fruits/vegetables that are intended for human consumption. The best way to use manure as a fertilizer, is to do it in the fall or winter, giving it months to break down. (Weigel, 2019)

All of these options are not that harmful for the soil and air quality, if done in a proper way, where the manure is first composted in order to become a better fertilizer and have less environmental impact. The exact impact depends per purpose and management system. The costs of manure retrieval can be significant depending on the amount of manure and the distance the manure has to travel.

7. Collaboration with other farmers

In Sweden a popular option is to collaborate with other farmers. Usually the stables do not own enough land to spread the horse manure and therefore have to pay for a different option to get of the manure, like those described above. Here a solution could be to work together with other farmers in the area. The farmer could use the horse manure to spread as a fertilizer on his/hers land. It might even be possible to receive hay or straw from the farmer in return, which would be beneficial for both the farmer and the stable. (SLU, 2013)

3.1.2. Water resource protection

The quality of water resources is impacted by horses in five different ways. First of all, land that is overgrazed by horses or where the soil is laying bare (no grass, exercise areas) can cause the sediment to erode in surface water. Secondly, most stables have an area where they wash the horses, the water is polluted by the soap/manure and enters the surface and groundwater. Thirdly, horse manure produces excessive nutrients and those can be carried away by rain water, showing why it is important to roof the manure storage area. Fourth, horses trample the fields and graze the grass very short, if this happens in areas close to a river this can lead to erosion and sedimentation of the riverbank. Lastly, vegetation (weeds and plants) that is removed in most fields, should be kept to filter and absorb water and pollutants from runoff. Erosion itself is a natural process, but with these five influences it can be accelerated. Therefore, horses should be grazing rotationally and switching fields roughly every three months to protect the fields from overgrazing and polluting the groundwater. (Shere, 2012)

3.1.3. Current situation equine sector Netherlands & Sweden

Since this research is a comparison between the Netherlands and Sweden, it is useful to take a look at the current situation regarding equine manure in both countries. What kind of methods are regularly used and are they already implementing sustainable solutions?

SWEDEN

A research from 2016 compiled from 67 stable owners with a total of 502 horses showed that in Sweden, 69 percent of the horses are kept in stables. About 74 percent of the manure is collected all year round from the stables, only a couple stables collected the manure from the paddocks and fields as well. Softwood shavings are the most common bedding material that is used by stables. In some stables straw, peat, hemp, wood shavings or straw pellets were used to improve the amount of nutrients in the horse manure, creating a higher quality compost material. In 46 percent of the cases the manure is stored on concrete plates, 26 percent of stables uses containers and the remainder keeps the manure on the ground without protection of the soil. However, since they use softwood shavings, there is minor leakage of nitrogen into the water or soil because the material composts really fast, but phosphorus has been found in higher percentages in the run-off due to this way of uncovered storage. Composting is a very common way to handle manure, it is used to improve the soil or to fertilize the soil for crop production, forty percent of the stables in the research spreads composted manure on neighbouring agricultural land. About twenty percent uses the composted manure on their own farmland and around ten percent disposed it at a special waste deposit land.

The use of equine manure as an energy resource is named in many research papers, but in practice it is still not commonly used. It is mentioned that the anaerobic process of digesting manure can potentially reduce the

environmental impact if for example the biogas is used to replace fossil fuels in transportation. (Kielen, Olsson, Nordgren & North, 2016)

THE NETHERLANDS

In order to find out the current manure situation in the Netherlands, a qualitative questionnaire was spread and answered by twenty equine stable owners/managers. The first question that was asked was what kind of bedding they use in the stable, fifteen stables use straw as a bedding material, four stables use a combination of straw with sawdust or wood shavings. The last stable did not use bedding at all because the horses are not stabled, but they are on the field 24 hours a day. How the manure is stored is distinctive, roughly half of the stables showed to use a manure pile. The other stables use a container to store the manure or a manure pit or plate. Then the respondents were asked if they remove or spread the manure from the land. Here nine stables answered that they do not remove the manure from the land, seven stables remove it from the fields and paddocks and four stables spread it over the fields. The use of the manure is quite clear, fourteen stables have the manure picked up by a mushroom cultivator, the most common method in the Netherlands to get rid of manure. The other six stables compost it, use it as a fertilizer, and one stable formed it into pellets that can be used in stoves as a source of energy. Lastly, they were asked how often the manure is picked up, most of the stables have a weekly or two-weekly pickup from a cultivation company as seen in figure 4.

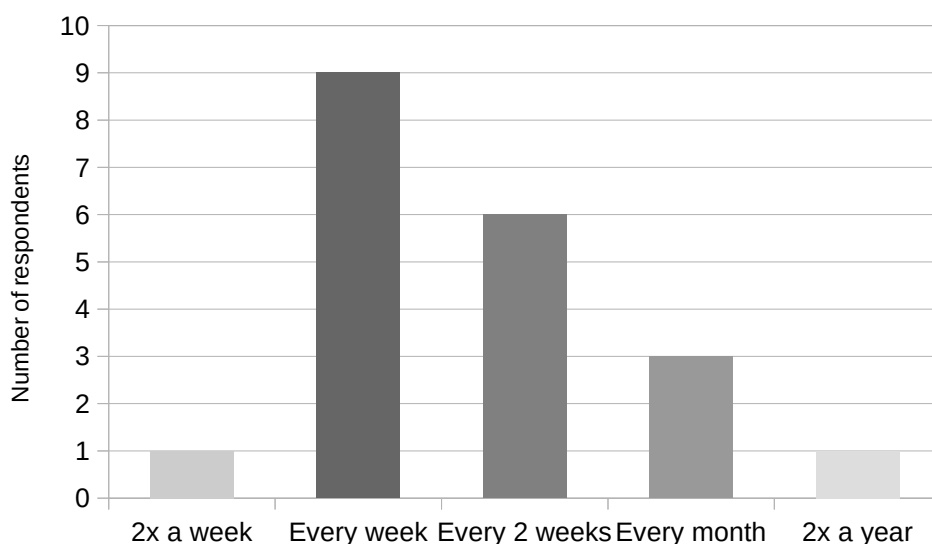


FIGURE 4: Pickup of manure storage

3.1.4. Preliminary assessment

Each of the options has its own benefits and disadvantages, besides that they each come with a different cost. In table 2 an overview is seen reviewing all the manure solutions. Bioenergy, combustion and landfill disposal are the most expensive options. Making bioenergy out of equine manure has the least impact on the soil and air. Composting, spreading manure and collaborating with other farmers are economically more interesting. This will be further elaborated on in chapter four and five of this research. Making a decision as stable owner or manager, is not that simple, there are more factors involved than just choosing one that you like. That also leads to the second sub-question, how much are the equine businesses willing to exploit on these solutions.

TABLE 2: overview of solutions for equine manure

	Costs *	Soil impact **	Air impact **
1. Spreading manure	€ / €€	-	-
2. Composting	€	++	+
3. Bioenergy	€€€	++	++
4. Combustion	€€€	++	+
5. Delivery to landfills	€€€	- -	- -
6. Specific purpose	€€	/	/
7. Collaboration other farmers	€	-	-

* Costs are expressed in €: cheap, €€: medium, €€€: expensive

** Impact is expressed in ++: less to no impact, +: little impact, -: medium impact, - -: big impact, /: unknown

3.2. How willing are Dutch and Swedish equine businesses to exploit sustainable solutions of manure in their organization?

According to Marbuah (2016) the willingness to change is not only an attitude, it is influenced by factors such as age, level of education, income, culture and marital status. The willingness comes from both internal and external factors, for example the role of the social capital plays a big external influence. If the country's social capital has a pro-environmental attitude, than that can positively influence citizens decisions on sustainability. The influence is not only seen in buying goods, but also in the attitude towards environmental regulations and policies on sustainability. If a country has a positive attitude towards sustainability they can stimulate collective action from citizens towards a common good, in this case towards environmental sustainability. Society is currently part of a shifting paradigm explained by Jedbratt (2019), where so far more questions are being asked then there are answers. Sustainability comes in waves, the previous wave was shifting towards acting correctly, with non-toxic foods, sustainable products, locally produced products, fair-trade, climate smart choices, urban agriculture and back to natural materials. The current wave has changed more towards a non-toxic environment, using fewer products, awareness of a products life cycle, reversing emissions, affordable sustainable choices, disconnecting, and new innovative materials.

It is interesting to review the willingness of both countries, not only in the equine sector, but also in general. It will show if the sector follows the general willingness on a national level or if its behind or ahead of the society.

3.2.1. Willingness on a national level

SWEDEN

In 2018 a research was done in the Nordic countries on the impacts of sustainability on buying decisions, which stated that 66 percent of the Swedish respondents view sustainability as a very important topic. When asked about buying decisions, the Swedes stated that 73 percent is influenced by sustainability when making a buying decision and about 42 percent of the respondents are willing to pay ten percent more for sustainable products. When asked which industry was most important to focus on sustainability they answered with the

food industry. They feel that this industry influences the most factors; animals, people and the environment. (Ridder, 2020)

However it is also found that Swedes say one thing, but do another. A research in 2019 (Ossianssion) showed that 65 percent of Swedes said they wanted to purchase more sustainable products and support sustainable brands, but the reality showed that only 26 percent actually did. But when advertising online that other people purchased environmentally friendly alternatives, the purchase of sustainable goods suddenly increased with 65 percent. The Swedes have a desire to fit in and follow social patterns, therefore they need to be stimulated to purchase sustainable alternatives. It is also worth mentioning that Swedish women are more motivated to change than Swedish men, for example three out of four women plan on flying less or not at all during the holidays. A climate survey from the European Investment Bank showed that eighty percent of Swedish women want to reduce their meat consumption, opposed to men with only 65 percent. The research also asked about the willingness to sacrifice their dream vacation destination, Sweden came out with only 40.7 percent willingness. The survey also showed that overall Swedish citizens are planning on making less lifestyle changes than some other EU countries are planning to do. One topic that the Swedes scored really high is sorting waste, 95 percent of the respondents stated that they plan on sorting their waste. When asked about renewable energy, only 53 percent of Swedes said they plan to use less heat for their homes in the winter, for the rest of EU this is 78 percent. However, 39 percent of the Swedes already switched to a green supplier of energy, which is fourteen percent higher than the EU average. (Ekman, 2020)

A research performed by IKEA in fourteen countries (2018), showed that the Swedish citizens are 47 percent optimistic about the future and believe it is not too late to help stop climate change and they want to innovate on energy efficiency. Another 36 percent is supporter, they also believe it is not yet too late, but they say that government support is needed to consume less and recycle more. Only ten percent is disempowered and 8 percent is sceptic, they believe it is too late to change or that the changing climate was not even caused by humans.

