



# **Farmer's attitudes towards dairy cow cleanliness: A qualitative study**

*Djurhållares attityder kring renlighet hos mjölkkor:*

*En kvalitativ studie*

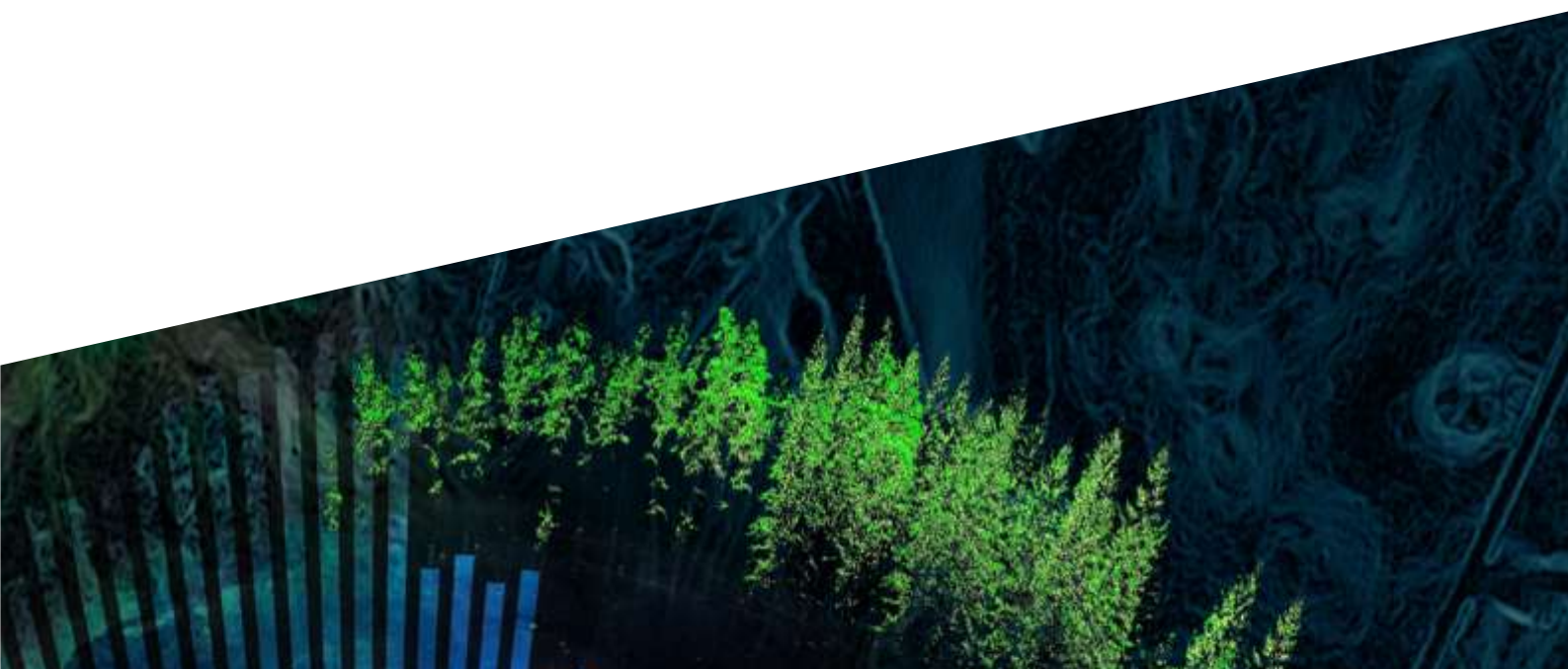
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Department of Animal Environment and Health

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# Farmer's attitudes towards dairy cow cleanliness

*Djurhållares attityder kring renlighet hos mjölkkor*

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# Sammanfattning

Otillräckligt rena mjölkor verkar vara ett växande problem enligt insamlad data från de officiella djurskyddskontrollerna i Sverige. Detta trots att de negativa konsekvenserna som smutsighet kan ha på produktionen är välkända. I denna studie så undersöktes mjölkbönders attityder och tankar kring problemet med smutsiga mjölkor genom telefonintervjuer, där fokus låg på att undersöka nivån av medvetenhet om hur smutsighet påverkar mjölkproduktionen, deras generella attityder och relationer till djuren, samt hur man ska jobba för att komma tillrätta med problemet. Intervjuerna bestod av 18 frågor och genomfördes genom en kvalitativ intervjuemetod. Efter intervjuerna så organiserades och systematiserades svaren genom att dela upp dem i olika teman, citat och nyckelord som sedan noga analyserades.

Resultatet visade att mjölkbönderna är väl medvetna om korrelationen mellan en framgångsrik produktion och rena djur, men att det finns en viss omedvetenhet kring hur vanligt problemet med smutsiga mjölkor är. Resultatet av studien visade på ett behov av ökad kommunikation mellan mjölkbönder och myndigheter, samt hur mjölkbönders hälsa, ekonomi, generella attityd och relation till mjölkor, likväl som deras utbildningsnivå inom djurvård kan vara bidragande faktorer till förekomsten av smutsiga mjölkor på svenska gårdar.

# Abstract

The negative consequences of having dirty dairy cattle are well known, as it will affect the animal welfare as well as the efficiency and economy of dairy production. But despite this, the occurrence of dirty cattle is increasing in Sweden. A recent Swedish study revealed that 49% of cattle farms had insufficiently clean animals.

The study result revealed that farmers have a wide understanding of how cleanliness in dairy cattle can affect the dairy production productivity, but also a lack of knowledge about the occurrence of dirtiness of dairy cattle in Sweden. It also revealed how communication between authorities and farmers need to be improved and how farmers mental health, economy, general attitude towards dairy cattle and relationship with them, as well as farmers education in animal welfare, may influence the occurrence of cattle dirtiness on Swedish farms.

Preventive measures in order to reduce the occurrence of dairy cattle dirtiness may include information and education on the occurrence of this problem, how to prevent it and what consequences dirtiness of dairy cattle can have. The relationship and communication between authorities and farmers also needs to be improved. Farmers mental and physical health need to be prioritized, as the study result revealed that farmers health also may influence cattle dirtiness. Hence, finding ways to improve farmers health and creating a supporting system for farmers in need of extra help, mentally as well as physically, may be important in order to increase cleanliness of dairy cattle.

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# Introduction

Dirty animals are found to be the most common non-compliance registered during both official animal welfare controls in Sweden (Lundmark Hedman et al., 2018; Keeling et al., 2009). Dirty animals are associated with an increased risk of disease and lower farm profitability (Ruud et al., 2010). The issue with dirty cattle has also received some attention in the Swedish media during 2020. This kind of negative publicity in media can also affect the consumers demand and, in its turn, cause lower profitability for the farmer (Tonsor et al., 2011).

In a study from 2021 by Lundmark Hedman and colleagues (2021) the occurrence of dirty cattle in the official Swedish animal welfare inspections were recorded. The results showed that 49% (n=183) of the 371 farms that were inspected, had insufficiently clean animals when the data was collected during a two-week period in January and February in 2020. Although 49% were assessed to have dirty animals, 33% (n= 120) of the farms was failing to act in accordance with the Swedish legislation, due to different assessments about when farms were compliant or not by the inspectors. Hence 16% of the farms were assessed as compliant despite having inefficiently clean animals. The median number of insufficiently clean animals on every farm was 7 animals (range between 1-280). Management routines was commonly mentioned by the farmers as one of the reasons to dirty animals (Lundmark Hedman et al., 2021).

There is plenty of research today showing the negative consequences of having dirty animals. Some of the known risk factors are mastitis (Munoz et al., 2008; Breen et al., 2009; Ellis et al., 2007), painful skin issues such as dermatitis and skin burns (Nafstad et al., 1999), hock lesions and lameness (Kester et al., 2014) and problems with thermoregulation, as a dirty coat can lose its insulating capacity (EFSA., 2009). Cattle dirtiness is known to impair the general health and welfare of the animals, and as a result also the production success as it is dependent on having healthy and happy animals.

