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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 was delivered 29 March 2018. To this end, a series of stakeholders related to the dairy value chain was consulted in order to acquire key market information. This is the second report based on the 2016 report. The literature review is essentially the same, with small alterations, but the survey part has in small parts been modified with addition of a few statements added.

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 towards 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 and more than the double amount of responders than in the study of 2016. 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 very important in dairy farming and in general, and the respondents had a positive view on the potential of PLF to be an important tool in enhancing animal welfare. However, some respondents considered that there would be less connection between animals and humans in dairy farming in future. Additionally, other practices in dairy farming were considered more important for the consumers, e.g. access to grazing, than the use of precision livestock technologies.

This report may in 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 a consumer organisations, retailers, third party certification organisations. This report may in 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, rather it has been found that there is a negative association between a high milk yield and 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 productions 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 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 could 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).

Recently, a strong position against PLF was taken by the organisation Compassion in world farming (Stevenson, 2017). It argued that PLF is more likely to be used in large-scale intensive systems in which the potential for a satisfactorily animal welfare is limited. Thus, PLF will facilitate animal production in large-scale, intensive, systems and which are negative to the environment. The view on animal welfare is also changing, adding also positive experiences by the animals, not only avoiding negative experiences or illness, which are possible to detect by PLF technologies. Stevenson, (2017) suggested that PLF must shift in the direction towards systems that enhance these positive experiences for the animals.

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 regions, 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 some 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 the 4D4F project participants for the different countries. A preliminary categorisation into different type of organisation like consumer organisations, animal welfare organisations and food retailers, governmental bodies, private companies, policy makers etc. Respondents from the 2016 investigation may be included in the present report.

Questionnaire development and platform

A questionnaire designed in the web based Netigate system (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 27 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, respondents had the possibility to add comments.

Members of the 4D4F project group in the participating countries invited to potential respondents to participate in the survey by email and/or telephone. In total 28 respondents completed the questionnaire representing Sweden, UK, Spain, Romania, Belgium, the Netherlands and Estonia.

Results

Response rate and distribution

In total complete responses were obtained from 31 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	Private company/ NGO/Political org./ Cooperation of org./ Gov. office/Other	Scope of organisation(s)
The Netherlands	2	1/1/0/0/0	Advocacy/Animal Welfare
United Kingdom	6	0/0/0/0/6	Advocacy/Other
Sweden	3	1/1/0/0/1	Policy making/Other
Romania	10	4/0/0/5/1	Policy making//Animal welfare/Other
Belgium	3	1/0/1/0/2*	Private company/Animal Welfare/Other
Spain	5	1/1/0/2/1	Policy making/Animal Rights/Other
Estonia	2	2/0/0/0/0	Policy making/Other
Total	31	9/3/1/0/7/11	

*Organisation double classified

Romania accounted for nearly 1/3 of all responses. Therefore, the number of their opinions is shown within brackets. This bias influenced the results very little.

Civil society competence

The respondents' competence and knowledge on dairy farming and precision farming technologies were investigated in four statements (Table 2). In the survey 27 out of 31 respondents agreed to have some knowledge on dairy production, fewer knew about PLF, and even fewer were 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). The opinions from Romania is shown within brackets.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No opinion
a)Our organisation have in general good knowledge on dairy farming in our country regarding structure (e.g. number of cows per farm and technological level) (n=31)	1	0	3(1)	11(5)	16(4)	0
b) I have before this questionnaire, come in contact with or been informed on Precision Livestock Farming (PLF, as described in the introduction)? (n=29)	1(1)	4(1)	7(1)	11(5)	6(2)	0
c) In our country, a large portion (>20%) of dairy cows are kept in loose housing/cubicles with milking in parlours (only Disagree or Agree) (n=29)		2(1)		21(7)		6(2) (Don't know)
d) Consumers or other civil society stakeholders in your country have enough knowledge to take positions regarding PLF. (n=30)	3(1)	11(2)	7(3)	7(3)	0	2(1)

The statement "In your country, a large portion (>20%) of dairy cows …" in table 2, the response from Romania and the Netherlands were not consistent within their countries. Diverging opinions, 14 disagree and 7 agree and 7 neutral were found if consumers or stakeholders had enough knowledge to take positions on PLF.