THE NETHERLANDS

The government in the Netherlands is all about ambitious goals, they plan to have a fully renewable energy supply by 2050 and want to reduce greenhouse gas emissions with 49 percent by 2030. However a research from CBS (The mission of Statistics Netherlands) in 2018 revealed that until then only six percent of all energy was renewable, putting them at the bottom of the EU list and far away from their goal in 2050. The Dutch citizens are becoming more aware of climate change. In 2012 only forty percent agreed that the air, water and soil are polluted, in 2017 that number had grown to 55 percent. More people are becoming willing to pay more taxes in order to preserve the environment. In general, ninety percent of the Dutch citizens view the environment as very important, with no big difference between men and woman. Elderly people (65+) care more about the environment than young adults, and higher educated citizens care more than those with a lower education. The CBS research showed that ninety percent of the Dutch citizens are aware of their own energy use and a remarkable 52 percent has already switched to a green energy provider, which is more than double of the European average at 25 percent (EIB 2019). The people that reduce their energy use, do this mostly to reduce costs, e.g. by plugging out appliances or putting on a sweater instead of turning up the heat. (Witt & Schmeets, 2018)

The research of the European Investment Bank (2020) performed in thirty countries showed that 63 percent of Dutch citizens have already reduced their meat intake and 79 percent buys local or seasonal products to fight climate change. The Netherlands scored a first place when they were asked if they walk or cycle on a daily basis to fight climate change, of course cycling had already been very popular for many years. 75 percent of citizens take a holiday in their own or neighbouring country to fight climate change, 67 percent agreed to fly less on holidays. From the people that do fly, 38 percent pay to make up for their carbon

emissions. The research also asked about the willingness to sacrifice their dream vacation destination, the Netherlands came out with only forty percent willingness. (EIB, 2020)

3.2.2. Willingness within the equine sector

SWEDEN

Unfortunately exact research about this topic has not yet been done in Sweden, but examples of willingness can be found. There are a number of (bigger) stables that are very environmentally active and that work on a daily basis to change towards a more sustainable business. Every year the Lövsta Future Challenge is organised, an international event with dressage and jumping at the Gothenburg Horse Show. As mentioned in chapter 3.1.1. this event has started using manure as a source of energy. The manure is recycled in an incinerator and provides heat and electricity for the entire event and for surrounding urban areas. The jackets the competitors wear, are made out of sustainable material and the travel from and to the horse show are all climate compensated. Every year an award is presented to a company or organization that is working on sustainability, the so called Lövsta Future Challenge Environmental Award. With these events they try to influence and inspire the equestrian sector to become more sustainable. (Lovsta, 2016)

This years (2020) winner of the Lövsta Future Challenge award was Julmyra Horse Center, one of Scandinavia's largest training facilities for trotters (type of equine sport) with 225 horses and a vision to double the amount of horses in the future. This company has worked since 2011 on reducing nutrient run-off that contributes to water eutrophication. Their stable is located in a sensitive area in the Northern Baltic Sea Basin District, therefore they decided to work together with the LIFE IP Rich Waters EU-project to improve water quality. They are at the front of manure management and are working on new systems to prevent run-off. For example they started mopping the pastures, ditches are re-drained and phosphorus dams are build to manage storm water. Besides working on the run-off from manure, they also manage their manure storage by composting it. The stable poses as a role model through their work with the authorities and by spreading their knowledge with others in the horse industry. (Lovsta, 2020)

Another example is Lövsta Stuteri, a breeding stable that successfully trains competitive horses in dressage and jumping, who have set their own environmental goals. They are ISO 14001 certified, meaning that they run an effective environmental management system (EMS). The certification ensures that the stable improves resource efficiency, reduces waste, measures environmental impact, meets legal obligations, and improves general environmental impact (ASQ, 2015). Their overall goal is to become an international example with sustainable horse activities, with the following smaller environmental goals:

- Climate compensation for air travelling (both horses and people) in cooperation with www.uandwe.com
- Environmental work is presented in the stallion catalogue every year to spread and inspire knowledge
- Creation of an action plan to protect and develop the biodiversity of the fields
- Suppliers are demanded to do environmental work
- Worked together with GotEvent, Swedish Equestrian Federation and The Natural Step to create the report; *The Horse as caretaker of our planet*, 2016.
- Machines are replaced with electric machines and vehicles to reduce fuel consumption and noise
- Waste is recycled (as well as horse shoes)

- Climate friendly thermal heating and reduction of energy (e.g. LED lighting)

(Stuteri, 2019)

A last example are the Swedish National Equestrian Centres Strömsholm, Wangen and Flyinge, three international equestrian education centres. Together their mission is to educate future equestrians, not only in the sport but also in all aspects of the horse sector (Stromsholm, 2020). Strömsholm is ISO 14001 certified and has place for two hundred horses. Since they are internationally known, they wanted to set an example how a big stable could run in a more environmentally friendly way. This resonates in daily mucking of the paddocks to prevent run-off in the groundwater, reducing household waste, using rapeseed oil to heat the six indoor arena's, the use of non-chemical cleaning products, and getting roughage from local farmers. Their biggest goal is to raise awareness in the equine sector, not only through the education centre, but through the entire supply chain (Sustainable Horse, 2015).

Of course these three examples do not directly show how willing every stable owner in Sweden is to change, but it certainly gives an indication that at least the bigger stables are trying to change and set an example. The urge to raise awareness for sustainable methods is rising and it is now a part of the courses in equestrian education centres. An exact research on willingness in the equine sector was done in Finland, number 7 on the environmental performance index, right below Sweden (EPI, 2020). Agricultural and equestrian research centres from Sweden cooperate often with similar research centres in Finland to learn and educate each other. Both the Swedish and Finnish equine sector are very similar and try to raise awareness and develop new sustainable methods. Therefore the results of the Finnish research on willingness are worth mentioning because they contribute to give an indication on the willingness in the equine sector in Sweden.

The research in Finland was done on a cross-section of the equine industry, with 580 respondents. They researched the willingness of small, medium and large equine businesses to change towards sustainable solutions. This contained four elements: the willingness to do business, the willingness to exploit services, the willingness to invest in technology and the willingness to exploit technology. In the last step of the research they presented the respondents with several sustainable solutions and asked them about the willingness to adopt and the reasons behind it. The product with the highest willingness to adopt was fuel. The stables are interested in making fuel out of manure, in the form of pellets or biogas. The reasons behind this is that it produces energy that the company can use for electricity and heating, it is a form of recycling. If the stable is on the larger size, it can even produce enough energy for households in the area. Small stables are interested in this solution and hope that in the future they can build small-level units and incinerators. At the moment this solution is still very expensive to invest in, therefore they are more willing to pay for a service that will collect the manure, transfer it into energy and provide it back to the stable. They suggested that current landfills could be a good place to install incinerators and that they could utilise the manure. The large stables are very interested in possibly installing incinerators on their property. For them it seems to be the solution with the most potential in the future. The willingness to adopt technology is two sided, on one side the willingness to adopt is high, but that is to exploit technology. On the other side the willingness is low, if it means that the stable has to invest in new technology. (Nasiri, Rantala, Saunila, Ukko and Rantanen, 2018)

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In order to find out the willingness of equine business to change to more sustainable solutions concerning manure, a qualitative questionnaire was build and answered by twenty stable owners/managers spread over the country. First, to get an indication how big sustainability is in the equine sector, the question was asked if the stable owners are aware of sustainable solutions. As a result, more than half (fourteen respondents) answered that they are not aware of sustainable solutions or that they are not interested. This resonates to the

fact that there has not been so much attention on sustainability in the equine sector and that it is not a topic that is discussed a lot among stable owners. The other six respondents did know about some solutions, mostly they had heard about the possibility to use manure as a bio energy source. Some of them became aware of this solution through the research that has been done in Scandinavia, others via livestock farms that have applied this technique. A couple respondents named mushroom cultivation and composting as a sustainable solution.

What is noticeable is that there were also quite a few negative reactions amongst the respondents who mentioned that in their eyes equine manure does not pose any risk for the environment and does not cause any nuisance. This connects with the resistance and scepticism coming from the agricultural sector. In 2019 and in 2020 there have been protests by farmers against new rules about the amount of manure that can be spread on agricultural land and the number of animals that a farmer can own (Rutten, 2019). These rules have been put in place to decrease the nitrogen and phosphate output in the atmosphere. Even though there is quite some evidence on the harmful impact farming has on the environment, a lot of farmers are resistant to believe because they are afraid for the future of their farms and scared that these new rules could affect their business. Now this does not necessarily mean that the respondents with the negative comments feel the same way the farmers do, but it gives a slight indication. Hence why the survey also asked if the stables see themselves changing towards more sustainable solutions in the future. Here eight respondents answered with a definite no, they do not want to change their stable, but the other twelve answered with a yes or maybe. For some it depends on the factors shown in figure five, the biggest factors being money and time. Changing mostly takes investment, as read in sub-question 3.1, and the solutions for equine manure are not always cheap. It is a matter of finding what fits best for the company, bigger stables might be able to invest more than smaller stables and also have more space. However when asked in the survey if they were willing to invest and if yes how much, thirteen respondents answered that they did not want to spend any money on buying new installations. Only four respondents are interested in investing up to €5000,-. But some mentioned that they were willing to invest more if it would provide something back from them, such as energy to provide the stable with lighting and heat.