Research has shown that the farmers attitudes and behaviour towards their animals are important factors of how the animals are treated (Hemsworth et al., 2002). Within the field of social psychology attitudes are defined as learned tendencies to evaluate people, issues, objects, or events in either negative or positive ways (Chaiklin., 2011). Farmers' decisions, thoughts, goals and how they interact with and manage their animals is clearly associated with both the animal welfare and production success (Seabrook et al., 2001, Lensink et al., 2001). A positive attitude

and a gentle interaction with the animals are also crucial to assure the animals welfare, as well as to notice any deviations and to discover diseases in time (ibid.).

A vague and poorly formulated animal welfare legislation could also increase the risk of misinterpretations of the directives (Lundmark et al., 2016). This may lead to subjective assessments during the animal welfare inspections, depending on the inspector's interpretation of the legislation (Lundmark Hedman et al., 2021), which further confirms the need of a clearer formulated legislation, and communication between stakeholders. The farmers perception of the inspections is also negatively influenced by this (Väärikkälä et al., 2018), which further complicates a good relationship and communication between farmers and authorities.

It is important to understand the underlying factors of issues with dirty cattle, in order to develop strategies for future prevention. The farmer's voice should be heard, with the aim to understand farmer's attitudes.

### **Aim and objectives**

The aim of this project was to investigate farmers attitudes and reasoning about the challenges with dirty cattle.

Other objectives were to investigate the level of awareness among farmers of how dirtiness affects dairy cattle production success and to explore their attitudes towards this issue. Also, the question on how to act going forward in order to reduce the occurrence of this common problem within the dairy production was explored.



# Materials and methods

## **Study design and population**

The method used in this master project was a semi-structured qualitative interview study, where 21 Swedish dairy farmers volunteered to participate during spring 2021. The project was advertised by using a short letter, with short information about the project, the interviewer, the supervisors, and the estimated length of the interview (30 min). The letter was distributed on the social media platforms Instagram and Facebook. Both on private profiles by people that volunteered to share the post, in the Facebook group ‘Svenska mjölkbönder’, but also by calling and sending emails and text messages directly to farmers that may be willing to participate in the project. The project was also advertised through an annual meeting with the ‘Federation of Swedish farmers north youth conference’, where a few words was shared about the project and how interested farmers could get in touch. The largest livestock association in Sweden – ‘Växa Sverige’ also offered some help with reaching out to farmers by publishing an add on their Facebook page. However, the most successful way of finding new participators was by asking the volunteered participators in the end of the interviews, if they knew anyone else that would be willing to participate. Most of the participants for this project were found in this way.

## **Structure and content of interviews**

The interview consisted of 18 different questions, whereof the first five questions were concerning the participants experience as dairy farmers, if they had an organic or conventional production, etcetera. The questions were formulated by using a qualitative interview design with semi-structured questions, by using and studying appropriate literature, for example, ‘Qualitative interview design: A practical guide for novice investigators’ (Turner et al., 2010), ‘Improving animal welfare: Qualitative and quantitative methodology in the study of farmers' attitudes’ (Kauppinen et al., 2010), and the Swedish book on qualitative interviews, ‘Den kvalitativa forskningsintervjun’ (Kvale et al., 2014). A qualitative interview methodology is an explorative method that can be used as a way to understand people’s mindset, values, motivations and the relationships between these (Strauss & Corbin., 1990). The interviews were structured according to the general interview guide approach and the questions were carefully worded in a way that was avoiding leading the participant into a specific direction, and at the same time allowing flexibility and freedom in interpretation of the questions for the participant. Before the interview started, the participants were informed that the interview was anonymous, that some questions might sound repetitive, but that it was necessary to get the most out of the interview and also that the interviewer was taking notes

during the conversation, which might lead to some moments of quietness. The average interview took about 30 minutes to finish.

### **The explorative thought through qualitative interview**

In order to understand the depth of this problem it was important to talk with different farmers to understand different attitudes, different routines and methods, but also what obstacles and challenges farmers are experiencing. The aim was to find farmers that openly and voluntarily wanted to share their story and help to create a wide description of this issue and their ways of handling it. When knowing the width of this issue, the next step may be to go further investigating this problem through a quantitative study.

### **Data collection**

After the interviews were conducted, the answers were organized and divided into different themes and keywords in word documents, to get an overview of the material and to recognize patterns. Several quotes that were representative to the material was also collected, and later used in the result section.

## Results and discussion

Farmers from different backgrounds were interviewed between February and March 2021, with different sexes and experience of farming, different sizes and types of farms, both organic and conventional, tie stalls and free stalls, robot milking and milking parlour etcetera. It is likely that the 21 farmers that chose to volunteer for this kind of study, may be people that consider cleanliness to be more important than the average. Farmers that are aware of that they may have or have had issues with cleanliness of cattle in the other hand, are probably less likely to participate in a study about cleanliness in dairy cows. Therefore, we can assume that the selection of participants for the present study may be slightly skewed towards farmers with a more positive view of the subject. However, it was prioritized to find farmers that were willing to explore their own reasoning around dirty cattle, and to speculate about why so many farms are non-compliant to the legislation in relation to dirty cattle.

### **Analyse of the answers**

#### ***“What are the best and the worse with your job?”***

The farmers expressed a gratitude for being able to work with animals, to create a relationship with them and the freedom and variety of being an entrepreneur. Economy and time were mentioned frequently during the interviews. Farmers experienced a lack of time and economic pressure running a business where the aim is to produce a high milking yield while keeping the expenditures low. Sick animals were also mentioned on several occasions during the interviews as one of the worst things with the job. Due to the stress of having sick animals, but also due to the costs it entails. The growing negative view of agriculture in the society was also mentioned as one of the downsides with the job of being a farmer. Following is a quote by one farmer that expressed his concern regarding this issue.

*“At the moment animal agriculture is perceived in an extremely negative way by the public. Sometimes it feels like you are almost a criminal, guilty to all the environmental issues in the world.”*

This quote depicts the overall concern with the public view of animal agriculture that farmers expressed throughout the interviews. According to the farmers, this is due to the way media portrays them. As a threat towards the environment, as well as how the growing animal rights movement show an increasing contempt against

animal agriculture. The contempt is mainly directed towards intensive animal farming, raising the ethical issues concerning the use of cows to produce a product intended for the calf. And the discussion on how we cannot justify the consumption of dairy when we need to remove the calf from the cow in order to make a profit from dairy production. Media has also contributed to a widespread discussion and growing animal welfare concerns, after broadcasting programmes on Swedish television in 2020 and 2021, addressing the issues with dirty animals, among other animal welfare concerns.

We know today that the interest in modern food production practises is increasing, and a growing number of consumers are demanding more ‘animal welfare friendly’ and ‘humane’ products (Alonso et al., 2020). When carrying out surveys, asking people about what the most important factor in an ideal farm is for them, the quality of life of the animals was the most important issue raised (Cardoso et al., 2016). However, the products still need to meet the requirements for the quantity needed and retain a competitive price on the market, which will further increase the pressure on the farmers.

As the job of being a farmer usually means that you are living in the middle of your workplace, the negative view of agriculture may potentially affect the mental health of the farmers, since the negative exposure are directed towards their home setting. Their mental health is likely to affect the production and consequently animal welfare (Devitt et al., 2015). Due to the growing number of stressors, where economy and time seem to be the two largest concerns, suicide among farmers is increasing (Gregoire et al., 2002). Mental illness is especially stigmatized in farming communities, and this appears to also affect the number of farmers seeking help, according to a study by Gregoire et al. (2002). This stigma seems to be correlated to the inaccessibility of health services in rural areas, and the negative view on this problem has been shown to affect the help-seeking behaviour of people in rural areas to a greater extent than urban areas (Gregoire et al., 2002). Many are ignoring their mental issues instead, which in turn may lead to an inability to perform management activities, such as issues with keeping animals clean (Devitt et al., 2015).

