
Future-Oriented Dairy Farmers' Willingness to Participate in a Sustainability Standard: Evidence from an Empirical Study in Germany

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ABSTRACT

As a major agricultural subsector, milk production plays an important role in the EU 28. Political decisions such as the abolition of the milk quota system in 2015, highly volatile milk prices, high bargaining power of retailers and fierce international competition have led to challenges for both farmers and dairies and have created a need to improve competitiveness. Furthermore, the dairy sector is increasingly subject to societal demands for higher animal welfare and ecological standards. The concept of sustainability in the form of a production standard can be seen as a means for both dairy farmers and dairies to gain competitive advantages and meet stakeholders' demands. Farmers' willingness to participate in a sustainability standard is a key factor for its successful implementation. One attractive target group for such a standard are future-oriented farmers who plan to stay in dairy farming in the long run. This study, therefore, focuses on future-oriented dairy farmers and investigates their willingness to participate in a comprehensive sustainability standard. A hierarchical agglomerative cluster analysis is conducted to identify different groups based on their willingness to participate. 211 farmers can be categorized into three different clusters: 'halfhearted sustainability proponents', 'highly dedicated sustainability proponents' and 'profit-oriented sustainability refusers'. Further analysis provides insights into the determinants of farmers' willingness to participate in a sustainability standard. The results of this study provide manifold starting points for deriving managerial implications for the successful implementation of sustainability standards in European dairy farming

Keywords: Future-oriented dairy farmers; sustainability standard; cluster analysis

1 Introduction

Milk production plays an important role in the EU 28. The leading European milk producers are Germany (production volume: 31.3 m tons per year), France (24.4 m tons) and the United Kingdom (13.9 m tons) (Destatis, 2015). Political decisions such as the abolition of the milk quota in 2015, highly volatile milk prices and fierce international competition have led to major challenges for both dairy farmers and dairies and demand adjustment measurements from them to stay competitive and improve their ability to cope with volatile market conditions (Doluschitz, 2009; Heyder et al., 2010). A central position in the current situation of low producer prices is attributed to retailers, who have high bargaining power and are, therefore, in a key position to set the milk price in Europe (Hartmann, 2001; Dries et al., 2009; Milchtrends.de, 2015). Furthermore, retailers have the power to set their requirements, for instance with regard to production standards, and sanction suppliers which do not meet these standards by delisting them (Reardon et al., 2004; Singh, 2011). From society's point of view, milk production has a relatively

positive image and is more accepted than pork and poultry production (Kühl et al., 2014). Nevertheless, demands for more animal welfare-friendly milk production with a focus on grazing opportunities for cows, abolition of dehorning, improvement of animal health, longer life expectancy of milk cows and other animal welfare improvements as well as more sustainable feed production are emerging issues in public debates in many European countries (van Calker, 2005; Gauly, 2015). Facing these challenges, dairies are currently in search of a long-term strategy to meet society's demands and retailers' requirements while maintaining or even improving their competitiveness in the face of the currently low milk price. The concept of a sustainability standard for producers, understood as a commitment to more sustainable milk production, for instance by a focus on high milk quality, improved animal health, and a longer life expectancy of dairy cows, can be seen as a means by which farmers and dairies can gain and sustain competitive advantages. They can thereby meet the demands of the wider public, retailers and other stakeholders (Porter and Kramer, 2006; Flint and Golcic, 2009; Heyder and Theuvsen, 2012).

In this paper, sustainability is defined with reference to the so-called triple bottom-line approach. This means that companies striving for higher sustainability integrate ecological and social goals in addition to their primary objective of making a profit. These three pillars—ecological, social and economic responsibility—result in long-term sustainable development at enterprise level (Crane and Matten, 2004). Similar to other industries, which operate under the critical eye of the wider public, the concept of sustainability has also gained growing relevance in the agribusiness sector and its various sub-sectors (Friedrich et al., 2012). Van Calker et al. (2005), Meul et al. (2012) and Lassen et al. (2014) all identify comprehensive sustainability approaches for the dairy industry. These concepts mainly follow the general sustainability approach of the three pillars but also add an additional animal ethics or animal welfare dimension (van Calker et al., 2005; Meul et al., 2012; Lassen et al., 2014). In this sense, Schodl et al. (2015) point out animal welfare as an important aspect of improved sustainability. Despite various attempts to define and implement sustainability concepts for the dairy sector, comprehensive research in this field is still scarce. Most previous studies have focused on selected areas of sustainability in the dairy industry. Studies that focus on ecological sustainability address aspects such as land conservation, greenhouse gas emissions or reduction of water consumption, energy use or environmental pollution (cf. Refsgaard et al., 1998; van Calker et al., 2004; Weiske et al., 2006; Meul et al., 2009). The second pillar of sustainability, i.e. the economic approach, is generally characterized by reference to financial performance indicators such as net farm income or animal productivity, for instance, milk yield (cf. Santarossa et al., 2004; van Calker et al., 2004; Camarillo et al., 2012). The social dimension is the third pillar of sustainability. Van Calker et al. (2005) separate the social dimension into internal social sustainability, such as working conditions of farm workers, volunteering or work training, and external social sustainability, such as animal welfare, animal health, landscape quality and food safety (cf. Armstrong and Pajor, 2001; van Calker et al., 2005, 2007). Despite a large number of studies addressing specific aspects of sustainability of dairy farming, comprehensive studies addressing all three pillars of sustainability are rare so far.