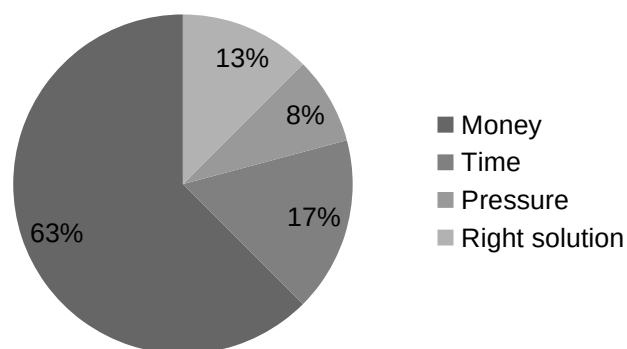


FIGURE 5: Dependent factors for changing towards sustainable solutions

In the last part of the survey the respondents were asked if and how the decisions for their stable are influenced by policies and regulations from the government. One third exclaimed that they are not influenced by the government. Others said that they are influenced by permits, such as environmental permits (disposal, waste, storage, recycling) and surrounding permits (buildings and structures). A couple of respondents noted that they might be influenced more by the government in the future, due to new rules or regulations that might come into place, or if disposal of manure becomes more expensive (higher taxes). Again here the respondents mentioned some negative comments, such as:

- The government does not know what it is doing regarding manure disposal
- The nitrogen output of horse manure has never been properly measured
- The equine sector is not seen as an individual sector, instead it is kept under agriculture and livestock

This shows that they would like that the government sees the equine sector as its own sector and that they perform more research on this topic. Some respondents also mentioned that they are afraid that they are put out of business if taxes are raised or more regulations are put in place. The last question that was asked is if the stables feel pressure from the government to change towards more sustainable solutions, fifteen respondents answered this with no, they do not feel under pressure.

3.3. How does culture in both countries influence the adaptation towards more sustainable solutions of equine manure?

This sub-question with the main subject culture was added to give insights on where people's beliefs and values come from. It is interesting to see if the culture in one country is maybe a source of the countries willingness. As a child you are raised in the nature versus nurture principle, some traits you get through nature, they are deeply imbedded in your DNA such as your physical appearance. Other traits are nurtured, gained by experiences as a child, such as how you were raised and educated. If for example, you had bad experiences with superiors in your childhood (e.g. verbal abuse from a parent or teacher), this could result in a lack of trust in superiors of the country, such as the government followed by a lack of trust in policies and regulations. Other parts of nurture can be the religion and communities someone was raised in. These can have a substantial influence on a persons beliefs and values, which can resonate in the willingness to adapt and pay for more sustainable solutions. These theories are explained through four different models/theories that were shortly introduced in the theoretical framework part of this document. These will now be further explained and investigated, together they will form the basis to answering this sub-question. The first model is the cross-cultural kaleidoscope by Jenny Plaister-Ten, the second is how culture changes the climate change debate by Andrew Hoffman, the third model is the GLOBE project by Robert House, and the last model is the country comparison by Geert Hofstede. In the end of this chapter a SWOT-analysis shows a clear overview of all the models/theories showing the highlights of the culture in the Netherlands and Sweden.

3.3.1. Cross-Cultural Kaleidoscope

Jenny Plaister-Ten (2014) approaches the world in a kaleidoscope (figure 6) with an internal lens and an external lens, representing the internal and external environment. The context of a situation is formed by the external environment, while the meaning of the context is formed by the internal self. Subconsciously every person forms values and beliefs, it is useful to think about them and create awareness. The internal lens from the kaleidoscope represents that persons personality with his/hers thoughts, feelings and emotions, showing his/hers cultural identity. The external lens is the influence from outside, it can influence the thoughts, feelings and most importantly it can influence someones decisions.

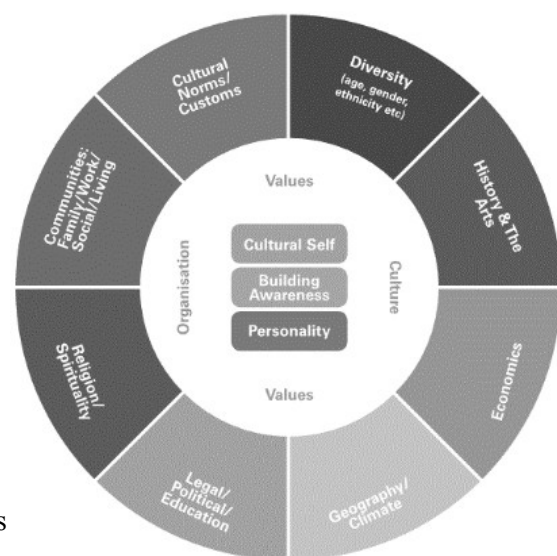


FIGURE 6: The Cross-Cultural Kaleidoscope (Ryambling, 2015)

The external lenses are divided into eight different sections. The first lens is diversity, this talks about the ethnicity of a person, how old that person is, and any gender differences. The second lens is the historic lens, history plays a very important part in how people have developed over the years, a turbulent past of a country can leave quite the imprint on people, for example slavery still leaves its marks on people and leads to intense discussions. The third lens is the economics lens, especially for leaders or business owners the economic structure of a country can influence the decisions he/she has to make, especially during economic crisis such as a recession. The fourth lens is the lens of geography and climate, such as noise levels and light can influence how people interact, e.g. in densely populated areas there is less respect for personal space. The fifth lens is the legal/political/education lens, in countries with strict rules and punishments and rote⁹ educational methods, consent usually follows which influences someones attitude towards authority, creativity and taking risks. The sixth lens is religion and spirituality, a persons beliefs in religion can guide/influence behaviour which can drive that person or get in the way. The seventh lens are communities, especially family communities can influence someones social responsibility along with faithfulness towards a specific group. The eighth and last lens are cultural norms, this influences constructs like guilt and shame, people for example can be ashamed when they believe in equality and they see someone being harassed for being gay. (Plaister-Ten, 2014)

In order to understand the general culture in both countries an overview of the external lenses was created below for Sweden and The Netherlands.

SWEDEN

Sweden is not just IKEA, ABBA and Volvo, although these stereotypes have defined the country for the past decade, the country has changed and is far more than just its stereotypes.

- **Diversity:** besides the stereotype of tall people with blond hair, the Swedish population is diverse with fifteen percent of the population having a foreign background (The Local, 2012). The largest age group with almost forty percent, are people between the age 25 and 54 (World Population Review, 2020).
- **History:** Sweden is remembered by its Viking Age (the 9th century), where the vikings raided most of northern Europe and traveled overseas. In 1300 Sweden was united as the Kalmar Union together with Denmark and Norway, later on Sweden exited this union. Sweden was defeated in the Great Northern War in 1700 and the country was reduced to its current size. During World War I and II they managed to stay a neutral part. (Sweden, 2020)
- **Economics:** Sweden is part of the European Union, but not part of the Monetary Union and have their own Swedish Krona instead of the Euro. They have an economy based on knowledge, unified in global value chains, high standards of living, high standards of well-being, higher incomes and higher environmental quality. The economy is strongly growing, more is consumed, invested and exported and import has increased due to the strong demand from citizens (OECD).
- **Geography & climate:** the climate in Sweden is cold in the south with cloudy winters and cool summers with long hours of light. The north of the country has extremely cold winters with little daylight and short summers. The land is mainly flat or rolling lowlands with mountains in the west. The capital city Stockholm is the most dense area with 1.5 million citizens (out of a 10.1 million population). (Briney, 2019)
- **Legal/politics/education:** the government type in Sweden is a parliamentary constitutional monarchy. The Swedish are very gender equal, making sure that women have equal powers as men

9 Rote methods = memory method that involves repeating information over and over again (Improve Memory, 2019).

to shape society. The government works on six interim goals; equal distribution of power and influence, economic equality between women and men, equal education, equal distribution of unpaid care and household work, equal health, and lastly that men's violence against women must stop (Statistics Sweden, 2018). The school system is financed with taxes and is mandatory between the age of 6 and 16, the students in Sweden score remarkably high in mathematics, reading and science (Sweden, 2019). According to the Ranking of National Higher Education Systems 2020, Sweden gets a 5th place with a score of 84.3 percent (Williams & Leahy, 2020).

- **Religion & spirituality:** 58 percent of the Swedish population is member of the Lutheran Church, with only a small amount of people that attend regular Sunday services and only nineteen percent of the Swedes claim to be religious. The presence of religion is seen in the performance of traditional rituals or ceremonies, such as Lucia (the bearer of light) who brings light in the dark winters. Sweden also ranks among the ten most tolerant countries in the world. (Sutherland, 2020)
- **Communities:** a community gives a sense of belonging and purpose. There are many forms of communities, in Sweden exercising is very popular and there are many fitness communities. The Swedes take high value in job satisfaction and have build entire communities around work, such as social events after work hours. (Lau, 2017)
- **Cultural norms:** Swedes believe in equality, are humble and find bragging unacceptable. They like to listen to others and they speak soft and calm. Hospitality and kindness is not taken for granted and they will always say thank you. The Swedes work hard, but also take time to go out and enjoy themselves. Because they believe in equality, they don't encourage competitions and children are raised to believe that they are not more special than any other child. Family is extremely important and children's rights are protected. (Commisceo, 2019)

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The Dutch like their products cheap and they are careful when it comes to spending money. But the Netherlands is more than bikes, cheese, wooden shoes and windmills, although these stereotypes still exist there are more deeper levels of this culture.

