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**Participant(s):** KSLA (SLU)

**Author(s):** Anders Herlin and Stefan Gunnarsson

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## Executive Summary

This Consumer and Civil Society Feedback Report is a summary of previous research in the area and a survey of stakeholder groups to be available as at 30<sup>th</sup> November 2016. To this end, a series of stakeholders related to the dairy value chain were consulted in order to acquire key market information.

The contractual date of delivery was 31/08/2016 but permission was granted from the project officer to submit by 30/11/2011. The reason for this was that the work required contacts to a number stakeholders and that turned out to be very difficult during the European holiday season in July and August.

In order to get a detailed understanding of the willingness to set up marketing initiatives related to animal welfare (AW) measures based on precision livestock farming (PLF) systems, the first aim of this study was to survey the current literature. In order to obtain empirical information of the stakeholder views on PLF in the food chain in different parts of Europe, an expert survey was conducted with key actors such as consumer organisations, retailers and third party certification organisations.

The area of consumers'/citizens' attitude to modern animal production has been studied fairly well regarding some aspects, e.g. the attitudes in issues related to organic farming, as well as animal welfare (incl. production diseases), have been surveyed in several countries in Europe, North America and Oceania. In studies that have surveyed consumers in more than one country at the same time, and through meta-studies of previous research, geographical, cultural and socio-demographic differences have been analysed. Factors underlying the attitudes and preferences of the consumers/citizens have been analysed in order to increase understanding. Education and experiences may influence some attitudes of private consumers, whereas other AW concerns are likely to persist, especially when farm animal practices conflict with deeply held values around animal care in individual citizens. Nevertheless, few studies



have focused on specific features of PLF technology, even if studies of consumer attitude to automatic milking systems have been performed.

Although there were a limited number of responses in the survey, the aim was met to include at least ten different consumer and civil society representatives from several parts of Europe. It was found that there were doubts among responders if there was enough competence to have opinions on PLF in dairy production. Animal welfare was considered to be very important in dairy farming and in general there was a positive view on the potential of PLF to be an important tool in enhancing animal welfare. However, there were also opinions that there would be less connection between animals and humans in dairy farming. Additionally, other practices in dairy farming are considered to be more important for the consumers, e.g. access to grazing, than the use of precision livestock technologies.

This report may, in the future, support the development of farm certification programs that will achieve improved PLF systems for monitoring of dairy production.



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## Background

In contemporary dairy farming, a high level of mechanization for heavy and tedious chores and a better information flow helps the farmer to have more animals and produce more efficiently. However, consumers have voiced several concerns over current and new practices and technologies used by the agricultural community, e.g. broiler meat and egg production. In dairy production, for example the access to pasture (Arnott et al., 2016), pain control for dehorning and early separation of cow and calf, has been debated in Europe and North America (Weary et al., 2016). There are also structural changes, dairy herds getting larger and into sizes way larger than was traditionally managed in traditional family farming operations (Berckmans, 2014). This implies less care of and welfare of the individual cow that furthermore may be a concern for some consumers interested in cow welfare.

Currently, introduction of various new technologies, like sensors and computational methodologies, assist farmers in controlling animals and surveying production (Berckmans, 2014). Precision livestock farming (PLF) systems are serious investments and its potential advantages, e.g. saving labour time, early detection, animal welfare, that need to be integrated in a thorough business strategy. Animal welfare (AW) measures might however, not be considered as a priority as the consumer market is not yet fully adapted to guarantee a satisfactory return on investment for these types of investments. However, PLF technologies may at least partly replace expensive AW audits, depending on the aim of these audits, see Lundmark and co-workers (2016) for different approaches in AW auditing (Lundmark et al., 2016).

Even if animal welfare concerns are recognized as a public issue in the EU, this needs to be considered in an economical context, as European farmers have to compete on the global market. The citizens' relationship with modern animal farming, including dairy farming, appears to be ambivalent, as on one hand there is criticism of modern animal farming methods; on the other hand people appreciate certain aspects of industrial farming, such as increased food safety and low food prices (Boogaard et al., 2011).