Against the background described above, dairies worldwide have put sustainability on their agenda. The dairy industries in the United States (Innovation Center for U.S. Dairy, 2015), Australia (The Australian Dairy Industry, 2015) and some European countries, such as Ireland (Origin Green, 2015), have already introduced initiatives for food chain-wide sustainability schemes. Similar initiatives have sporadically also occurred in other countries, for instance, New Zealand (e.g., Fonterra's Sustainable Dairying and Sustainable Manufacturing initiatives) and France (e.g., Lactalis' Sustainable Development program). Meanwhile, the German dairy sector has been lagging behind. But, more recently, German dairies and international dairy companies with subsidiaries in Germany have started to develop sustainability management concepts for their companies and milk suppliers; the first being the German subsidiaries of FrieslandCampina (top agrar, 2013; FrieslandCampina, 2015) and ArlaFoods (2015) and the largest German dairy Deutsches Milchkontor (2015).

Thus, it can be concluded from recent industry initiatives that sustainability has become an emerging issue for dairies worldwide. This has resulted in a multifaceted picture of company-specific sustainability schemes. The successful implementation of standards, whether industry-wide or firm-specific standards, is a demanding task (Besen and Saloner, 1989; Schulze et al., 2008). One key success factor for the implementation of a sustainability standard is farmers' willingness to participate in such a standard (Sattler and Nagel, 2010; Sayem, 2012; Gocsik et al., 2014) but very little is currently known about farmers' attitudes and motivation on this subject. This observation also holds true with regard to large-scale future-oriented dairy farmers, who are considered as 'first movers' or rather 'early adopters'. They are an important target group for dairies interested in implementing a sustainability standard due to these farmers' long-term willingness to stay in milk production and increase output quantities.

The small number of previous studies tends to take definitional approaches to sustainability in the dairy industry (Refsgaard et al., 1998; Armstrong and Pajor, 2001; Santarossa et al., 2004; van Calker et al., 2004, 2005, 2007; Meul et al., 2009, 2012; Camarillo et al., 2012; Lassen et al., 2014). Despite these

various attempts to define what sustainability actually means in the dairy sector, the concept is still diffuse and imprecise in its definition. Empirical research on sustainability management in the dairy sector is mostly limited to a few preliminary studies on how firms interpret and implement sustainability (Gibon et al., 1999; van Calker, 2005; Friedrich et al., 2012). In fact, there is currently no literature at all on dairy farmers' willingness to participate in a sustainability standard.

Against this background, this study was designed to investigate future-oriented dairy farmers' willingness to participate in a sustainability standard and to differentiate groups of farmers based on their differing degrees of willingness to participate. The results of this study suggest manifold managerial implications for dairies and other actors, which are interested in implementing sustainability standards for future-oriented dairy farmers and want to tailor the sustainability standards to the farmers' expectations.

The remainder of the paper is organized as follows: The theoretical background of the empirical analysis is described in section 2 and the methodology in section 3. The fourth section provides an overview of our empirical results. The paper closes with a discussion of the results and conclusions.

2 Theoretical background

The literature provides various approaches to explain the introduction and the intention to use new technologies, e.g. the Technology Acceptance Model (Davis, 1989; Venkatesh and Davis, 2000), the Theory of Planned Behavior (Ajzen, 1991) or the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003). The various approaches have in common that the term *technology* is used in a broad sociological sense referring to any substitution of equipment for human labor (Blau et al., 1976); it can therefore embrace industrial production techniques, information and communication technologies, and management techniques, such as certification systems or standards.