- **Diversity:** 76.9 percent of the population has a Dutch ethnicity, 2.4 percent is Turkish, 2.3 percent Moroccan, 2.1 percent Indonesian, 2.1 percent German, 2 percent Surinamese, 1 percent Polish, 4.8 percent other. The biggest age group, with six million people (out of 17.2 million population), are people aged between 40 and 65 years old. (CIA, 2020)
- **History:** a big historical event that left its imprint on the Netherlands was World War II. The country was invaded and occupied by the Germans in 1940. The Jewish population was summoned and the whole country suffered under the burden of war and increasing terror. They resisted against the attempts from Germany to take over the country and succeeded, but it has left a permanent imprint on citizens and is now an integrated part of education. (Amsterdam.info, 2020)
- **Economics:** the Netherlands is part of the European Union and has the sixth-largest economy in the EU. They have a high trade surplus which remains consistent, they hold stable industrial relations and have a low unemployment rate. Their biggest export partners are Germany, Belgium, UK, France and Italy. The biggest import partners are China, Germany, Belgium, US, UK and Russia. (CIA, 2020)
- **Geography & climate:** the Netherlands has a marine climate with cool summers and mild winters. Most of the land is below sea level with the protection of dikes. The country is small but highly urbanized. (CIA, 2020)

- **Legal/politics/education:** the government type in the Netherlands is a parliamentary constitutional monarchy with a civil law. The Kingdom of the Netherlands consists of four parts: the Netherlands, Curacao, Sint Maarten and Aruba. The Netherlands is governed by a coalition of several political parties, with the prime minister from one of those parties. Children are obligated to follow education from the age 5 until they are 16 years old. According to the Ranking of National Higher Education Systems 2020, the Netherlands gets a 10th place with a score of 81.6 percent (Williams & Leahy, 2020). (Amsterdam.info, 2020)
- **Religion & spirituality:** most of the country is atheist (50.7 percent), which is accepted and respected among Dutch citizens. The rest is Roman Catholic (23.6 percent), protestant (14.9 percent), muslim (5.1 percent) or something else (5.6 percent). Most of the population however (75.5 percent) agrees that religion is not an important part of their daily lives. (CIA, 2020)
- **Communities:** volunteering is a big thing in the Netherlands, with a community of almost 5.5 million volunteers (out of 17.2 million population). A part of being Dutch is to complain, there have risen many communities that complain over Dutch activities, such as the train-services or political campaigns. (Chow, 2017)
- **Cultural norms:** like the Swedes, the Dutch people believe in equality and are a modern society. The people value independency, like to rely on themselves, are tolerant and modest, and are entrepreneurial. They grow up to be educated and to work hard with ambitious goals. The Dutch people value their heritage, with a big history in arts and music. It is considered rude when people won't introduce themselves by shaking hands. (Bosrock, 2016)

Now that an overview was created by using the cross-cultural kaleidoscope, it gives insight on the culture in both countries. The tool mainly creates awareness on the impact of culture and systematizes the external factors.

3.3.2. How culture changes the climate change debate

Each and every person in this world filters statements through their own world-views with motivated reasoning, these are called cognitive filters. Opinions about climate change are formed with preferences, personal experiences, and previous acquired knowledge. Most persons identify themselves with a group or community, the values from this group can form an important part of forming our own world-view. The opinions and values from friends, family, colleagues, or respected leaders are part of forming an individual world-view. Each person is a product of their internal and external surroundings, their cultural identity can overrule scientific evidence. Cultural values can create basic assumptions that lead how a person thinks and feels when it comes to problems they face. Besides that, people also have limited access to the amount of information on climate change, and not everyone has the same cognitive ability to understand scientific evidence. (Hoffman, 2015)

The atmosphere and the ocean are warming, the amount of snow and ice is decreasing causing the sea levels to rise, and the greenhouse gas emissions are increasing. Human influences on the climate have been the dominant cause that the climate is changing so rapidly. But not every person is interested to take on the discussion and read in to the evidence. There are six different types of persons when it comes to believing or not-believing in climate change. First you have the alarmed, these people are very worried about the changing climate and view it as a personal threat. Then you have the concerned people, they believe in climate change, but they are not one-hundred percent certain and don't view it as a big threat. The third group of people are the cautious, they are slightly convinced that the climate is changing, but their belief is weak and they can easily change their mind. The fourth group are the disengaged, they are not sure that the

climate is changing. The fifth group are the doubtful people, they don't know if climate change is real and definitely do not see it as a personal threat. The last group are the dismissive people, they are sure climate change is fake and do not worry about it at all. (Hoffman, 2015)

Usually climate change is viewed as a technological or economical problem, but it is mostly behavioural and cultural. As said before climate change is caused by human actions, even though some people refuse to believe that. The increasing number of cars we use, the number of factories there are to provide us with products, the big scale farms to provide us with enough meat, the amount of electricity we use, and much more. These all produce greenhouse gas emissions, impacting the atmosphere and causing the climate change. In order to reduce the environmental impact, humans would have to change their consuming behaviour, such as driving less cars, using fewer products, and using less electricity. But people's reasoning is influenced by emotion. The view on climate change conflicts with concerns over the government and market, religion and who we trust as representatives. Resulting that some people view climate change as something that environmentalists push through a radical socialist agenda, they start to not trust scientists anymore and think that the government is tampering with the issue. Media plays a big role in steering people in a certain direction, but for example social media can lack scientific evidence. Social media allows people to find information towards their values, such as information in a pessimistic or optimistic direction regarding climate change. It can also help build communities on online platforms, besides, Google remembers the search history and gives people personalized ads based on their interest. (Hoffman, 2015)

In order to move forward in the climate change process, there are three possible ways. The first is the optimistic path, if the development of energy technology would be groundbreaking, reliable, affordable and pollution free, then people would be very likely to accept because it does not require them to change their values. The second path is for the pessimists, where people will remain to fight and hold steady to their own values. The third path is the consensus based path, finding solutions in the middle by social debate. People are more likely to accept the message if it comes from someone they trust as representative, especially spoke-persons that can represent climate change from both sides should emerge to shape the debate. Scientific information should be broken down into understandable pieces, available for anyone who is interested. The scientific evidence should debate both sides and not put forward single statements. The message should be personal and explain directly how it influences that person or his/hers environment. (Hoffman, 2015)

SWEDEN

Being the first country worldwide that passed an environmental protection act, they have not looked back. They have embraced sustainability and hold the eighth place on the environmental performance index. The Swedish economy keeps growing while reducing the amount of emissions and limiting pollution. They have managed to provide half of the energy in the country with renewables and created strict legislations to reduce greenhouse gas emissions., leading to noticeable cleaner air and water. They are now the focus for leading environmental research and want to show the world that they can build a modern welfare state within nature's limits. This resonates in every sector, including the equine sector. With ambitious goals to go fossil-free and to have one-hundred percent renewable energy by 2045. Sweden corporates with Nordic neighbours to innovate technology in a green way. According to the Gullers Grupp (2018), Swedish citizens are highly committed to contribute towards a greener future and hold a positive and optimistic attitude. Almost 95 percent of the population in Sweden thinks that the country will be, or is affected by climate change and 81 percent thinks they can slow down climate change by reducing their ecological footprint. Climate change is personal for the Swedes and they work hard to be more energy efficient by driving greener cars, lowering the consumption of energy and traveling by train instead of airplanes. They have a positive attitude towards government instruments to reduce climate impact, but with extra taxes and fees the support is slightly

declining. However, they are willing to pay more for goods and services of companies that work on their footprint. More women than men believe in climate change, women also sense a responsibility towards society to change their behaviour. In conclusion the Swedes are optimistic and belong with the group of alarmed and concerned people. (Sweden, 2020)

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With an 11th place on the environmental performance index, the Netherlands is good on its way in reducing environmental impact (EPI, 2020). Climate policies have been developed by the Dutch Government (2020) in order to reduce greenhouse gas emissions. They believe in standing together in the battle against climate change and are committed to multiple international agreements. The countries climate policies are based on national and international research, they agree with research that climate change is mainly caused by human activities. Besides reducing greenhouse gas emissions, they have also built dikes and dunes to protect the country from flooding due to the rising sea levels. They try to find and develop new technology for sustainable energy sources, such as utilizing solar energy and wind power. The Dutch citizens are sceptic according to an article from the AD newspaper (Dongen & Mersbergen, 2019), only 48 percent believes that the government should take action to reduce greenhouse gas emissions, however 65 percent are worried about the changing climate. A couple of years ago 78 percent of the population was worried, but ever since the new climate policy Dutch citizens are unenthusiastic. They are mostly afraid, as mentioned before in subquestion 2, that it will cost them more money and that they have to give up on experiences such as vacations by plane, shorter showers, and eating less meat. This has led to cognitive dissonance, people hold to their own beliefs and values and search for communities and groups that doubt the necessity of reducing greenhouse gas emissions. Although two-third of the citizens are convinced that climate change is caused by humans, the group that wants to take action (six out of ten citizens) for their own behaviour is visibly smaller. Men, elder and lower educated citizens are the most sceptic, in controversy to women, students and higher educated citizens, who would like to take action. In conclusion the Dutch population has mixed feelings about climate change, they are slightly concerned and cautious, they see climate change as a real thing, but are not that willing to change their own behaviour.