There is a need to make a successful connection of dairy producers to the markets and therefore, understanding of public opinions is important in order to verify and analyse markets before developing marketing strategies. A value chain approach ideally starts from an understanding of consumer demand and works its way back through distribution channels and the different stages of production, processing and marketing.

Surveying consumer knowledge and attitudes towards practises in modern farming has been performed regarding GMO, organic farming and animal welfare practises, and also in dairy production on robotic milking etc. The recent development in dairy farming involves more extended use of sensors and computer technologies to control and manage animals. However, this major breakthrough has also raised concerns about how PLF affects cow welfare and the people working with cow management.

## Aim

In order to get a detailed understanding of the willingness to set up marketing initiatives related to AW measures based on PLF systems, the first aim of this study was to survey the current literature. This includes scientific studies of attitudes among



consumers in relation to technologies and management in modern animal production and specifically regarding PLF in dairy production. Furthermore, the literature review was performed in order to set a proper background to the findings in the survey.

In order to obtain empirical information of the stakeholder views on PLF in the food chain in different parts of Europe, an expert survey was conducted with key actors such as consumer organisations, retailers, third party certification organisations. This report may, in the future, support the development of farm certification programs that will achieve improved PLF systems for monitoring of dairy production.

## Literature review

### Modern dairy production and the challenges to animal health and welfare

The scientific knowledge about challenges for animal health and welfare in dairy production has previously been scrutinized by EFSA (European Food Safety, 2009). A high milk yield is not a valid indicator of good animal welfare, and for example, it has been found that a high milk yield is negatively associated with good health assessed through the occurrence of diseases and injuries in the cows (Coignard et al., 2014). However, new technologies and management routines, i.e. PLF (Berckmans, 2014), may contribute to an increased animal health and welfare of the cows, reducing the production losses that can be attributed to production diseases, e.g. lameness (Viazzi et al., 2013).

### Consumer attitudes to Animal welfare and production diseases in dairy cattle

Apart from improving health and welfare for the individual dairy cows, there are other aspects of dairy production in the modern society, as farm animal welfare concerns not only the animals themselves, but also producers, consumers, and citizens in general. Attitudes related to animal welfare have been widely investigated in several disciplines, including biology, ethics, food sciences and economics (Lund et al., 2006, Boogaard et al., 2011). Recent study of attitude in an EU-wide survey, covering ~2500 individuals from five European countries, found that human values related to self-transcendence are strongly associated to overall animal welfare attitudes. Furthermore, these are explicitly related to food choices, while values related to the spheres of self-enhancement and conservatism are significantly associated to less sensitive attitudes to animal welfare (Cembalo et al., 2016).

However, the welfare of dairy cows is often perceived to be better within pasture-based systems by the public. For example, a British study (Ellis et al., 2009) found that 95% of consumers questioned did not think it acceptable to keep cows permanently housed indoors. Similarly, pasture access was viewed as important for welfare in a recent North American survey amongst both those affiliated and unaffiliated with the dairy industry (Schuppli et al., 2014). Considering the analyses that have been made on health and welfare and pasture access, there remain considerable animal welfare benefits from incorporating pasture access to dairy production systems. (Arnott et al., 2016). Thus, consumer attitude in this issue is not completely erroneous.

An empirical study of different stakeholders within the North American dairy industry on key issues affecting the welfare of dairy cattle, found that participants across all



stakeholder categories identified similar animal welfare issues, e.g. cow comfort, disease and on-farm mortality, and they rated lameness as the most important welfare issue facing dairy cattle. Although the study found that, the underlying reasons were grouped according to animal-centred concerns and industry-centred concerns, the rating of animal welfare issues in dairy cows were not very different. Furthermore, it was found that while those persons that were closer to the production processes (i.e. meat producers, farmers) were generally used to stressing the biological and physical spheres of the animal, those not involved in production are mostly concerned with subjective and emotional states (Ventura et al., 2015).

In another study, surveying American veterinary students, it was found that the individual attitudes toward the welfare of animals can be considered the results of two separate but somehow interdependent forces. The first originates as a cognitive judgment leading to beliefs about animals and animal use. The second is mainly characterized as an emotional and affective response and includes personal empathy with animals (Paul and Podberscek, 2000).