***“What do you think are the most important factors for the cattle to be healthy and what do you do yourself for them to be healthy?”***

Nutritionally adequate feeding, clean water, regular supervision, good milking routines, cleaning routines, good routines in general, enough space, soft surfaces, and a calm environment were some of the aspects mentioned as important factors for the cattle to be healthy, which also were factors that the farmers strived to fulfill themselves. One farmer said, *“You should make it simple for yourself to do things*

*the right way*”, and, to always act in accordance with preventative measures and making sure that you have all the basic needs of the animals ensured to start with. The overall view on this subject is that there are many parameters that matters to keep dairy cattle healthy, but if any of the basic parameters fail, the risk of everything else collapsing will increase too. Below are quotes that summarize some of the common attitudes found in this study towards today’s farming. It relates to the dairy system we have today with an increasingly controlled production, that often concur with moving the animals away from their natural environment.

*”Cows in Sweden today has a high level of welfare, both in comparison with wild animals and farm animals hundred years ago. I would rather be a dairy cow than a moose in the forest. At the same time, our housing systems are adapted in a way to promote economy, but not necessary care for all the needs of the animals. We deny them the company of their calves and a natural life where all their behavioural needs are satisfied.*

*The closer we get to a natural environment, the worse the animal welfare gets for the cows, as it will become harder to care for all their needs. The dairy production is very controlled today, which has both pros and cons. The udder health, the somatic cell count, hoof health and so on, is always better in more controlled environments indoor. The negative part of this is that we take the animals further away from their natural environment. When the cows are grazing during the summers, the supervision and control of the animals is decreasing. The farmer has a responsibility to provide the animals with as large possibilities as possible to live a natural life. But it needs to be a balance between economy and animal welfare.”*

While the public seem to view the conventional animal farming today as quite problematic, farmers are in general more satisfied with the present situation of farm animal welfare (Vanhonacker et al., 2008). However, as the quote above is showing, there is also an existing self-awareness and criticism of the way farming has changed throughout the years, how the economic pressure and competition has increased and is threatening the welfare and natural behavioural needs of farm animals. A well planned breeding programme was also mentioned during the interviews as one especially important factor for the cattle to be healthy. This is confirmed in for example Oltenacu et al. (2005), where it is stated that to prevent health problems and enhance the quality of life for the dairy cattle, a well-planned breeding programme with clear goals is necessary. However, through breeding, the dairy production per cow has more than doubled during the last 40 years, at the expense of animal welfare, as the longevity and general health has decreased along the line with this development (Oltenacu et al., 2005). The second paragraph of the quote above expresses the consequences of the way we have bred dairy cows up until today and how these highly efficient milk producers are no longer capable of living a natural life without constant supervision by humans. The requirement of

having cows on pasture during the summers in Sweden has also been discussed and questioned by the Federation of Swedish Farmers (Lantbrukarnas riksförbund – LRF) multiple times throughout the years, as many farmers argue that they cannot afford to have dairy cows outside anymore with today's competition with the rest of the world and increased pressure on the milk production in Sweden. However, in general many farmers still argue that the outdoor grazing requirement need to be preserved. Hence, this motion has not yet been transposed. Having cattle inside is clearly associated with an increased risk of dirtiness (Nielsen et al., 2011) and striving to have cows indoors to a greater extent is not likely to decrease the welfare issues that we see with dairy cattle dirtiness.

***- Is it important for you to build a relation with your cows? And why is it important/not important?***

There were two clear opinions in relation to this question, where some completely agreed on the importance of creating a relationship to the animals, to make the handling of them easier, to make them less stressed around humans, to get to know every individual in order to recognize differences in behaviour and to be able to read the ranking within the herd. Farmers relationship with his/her animals were believed to reflect the farmers general perception of animals. The other farmers argued that the only important relation for the cows is the one they have with other cows, and that today's use of computers are replacing the supervision of the animals. However, all the participating women in the study thought that building a relation with your cows is important, which is in line with previous studies on this subject, where researchers found that women value having a relationship with their dairy cows to a greater extent than men (María., 2006; Miranda-de la Lama et al., 2013)

*"This is incredibly important. We cannot walk pass a cow, standing there with large eyes looking at you, without letting your hand stroke her back. Your relationship with the cows is also important when you need to leave them and take them home from pasture during the summer months. A good relation also reduces the risk of injuries and makes the job easier in every single way."*

Studies has shown that the attitudes of stockpeople towards dairy cattle is strongly correlated to production success (Waiblinger et al., 2002). Positive attitudes and interaction with dairy cattle have been shown in several studies to reduce stress and enhance the milking yield (Waiblinger et al., 2002; Waiblinger et al., 2003; Fukasawa et al., 2017). However, some of the interviewed farmers did not value the relationship between the animals and stock people, as they argued that the relationship can be replaced by computers looking after the cow's health instead. Some also claimed that cows that are constantly a little nervous will enhance the

job and limit distractions when working, as they will stay away from you. This might be a lack of understanding of the benefits of building a relationship with the cows, or simply a different attitude towards animals and the importance of human-animal interaction. In a study by Hedlund & Løvlie (2015) it was shown that nervous cows produce less milk. However, the awareness of this correlation may not be widespread, judging by the answers from the interviews. Computers may be able to substitute some parts of the daily health examination that otherwise would be carried through by humans. However, study results clearly shows that stock people's handling of the animals is affecting the dairy cattle's behaviour and stress levels, which in turn will reduce the milking yield if the handling is carried through in a rough way (Mota-Rojas et al., 2020). In other words, building a relationship between dairy cattle and humans should not be underestimated for the productivity of dairy cattle. In the interviews, there was clearly a lack of understanding about to what degree stressed animals may have a negative effect on the dairy production, as stressed animals will simply produce less, hence reducing the overall milking yield. This correlation cannot be denied when considering the research that has been done on this subject.

***- Do you think it will make a difference for the health of the cows if they are clean or dirty?***

Overall, the farmers' agreed on that it will be easier to avoid diseases and infections when dairy cows are kept clean and in the long run that dirtiness will also affect the production success.

Cleanliness seems to be recognized as an important factor for healthier individuals and lower veterinary bills among the interviewed dairy farmers. However, some still argued that the importance of cleanliness is overrated, as a dirty cow is not equal of the cow being unhealthy. But it also depends on farmers' subjective definition of cleanliness and perception of what is dirty and not. Subjectivity can also be a problem during inspections due to the inspector's subjective definition of cleanliness according to the farmers. Previous studies have indicated that clearer guidelines from the Swedish Board of Agriculture might be needed (Lundmark Hedman et al., 2021). However, the definition of cleanliness seems to be unclear as animal welfare inspectors interpret the legislation in one way, while farmers sometimes does not comply (Miele et al., 2017). If the definition of what is dirty or not is not clear from neither the farmers nor the inspector's part, the communication and education for all parts must be improved, in order to know what is expected and what is not.

*" It is a question of definition, what is dirty and not dirty? Whether they are dirty or not will also depend on the type of stable they are in. I have dirtier animals right now, but I have never had such a low somatic cell count."*

In this specific case the farmers' experience contradicts the science, as many studies have found a strong correlation between a high somatic cell count and animal dirtiness, (Sant'Anna et al., 2011; de Pinho Manzi et al., 2012; Munoz et al., 2008) as the prevalence of pathogens that are the cause of mastitis is known to be higher when the udder is not clean enough (Schreiner et al., 2003). However, without knowing how dirty the cows in this specific case were, judging by the low somatic cell count that the farmer experienced, you could assume that the udder health still was on a high level.

*"Some individuals are always dirty".*

There was also a mutual agreement on that some individuals seem to be impossible to keep clean. However, the reason why some individuals always are dirty remained unclear among the farmers. When cows are in heat it is common that they mount each other and by this possibly make them dirtier (Diskin & Sreenan., 2000). However, if one individual always has issues with dirtiness it might be some other underlying issues, for instance a competition of resources due to overcrowding (Grant et al., 2001). Dirty animals should always be considered abnormal according to a study by Nafstad (1999), as it is not natural for cattle to be dirty constantly and as it will harm them mentally as well as physically.