Animal welfare and precision livestock technologies in dairy farming.

The opinions on animal welfare, as well as, the opinions on the relationship between PLF and animal welfare were investigated in a set of ten statements (Table 3). Nearly all respondents (except one from UK) agreed that animal welfare is important in dairy production.

However, diverging opinions were found on the statements on PLF increasing the risk for less attention to the individual animal and 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, good agreements were found on the statements regarding the role of PLF in early detection of disease in general and mastitis in particular and that lameness is a major animal welfare problem. Some diverging opinions were found on "rely more on sensor information than on their knowledge". The responders also leaned on disagreeing on "more technology mean less work time per animal and thus decreased animal welfare"

Table 3. Responses on statements related to animal welfare and in relation to PLF technologies in dairy farming. The opinions from Romania is shown within brackets.

Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No opinion
a) Animal welfare is important in dairy production. (n=30)	1	0	1(1)	10(3)	18(6)	0
b) Precision Livestock technologies have the potential to improve animal welfare (n=30)	0	0	2	14(6)	13(4)	1
c) Precision Livestock Farming increase the risk for less attention to the individual animal. (n=30)	0	7(1)	10(6)	8(2)	2(1)	3
d) Precision Livestock Farming decrease animal welfare because less bonding between humans and the individual animal (n=30)	1	6(1)	10(5)	8(2)	1(1)	4(1)
e) 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 (n=30)	0	0	1	12(7)	15(3)	2
f) Mastitis is a major disease in dairy cows which can be better managed with the use of PLF technologies (n=29)	0	0	2(1)	13(5)	10(4)	4
g) Lameness in dairy cows is a major animal welfare problem (n=29)	0	3(2)	6(3)	9(2)	8(2)	3
h) The health of calves is important to monitor with Precision Livestock Farming technologies as they are more vulnerable to disease (n=29)	0	0	3(2)	12(3)	10(4)	4
i) Precision Livestock Farming make dairy farmers rely more on sensor information than on their knowledge on the animals' expression of health (n=30)	1	5	7(3)	12(6)	3(1)	2
j) More technology will mean less work time per cow and thus decreased animal welfare (n=28)	4	11(3)	6(3)	2	2	3

The dairy farming technology, sustainability, competitiveness and consumers

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

PLF and new technologies were regarded by a majority of responders to help reduces drugs in animal production, improve performance, support dairy farmers become more competitive and sustainable. However, some more responders were here neutral and one negative. Responders were mainly confident in farmer skills and knowledge being superior to technologies for animal welfare.

Table 4. Opinions on the role of PLF technologies on drug use, production effectiveness, sustainability and the human factor. The opinions from Romania is shown within brackets.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No opinion
a) Precision Livestock technologies can result in less use of drugs for animal growth or treatment of disease. (n=28)	0	1	1(1)	15(5)	8(3)	3
b) Adoption of new technologies will help dairy farmers to improve production (n=28)	0	0	1	16(5)	10(4)	1
c) Adoption of new technologies will help dairy farmers to be competitive (n=28)	0	0	1	15(5)	11(4)	1
d) Adoption of new technologies will help dairy farmers to be more sustainable (n=28)	0	1	6	12(5)	9(4)	0
e) Human knowledge and “farmer eye” are superior to technologies for maintaining animal welfare. (n=28)	0	5(1)	11(6)	11(2)	0	1

Consumer interests in dairy farming technologies produced several diverging opinions. Responders had different opinions on how much consumers were interest in dairy farming practices, if it can be more acceptable PLF and if they can make conscious choices based on labels on animal welfare monitoring. Diverging opinions were also found if PLF can replace manual audits of animal welfare and if there is a risk the PLF will lead to larger farms and worse animal welfare. There was greater agreement on PLF leading better traceability of milk and that it can be used in setting up an animal welfare label.