In agricultural economics research, the Technology Acceptance Model (TAM) has repeatedly been applied for analyzing the willingness of actors along food supply chains to use or invest into new technologies (e.g., Jahn and Spiller, 2005; Heyder et al., 2012; Kröger and Theuvsen, 2016) and, therefore, also serves as a theoretical starting point for this study. The TAM mainly describes the link between factors such as attitudes or beliefs, on the one hand, and the intention to use and the actual use of a technology, on the other (Davis, 1986, 1989). The central elements of Davis' (1989) TAM are *perceived usefulness* and *perceived ease of use*. The former describes users' belief to improve the job performance when using the technology. The latter can be interpreted as the user's perception of the convenience of a given system. These factors influence the *intention to use* a technology and affect its overall actual use (Davis, 1989; Vogelsang et al., 2013). Davis (1989) postulates that the relationship between the *perceived usefulness* of and the *intention to use* a technology is the significantly strongest factor in his model to explain users' actual usage of a technology. Studies on farmers' and agribusiness firms' willingness to participate in the implementation of new technologies also assert that *perceived usefulness* is significantly important for the use of any given technology (Jahn and Spiller, 2005; Voss et al., 2009; Arens et al., 2012; Heyder et al., 2012). In another study, Davis et al. (1992) confirmed the high impact of *perceived usefulness* and *intention to use* on users' willingness to participate and actual usage of a technology.

Additionally, Davis et al. (1992) identified a further factor—*users' motivation*—as important for the willingness of individuals to participate in or rather use a technology. Psychological research usually distinguishes between *intrinsic* and *extrinsic* sources of motivation (Deci, 1972; Scott et al., 1988). *Intrinsic motivation* relates to inner incentives, such as enjoyment of the activity itself or individual norms and values (Berlyne, 1966; Ryan and Deci 2000). *Extrinsic motivation* is defined as external reasons for a person to act in a certain way; in a work context it stems from, for example, financial rewards or job performance reviews (e.g. Vroom, 1964; Lawler and Porter, 1967; Ryan and Deci, 2000). This distinction also allows understanding farmers' motivation with regard to sustainability. Literature on land conservancy as a sustainable farm management practice, for instance, shows that farmers' willingness to participate in a sustainability commitment is highly motivated by economic incentives (cf. Morris et al., 2000). Very similarly, Kjaernes et al. (2007) and Franz et al. (2012) showed that financial incentives are a primary motivation for farmers to implement higher animal welfare standards. This can be confirmed by reference to the Animal Welfare Initiative recently initiated by German food retailers, the German meat industry and farmer associations. Many farmers have decided to participate in the initiative and are prepared to face its requirements regarding higher animal welfare standards. Besides a better reputation, farmers predominantly expect higher product prices and competitive advantages stemming from improved animal welfare standards on their farms (Initiative Tierwohl, 2016; top agrar, 2016). But farmers' long-term willingness to participate is also driven by *intrinsic motivation*, such as society's recognition of their commitment to sustainable farming practices or their personal belief and involvement in the sustainable activities (Källström and Ljung, 2005; Schenk et al., 2007; Bewket, 2007; Sattler and

Nagel, 2010; Mzoughi, 2011). Additionally, farmers' evaluation of current sustainability measures, e.g. the German sustainability measure 'QM-Milk', and the sufficiency of these lenient standards is another important factor in their willingness to participate in a sustainability standard. Studies about the implementation of sustainability programs have indicated that farmers are skeptical about adjusting their production processes to higher sustainability because of the high economic risks they perceive to be involved. The willingness of suppliers or consumers to pay more for higher sustainability standards is also uncertain and could be another explanation why farmers are more willing to retain their existing—although in many cases less sustainable—production processes (cf. Duffy and Fearn, 2009; Rodriguez et al., 2009; Deimel et al., 2010).

Thus, with regard to farmers' willingness to participate in the introduction of a new technology such as a sustainability standard, at least five decisive factors can be derived from the existing research: perceived usefulness, intention to use a standard, extrinsic motivation, intrinsic motivation, and the perceived sufficiency of a lenient standard. These concepts will serve as a guideline for the subsequent analysis of future-oriented dairy farmers' willingness to participate in a sustainability standard.