***- Do you think it will make a difference for your economy if they are dirty or clean?***

*"Dirty animals are bad for the economy. Preventive work should be prioritized. Clean and happy animals will produce better and stay healthy for longer. Take care of the animals and they will take care of you."*

It is always positive with clean animals from many different perspectives, but the economy seems to be one of the greatest motivations, naturally, as any dairy production always need to prioritize the financial gain of the production at first hand. As the quote above expresses, keeping the animals clean and taking good care of them in general will also reward you with a financial success in the end. There seem to be no doubt among farmers that having dirty animals is a possible risk of some future issues like infections and mastitis, which inevitably will lead to higher veterinary bills in the end. A clean animal is not only happier and produces better, but they will also be cheaper to keep in the long run according to the farmers, which is also supported by research (Ruud et al., 2010). The quality of the milk can be affected due to contamination of dirt or mastitis, but a dirty udder can also cause problems for the milking robot to find the nipples according to farmers' experience. Overall, there is a widespread understanding of the existing risks of having dirty animals and how it may affect the farm profitability in the end. However, the issue of dirty cattle has yet received little attention within the industry (Lundmark Hedman et al., 2021) and considering how large this issue is, the correlation between farmer's own economy and cattle dirtiness do not seem to always be understood and implemented in practice.



Apart from the economy being affected by having dirty animals, the farmers own mental health was also mentioned as a reason to take care of the animals and to keep them clean, in order to have a clean consciousness and a good night sleep. This may also be a clue to why animals would end up being mistreated to start with, as the mental health of the farmer has been shown to be correlated with the welfare of the animals (Hansen., 2019). One step in the wrong direction, such as unexpected expenses or personal tragedies, could lead to a vicious circle of deteriorated mental health of the farmer, hence also an increasing risk of welfare and health issues of the animals (ibid.).

**- What do you do to prevent dirty cows?**

*”An abundance of bedding material! To make sure that the manure scraping system works and the rotating back brushes. To keep the walking aisle clean. Then the animals will not get dirty! Exceptions always exist with animals lying down in the aisles. But that is one in a hundred. It is an error in the system if they get dirty.”*

To have good routines seems to be high on the list when asking farmers about the most decisive factors to keep the dairy cows clean. Scraping, adding new bedding material often and constantly looking after the stable and the animals to keep everything clean was mentioned as the most important factors to include in the everyday routine. Clipping the cattle was also mentioned as an efficient way to keep the cattle clean. In a study by Hauge et al. (2012), farms with regular management practises, such as clipping, cleaning, and brushing the dairy cows, had 17% less animals that was assessed as dirty during inspections, in comparison with herds with less frequent management routines. Seemingly, it is mutual agreement of the importance of having good and well-established routines, from both farmers’ and researchers’ point of view.

To have soft and clean beddings with plenty of space was also mentioned as an important preventative factor to prevent dirty cows. If the cows do not have access to clean and comfortable beds, there is a risk that they may look for another place to rest. The importance of clean, dry and comfortable beds cannot be overestimated as a cow will always choose that place over a suboptimal place such as the walking aisle (Jensen et al., 1988). Farmers testified that there are always exceptions to the rule, with some individuals choosing to lie in the walking aisle instead of on the beds. According to the farmers this may be a hierarchy issue, which means that lower ranked cows in the herd want to keep distance to other cows, possibly also due to a lack of space where the beds are due to a poorly planned housing system or overcrowding. Having too many animals in a building is a known risk factor for dirty animals (Veissier et al., 2004), as it can be a stressor that also affect their behaviour and the milking productivity (Templeton., 2014). Larger livestock densities are also associated with cattle choosing the walking aisle more often instead of the beds, which is also increasing the risk for lameness (Krawczel et al., 2008). When having the option of a soft bed with a generous amount of bedding

material in comparison to concrete floor, the preference will usually be the soft bed (Gebremedhin et al., 1985). The awareness among the interviewed farmers regarding the consequences of overcrowding and a poorly planned housing system seem to be well established. Apart from using more bedding material and aiming for smaller herds, individuals with this abnormal behaviour and preference of concrete floor instead of a bed, were often described as ‘outliers’ and ‘different personalities’ and their odd behaviour were justified by this. Perhaps it may be easier to dismiss these few outliers in a herd and not act to get rid of the issue. It could be debated whether this may lead to more problems with dirtiness of cattle if a few exceptions are accepted by the farmers.

***- What factors do you think lies behind the cases where the cleanliness of the cows has failed?***

Naturally, the farmers answers to this question looked a lot alike the previous answers about how to prevent dirty cows, but rather the absence of preventative measures. However, these answers also touched a wider perspective on cause and effect, such as the attitude of the farmer, lack of time, bad economy, high workload, ignorance, stress and mental illness of the farmer. Different individuals may have different views of what level of dirtiness is tolerable, as already discussed. Home blindness may lead to things escalating in a vicious circle with a deteriorating outcome for the animals. The interviewed farmers agreed on that the health of the farmer is crucial and that no one want to hurt animals by purpose. It is believed that it is usually some kind of tragedy behind, when cows are maltreated. Perhaps in a combination with mental illness being stigmatized within the farming communities, leading to an avoidance of seeking for help when needed (Gregoire., 2002). However, the personality and general attitude of the farmer was also mentioned as a possible negative influence on how the animals are treated, which studies also confirms, the attitude is important not only for the welfare of the dairy cows, but also for the production (Hanna et al., 2009). Some farmers are believed to simply not prioritize cleanliness, which may be a result of a lack of judgement, a bad attitude or ignorance.

*” It might be a lack of judgement. In extreme cases it can be a combination of bad judgement and that some unwanted situations have occurred, for example with the economy. In general, no one has animals to make them suffer, but there are always exceptions to the rule.”*

The quote above, taken from one of the interviews summarise the answers to this question very well. It is widely believed that no one that have chosen to work with animals to start with would purposely cause harm to them. But when things go wrong, for instance in relation to economic issues or mental illness, this may lead to a lack of judgement of the cleanliness of the cows and a decay of all the routines that are meant to prevent it, according to the farmers.

***- What factors do you think are important to decrease the noncompliance in cleanliness of dairy cows in general?***

This question seemed to be hard to distinguish from the previous, hence why farmers gave similar answers to it. However, they tried to nuance the answers the best they could by giving some new angles to the topic, which also was the purpose of including this question despite its similarity to previous questions. Some of the topics that was repeated however, was the importance of good routines, generous amounts of bedding material, the negative impact of a bad economy, the farmers attitude and their subjective view of what is dirty and not. Some new angles mentioned was how education of the farmer on the welfare of cattle could be improved in many cases. To educate them in what consequences dirtiness of cattle has in the long run and how it also will affect the production success. Most farmers seem to have a positive attitude towards providing higher animal standards (Schukat et al., 2019), and we know that providing species-specific education in animal welfare is an efficient way to improve farm animal welfare, provided that the information is communicated in a respectful way (Croyle et al., 2019). The positive attitude of the farmers in the present study towards providing education, together with previous study results, suggests that offering suitable education to farmers may be one possible solution to stop the growing trend of dirtiness of dairy cattle.

*“Suitable feeding rations and cleaning routines goes a long way”.*

Providing the animals with suitable feeding was also mentioned by the farmers as a possible preventative measure of cattle dirtiness, as liquid manure is common among dairy cattle due to the high protein and low fiber relation in the feeding they are provided, which is known to significantly impede cattle cleanliness (Hauge et al., 2012). When cattle are having diarrhoea, they tend to not lift their tail when dropping the dung, of which the dung tends to spray in all directions according to the farmers. More space could perhaps decrease the risk of spreading the faeces to other cattle. However, having well balanced feeding rations with good amounts of roughage to increase the fibre intake should provide good conditions to prevent dirtiness caused by liquid manure. Unfortunately, the issue with liquid manure is a remaining constant struggle within the dairy production, as a high protein intake is also needed to keep the milking yield high (Thomas., 1971). It is a challenge to keep the balance between the high protein intake that is needed for high-performing dairy cattle in order to keep the production high, and the fiber intake to promote optimal rumen function, among many other benefits (Erickson et al., 2020).