3.3.3. The GLOBE project

As shortly described in the introduction, the GLOBE project by Robert J. House (Barmeyer & Franklin, 2016) shows how culture is defined as “shared motives, values, beliefs, identities, and interpretations or meanings of significant events that result from common experiences of members of collectives that are transmitted across generations”. In this study 17,000 middle managers participated out of 62 different cultures. The study measured cultural values in nine different dimensions: “performance orientation, assertiveness, future orientation, humane orientation, institutional collectivism, in-group collectivism, gender egalitarianism, power distance, and uncertainty avoidance” (Barmeyer & Franklin, 2016). In Houses’ book *Culture and Leadership Across the World* (2007) he dedicates one chapter to each of the 62 different cultures. This research focuses on chapter three and seven in the book, which discuss the culture in Sweden and the Netherlands.

SWEDEN

The GLOBE project used quantitative research in order to receive information on all 9 dimensions. The questionnaire was answered by 896 middle managers (82.3 percent male, 17.7 percent female), 97.1 percent of them having a full Swedish nationality. They categorized the answers of the results in two different sections, first the society culture “As Is”, followed by the society culture “Should Be”. The “As Is” society represents how the country currently performs in each dimension, the “Should Be” society shows what the country aspires. For each dimension, the country was ranked in comparison with the other 61 countries that

were part of the GLOBE research. The score system that was used is as followed: 1) very low, 2) low, 3) relatively low, 4) medium, 5) relatively high, 6) high, and 7) very high. (Chhokar, Brodbeck & House, 2007)

TABLE 3: Result Sweden GLOBE project (Chhokar, Brodbeck & House, 2007)

Cultural Dimension	Society Culture "As Is"		Society Culture "Should Be"		Diff. "Should Be" – "As Is"
	Score	Band ^a (Rank) ^b	Score	Band ^a (Rank) ^b	
<i>Institutional Collectivism</i>	5.22	A ^d (1)	3.94	C ^d (58)	–1.28
<i>Uncertainty Avoidance</i>	5.32	A ^d (2)	3.60	D ^e (58)	–1.72
<i>Gender Egalitarianism</i>	3.84	A ^c (8)	5.15	A ^d (2)	1.31
<i>Future Orientation</i>	4.39	B ^d (9)	4.89	C ^d (56)	0.50
<i>Humane Orientation</i>	4.10	C ^d (28)	5.65	A ^c (9)	1.55
<i>Performance Orientation</i>	3.72	B ^c (48)	5.80	C ^c (42)	2.08
<i>Power Distance</i>	4.85	B ^d (51)	2.70	C ^c (31)	–2.15
<i>In-Group Collectivism</i>	3.66	C ^c (60)	6.04	A ^c (11)	2.38
<i>Assertiveness</i>	3.38	C ^c (61)	3.61	B ^c (38)	0.23

^aBands A > B > C > D > E are determined by calculating the grand mean and standard deviations across all scales. These means and standard deviations are used to calculate high, medium, and low bands of countries (Test Banding, cf. Hanges, Dickson, & Sipe, 2004). ^bNumbers in parentheses (Rank) indicate rank order for Sweden among the 61 GLOBE countries. ^cThree group bands identified ranging from A to C (high–low). ^dFour group bands identified ranging from A to D (high–low). ^eFive group bands identified ranging from A to E (high–low).

As you can see in table 3 the first three dimensions in the "As Is" category; *institutional collectivism*, *uncertainty avoidance*, and *gender egalitarianism* score very high, ranked A in comparison to the other countries in the research. This makes Sweden a collectivist society, where relationships with others and interconnectivity between people is important. Equality is valued and rules/procedures are there to reduce uncertainty. Looking at the "Should Be" results, you can see that the focus lies slightly different. *Gender egalitarianism* is still valued as something that is supported and needs to be supported in the future. From the Swedes point of view, they aspire to work more on *humane orientation* and *in-group collectivism*. Humane orientation focuses on encouraging and rewarding people for being kind and caring towards others. In-group collectivism focuses on expressing pride, loyalty and cohesiveness in organisations and/or families. However, the "As Is" society culture represents Sweden scoring very low on *in-group collectivism*, they rank a 60th place in comparison with the other countries. So although they are ranked as the most collectivist society, they are also extremely individualistic and come forward as a timid and non-assertive society compared to the other countries in the study. (Chhokar, Brodbeck & House, 2007)

For each dimension in the "As Is" culture, there can be named a few examples how it is seen back in the countries culture. First of all on *institutional collectivism* Sweden scores very high, this can be seen in high unionisation (nine out of ten wage earners are member of a union), they have a high-tax situation to provide for shared interests, they have the 'Right of Public Access' and the 'Principle of public access to official records' which gives citizens the right to access official records. The second dimension, *uncertainty avoidance* describes how the country handles unpredictability of future events. By protecting the rights of citizens and with policies, Sweden scores very high in this dimension by keeping a close eye on public rights and fully equipping all citizens with health services under insurance. The third dimension, *gender egalitarianism*, is again a dimension where the Swedes score very high. Men and women mostly enjoy an equal status, however there is still a slight tug towards the male side. You can see an increase of women on the Swedish parliament (they cover almost fifty percent), but in most working life men still dominate and enjoy more income. Something that has changed is that after the birth of a child, the parents get fifteen months of parental leave together, it is up to them how they divide that between the mother and the father. The fourth dimension is *future orientation*, Sweden ranks pretty high and is always occupied with planning

and making investments for the future. They have a long-term focus which can be seen back in the years of investing in education and in the spending on research and development. The fifth dimension is *humane orientation*, which focuses on encouraging and rewarding people for being kind and caring towards others. Sweden scores medium in this dimension even though other countries view them as being very humane. That is because in the GLOBE research, the dimension is based more on individual characteristics rather than on institutional ones. But humane orientation can still be seen in the Swedish Prison and Probation service, where people receive little intervention and get all the care they need in prison. Besides that Sweden is very friendly towards its handicapped citizens, they have several disability policies to make sure even the handicapped can enjoy as much in life as possible. The sixth dimension is *performance orientation*, where Sweden scored on the lower side, it talks about how people are rewarded and encouraged. This is an effect of the stimulation of organizations rather than individuals, however companies are aware of this and try to encourage and reward their employees themselves. The seventh dimension is *power distance*, Sweden scores medium because power is usually equally shared. This is seen in the lack of dress-code in companies, standard burial grounds with no exception for wealthier people, and the fact that they do not show paintings/pictures of political leaders in public places. The eighth dimension is *in-group collectivism*, Sweden scores relatively low in comparison to the other countries and is therefore seen as an individualistic society. This resonates with the score of institutional collectivism, most citizens prefer to be independent and strong, they do not want to be a burden for other people. Children are taught early on to be independent and are expected to leave the house at the age of 18. The number of single-households in Sweden is higher because generations will not live together, or at least not long. The final dimension is *assertiveness*, Sweden has the lowest ranking out of all 62 countries. The Swedes are more laid back, timid, and surely not dominant or aggressive in social environments. They do not like to express emotions and like to keep to themselves. Verbal and non-verbal expressions of emotion (such as a hug or a kiss on the cheek) are rare. (Chhokar, Brodbeck & House, 2007)

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In the Netherlands the questionnaire was answered by 287 middle managers. There are two tables describing the results of the research, the first table discusses the “As Is” society, the other table shows the “Should Be” society. Again each dimension, the country was ranked in comparison with the other 61 countries that were part of the GLOBE research and the score system that was used is as followed: 1) very low, 2) low, 3) relatively low, 4) medium, 5) relatively high, 6) high, and 7) very high. (Chhokar, Brodbeck & House, 2007)

By looking at table 4, it can be seen that it is structured slightly different, but in theory it shows the same as the table from Sweden. It shows each score (mean) for every dimension and it shows how the country scored in comparison to the other 61 countries in the research (band). It shows that the Netherlands score high on *future orientation* and *assertiveness*. The Dutch prefer to plan ahead alongside rules and order. In their assertiveness, they can be a little bit blunt and insensitive towards other people, the Dutch are very direct (sometimes even a little dominant) and say what is on their mind. They score low on *in-group collectivism* because they prefer very much to be seen as individuals, children are taught early on to have individual accomplishments. They score pretty high on the *gender egalitarianism*, women mostly enjoy the same opportunities as men, although that is not yet reflecting in their jobs. Women still mainly choose to have a lower status, take care of the children and serve for others, whilst men dominantly still take the higher positions. The number of women in politics is rising, right now they cover around 35 percent. Like the Swedes, the Netherlands score lower on *power distance* because they do not value hierarchic relationships. (Chhokar, Brodbeck & House, 2007)

When looking at table 5, the “Should Be” society, it shows that the Netherlands only score an A in comparison to the other 61 countries in *gender egalitarianism*. That is, according to the middle managers, something that needs to have more focus on. They want to increase the number of women in higher job

positions and want them to enjoy the same income as men do. The dimensions *performance orientation*, *future orientation*, *institutional collectivism*, *humane orientation* and *in-group collectivism* score with a B in comparison to other countries. They want to increase effectiveness, motivate to innovate, handle relationships with more sensitivity, have more loyalty, still keep an eye on long-term plans, sharing power, and try to experiment more. This indicates that the Dutch culture is changing towards more collective interests, where power is shared equally between men and women. (Chhokar, Brodbeck & House, 2007)

TABLE 4: Results Netherlands GLOBE project ("As Is" society)(Chhokar, Brodbeck & House, 2007)

	Mean	Band ^a	Maximum	Minimum
Performance Orientation	4.32	B	4.94	3.20
Future Orientation	4.61	A	5.07	2.80
Assertiveness	4.32	A	4.97	2.79
Institutional Collectivism	4.46	B	5.22	3.25
Gender Egalitarianism	3.50	B	4.33	2.50
Humane Orientation	3.86	C	5.23	3.18
Power Distance	4.11	C	5.80	3.59
In-Group Collectivism	3.70	C	6.36	3.18
Uncertainty Avoidance	4.70	B	5.37	2.85

^aBands A > B > C > D are determined by calculating the grand mean and standard deviations across all society "As Is" and "Should Be" scales respectively for the GLOBE sample of countries. These means and standard deviations are then used to calculate low, medium, and high bands of countries (GLOBE standard procedure, cf. Hanges, Dickson, & Sipe, 2004).