3 Material and methods

3.1 Study design

To answer the research question outlined in the introductory section, a web-based survey of farmers' perceptions of and attitudes towards alternative sustainability standards in dairy farming was conducted in March and April 2015. The questionnaire comprised three sections: Socio-demographic characteristics were gathered in the first part, followed by an evaluation of farmers' willingness to participate in a sustainability standard and their motivation to participate and, finally, a request for farm characteristics. The survey contained primarily closed questions to be answered on five-point Likert scales*. After a pre-test, the questionnaire was distributed throughout Germany. 528 respondents start answering the questionnaire and a total of 226 dairy farmers from all over Germany finished it. Future-oriented farmers were identified by means of a question concerning their production planning, categorizing them as future-oriented if they planned either to increase their current production volume or keep it at least constant and not future-oriented otherwise. This screening left 213 future-oriented dairy farmers in the sample for empirical analyses.

3.2 Statistical analysis

The statistical analysis was conducted using IBM SPSS Statistics 23. To characterize the sample, descriptive statistics such as frequency distributions, mean values (μ) and standard deviations (SD) were used (Backhaus et al., 2008; Bühl, 2010). A hierarchical agglomerative cluster analysis was conducted to identify different groups of farmers in the sample based on their differing degrees of willingness to participate in a sustainability standard. Respondents with the shortest distance to each other were combined using the single-linkage procedure. During this analysis, two outliers were identified, leaving 211 respondents. To identify the optimal cluster solution, the Ward method was employed to combine respondents, which minimally increased the variance in the cluster group. Applying the elbow criteria yielded three clusters. By using the k-means method, the solution was determined in six iterations. Finally, discriminant analysis confirmed that 96.7 percent of the cases originally grouped were classified correctly. The cluster-building variables are described using a univariate variance analysis (ANOVA) (Tab. 2 in chapter 4.2). A post hoc test (Tamhane's T2 or LSD) yielded the differences in the mean values (Backhaus et al., 2008; Bühl, 2010)†.

3.3 Sample description

The sample in this study contains 211 respondents; of those are 90 percent men. Respondents in the sample are on average 46 years old and have 24 years of work experience. Most respondents completed some level of higher education, as 32.7 percent attended university and 30.8 percent completed advanced training in agriculture. With regard to the size of farmland, the farms in the sample are approximately eight times larger than an average German dairy farm (417 vs. 58.6 ha) (Destatis, 2013; DBV, 2014). The farmers surveyed keep on average 230 cows, whereas the average German herd size is only 57 cows (Statista, 2015). In the sample, the average milk yield, which is a central key indicator of productivity in dairy farming, is 9,001 kg per cow and year and, thus, higher than the German average of 7,541 kg per

* Scale: -2= strongly disagree to +2= strongly agree and -2=very unimportant to +2=very important.

† Level of significance in this study: n.s.=not significant; $p \leq 0.05$ significant*; $p \leq 0.01$ very significant**; $p \leq 0.001$ highly significant***.

cow and year (Statista, 2014). This shows that the sample consists of farms with an advanced herd management whose quality is highly correlated with milk quality and animal health and finally with the milk yield. Nowadays high-yield cows are able to give on average 9,000 to 10,000 kg milk per year (Agrarheute.de, 2014). Tab. 1 gives an overview of the main farm characteristics in comparison to average dairy farms in Germany.

Tab. 1.
Farm characteristics of the sample in comparison to average dairy farms in Germany

	Sample	German average
Farm size (ha)	417	58.6
Proportion of grassland (%)	26	28
Ø Herd size (number of dairy cows per farm)	230	57
Ø Amount of milk per cow and year (kg)	9,001	7,541

Source: Authors' calculation; Destatis 2013; DBV 2014; Statista 2014; 2015.

Most of the respondents come from North Rhine-Westphalia (21.3 %), Bavaria (19 %) and Lower-Saxony (17.5 %), followed by farmers from Saxony (8.1 %), Schleswig-Holstein (7.6 %) and Mecklenburg-West Pomerania (6.6 %). Thus, most of the dairy farms surveyed are located in typical regions for intensive dairy farming in Germany (Destatis, 2011). Since the focus in this study lays on future-oriented dairy farms, the share of larger farms is higher than in the basic population. Concerning their future strategic orientation, 47.4 percentage of the respondents intend to remain with their current production volume, whereas 52.6 percent plan to increase their milk production in the future.

Most of the respondents (92.9 %) produce milk in a conventional way, whereas 7.7 percent follow an organic approach (BMEL, 2014). Conventional as well as organic farmers' share of income from the dairy production lays around 68.47 percent. But there is a very significant correlation between the share of income and the farm size (0.006**). The share of total income from milk production decreases with the farm size. On farms with an average farm size below 100 ha, the share of total income from dairy farming lays around 74 percent. Instead, on farms with an average size larger than 201 ha, the share of total income from milk production is around 54 percent.