***- Do you think that the choice of housing system may affect cleanliness of dairy cows?***

*“The farmer will remain to be the most important factor for a functioning production, regardless of the housing system”.*

In general, farmers believed that every housing system is possible to keep clean, but with different work effort. Having the wrong measures and design will complicate things, but most housing systems should still be possible to keep clean with suitable cleaning routines. However, it cannot be denied that a well-planned housing system will provide many benefits, such as simplifying cleaning and general management routines, according to the farmers. To have a balanced group dynamic, with a number of animals suitable for the building and by keeping animals together that get along well, was also mentioned as being more important than the housing system.

Having a correct cubicle adjustment in housing systems has been shown to be important for the animal welfare and comfort of dairy cows (Veissier et al., 2004), as well as adequate sizes of beds (Gaworski et al., 2003). and a general housing design that promotes comfort and prevents joint lesions and other injuries (Fulwider et al., 2007). According to the farmers, incorrectly designed housing systems may be a stressor for dairy cows, when for instance not having enough space, inadequate bed sizes or too narrow walking aisles, which also has been shown to be true (Krawczel et al., 2008), but the farmers also mentioned that it can complicate the work for the farmer if the construction is not planned in a way that makes the management easy. High air humidity due to inadequate ventilation systems or too many animals indoor is also associated with dirtiness of cattle (Hauge et al., 2012), and this was also mentioned by the farmers. However, regardless of what kind of housing system you use, it does not matter if the management of it remain insufficient, according to the farmers.

Some of the interviewed farmers currently used a tie stall housing system or had previous experiences from this kind of system and tie stalls was believed to have an advantage of the more modern free housing systems, with regards to dirtiness of cattle. However, the study results by Neja et al. (2016) shows the opposite, that more than twice as many cows in free-stall systems had clean udders in comparison with cows in tie-stall systems and naturally, the somatic cell count then also decreased in free stall systems. Another study showed that dairy cattle in tie-stalls had a higher milking performance caused by a decrease in the somatic cell count, due to cleaner udders (Micinski et al., 2011). Farmers stated that it was easier to manage the cleaning in a tie stall and perhaps this is true in some cases, alternatively this belief may be coloured by farmers' subjective experience, as the dung will stay in the aisles due to the cows' inability to change position in the beds or walk around to spread the dung in other places of the building. Hence it may seem like the building and animals are cleaner. It is without doubt a clear correlation between cleanliness and a decrease in the somatic cell count, but whether the tie-stall or free-stall system has an advantage regarding this should be further investigated in future studies. However, it was a mutual agreement on the importance of the farmers role in cleanliness of dairy cattle and that the housing system will always be secondary.

It is therefore reasonable to draw the conclusion from the farmers' answers to this question, that the housing system do affect the cleanliness of cattle, but the attitude of the farmer will remain the most important factor of keeping the animals clean.

***- Do you believe that the animal welfare inspections are doing fair judgements in general of cleanliness of dairy cows?***

The answers to this question indicated that farmers may have expectations on the inspections that differs from the inspector's actual tasks, as they were often perceived as advisers rather than inspectors. Overall, the contempt against inspectors was clear, as they were viewed as ignorant and incompetent, detached from reality, often with lacking practical experience, common sense, and knowledge about farm animals. The statement of inspectors being incompetent with a lacking experience of farm animals was particularly mutual among the farmers.

*I feel like a criminal. And I know that many of my colleagues feel the same. However, the controls are a must to gain credibility within the industry and we need the financial support the government provide. Having no controls is obviously not an option either”.*

The general belief seemed to be that the inspectors are there to judge and condemn the farmers and that farmers are perceived as criminals in the eyes of the authorities. However, the farmers still recognized the need of the inspections for the financial support they receive. From the animal welfare perspective, it was mixed feelings about the consequences of non-compliance on farms, as some argued that the outcome of neglect of animals should be harder, while others complained about the consequences already being too hard. Some would argue that economic issues may be the reason to why the neglect of animals exists to start with, a large fee may only contribute to further deterioration of a farm. However, bad economy is not an excuse to neglect animals to start with, no matter of the reason behind it. According to the farmers, farms that are receiving non-compliance remarks during animal welfare controls are also contributing to a bad reputation for other farmers and this could also be a reason for harder consequences for farmers that do not meet the animal welfare requirements.

As discussed earlier, the inspections usually take place close to the farmers' home, as most farmers live and work at the same place, and this may result in farmers feeling particularly vulnerable during these inspections. Improved communication and a good relation between the authorities and farmers may be one step in the right direction in order to reduce this feeling of vulnerability. A Finnish study investigating farmers' attitudes towards animal welfare inspections performed by the official authorities, showed that farmers who did not recognize why these inspections was performed had a more negative view of the inspections (Väärikkälä et al. 2018). Hence the importance of good communication between authorities and farmers cannot be neglected. Also, it is clear that the official guidance needs to be

improved for both farmers and inspectors, as study results has also confirmed an existing inconsistency in the categorization of farms as non-compliant during inspections (Lundmark Hedman et al., 2021). Another qualitative interview study by Anneberg et al. (2012), concluded that the outcome of the inspections can be improved if the farmers are involved in co-reflection of the assessment, legislation, and animal welfare during the inspections. To be better informed of the structure of the animal welfare inspections from start was also concluded as an important contributor to a good collaboration between farmers and authorities.

***- Do you think that you have been assessed in a fair way during animal welfare inspections?***

Despite the harsh and judgemental attitude towards inspectors, the farmers also concluded that they were assessed in a fair way during the inspections, also adding that they had not received any remarks themselves. Here it could be discussed whether the farmers that volunteered for the present study were more likely to have well managed farms and therefore were more likely to have no experience with remarks after inspections. However, there were additional complaints about the inspector's assessments when asking this question, suggesting that they assessed insignificant details, while also focusing on trivial details. They were also believed to look for things to remark on constantly. This may be a misunderstanding of the role of the animal welfare inspectors. As discussed in a previous question however, this perception may be coloured by the feeling of being particularly vulnerable when having the inspections 'at their home', but possibly also a misunderstanding of why the inspections exists and what the actual duty of the inspectors are. Again, communication seem to be a recurring issue, hence also possibly a part of the solution to the existing problems in miscommunication between farmers and authorities. By finding ways of avoiding misunderstandings and enhance communication overall, perhaps the issues with dirtiness of dairy cattle could also be reduced.

***- Do you have any thoughts about the investigative journalism television program 'Uppdrag granskning's detection of dirty cattle on KRAV-farms (Swedish organization that develops regulations for ecological and sustainable agriculture), earlier this year and on 'Arlagården' last year?***

This question aroused many emotions, theories, and insider rumours about the causes behind the farmer with the mistreated and dirty dairy cows that was filmed in the 'Arlagården' programme that was shown on Swedish television 2020. The interviewed farmers concluded that this programme was angled by 'Uppdrag granskning' with a predetermined agenda, claiming that the cows that were filmed was clean. The theory behind was that the manure removal system had broken down temporarily, hence the reason to why the cows were standing and lying down in manure. However, the filmed material from this programme also showed that many of the animals were very skinny, which is harder to defend, as malnutrition does

not happen overnight. Moreover, the programme was claimed to be biased, unfairly angled, a part of a political game due to the growing power from animal right activists and that UG is kicking on someone that is already down. The last claim derives from the theory that has been discussed earlier in the present study, that farmers that are mistreating animals usually has some kind of mental or health issue, that give rise to a deterioration in the welfare of animals. Overall, the UG programme was seen as ignorant, presenting an unfair and twisted picture of the reality of the dairy industry, as the issue of dirty cattle is not as widespread as the programme wanted it to appear like. However, as the recent study by Lundmark Hedman, and colleagues (2021) showed, the issue of dirty animals on Swedish farms seem to be a recurring issue that need to be taken seriously. The farmers' theories regarding these two television programmes by UG may still be angled and biased, but it cannot be neglected that nearly half of 371 visited cattle farms in Sweden had insufficiently clean cattle according to the official animal welfare inspections in Sweden (Lundmark Hedman et al., 2021). Hence the truth may lie somewhere in between. However, the issue with dirty cattle needs to be recognized from all parts involved, in order to act with preventative measures.