TABLE 5: Results Netherlands GLOBE project ("Should Be" society)(Chhokar, Brodbeck & House, 2007)

	Mean	Band ^a	Maximum	Minimum
Performance Orientation	5.49	B	6.58	2.35
Future Orientation	5.07	B	6.20	2.95
Assertiveness	3.02	C	4.94	2.40
Institutional Collectivism	4.55	B	5.65	3.80
Gender Egalitarianism	4.99	A	5.17	3.18
Humane Orientation	5.20	B	6.09	3.39
Power Distance	2.45	D	4.35	2.04
In-Group Collectivism	5.17	B	6.52	4.06
Uncertainty Avoidance	3.24	D	5.61	3.16

^aBands A > B > C > D are determined by calculating the grand mean and standard deviations across all society "As Is" and "Should Be" scales respectively for the GLOBE sample of countries. These means and standard deviations are then used to calculate low, medium, and high bands of countries (GLOBE standard procedure, cf. Hanges, Dickson, & Sipe, 2004).

3.3.4. Country comparison

Geert Hofstede (2010) explains that there are different levels of culture, the first of them being culture at a national level according to one's country. The Dutch and the Swedish national culture are described by him in 6 different dimensions (6-D model): "power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, and indulgence" (Hofstede, 2010). Each dimension has its own deep embedded drivers which describes how the Dutch culture is different from the Swedish culture. In figure 7 the 6-D model of Hofstede is seen, on the Hofstede Insights website you can choose to compare any country with one or two other countries. For the purpose of this research the countries Sweden and the Netherlands were selected. Each dimension will be discussed for both countries. (Hofstede Insights, 2020)

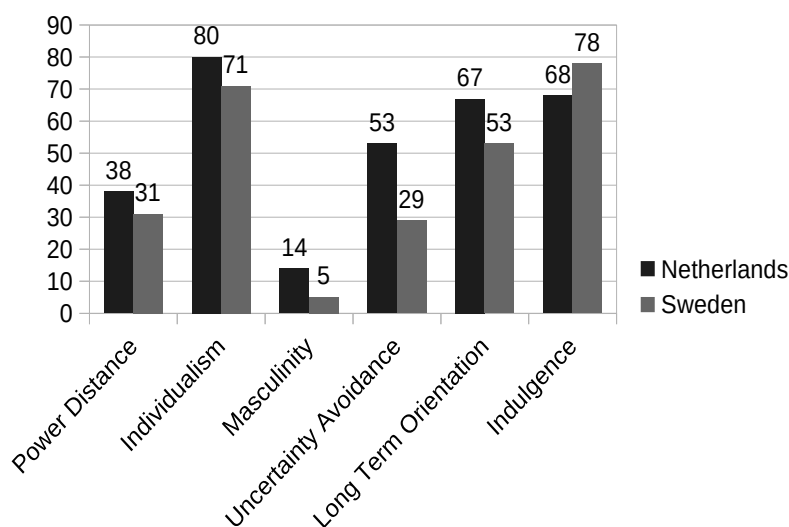


FIGURE 7: 6-D model Netherlands vs. Sweden (Hofstede Insights, 2020)

Power Distance

The purpose of this dimension is to point out that not all people are equal, there will always be people who are more superior than others, such as country leaders. But there can be a difference in how much power these people hold, for example president Putin of Russia has a great amount of power and will barely listen to his citizens. In the Netherlands and Sweden power distance is low, the power is decentralized and citizens feel that their voice is heard. Managers work together with their employees as a team and consult together to make decisions. In both countries having control is not favourable and communication with managers is informal, direct and participative. Citizens like to be independent, enjoy equal rights, and can consult with their superiors. (Hofstede Insights, 2020)

Individualism

This dimension describes how independent people can be in a certain country. With a score of 80, the Netherlands scores high on individualism. Dutch citizens consider themselves as “I” and do not prefer to have a big steady social framework. They like to take care of themselves and to care for direct family. Work relationships are based on mutual advantages and being promoted will only happen when someone has delivered good quality and is worthy of promoting. The management is mostly based to manage individual persons, although they try to stimulate teamwork more these days. Sweden is not far behind from the Netherlands and has a decent score of 71 on individualism as well, however the Swedes are taught to put society first and therefore come forward as a more collectivist society. (Hofstede Insights, 2020)

Masculinity

A high masculinity score in the 6-D model means that the country is aiming for success, they like competing and aim for high achievement. Children are taught about winners and will focus their life on accomplishing goals. A low score indicates that the country is more feminine, winning is not important at all, instead they want to care for others and enjoy a high quality of life. Success is having a great life where they enjoy what they do everyday and they do not like to stand out from the crowd. Sweden has an extremely low score of 5 on masculinity, meaning that the country is very feminine. The Swedes are all about having a good life/work balance, equality is valued, they prefer having solidarity and quality in their working life. In case of discussion or conflict, all parties will have the opportunity to discuss and they will negotiate to get to a compromise. Therefore the country is known for their long discussion when it comes to difficult topics, they will discuss as long as needed to reach consensus. As said, the Swedes do not live to work, they enjoy free time and usually work on more flexible schedules. They like to live ‘lagom’, a saying that means doing everything in moderation (not too much, not too little, not too noticeable). By living ‘lagom’ every citizen can have a good life, it has even been included in the “Jante Law”, a code of conduct that prevents people from being too personally ambitious which is considered unworthy and inappropriate. The Netherlands, with a score of 14, is a very feminine country as well. They also value having a good work-life balance, managers support employees and they make decisions together. Like the Swedes, they end conflicts with compromise after a long period of discussion. (Hofstede Insights, 2020)

Uncertainty Avoidance

This dimension shows how a country deals with an insecure future, do they let it happen or do citizens worry about it? For some it brings anxiety and threat, while others sit back and relax. The Netherlands scores right in the middle with a score of 53, meaning that they slightly prefer to have less uncertainty. Citizens have a slightly bigger need for more rules, time is valuable and they feel an inner urge to work hard. They like to be on time and can often be perfectionistic. Security is a big part to motivate individual citizens, this can also come forward in having longer work contracts, creating financial safety. Innovation is resisted because it comes with insecurity. Sweden however is more laid back, they have a relaxed view when it

comes to the future and would prefer to have rules only if really necessary. They work on flexible schedules, work hard when it is needed and like to innovate. (Hofstede Insights, 2020)

Long-term Orientation

Dealing with challenges right now and in the future, while meanwhile thinking of the past, that is what long term orientation is all about. If a country scores low in this dimension, they are considered normative societies, they focus on traditions from the past and do not like to orient forward, they want things to stay as they are. If a country scores higher, then they are viewed as a pragmatic society, these are mostly more modern countries who focus on the future. The Netherlands is an example of a pragmatic society with a score of 67, they like to adapt their traditions to a more modern style and they believe in saving and investing for the future. The Swedes hang right in the middle with a score of 53 and are balanced in keeping traditions while also looking at the future. (Hofstede Insights, 2020)

Indulgence

The last dimension is indulgence, which describes the level of socialization and how citizens control desires and impulses. This is something that citizens develop by how they are raised. A low score in indulgence is called a restraint society, where there is strong control and people are not able to follow their desires and impulses. Sweden scores relatively high with 78 and is seen as an indulgent culture. As said before they want to enjoy themselves therefore they like to follow their desires, have fun and be impulsive every once in a while. They are optimistic about life, consider leisure time as important, that's why they also like to socialize with co-workers after work hours. The Netherlands is not far behind with a score of 68, but they are less impulsive to do as they please and are more careful with spending money. They also like to keep their work life and their personal life separate. (Hofstede Insights, 2020)

One of the main reasons that Sweden is ahead of the Netherlands and other countries regarding sustainability, is due to the country's femininity. Hofstede describes a feminine society as "one where quality of life is the sign of success and standing out from the crowd is not admirable". The Swedes value quality of life and are motivated by liking what they do, with that attitude they manage to grow their economy while reducing carbon emissions and pollution. They are not afraid to innovate and are not afraid of uncertainty, they will take more risks when it comes to develop new sustainable technology. (Hofstede Insights, 2020)

3.3.5. SWOT analysis

The 4 models/theories have provided a great deal of information about the culture in the Netherlands and Sweden. In order to write a conclusion (chapter 5) to the sub-question it is useful to first create a short overview of the information that was retrieved. Below you will see a SWOT-analysis for both countries, describing the strengths, weaknesses, opportunities and threats above each figure based on the results from the 4 models/theories mentioned in this chapter (3.3.). The final conclusion can be read in chapter 5.

SWEDEN (figure 8)

Strengths: Sweden has a parliamentary constitutional monarchy with a strong economy based on knowledge. Power is decentralized and they rank as the number 1 most feminine society in the world, meaning they take high value in caring for others and enjoying a high quality of life. Genders are treated as equal as possible, hence why they do not encourage competitions and children are raised equally. The Swedes are humble, positive and hold an optimistic attitude towards sustainability. As a collectivist society, the relationship and interconnectivity with other people is important. Lastly citizens enjoy the "Right of Public Access" which gives them the opportunity to access scientific information easily.

Opportunities: with an 8th place in the environmental performance index, the Swedes still have opportunities to grow further. They have managed so far to keep a growing economy while reducing emissions and limiting pollution of businesses. They hold an ambitious goal to be fossil free and use 100 percent renewable energy by the year 2045. Citizens are willing to change and pay more towards greener sustainable solutions.