The innovations developed by scientists working on animal welfare are often not adopted in practice by the producers (Weary et al., 2016). In this paper, the authors argue that one important reason for this failure is that the solutions proposed do not adequately address the societal concerns that motivated the original research. Furthermore, they claim that some solutions may fail because these do not adequately address perceived constraints within the industry. Using examples from the recent work, Weary and co-workers showed how research methods from the social sciences could address both of these limitations (Weary et al., 2016). For example, those American farmers that persist in tail-docking cattle (despite an abundance of evidence showing that the practice has no benefits) often justify their position by citing concern for cow cleanliness. The results of the study indicate the nature of new extension efforts directed at farmers that continue to tail dock, suggesting that these efforts will be more effective if they focus on providing producers with methods of proven efficacy for keeping cows clean (Weary et al., 2016).

Work on pain mitigation for dehorning have shown that some participants reluctant to provide pain relief believe that the pain from this procedure is short lasting and has little impact on the calf (Weary et al., 2016). This result informs the direction of new biological research efforts to understand both the magnitude and duration of any suffering that result from this type of procedure. These, and other examples, illustrates how social science methodologies can document the shared and divergent values of different stakeholder, in order to ensure that proposed solutions align with mainstream values. Furthermore, beliefs regarding the available evidence can be used to help target new scientific research that meets the perceived gaps, and identification of barriers in implementing changes may ease adoption of ideas by addressing these barriers (Weary et al., 2016).

The debate about citizens' concerns about farm animal welfare is often dismissed on the assumption that citizens are not well informed about farming practices. In a recent Canadian survey, interested citizens were asked questions before and after a tour of a large dairy farm (Ventura et al., 2016). It was found that farm visits had a mixed effect on perceptions of whether dairy cows had a 'good' life, improving perceptions for a quarter of participants, worsening perceptions in a third, with no shift in the remaining



participants. These visits appeared to mitigate some concerns, e.g., provision of adequate food and water, gentle humane care. However, other concerns were reinforced or elicited, such as lack of pasture access, early cow-calf separation. Furthermore, animal welfare-relevant values held by participants, e.g., natural living, care, appeared to play an important role in influencing perceptions of farm practices. Ventura and co-workers (2016) concluded that the results suggest that education and exposure to livestock farming may resolve certain concerns, while other concerns will likely persist, especially when practices conflict with deeply held values around animal care (Ventura et al., 2016). In accordance with this it is important to stress that in successful marketing it is crucial that food companies are able to inform and label food items in a reliable way for consumers as well as for the society (Bowman et al., 2016).

### **Consumer attitudes regarding PLF and AW in dairy production**

Previously the ethical implications and the consumer attitude to automatic milking systems (AMS), have been investigated and it was found that there was a significantly positive relationship between being more aware about the technique and positive attitudes. This can be compared to that of those with greater awareness of the use of Bovine somatotropin (BST) actually considered it to be less acceptable (Millar, 2000, Millar et al., 2002). Therefore, it cannot be concluded that consumer concerns are solely based on lack of knowledge, as increased awareness about production conditions may not increase public acceptance.

There are several studies on consumer attitude to dairy production and cow welfare. However, few studies have been focused on the consumer's approach to PLF, with the exception for attitude to AMS. There is definitely a challenge to describe PLF technologies and what it can do for animals and farmers, for the consumer stakeholders (Berckmans, 2014). On the positive side there may be consumers considering that farmers will have better tools for monitoring animals that need help or assistance. On the negative side, consumers may consider that the PLF technologies will drive "factory farming" even further, and that the relationship between animals and humans will be even more distanced or deteriorated, and that the weaker human-animal relationship will decrease AW.