***- Do you have any other suggestions that you have not already mentioned about solutions to decrease the cases of dirty dairy cattle on farms?***

*"Some kind of support system is needed for farmers. As it is embarrassing to not be able to take care of your own animals, farmers will not ask for help when needed. Education in animal welfare would also be beneficial for all farmers."*

The main suggestions mentioned by the farmers was a better cooperation between the authorities and farmers, some kind of support group for farmers in need of help and offered education in animal welfare and preventative measures to prevent maltreatment and dirtiness of cattle. It was also suggested that animal welfare inspectors should give advice as well and not only strive to convict farmers. However, as already mentioned this may be a misunderstanding of the role of animal welfare inspectors. Having said that, the need for a support group for farmers that struggle to handle their situation, as well as education in animal welfare, seem to be highly requested and could perhaps be a welcomed option and a possible solution to prevent neglect of cattle in the future. However, the Federation of Swedish farmers (LRF) do have a support service for farmers in need of someone to talk to already (Lantbrukarnas Riksförbund., 2021), but the interviewed farmers did also ask for a 'hands on support' specifically, which is not offered by LRF today.

Due to the current situation in the world with the Covid-19 pandemic, farmers also wanted to lift the degree of self-sufficiency in food in Sweden. There is a concern among farmers about the pressure on them to deliver cheap food in the most efficient way. According to the farmers the politics need to change in order for them to deliver high quality food and an increased animal welfare. Consumers need to be prepared to pay more for the food in order to secure the future self-sufficiency. However, with the competition from other EU member countries today, this may

be hard to implement. Due to an increased interest and concern about animal welfare from the public however, The European Commission implemented an EU strategy for protection and welfare of animals in February 2012 (EC/European Commission., 2012), and in 2020 ‘Animal Welfare’ was included in the Farm to Fork strategy, that is a part of The European Green Deal that aims to make Europe climate-neutral by 2050 and to improve the economy, people’s health and care for nature (ibid.). By improving the animal welfare in Europe, food safety and quality, animal health and biodiversity can be improved as well, according to the European Union Strategy for the Protection and Welfare of Animals (ibid.). As the farmers pointed out, the Covid-19 pandemic has been a reminder about the importance of supporting the agriculture and food production to ensure our survival during challenging times, but it has also been a reminder about the connection between animal welfare and how it is linked to human health, which further shows how important it is to also consider animal welfare under a One-Health approach (ibid.). With this said, we are hopefully moving towards a future with an increased awareness of the animal welfare issues we are facing today, a collective improvement of it in Europe and thereby also a more equitable competition between food producers throughout Europe.

### **Ethical and sustainability aspects**

The farmers that chose to volunteer for the present study were informed that their participation was anonymous. The study and quotes in the present study are written in a way that will prevent recognition of the farmers and information that could risk putting farmers in a vulnerable situation was left out.

It is needed to act urgently in order to find solutions and preventative measures to fight the issue with dirtiness and enhance the overall animal welfare for dairy cattle, while still keeping the production efficient. However, as dairy is not considered to be necessary for human health, it could be discussed whether it is ethically justifiable continuing producing a product most people can survive without. The pioneer of the animal liberation movement, Peter Singer would argue that if it is possible produce food for humans without causing harm to animals and if we can survive and be healthy without it, we should do so (Singer., 1973). Between 65 and 70% of the human population on earth are lactose intolerant (Bayless., 2017) and dairy intake has also been associated with skin issues such as acne vulgaris (Juhl., 2018) and breast cancer (Kroenke., 2013). However, dairy is also rich in nutrients such as vitamin D, calcium, phosphate, and protein, which makes it advantageous for the elderly population as it prevents malnutrition and muscle mass loss (Du et al., 2019). From an anthropocentric perspective where humans stand above everything, including animals (Norton., 1984), you could argue that animals are here for us to use, and we can therefore justify continuing consuming dairy products. From Singers perspective of utilitarianism however, we can not justify it



unless the harm outweighs the good, as the definition of utilitarianism is to choose the action that produces the greatest happiness for the greatest number (Scarre., 2020). When then considering that we need to remove the calf from the dairy cow to increase the economical outcome for the dairy production, that we are keeping dairy cows indoor during the majority part of the year for the same reason and when also considering the issues with dirtiness of cattle that this master's thesis is focusing on, justifying consumption of dairy products may be uncertain. When also considering the economic benefit of the farmer and the positive aspects of the humans that get to consume the dairy products, it can still be discussed whether the good outweigh the harm of an animal. However, more humans can probably benefit from the milk than the one or two calves that the milk was intended for. If it would be possible to decrease the issues with dirtiness of cattle, at the same time as focusing on general improvements of the welfare of dairy cows, where all their behavioural and physical needs are satisfied, perhaps this would make it more ethically justifiable as well.

For a sustainable dairy production, both from the animals, the farmers and the consumers perspective, the production need to be economically sustainable at the same time as all the animals' needs are fulfilled. Depending on the subject, sustainability can be defined in slightly different ways, but in a broad sense, sustainability refers to how well something sustains over time (Thiele., 2016).

Continuing on the subject of sustainability, 'One welfare' is a concept that is recognising the connections between animal welfare, human welfare and the environment and is created to improve human and animal welfare worldwide. It recognizes the relationship between animal and human health and welfare and environmental science, and how these are dependent on each other. Hence, this concept also needs to be integrated in policy making and projects internationally, to reduce human and animal suffering while also supporting food security and productivity. By working for a more integrated approach between these, it may result in better animal and human welfare and wellbeing globally.

## **Conclusion**

The aim of this project was to investigate farmers attitudes and reasoning about the challenges with dirty cattle, while also investigate the level of awareness among farmers of how dirtiness affects dairy cattle production success and to explore their attitudes towards this issue. In conclusion, the general picture that the interviewed farmers provided was an overall satisfaction of the present situation of cleanliness of dairy cattle on Swedish farms. This may be due to farmers' primary focus on their own production rather than others. Also, as mentioned in the beginning of the

present study, the farmers that chose to volunteer for this study may be more likely to have a farm with an overall high standard of animal cleanliness, hence their picture of the general dairy cattle cleanliness in Sweden may be coloured by their own standards of cleanliness. However, judging by the answers from the present study, the definition of what is clean and not may also be subjective, which could also be due to lacking guidelines from the Swedish Board of Agriculture. Hence, it is reasonable to conclude that better communication between all parts involved and clearer guidelines from authorities is needed. Overall, when asking questions about how dirtiness affects dairy cattle production success, it seems to be well understood that clean dairy cattle will lead to healthier individuals, hence also a better production success in the long run. Thus, the awareness of this connection may not be the underlying explanation to why this issue exists.

When asking about the importance of building a relationship with the dairy cows, all of the women participating in the present study concluded that it is important. This could be a subject to further investigate in future studies, to increase the understanding of how factors such as the gender of the farmer may play a role in the welfare of cattle, as well as how gender and cases of non-compliance during the official animal welfare inspections could be correlated.

The interviews also showed a lack of knowledge about the correlation between stressed dairy cattle and the impact stress has on dairy production. An increased understanding of correlations like this, may have an important role in the improvement of animal welfare, as having knowledge about this may change the attitude of the farmers and motivate them to evaluate their own relationship towards their dairy cows and how it may affect their stress levels, hence also the dairy production.

Continuing the subject of relationships, the farmers also talked about how the communication and the relation between authorities and farmers need to be improved, as there is an overall negative picture of the authorities and the animal welfare inspections they perform today. This negative relationship may influence the communication, and consequently further complicate improvement of the animal welfare and cleanliness of dairy cattle. If the expectations from the animal welfare assessments are unclear, it will make it hard for the farmer to know what to improve and by this risking that any improvement will remain absent. Building a good relationship and by that improving communication between farmers and authorities may also reduce the feeling of vulnerability that many farmers seem to experience today. Misunderstandings due to bad communication may be a good breeding ground for failure to meet the requested requirements in animal welfare

and cleanliness of cattle on farms, hence finding ways to amend communication cannot be stressed enough. This needs to be further investigated in future studies.