4 Results

4.1 Descriptive results

Overall, farmers have a positive attitude towards a sustainable milk production (Fig. 1) as 84.4 percent value it as necessary and 80.5 percent as reasonable. Although 47.4 percent of the future-oriented farmers rate a sustainable milk production as easy to understand, 28.9 percent of the respondents see difficulties regarding the implementation of more sustainable production practices. However, 90 percent of the respondents state that they have already implemented some aspects of sustainability.

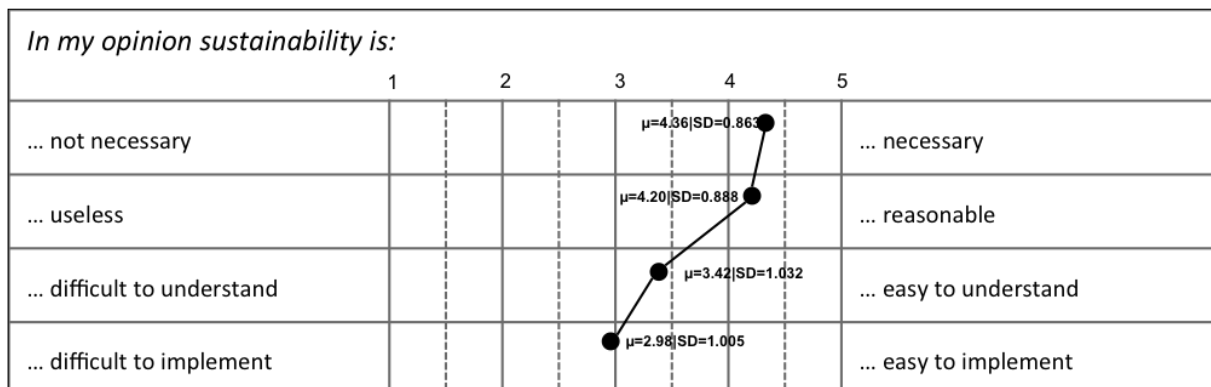


Figure 1. Future-oriented farmers' attitude towards a sustainable milk production (N=211)

Source: Authors' calculation

Furthermore, it can be shown that the future-oriented farmers in our study reveal a diverse picture concerning their willingness to participate in a sustainability standard (see Fig. 2).

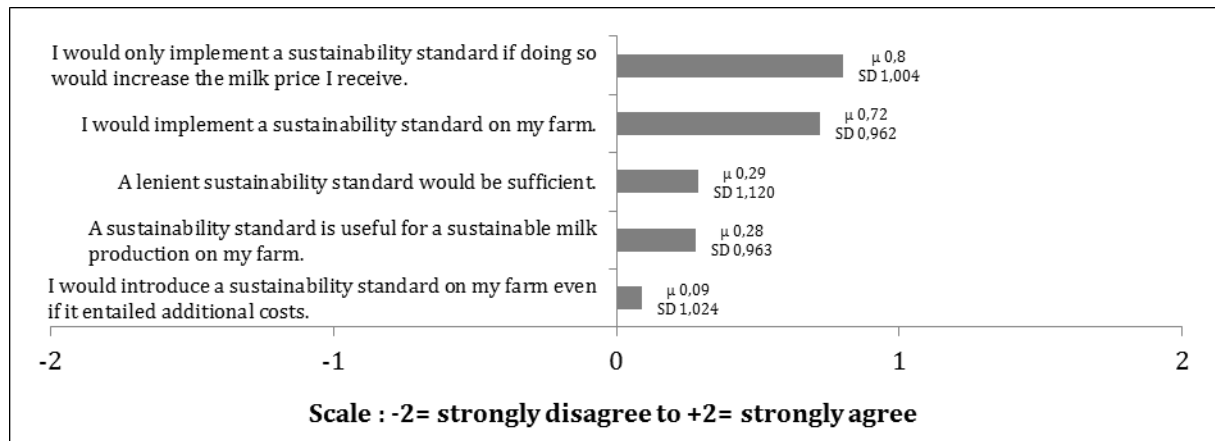


Figure 2. Future-oriented farmers' willingness to participate in a sustainability standard (N=211)
Source: Authors' calculation

In general, the farmers revealed positive attitudes concerning the implementation of a sustainability standard on their farms. Farmers tended to be indifferent when asked about their intrinsic motivation to introduce a standard whose implementation would entail additional costs. They are also indifferent whether a sustainability standard promotes sustainable milk production and whether a lenient sustainability standard such as the German QM-Milk standard would be sufficient. On average, the farmers' responses showed that they are predominantly extrinsically motivated with regard to the implementation of a standard especially if it would lead to a higher milk price. Overall, the answers of the organic farmers are in line with those of the conventional farmers surveyed. For all questions, there was a high standard deviation, which reflects a broad distribution in the measured values (Bühl, 2010). These findings support the use of a cluster analysis to identify differences between groups in farmers' regarding their different degrees of willingness to participate in a sustainability standard.