Weaknesses: even though Sweden has a code of conduct that makes sure that people put the society first, the country remains a relatively individualistic society. Citizens are taught from a young age to be independent and not assertive. Organizations are rewarded and encouraged instead of individuals, creating a lower performance orientation. They live ‘lagom’ meaning that they do everything in moderation, not too much, not too little and not too noticeable. Although this means that they try to provide a good life for every citizen, it also means it prevents people from being too ambitious, which can be considered as a weakness in innovation.

Threats: the “Jante law” is a code of conduct that makes sure that society is being put first instead of the individual. It is considered inappropriate to boast about individual accomplishments and they should not be jealous of others. On a sustainability level this is beneficial, because citizens think about the goals of society instead of what it would mean for them personally. But on a personal level this is considered a threat, people have low self-esteem and are not likely to start up their own business. Citizens feel that the country could accomplish more on a global scale by breaking the Jante law and start to be proud and brag a little more.



Figure 8: SWOT-analysis Sweden

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Strengths: with 23.1 percent foreigners, the Netherlands has a very diverse population. Even though it is a small country, they have the sixth largest economy in the European Union with a parliamentary constitutional monarchy with a civil law. Power is decentralized and citizens can put their voice forward by voting. Businesses prefer a bottom-up management style where employees are part of the decision managers make. As a feminine country they enjoy a good work-life balance, managers support employees, and will make decisions by discussing and compromising. Even though the citizens like to complain a lot, they are not

afraid to make their hands dirty, hence why the country has 5.5 million people that regularly volunteer. Citizens are independent and entrepreneurial, startups are not uncommon due to their assertiveness.

Opportunities: with an 11th place on the environmental performance index, the Netherlands still has chances to grow further. Climate policies are constantly reviewed and developed to reduce environmental impact, they believe in standing together in the fight against climate change and are committed to international agreements. They score on the higher side on long-term orientation, meaning that they try to focus on the future, and they are changing to more shared power. By increasing effectiveness, innovation, relationships, loyalty and experimenting they have the opportunity to change towards more collective interests.

Weaknesses: due to factors money and time, the Netherlands are less willing to pay or change their behaviour towards sustainable solutions. Especially companies fear that greener solutions will cost them more money and will put them at a financial risk. As said the Netherlands is a very individualistic society with low in-group collectivism, they see themselves as “I” instead of “we”. The greater good of the society is not put first, instead the individual wishes are prioritized. Besides that, they are no risk-takers and prefer to save and invest with a focus on the future.

Threats: the Netherlands has sceptic citizens, only 48 percent believes that the government should take action against climate change. They are afraid it will cost them money and quality of life, which has caused cognitive dissonance. Dutch citizens hold to their own beliefs and values and search for communities and groups that doubt the necessity of reducing greenhouse gas emissions. This has led towards a great resistance to new climate policies, in agriculture it has caused protests amongst farmers who now have joined together to stop the government from making more policies.



Figure 9: SWOT-analysis Netherlands

Chapter 4 – Discussion

The objective of this research was to first create an overview of all the different possible solutions in regard to processing manure and how sustainable these solutions are. The second objective was to find out how willing equine enterprises are to adapt towards more sustainable solutions. The third objective was to find out the differences between the Dutch and Swedish equine sector based on culture. The fourth, and overall objective was to create awareness on sustainable manure solutions in the Dutch equine sector.

The first sub-question focused on what kind of approaches there are to sustainable solutions for manure in the equine sector. Research (mostly from Sweden) provided a list of seven different solutions; spreading manure to agricultural land, composting, biogas plants, combustion, delivery to landfill, specific purposes and collaborating with other farmers. For every solution, water resources should be protected against runoff from manure. In Sweden composting is the most popular option, usually the manure is composted and after it is spread on land from other farmers. In the Netherlands most manure is picked up and used for a specific purpose such as mushroom cultivation. Research however, showed that processing manure for bioenergy with incinerators is the most sustainable solution. At the moment this method needs big investment due to its advanced technology, in comparison composting comes with a relative small investment and also at little environmental impact.

The second sub-question focused on the willingness in the Dutch and Swedish equine sector to exploit sustainable solutions of manure. For this part literature in Sweden provided that citizens are willing to pay up to 10 percent more for sustainable products and that women are more active in buying more sustainable than men (IKEA, 2018). The Swedish equine sector did not have any research on willingness, but stables showed innovative solutions such as nutrient runoff prevention, waste recycling and even bioenergy in bigger stables and FEI events that use the energy for electricity and heat. Literature in the Netherlands showed that the government sets ambitious goals and that the citizens actively help by reducing energy, reducing their meat intake and by cycling or walking to work. For the willingness in the Dutch equine sector a survey was held amongst twenty stable owners. This resulted that three quarter of the respondents were not willing or aware of sustainable solutions. Money and time seem to be the main factors that hold them back.

The third and last sub-question researched how culture in both countries influenced the adaptation towards more sustainable solutions of equine manure. Four models/theories were used for this research; the cross-cultural kaleidoscope (Plaister-Ten, 2014), how culture changes the climate change debate (Hoffman, 2015), the GLOBE project (Barmeyer & Franklin, 2016), and the country comparison model (Hofstede, 2010). This research provided a list of strengths, weaknesses, chances and threats for Sweden and the Netherlands. Sweden ranks as the most feminine society in the world, they take high value in caring for others and enjoy a high quality of life, hence why children are raised equally and competitions are not encouraged. They hold a positive and optimistic attitude towards the future and are active on reducing emissions and limiting pollution from businesses, that brought them an 8th place on the environmental performance index. But their weaker points are that they are non-assertive and live ‘lagom’, meaning they do not too much, not too little and not too noticeable. The “Jante Law” (a code of conduct) ensures that individuals put society first, which is beneficial for sustainability, but not so much for the individual. The Netherlands are as well a more feminine society with decentralized power. They enjoy a good work-life balance, enjoy volunteering and are independent and entrepreneurial. Climate policies are constantly reviewed and developed to reduce environmental impact on the long term, which gave them an 11th place on the environmental performance index. Weaknesses are that they show little willingness to pay, are pragmatic about the future and new

techniques and show resistance towards new climate policies. The citizens are sceptic and afraid it will cost them money and quality of life.

The research that was conducted was for the most part successful and done by the described method in chapter 2; material & methods. The literature research proved to be most successful for Sweden by doing the research in Swedish language. With the help of translating machines those documents could be included in the research. For Sweden mostly peer-reviewed researches and articles could be used, for the Netherlands those were harder to find and more non peer-reviewed articles had to be used. As for the first sub-question, information about costs are missing. Only indications were given about costs, but exact prices for the installments or services were not acquired. This somewhat limits the full description of the solutions. If the ways of processing manure were to be presented to stable owners, than costs would need to be included since some of them can be quite an investment. The conducted survey proved to be very successful and provided with detailed answers. Initially it was thought that a survey in Sweden on willingness was not necessary because there was already a research about the subject, however during the process it came to the attention that this research was done in Finland. Therefore a solution had to be found in order to find information on the willingness in the Swedish equine sector. The decision was made to review Swedish stables and their level of sustainability. It is highly recommended to perform a survey in the Swedish equine sector on willingness in case this research is performed again or in further depth.

The whole research and how it was described in the methodology proved to be successful. The theory that culture might have an influence on willingness clearly came forward and that the Swedish equine sector lies ahead with more innovations and a more active and positive attitude towards changing towards more sustainable solutions. An unexpected helpful resource came from the researcher Camilla Vålmaa who worked on the report: Horses and Sustainable Development (Sweden, 2016). She provided Swedish research institutes and research documents that could help find out the willingness of the Swedish equine sector. The final research closed the knowledge gap and met all the objectives that are written above. The research results are requested by most of the respondents and by a research organisation in Sweden, therefore the biggest goal was achieved by creating awareness in the Dutch equine sector.

Chapter 5 – Conclusions & Recommendations

In this study, it was examined how the Dutch equine sector could learn from the Swedish equine sector regarding the use of manure as a sustainable solution. With the objectives to create an overview of sustainable solutions, how willing the sector in both countries is to change, how their culture has a different influence on their willingness, and to create awareness on sustainable solutions.

After examining many scientific research papers in Sweden and in the Netherlands, sub-question one presented seven approaches on sustainable solutions: spreading manure to agricultural land, composting, biogas plants, combustion, delivery to landfill, specific purposes, and collaborating with other farmers. Biogas proved to be the most sustainable solution but comes at an expensive investment, therefore composting is a good sustainable solution for a low budget. The answer to sub-question two on how willing both countries are to exploit sustainable solutions showed that the Swedish society is willing to pay and change towards greener solutions. The Swedish equine sector shows innovation and an active role in the research on sustainability. In the Netherlands the society works actively on reducing environmental impact, however the survey held amongst twenty Dutch stable owners showed resistance due to money and a lack of time, as well as scepticism towards the Dutch government. The third and last sub-question researched the influence of culture on adapting more sustainable solutions. The outcome showed that the behaviour of the society in both countries played a role in the adaptation. The Swedes are positive and optimistic towards the future, but are held back by their non-assertiveness. As the most feminine society in the world, they care for others and are taught to put society first, which is why they care substantially about climate change and why they score high on the environmental performance index. The Dutch culture is slightly similar, they are as well a feminine society with decentralized power. They enjoy independency and entrepreneurialism, but they are less willing to pay and are pragmatic about the future. This holds them back from changing towards more sustainable solutions.