The study also revealed that farmers' health issues may be a possible reason behind the increased cases of dirty dairy cattle during animal welfare inspections in Sweden. Hence, it is important to find ways to support farmers at an early stage. As suggested by the interviewed farmers, some kind of support system for farmers in need of help mentally as well as practically, may be another preventative measure to further decrease the cases of dirty cattle on farms.

When asking the farmers about the housing systems role in dirtiness of dairy cattle, the agreements of its importance was mutual. However, farmers also concluded that in the end, the attitude of the farmer will remain the most important factor of keeping the dairy cattle clean. Increased awareness of the present issues of dirtiness of cattle and how to improve it need to be the initial step. However, as it seems to be an overall ignorance about how widespread this issue is, education concerning this and the factors involved in both cause and preventative measures need to be prioritized, in order to solve the ongoing issues with the dirtiness of cattle.

The reason why many farms fail to comply with the legislation seem to be complex and dependent on many different factors. However, this study has revealed some of the possible causes, such as lacking information from the authorities and communication between them and farmers, a subjective view of what cleanliness means, the general attitude toward dairy cattle and relationship with them, farmers health and the need of a support system, lack of education in animal welfare and possible also an ignorance towards the existence of the occurrence of this issue. Future studies are needed to further investigate what measures that needs to be taken in order to find ways to improve the welfare of dairy cows, and to eliminate the issues of dirtiness of cattle that we experience today.

## References

- Alonso, M. E., González-Montaña, J. R., & Lomillos, J. M. (2020). Consumers' concerns and perceptions of farm animal welfare. *Animals*, 10(3), 385.
- Anneberg, I., Vaarst, M., & Sørensen, J. T. (2012). The experience of animal welfare inspections as perceived by Danish livestock farmers: A qualitative research approach. *Livestock science*, 147(1-3), 49-58.
- Bayless, T. M., Brown, E., & Paige, D. M. (2017). Lactase non-persistence and lactose intolerance. *Current gastroenterology reports*, 19(5), 23.
- Breen, J. E., Green, M. J., & Bradley, A. J. (2009). Quarter and cow risk factors associated with the occurrence of clinical mastitis in dairy cows in the United Kingdom. *Journal of dairy Science*, 92(6), 2551-2561.
- Cardoso, C. S., Hötzel, M. J., Weary, D. M., Robbins, J. A., & von Keyserlingk, M. A. (2016). Imagining the ideal dairy farm. *Journal of Dairy Science*, 99(2), 1663-1671.
- Chaiklin, H. (2011). Attitudes, behavior, and social practice. *J. Soc. & Soc. Welfare*, 38, 31.
- Croyle, S. L., Belage, E., Khosa, D. K., LeBlanc, S. J., Haley, D. B., & Kelton, D. F. (2019). Dairy farmers' expectations and receptivity regarding animal welfare advice: A focus group study. *Journal of dairy science*, 102(8), 7385-7397.
- De Pinho Manzi, M., Nóbrega, D. B., Faccioli, P. Y., Troncarelli, M. Z., Menozzi, B. D., & Langoni, H. (2012). Relationship between teat-end condition, udder cleanliness and bovine subclinical mastitis. *Research in Veterinary Science*, 93(1), 430-434.
- Devitt, C., Kelly, P., Blake, M., Hanlon, A., & More, S. J. (2015). An Investigation into the Human Element of On-farm Animal Welfare Incidents in Ireland. *Sociologia ruralis*, 55(4), 400-416.
- Diskin, M. G., & Sreenan, J. M. (2000). Expression and detection of oestrus in cattle. *Reproduction Nutrition Development*, 40(5), 481-491.
- Du, Y., Oh, C., & No, J. (2019). Advantage of dairy for improving aging muscle. *Journal of obesity & metabolic syndrome*, 28(3), 167.

EC/European Commission. (2020). Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions. *Our life insurance, our natural capital: an EU biodiversity strategy to*, 1-14.

EFSA (2009). Scientific report on the effects of farming systems on dairy cow welfare and disease. *EFSA Journal*, 7(7).

European Commission. (2012) European Union Strategy for the Protection and Welfare of Animals 2012–2015.

Ellis, K. A., Innocent, G. T., Mihm, M., Cripps, P., McLean, W. G., Howard, C. V., & Grove-White, D. (2007). Dairy cow cleanliness and milk quality on organic and conventional farms in the UK. *The Journal of dairy research*, 74(3), 302.

Erickson, P. S., & Kalscheur, K. F. (2020). Nutrition and feeding of dairy cattle. In *Animal Agriculture* (pp. 157-180). Academic Press.

Fukasawa, M., Kawahata, M., Higashiyama, Y., & Komatsu, T. (2017). Relationship between the stockperson's attitudes and dairy productivity in Japan. *Animal Science Journal*, 88(2), 394-400.

Fulwider, W. K., Grandin, T., Garrick, D. J., Engle, T. E., Lamm, W. D., Dalsted, N. L., & Rollin, B. E. (2007). Influence of free-stall base on tarsal joint lesions and hygiene in dairy cows. *Journal of dairy science*, 90(7), 3559-3566.

Gaworski, M. A., Tucker, C. B., Weary, D. M., & Swift, M. L. (2003). Effects of stall design on dairy cattle behaviour. In *Fifth International Dairy Housing Conference for 2003* (p. 139). American Society of Agricultural and Biological Engineers.

Grant, R. J., & Albright, J. L. (2001). Effect of animal grouping on feeding behavior and intake of dairy cattle. *Journal of dairy science*, 84, E156-E163.

Gregoire, A. (2002). The mental health of farmers. *Occupational Medicine*, 52(8), 471-476.

Hawton, K., Simkin, S., Malmberg, A., Fagg, J., & Harriss, L. (1998). Suicide and stress in farmers. *London: The Stationery Office*, 1-122.

Hanna, D., Sneddon, I. A., & Beattie, V. E. (2009). The relationship between the stockperson's personality and attitudes and the productivity of dairy cows. *Animal*, 3(5), 737-743.

Hansen, B. G., & Østerås, O. (2019). Farmer welfare and animal welfare-Exploring the relationship between farmer's occupational well-being and stress, farm expansion and animal welfare. *Preventive veterinary medicine*, 170, 104741.

Hauge, S. J., Kielland, C., Ringdal, G., Skjerve, E., & Nafstad, O. (2012). Factors associated with cattle cleanliness on Norwegian dairy farms. *Journal of dairy science*, 95(5), 2485-2496.

Hawton, K., Fagg, J., Simkin, S., Harriss, L., & Malmberg, A. (1998). Methods used for suicide by farmers in England and Wales: The contribution of availability and its relevance to prevention. *The British Journal of Psychiatry*, 173(4), 320-324.

Juhl, C. R., Bergholdt, H. K., Miller, I. M., Jemec, G. B., Kanters, J. K., & Ellervik, C. (2018). Dairy intake and acne vulgaris: a systematic review and meta-analysis of 78,529 children, adolescents, and young adults. *Nutrients*, 10(8), 1049.

Kauppinen, T., Vainio, A., Valros, A., Rita, H., & Vesala, K. M. (2010). Improving animal welfare: qualitative and quantitative methodology in the study of farmers' attitudes. *Animal Welfare*, 19(4), 523.

Keeling, L. J. (2009). An analysis of animal-based versus resource-based comments in official animal welfare inspection reports from organic and conventional farms in Sweden. *Animal Welfare*, 18(4), 391-397.

Kester, E., Holzhauser, M., & Frankena, K. (2014). A descriptive review of the prevalence and risk factors of hock lesions in dairy cows. *The Veterinary Journal*, 202(2), 222-228.

Knudsen, C., & Wilson, C. (1985). Agriculture sector survey. *Battlefords, Saskatchewan: Battlefords Branch of the mental Health Association in Saskatchewan*.

Krawczel, P. D., Hill, C. T., Dann, H. M., & Grant, R. J. (2008). Effect of stocking density on indices of cow comfort. *Journal of dairy science*, 91(5), 1903-1907.