4.2 Cluster analysis

The variables reflecting farmers' willingness to participate in a sustainability standard were derived from the literature on technology acceptance and farmers' willingness to participate in sustainability initiatives (see section 2) and used as cluster-building variables. Hence, *perceived usefulness* (Davis, 1989; Davis et al., 1992) and *intention to use a standard* (Davis, 1989; Davis et al., 1992), *extrinsic motivation* (Ryan and Deci, 2000; Kjaernes et al., 2007; Franz et al., 2012), *intrinsic motivation* (Källström and Ljung, 2005; Schenk et al., 2007; Bewket, 2007; Sattler and Nagel, 2010; Mzoughi, 2011) and farmers' evaluation of the sufficiency of current lenient sustainability measures (Rodriguez et al., 2009; Duffy and Fearn, 2009; Deimel et al., 2010) are used as cluster-building variables to merge respondents into homogenous groups (see Tab. 2).

Cluster 1 contains 98 respondents and is the largest cluster in this analysis. The farmers in this cluster take an undecided position towards a sustainability standard. They can imagine implementing a standard, but they are indifferent as to whether a standard is useful for a sustainable milk production on their farm. In general, they have only limited motivation to take part in a standard even if financial incentives are provided. Therefore, they can be described as *halfhearted sustainability proponents*.

The second cluster contains 59 farmers who indicated a strong willingness to participate in a sustainable milk production. Respondents firmly agreed that they can imagine implementing a sustainability standard and believe that such a standard is useful for a sustainable milk production. Farmers in this group are intrinsically motivated to implement a sustainability standard since they stated that they would do so even if it entailed additional costs. Farmers in this group are indifferent concerning their extrinsic or financial motivation to implement a standard, and they have a negative attitude towards a lenient sustainable standard. We, therefore, labeled this group *highly dedicated sustainability proponents*.

Tab. 2.
Cluster building variables

Statements ^{1,2}		Cluster 1 N=98 46.4%	Cluster 2 N=59 27.9%	Cluster 3 N=54 25.7%	Total N=211
Perceived usefulness ^{***} <i>A sustainability standard is useful for a sustainable milk production on my farm.</i>	μ SD	0.27 ^{bc} 0.711	1.08 ^{ac} 0.624	-0.56 ^{ab} 0.945	0.28 0.963
Intention to use a standard ^{***} <i>I would implement a sustainability standard on my farm.</i>	μ SD	0.74 ^{bc} 0.647	1.58 ^{ac} 0.498	-0.26 ^{ab} 0.915	0.72 0.962
Extrinsic motivation ^{***} <i>I would only implement a sustainability standard if doing so would increase the milk price I receive.</i>	μ SD	0.72 ^{ef} 0.847	0.32 ^{df} 1.09	1.46 ^{de} 0.818	0.8 1.004
Intrinsic motivation ^{***} <i>I would introduce a sustainability standard on my farm even it entailed costs.</i>	μ SD	0.06 ^{bc} 0.553	1.2 ^{ac} 0.55	-1.06 ^{ab} 0.738	0.09 1.024
Evaluation of current sustainability measures ^{***} <i>A lenient sustainability standard would be sufficient.</i>	μ SD	0.22 ^{bc} 0.806	-0.69 ^{ac} 0.915	1.48 ^{ab} 0.574	0.29 1.120
¹ Level of significance: n.s.=not significant; p \leq 0.05 significant*; p \leq 0.01 very significant**; p \leq 0.001 highly significant***; ² Scale: -2= strongly disagree to +2= strongly agree; ^{abc} Significant differences between the clusters on the level of significance 0.05 (post hoc test – Tamhane’s T2); ^{def} Significant differences between the clusters on the level of significance 0.05 (post hoc test – LSD)					

Source: Authors’ calculation

Cluster 3 is the smallest group and contains only 54 respondents. These farmers would not voluntarily participate in a sustainability standard. They are indifferent concerning the implementation of such a standard on their farms and disagree with the idea that a sustainability standard is useful for a sustainable milk production on their farm. They would not implement a standard if it entailed costs but would be highly motivated to do so if there were financial incentives for its implementation. This cluster can be described as *profit-oriented sustainability refusers*.