Table 5. Opinions on consumer interest in dairy farming technologies and practices and the role of PLF technologies in traceability of dairy products. The opinions from Romania is shown within brackets.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No opinion
a) Consumers are in general interested in the technologies that are used in dairy production (n=29)	1	10	7(2)	8(6)	1(1)	1
b) Precision Livestock technologies may improve consumer acceptance of current practices in dairy farming (n=28)	1	5	8(1)	10(7)	1	3
c) Precision Livestock technologies can provide more accurate traceability of milk (n=28)	2	1	1(1)	15(5)	8(3)	1
d) Precision livestock technologies can be used to set up an animal welfare label? (n=28)	0	3	6(1)	14(6)	4(2)	1
e) Consumers will be able to make conscious choices by the use of a label that guarantees animal welfare which is based on health monitoring using Precision livestock technologies? (n=27)	1	2	10(1)	10(6)	2(2)	2
f) Precision Livestock technologies can replace manual audits of animal welfare as the status of the individual animal can be recorded throughout its life and therefore a guarantee of the welfare of the animal (n=28)	2	6	6(1)	10(7)	1(1)	3
g) Precision Livestock technologies helps farmers to monitor animals day and night which improves animal welfare (n=28)	0	0	1	15(5)	10(4)	2
h) There is a risk that Precision Livestock technologies will lead animal production in a direction to much larger farms and thus worse animal welfare (n=27)	1	9(3)	7(4)	7(2)	2	1

The free opinions are here given.

A responder from UK gave the following statement:

> “The people behind the technology are key and having a label saying you use it is not synonymous with better farming. There needs to be plenty of training and adaption to use PLF for many farmers. Animal welfare can be improved with technology but it comes with risks and these needs to be made clear to farmers/advisors e.g. what happens when it fails? Not a reason not to visually check a cow? How good is the understanding of what PLF tells you?”

Another opinion from UK stated the following:

> "Different PLT* will have different outcomes. Hard to generalise." (PLT=Precision Livestock Technologies, edited)

From Sweden:

> "For consumers other aspects may be more important i.e. grazing in summertime"

Three opinions were delivered from Belgian responders:

> "As an organisation we feel strongly excluded from the dairy sector and remain uninformed. On the other hand, we do not believe that all those actors within the sector will install the necessary control mechanisms. To give an example, when a veterinarian of a farmer is asked to control animal welfare he will not do so for the farmer will then employ another veterinarian if he does so. " (minor editing)

> "PLF is specifically targeted towards growing farms, and holds the risk of increasing the gap between very large farms and other farms. The opinions in questionnaire only speak for organic farmers " (minor editing)

> "We learn about agriculture via our suppliers, not directly"

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 responses from 31 different organisations in eight European countries. Only few consumer organisations responded due to the low priority of the subject for them. 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. The ambition to enrol at least 20, was met with in total 31 respondents with 27 to 31 opinions given. It was evident that one of the respondents missed out a majority of the statements.

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

Romania was over-represented in the results with about 1/3 of respondents but the separate reporting of their opinion did in most statements reveal only minor deviation from the other respondents, especially if opinions “agree”, “strongly agree”, “disagree” and “strongly disagree” respectively, is put together. In table 2, statement b, there were less than expected “neutral”, but more in table 4, statement e. These deviations in opinions are small and can be ignored at this point.

Together with opinions in table 2 and table 5 and comments given here, implies that several actors in civil society may not be ready to form solid 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. Furthermore, there seems to be a rather common view that PLF has a potential to improve animal welfare and help reduce drug use and improve mastitis management. Nevertheless, some responders were concerned that the attention and bonding to the individual animal would suffer, but there was little concern on using more technology to reduce worktime would impair animal welfare. 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 responses were rather split on the notion that PLF could be used for partly replacing manual welfare audits.

There were large agreements that 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 is 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. 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 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 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 animal production more efficient with a good conscience regarding animal welfare as every animal is individually monitored all the time for health and welfare.

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