In conclusion, the Netherlands can learn from Sweden first of all by considering composting as a solution that takes a small investment and is relatively easy to do for every size stable. The process has little environmental impact and the end product is a great fertilizer for agricultural land. Second, incineration of manure should be researched more and cooperations with other larger scale stables or farms should be considered to make this option more viable. Swedish examples showed that this solution has almost zero environmental impact and that it could benefit the stable with a bioenergy source in the form of electricity and heat. Furthermore, the Netherlands could learn from Sweden to be more open and optimistic towards sustainable solutions. Not all solutions have to be a big investment and some could even benefit the stable, but large effort is needed to convince the industry of both the need to change and the alternatives that are available.

Future researchers should consider investigating the costs of sustainable solutions for manure in more detail and describe how these solutions could be applied in small, medium and large size equine enterprises in order for the research to be more directly applicable. To take away reluctance within the Dutch equine sector, it is recommended that best practices from the Swedish equine sector should be actively shared and discussed. This could be initiated by local Dutch governments or umbrella organisations, otherwise the Dutch equine sector could remain more stagnant than foreign counterparts and it could take away the financial risks involved and the lack of belief in the Dutch government.

Regardless, these results showed that the Dutch equine sector can learn from Sweden if they show more willingness. Climate change is happening and that sooner or later every business will have to do their part to

grow towards a more sustainable future. So then why not work for a greener future and have it be beneficial for the stables?

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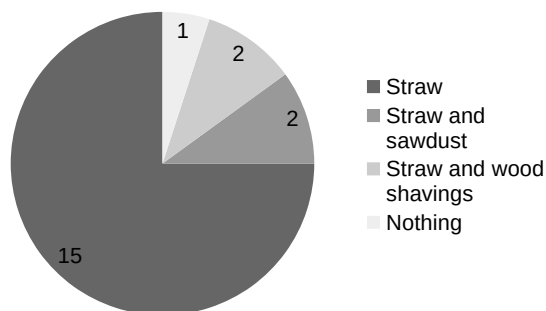
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Appendices

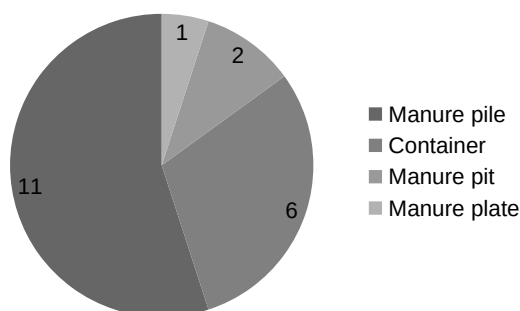
I. Results survey in graphs

1. What kind of bedding is used in the stables? (Straw, Flax, ...)



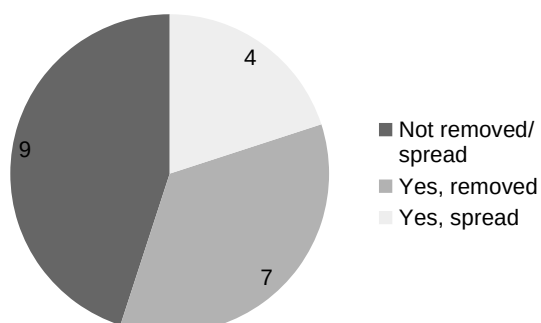
Survey question 1: Kinds of bedding used

2. Can you tell me how the manure is stored at your stable? (Container, pile, ...)



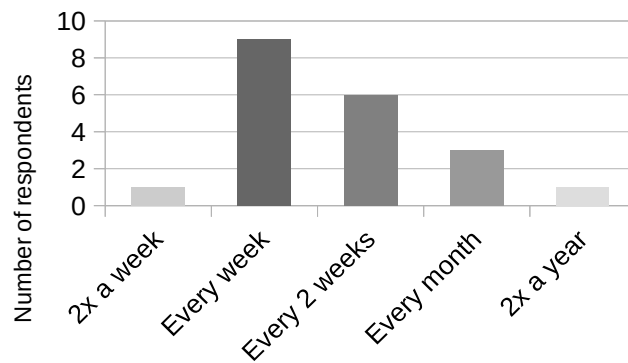
Survey question 2: Kinds of manure storage

3. Do you remove/spread manure from the grassland and/or paddocks? If yes, how often?



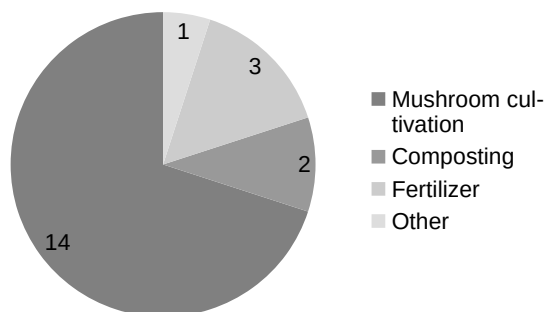
Survey question 3: Removal or spreading of manure

4. Can you tell me how long the manure is stored at your stable? (How many weeks/months till it is used/picked up)



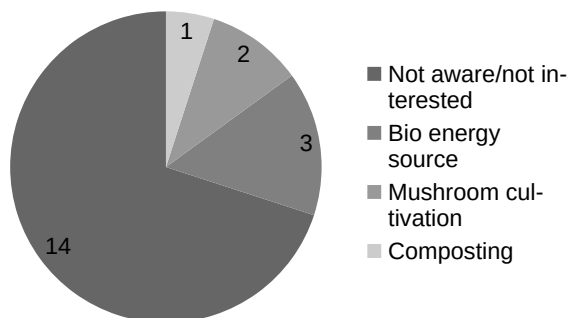
Survey question 4: Pickup of manure storage

5. For what purpose is the manure used? (Fertilization own land, champion business, ...)



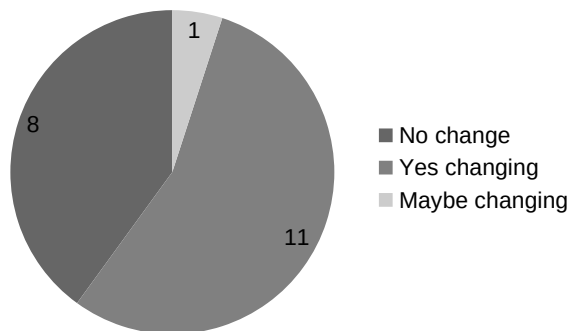
Survey question 5: Destination of manure

6. Are you aware of sustainable solutions for manure? Can you name an example?



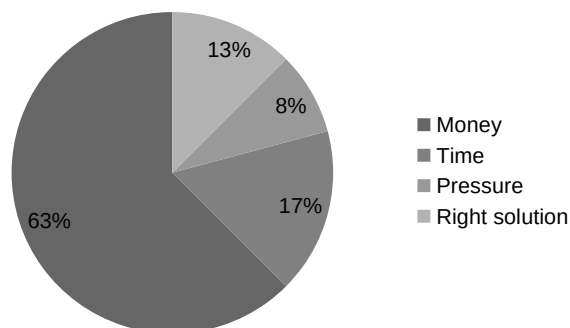
Survey question 6: Awareness of sustainable solutions

7. Do you see your stable changing towards more sustainable solutions in the future?



Survey question 7: Willingness to change

8. What are the depending factors towards changing to more sustainable solutions? (Money, time, pressure from surrounding?)

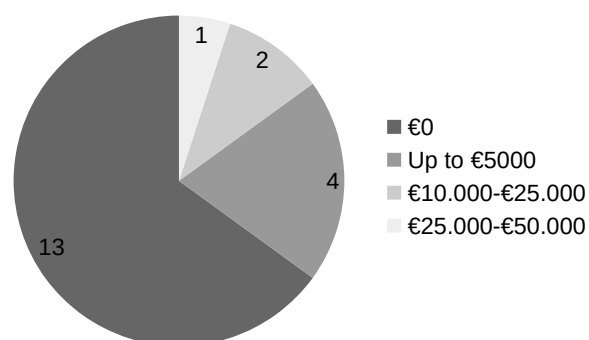


Survey question 8: Dependent factors that hold back change

Open opinion questions:

9. What is your maximum budget for a sustainable manure solution? (Purchase price)

a. €...



Survey question 9: Budget for sustainable solutions

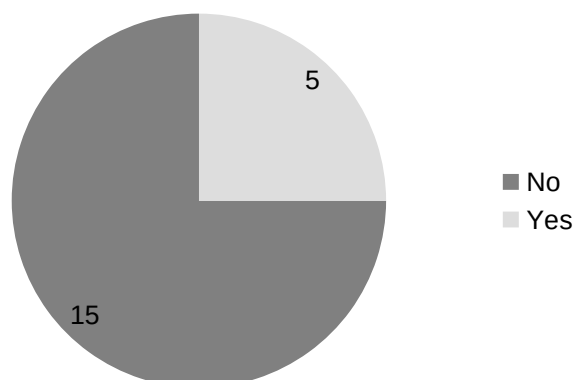
10. Can you describe if and how your decisions for your stable are influenced by policies and

regulations created by the government?

Survey question 10: Influence government

No influence	7x
Yes influenced	- by permits - building regulations - 6x
Maybe	- if disposal becomes more expensive - if rules are made - only if demanded by law - if necessary (to keep customers satisfied as well)
Comments	- government does not know what its doing regarding manure disposal - if less manure can be spread on the land, that means for us that we have to shrink and keep less horses - the nitrogen output of horse manure has never been properly measured - gids goede praktijken: ventilation, size of stables, light - may end the business if taxes on environment rise - environmental permits and surrounding permits - equine sector mostly kept under agricultural/livestock sector, but output is much smaller

11. Do you feel limited or pressured by policies and regulations from the government? (For example, the limit on spreading manure (Rijksdienst, Mest gebruiken en uitrijden, 2020))



Survey question 11: Pressure from government