The ANOVA identified significant differences between the clusters concerning several socio-demographic characteristics (see Tab. 3). The average age (rounded up) of the respondents was 46 years (N=211). The post hoc test (Tamhane’s T2) identified a very significant difference (p=0.003**) between the *halfhearted sustainability proponents* (Cluster 1) and the *highly dedicated sustainability proponents* (Cluster 2). The latter group contains the oldest farmers (average age = 49). The *profit-oriented sustainability refusers* (Cluster 3) are, on average, 46 years old.

Tab. 3.
Differences between clusters and socio-demographic characteristics

Socio-demographic characteristics ¹		Cluster 1 N=98 46.4%	Cluster 2 N=59 27.9%	Cluster 3 N=54 25.7%	Total N=211
Age (in years) ^{**}	μ SD	43.99 ^b 9.58	48.97 ^a 8.534	46.13 10.749	45.93 9.799
Work experience (in years) ^{n.s.}	μ SD	22.71 11.112	26 10.56	24.78 11.503	24.16 11.102
Share of total income from milk production (%) ^{n.s.}	μ SD	65.45% 21.247	73.76% 20.873	68.19% 20.697	68.47% 21.192
¹ Level of significance: n.s.=not significant; p \leq 0.05 significant*; p \leq 0.01 very significant**; p \leq 0.001 highly significant***; ^{abc} Significant differences between the clusters on the level of significance 0.05 (post hoc test – Tamhane’s T2)					

Source: Authors’ calculation

As it can be seen, there is a no significant difference between the three clusters with regard to the share of total income that comes from milk production. The youngest cluster with the lowest work experience is the *halfhearted sustainability proponents* (Cluster 1). In line with the descriptive results in chapter 4.3 it becomes obvious that this group with the lowest total income stemming from milk production has the biggest farm size (μ =485.33 ha). Contrary to this, the *highly dedicated sustainability proponents* (Cluster 2) receive a share of approximately three-fourths of their total income from dairy farming.

Tab. 4.

Differences between clusters with regard to farm characteristics

Farm-characteristics ¹		Cluster 1 N=98 46.40%	Cluster 2 N=59 27.90%	Cluster 3 N=54 25.70%	Total N=211
Farm size (ha) ^{n.s.}	μ SD	485.33 838.904	366.14 603	349.76 739.605	417.3 753.406
Herd size (number of dairy cows per farm) ^{n.s.}	μ SD	241.45 300.626	226.34 265.588	212.5 328.819	229.82 297.756
¹ Level of significance: n.s.=not significant; p \leq 0.05 significant*; p \leq 0.01 very significant**; p \leq 0.001 highly significant***					

Source: Authors' calculation

The clusters do not differ significantly with regard to their farm characteristics. In general, all three clusters show a high amount of milk production per cow per year (μ =9001.2 kg per cow/year). A closer look at the cross tabulation indicates that 44.5 percent of the *profit-oriented sustainability refusers* (Cluster 3) produce less than 8,900 kg per cow/year, whereas 35.5 percent of the *highly dedicated sustainability proponents* (Cluster 2) produce more than 9,700 kg per cow/year.

As stated in the sample description, the average herd size on the farms surveyed is high above the German average. The number of cows does not differ significantly between the clusters, but a more detailed look at the cross tabulation reveals that 32.2 percent of the *highly dedicated sustainability proponents* (Cluster 2) have a herd size of more than 100 cows per year. In contrast, 42.6 percent of the *profit-oriented sustainability refusers* (Cluster 3) keep less than 70 cows.

4.3 Perceived impact of implementation of a sustainability standard

Farmers have different reasons to participate in a sustainability standard. Two groups of factors describing the perceived impact of sustainability are shown in tables below: effects on the image of agriculture and societal pressure (Tab. 5) and economy, market and production (Tab. 6).

Tab. 5.