### **Conclusions of literature review**

The area of consumers'/citizens' attitude to modern animal production has been studied fairly well regarding some aspects, e.g. the attitudes in issues related to organic farming, as well as, animal welfare (incl. production diseases) have been surveyed in several countries in Europe, North America and Oceania. Occasionally studies have been performed in other countries, e.g. Asia. In studies that have surveyed consumers in more than one country at the same time, and through meta-studies of previous research, geographical, cultural and socio-demographic differences have been analysed. Factors underlying the attitudes and preferences of the consumers/citizens have been analysed in order to increase the understanding. Education and experiences may influence some attitudes of private consumers, whereas other AW concerns are likely to persist, especially when farm animal practices conflict with deeply held values around animal care in individual citizens. Nevertheless, few studies have focused on specific features of PLF technology, even if studies of consumer attitude to automatic milking systems have been performed. Therefore, we find it relevant to perform a





survey of stakeholder attitude to selected features of PLF in contemporary dairy farming.

## Survey study

### Material and Methods

#### Civil society representatives (study population)

Respondents, which were considered to represent the civil society with interest in farming practices for food production (consumer organisations, animal welfare organisations and food retailers), were identified by project participants from different countries. A preliminary categorisation was conducted into different type of organisation like consumer organisations, animal welfare organisations and food retailers, governmental bodies, private companies, policy makers etc.

#### Questionnaire development and platform

A questionnaire was designed in the web based Netigate system ([www.netigate.se](http://www.netigate.se)), which allows easy responding and computation of results. The questionnaire contained a primary section with basic information about name of organisation, name of person responding, website, e-mail and characterisation of the organisation. The second part consisted of 24 statements reflecting different issues of practices in diary production, animal welfare and possibilities to use PLF for different purposes. Respondents could here give their opinion from “strongly disagree” to “strongly agree” or indicate that they had no opinion on the statements. Furthermore, possibilities to give comments on the two last statements were given.

In total e-mails were sent to the 44 respondents identified, and some of the used e-mails were general for the organisations. As no responses was obtained after a week, personal contacts with the organisations were taken in order to improve response rates. After this was done, complete responses were obtained from 13 organisations in six countries (Sweden, UK, Spain, Romania, Malta, Belgium).

## Results

### Response rate and distribution

In total complete responses were obtained from 13 key actors, and the distribution and characteristics of respondents are presented in table 1.



Table 1. The distribution and characteristics of responders that completed the questionnaire.

Country	Number of organisations	NGO/GOV/Private Company/Other	Scope of organisation(s)
Belgium	1	1/0/0/0	Policy making, Advocacy
Malta	5	1/2/0/2	Animal welfare, Policy making, Consumer rights, Animal rights
Romania	3	0/2/1/0	Consumer rights, Animal welfare, Animal rights, Policy making
Spain	1	1/0/0/0	Policy making
Sweden	1	2/0/0/0	Animal welfare
United Kingdom	2	2/0/0/0	Advocacy, Animal welfare
Total	14	7/4/1/2	

### Civil society competence

The respondents' competence and knowledge on dairy farming and precision farming technologies were investigated in four questions (Table 2). Ten out of 13 respondents agreed to have some knowledge on dairy production and new technologies that are used but they were less confident that civil society could to take positions on the livestock precision farming.

Table 2. Distribution of the respondents' organisation on their general knowledge on dairy farming regarding structure).

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No opinion
a. Have you, before this questionnaire, come in contact with or been informed on Precision Livestock Farming (PLF)?	1	1	0	7	3	1
b. In your country, a large portion (>20%) of dairy cows are kept in loose housing/cubicles with milking in parlours (only Disagree or Agree)		3		10		
c. Do consumers or other civil society stakeholders in your country have enough knowledge to take positions regarding PLF.	0	5	2	6	0	0

The statement "In your country, a large portion (>20%) of dairy cows ..." in table 2, the responses from Malta and Romania were not consistent within countries. Diverging opinions, five disagree and 6 agree, were found if consumers or stakeholders had enough knowledge to take positions on PLF. Disagreement to the statement included two from Malta and one from Belgium, Spain and Sweden each, while six agreed and two took a neutral position.