Kroenke, C. H., Kwan, M. L., Sweeney, C., Castillo, A., & Caan, B. J. (2013). High-and low-fat dairy intake, recurrence, and mortality after breast cancer diagnosis. *Journal of the National Cancer Institute*, 105(9), 616-623.

Kvale, S., Brinkmann, S., & Torhell, S. E. (2014). *Den kvalitativa forskningsintervjun*. Studentlitteratur.

Lantbrukarnas Riksförbund. 2021. Behöver du prata med någon? - LRF. [online] Available at:

<<https://www.lrf.se/medlemsformaner/foretagarmedlem/omsorgsgrupper/>>  
[Accessed 27 November 2021].

Lensink, B. J., Veissier, I., & Florand, L. (2001). The farmers' influence on calves' behaviour, health and production of a veal unit. *Animal Science*, 72(1), 105-116.

Lundmark Hedman, F., Andersson, M., Kinch, V., Lindholm, A., Nordqvist, A., & Westin, R. (2021). Cattle Cleanliness from the View of Swedish Farmers and Official Animal Welfare Inspectors. *Animals*, 11(4), 945.

Lundmark Hedman, F., Hultgren, J., Röcklinsberg, H., Wahlberg, B., & Berg, C. (2018). Non-compliance and follow-up in Swedish official and private animal welfare control of dairy cows. *Animals*, 8(5), 72.

Lundmark, F., Röcklinsberg, H., Wahlberg, B., & Berg, C. (2016). Content and structure of Swedish animal welfare legislation and private standards for dairy cattle. *Acta Agriculturae Scandinavica, Section A—Animal Science*, 66(1), 35-42.

María, G. A. (2006). Public perception of farm animal welfare in Spain. *Livestock Science*, 103(3), 250-256.

Micinski, J., & Pogorzelska, J. (2011). The effect of dairy cattle management systems on milk yield, composition and somatic cell count. *Acta Scientiarum Polonorum. Zootechnica*, 10(3).

Miele, M., Lomellini-Dereclenne, A. C., Mounier, L., & Veissier, I. (2017). Implementation of the European legislation to protect farm animals: A case-study on French inspections to find solutions to improve compliance. *Animal Welfare Journal*, 26(3), 311-321.

Miranda-de la Lama, G. C., Sepúlveda, W. S., Villarroel, M., & María, G. A. (2013). Attitudes of meat retailers to animal welfare in Spain. *Meat Science*, 95(3), 569-575.

Mota-Rojas, D., Maurice Broom, D., Orihuela, A., Velarde, A., Napolitano, F., & Alonso-Spilsbury, M. (2020). Effects of human-animal relationship on animal productivity and welfare. *Journal of Animal Behaviour and Biometeorology*.

Munoz, M. A., Bennett, G. J., Ahlström, C., Griffiths, H. M., Schukken, Y. H., & Zadoks, R. N. (2008). Cleanliness scores as indicator of *Klebsiella* exposure in dairy cows. *Journal of dairy science*, 91(10), 3908-3916.

Nafstad, O. (1999). Skader og kvalitetsfeil paa norske storfehuder. *Norsk Veterinærtidsskrift*, 111, 311-320.

Nielsen, B. H., Thomsen, P. T., & Sørensen, J. T. (2011). Identifying risk factors for poor hind limb cleanliness in Danish loose-housed dairy cows. *Animal*, 5(10), 1613-1619.

Norton, B. G. (1984). Environmental ethics and weak anthropocentrism. *Environmental Ethics*, 6(2), 131-148.

Oltenu, P. A., & Algers, B. (2005). Selection for increased production and the welfare of dairy cows: are new breeding goals needed?. *AMBIO: A Journal of the Human Environment*, 34(4), 311-315.

Ruud, L. E., Bøe, K. E., & Østerås, O. (2010). Risk factors for dirty dairy cows in Norwegian freestall systems. *Journal of dairy science*, 93(11), 5216-5224.

Scarre, G. (2020). *Utilitarianism*. Routledge.

Schreiner, D. A., & Ruegg, P. L. (2003). Relationship between udder and leg hygiene scores and subclinical mastitis. *Journal of dairy science*, 86(11), 3460-3465.

Schukat, S., Kuhlmann, A., & Heise, H. (2019). Fattening pig farmers' intention to participate in animal welfare programs. *Animals*, 9(12), 1042.

Seabrook, M. F. (2001, January). The effect of the operational environment and operating protocols on the attitudes and behaviour of employed stockpersons. In *Proceedings of the 3rd NAHWOA Workshop, Human-Animal Relationship: Stockmanship and Housing in Organic Livestock Systems* (pp. 21-30).

Singer, P. (1973). Animal liberation. In *Animal Rights* (pp. 7-18). Palgrave Macmillan, London.

SLU.SE. 2021. *Ko och kalv tillsammans* / *slu.se*. [online] Available at: <<https://www.slu.se/fakulteter/vh/forskning/forskningsprojekt/not/ko-och-kalv-tillsammans/>> [Accessed 12 July 2021].

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research*. Sage publications.

Templeton, S. (2014). The effect of overcrowding on the behavior of lactating dairy cows in free-stall housing systems.

Thiele, L. P. (2016). *Sustainability*. John Wiley & Sons.

Thomas, J. W. (1971). Protein requirements of milking cows. *Journal of Dairy Science*, 54(11), 1629-1636.



Turner III, D. W. (2010). Qualitative interview design: A practical guide for novice investigators. *The qualitative report*, 15(3), 754.

Vanhonacker, F., Verbeke, W., Van Poucke, E., & Tuytens, F. A. (2008). Do citizens and farmers interpret the concept of farm animal welfare differently?. *Livestock science*, 116(1-3), 126-136.

Veissier, I., Capdeville, J., & Delval, E. (2004). Cubicle housing systems for cattle: Comfort of dairy cows depends on cubicle adjustment. *Journal of animal science*, 82(11), 3321-3337.

Väärikkälä, S., Artukka, S. M., Hänninen, L., & Nevas, M. (2018). Finnish cattle and pig farmers' perceptions of Animal Welfare Inspections. *Animal Welfare*.

Waiblinger, S., Menke, C., & Coleman, G. (2002). The relationship between attitudes, personal characteristics and behaviour of stockpeople and subsequent behaviour and production of dairy cows. *Applied Animal Behaviour Science*, 79(3), 195-219.

Waiblinger, S., Menke, C., & Fölsch, D. W. (2003). Influences on the avoidance and approach behaviour of dairy cows towards humans on 35 farms. *Applied Animal Behaviour Science*, 84(1), 23-39.

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# Appendix 1

Following questions were asked during the interviews.

- *For how long have you been a dairy farmer?*
- *How many cattle do you have in total and how many of these are dairy cows?*
- *Are you organic or conventional?*
- *Do you have a free stall system or tie stall?*
- *What dairy brand do you deliver to?*
- *What are the best and the worse with your job?*
- *What do you think are the most important factors for the cattle to be healthy and what do you do yourself for them to be healthy?*
- *Is it important for you to build a relation with your cows? And why is it important/not important?*
- *Do you think it will make a difference for the health of the cows if they are clean or dirty?*
- *Do you think it will make a difference for your economy if they are dirty or clean?*
- *What do you do to prevent dirty cows?*
- *What factors do you think lies behind the cases where the cleanliness of the cows has failed?*
- *What factors do you think are important to decrease the noncompliance in cleanliness of dairy cows in general?*
- *Do you think that the choice of housing system may affect cleanliness of dairy cows?*
- *Do you believe that the animal welfare inspections are doing fair judgements in general of cleanliness of dairy cows?*
- *Do you think that you have been assessed in a fair way during animal welfare inspections?*
- *Do you have any thoughts about the investigative journalism television program 'Uppdrag granskning's detection of dirty cattle on KRAV-farms (Swedish organization that develops regulations for ecological and sustainable agriculture), earlier this year and on 'Arlagården' last year?*
- *Do you have any other suggestions that you hav not already mentioned about solutions to decrease the cases of dirty dairy cattle on farms?*