### **Animal welfare and precision livestock technologies in dairy farming.**

The opinions on animal welfare and the opinions on the relationship between PLF and animal welfare were investigated in a set of eleven statements (Table 3). All respondents agreed that animal welfare is important in dairy production. However, seven respondents agreed to the statement on PLF increasing the risk for less attention to the individual animal. Diverging opinions were found on the risks of a decrease in the human – animal bond and that there would be a risk for farmers to rely too heavily on technology than farmer skills. However, 12 responders agreed or strongly (agreed one neutral) that PLF would trigger early detection of disease and thus improving welfare as well as the all day and night monitoring.



Table 3. Responses on questions related to animal welfare and in relation to PLF technologies in dairy farming.

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No opinion
Animal welfare is important in dairy production.	0	0	0	3	10	0
Lameness in dairy cows is a major animal welfare problem	0	0	0	7	5	1
Precision Livestock technologies have the potential to improve animal welfare	0	0	2	7	4	0
Precision Livestock Farming increase the risk for less attention to the individual animal.	0	3	2	7	1	0
Precision Livestock Farming decrease animal welfare because less bonding between humans and the individual animal	0	3	4	5	0	0
Early detection of disease symptoms in Precision Livestock Farming will help dairy farmers to take actions and thus treat animals early which results in improved animal welfare	0	0	1	10	2	0
Precision Livestock Farming make dairy farmers rely more on sensor information than on their knowledge on the animals' expression of health	1	1	4	6	1	0
More technologies will mean less working time per cow and thus decreased animal welfare	0	6	6	1	0	0
Precision Livestock Farming PLF helps farmers to monitor animals day and night, which improve animal welfare.	0	0	1	10	2	0
The health of calves is important to monitor with Precision Livestock Farming technologies as they are more vulnerable to disease	0	0	2	6	3	1
Precision Livestock technologies can replace manual audits of animal welfare as the status of individual animal potentially can be recorded and followed throughout its life and therefore a guarantee of the welfare of the animal.	0	4	2	5	1	1

### The dairy farming technology, sustainability, competitiveness and consumers

The opinions in relation to dairy farming technology, sustainability, competitiveness and consumers were investigated in ten statements together with comments on two statements (Table 4 and 5).



Table 4. Opinions on the role of PLF technologies on drug use, production effectiveness, sustainability and the human factor.

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No opinion
Do you think Precision Livestock technology can result in less use of drugs for animal growth or treatment of disease?	0	1	1	10	1	0
Adoption of new technologies will help dairy farmers to improve production	0	0	4	7	2	0
Adoption of new technologies will help dairy farmers to be competitive	0	0	4	7	2	0
Adoption of new technologies will help dairy farmers to be more sustainable	0	1	6	4	2	0
Human knowledge and “farmer eye” are superior to technologies for maintaining animal welfare.	0	2	3	6	1	1

Table 5. Opinions on consumer interest in dairy farming technologies and the role of PLF technologies in traceability of dairy products.

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No opinion
Consumers are in general interested in the technologies that are used in dairy production	1	3	6	2	0	0
Precision Livestock technologies may improve consumer acceptance of current practices in dairy farming	0	2	4	5	1	1
Do you think Precision Livestock technologies can provide more accurate traceability of milk	0	0	2	6	4	1

In two statements, responders could give opinion or provide comments. These were:

*Would consumers base their consumer choices on a label that guarantees animal welfare based on improved health monitoring using Precision livestock technologies?*

The results were one disagree, four being neutral and five agreed. There were three comments:

“Consumers are concerned with animal welfare? But not so much with how this is guaranteed. Perhaps if a lot of media attention would be directed towards the use of technology this might boom. But for the moment there is low knowledge on the farming sector in general.” (Vredeseilanden, Belgium)

“Agree but could only comment if ticking comments button. This is probably more about using PLF to underpin performance monitoring that improves compliance with existing labels e.g. organic or RSPCA assured or brand propositions, rather than new labels founded on PLF.” (Soil Association, United Kingdom)

“I think other aspects more important, e.g. access to pasture” (Compassion in World Farming, United Kingdom)



### *Could Precision livestock technology be used to set up an animal welfare label?*

The results were four disagree, two being neutral, four agree and one strongly agreed. There were two comments:

“Neutral - maybe it could be, but should it be? Risks exacerbating consumer confusion on animal welfare standards, performance and credentials” (Soil Association, United Kingdom)

“Again, other aspects such as pasture access much more important. Use of the right technologies alongside good husbandry can however improve welfare outcomes in good systems. They would decrease welfare if they resulted in animals not being given access to good environments including pasture or if they were just used as a labour-saving device rather than as an aid to management.” (Compassion in World Farming, United Kingdom)

## **Discussion**

The introduction of sensor technologies is not completely new in dairy production. The introduction of activity meters in the neckband of the cows was over three decades ago. The development in this field is going much faster now, mainly due to the development of robotic milking about 20 years ago. The need for an ‘around the clock monitoring became more evident and not only on the function of the milking process and the milk. Robotic milking technology together with demands on efficiency and a low availability of skilled staff as herds became larger, have driven the demand for tools to ensure efficiency and to save labour. At the same time, technologies became much cheaper and available. In a few years, there has been a leap in the development of sensor and information technologies and a number of applications have been developed for agriculture and for dairy farming. This technological development is rather unknown to the public except for the introduction of robotic milking. There are other practices in dairy farming that concerns the public, like the production system being organic or not, if grazing is practised and the welfare of the dairy calf. Robotic milking seems to be a positive technology in the eyes of the consumers, which also seem to increase with more knowledge.

The survey was limited and included complete responses from six European countries and 13 different organisations. Two consumer organisations declined to respond due to the low priority of the subject. Therefore, generalisations from the results of survey should be performed with caution, even if the obtained information is useful. Although, a limited number of responders responded in the survey, the aim was met to include at least ten different consumer and civil society representatives from several parts of Europe. However, the ambition to enrol at least 20, was not met.

Inconsistency was observed when analysing the results of the statement in Table 2, question b (“In your country, a large portion (>20%) of dairy cows ...”), where the responses from Malta and Romania were not consistent within countries as it was a fact-checking question. However, the correctness of the others responses was not controlled further, and inconsistency in other surveys regarding questions on facts is not unlikely.

Together with opinions in table 1 and table 5 and comments given here, implies that several actors in civil society may not be ready to form strong opinions yet and that the consciousness of the potential of the PLF technologies is not mature yet or slightly positive. As technology progresses and more stories on the use of sensors in dairy

farming emerge in public media, civil society will become more informed and more ready to make an opinion on the use of PLF.

As shown in Table 3, there is a general agreement that animal welfare is important in dairy farming and that lameness is perceived as a major welfare problem. There seems also to be a rather common view that PLF has a potential to improve animal welfare. Nevertheless, some responders were concerned that the attention and bonding to the individual animal would suffer. Responders were very positive to PLF, improved welfare, to the around the clock surveillance and the potential of early detection of disease. Less work time per animal due to PLF resulting in impaired animal welfare, was not a concern for the responders. The responders were rather divided on the notion that PLF could be used as to partly replace manual welfare audits.

There were large agreements that there would be less use of drugs with PLF and large agreements on the importance of PLF for improving sustainability and competitiveness (Table 4 and 5). Consumer interest of the role of PLF can be of interest but less so than other practices, such as grazing in summer which are considered more important.

### Conclusions of the survey study

Although, a limited number of organisations responded in the survey, the aim was met to include at least ten different consumer and civil society representatives from several parts of Europe. However, the ambition to enrol at least 20, was not met. There were doubts among responders if there was enough competence to have opinions on PLF in dairy production. PLF is a relatively a new phenomenon and has to be given time to be well understood by civil society and consumer stakeholders. Animal welfare was considered to be very important in dairy farming and in general there was a positive view on the potential of PLF to be an important tool in enhancing animal welfare. However, there were also opinions that there would be less connection between animals and humans in dairy farming. Additionally, other practices in dairy farming are considered to be more important for the consumers, e.g. access to grazing, than the use of precision livestock technologies. Essentially, PLF does not change the view on modern dairy farming, being a large scale “factory”. However, PLF makes it more efficient with a good conscience regarding animal welfare.

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