Impact of a sustainability standard: Image and social pressure

Statements ¹		Cluster 1 N=98 46.40%	Cluster 2 N=59 27.90%	Cluster 3 N=54 25.70%	Total N=211
The image of agriculture can be improved through a sustainability standard. ^{3***}	μ SD	1.05 ^{ef} 0.924	1.58 ^{df} 0.7	0.39 ^{de} 1.352	1.03 1.086
An effective communication about a sustainable production can help to remove wrong ideas about milk production. ^{2***}	μ SD	0.97 ^f 0.831	1.12 ^f 0.79	0.43 ^{de} 1.175	0.87 0.955
A sustainable standard becomes essential because of societies' requirements. ^{2***}	μ SD	0.63 ^{ef} 0.89	1.34 ^{df} 0.576	-0.19 ^{de} 1.065	0.62 1.027
¹ Level of significance: n.s.=non-significant; p \leq 0.05 significant*; p \leq 0.01 very significant**; p \leq 0.001 highly significant***; ² Scale: -2=strongly disagree to +2=strongly agree; ³ Scale: -2=very unimportant to +2=very important; ^{def} Significant differences between the clusters on the level of significance 0.05 (post hoc test – LSD)					

Source: Authors' calculation

Tab. 5 indicates that there are highly significant differences between the three clusters regarding their perceived impact of the implementation of a sustainability standard. The *halfhearted sustainability proponents* (Cluster 1) and the *highly dedicated sustainability proponents* (Cluster 2) believe that the image of agriculture can be increased through a sustainability standard, whereas the *profit-oriented sustainability refusers* (Cluster 3) are generally indifferent regarding this statement. All three clusters tend to agree that effective communication about sustainable production can help to remove incorrect ideas about milk production in the wider society. Support for this statement is strongest in Cluster 2. For the *highly dedicated sustainability proponents* (Cluster 2), a sustainable standard is becoming essential

because of society's demands, whereas the *halfhearted sustainability proponents* (Cluster 1) show a tendency to be indifferent and the *profit-oriented sustainability refusers* (Cluster 3) are given to reject this statement.

Tab. 6.
Impact of a sustainability standard: Economy, market and production

Statements ¹		Cluster 1 N=98 46.40%	Cluster 2 N=59 27.90%	Cluster 3 N=54 25.70%	Total N=211
Consumers realize and honor a standard for more sustainable milk production and pay more for the products. ^{3***}	μ	1.02 ^f	1.36 ^f	0.33 ^{de}	0.94
	SD	1.093	0.783	1.554	1.215
Sustainable milk production has a positive influence on the financial success of the farm. ^{2***}	μ	0.1 ^{ef}	0.78 ^{df}	-0.48 ^{de}	0.14
	SD	0.793	0.789	1.094	0.99
Sustainable milk production is an important competitive advantage in a rival market. ^{2***}	μ	0.28 ^b	1.12 ^{ac}	-0.02 ^b	0.44
	SD	0.917	0.873	1.073	1.042
Sustainable milk production is a good tool for reacting to volatile milk prices after the elimination of milk quotas. ^{2***}	μ	-0.07 ^b	0.36 ^{ac}	-0.46 ^b	-0.05
	SD	1.086	0.905	1.128	1.088
¹ Level of significance: n.s.=non-significant; p≤0.05 significant*; p≤0.01 very significant**; p≤0.001 highly significant***; ² Scale: -2= strongly disagree to +2= strongly agree; ³ Scale: -2=very unimportant to +2=very important; ^{abc} Significant differences between the clusters on the level of significance 0.05 (post hoc test – Tamhane's T2); ^{def} Significant differences between the clusters on the level of significance 0.05 (post hoc test – LSD)					

Source: Authors' calculation

The three clusters differ highly significantly regarding their opinion as to whether consumers will recognize and honor a standard for more sustainable milk production and have a higher willingness-to-pay for the products. Clusters 1 and 2 agree with this idea, whereas farmers in Cluster 3 are indifferent. Sustainability has a clear impact on financial success for the *highly dedicated sustainability proponents* (Cluster 2), whereas the *profit-oriented sustainability refusers* (Cluster 3) deny that sustainability has a positive influence on a farm's financial performance.

With regard to market and production aspects of implementing a sustainability standard, there are also highly significant differences between the three clusters. For the *highly motivated farmers* (Cluster 2), sustainable milk production represents an important competitive advantage in the market. The other clusters tend to be indifferent towards this statement. Both the *highly motivated sustainable proponents* (Cluster 2) and the *halfhearted sustainable proponents* (Cluster 1) tend to be indifferent towards the proposition that more sustainable milk production would be a good tool for reacting to volatile milk prices after the end of the European milk quota system. Hardly surprisingly, farmers with negative attitudes towards sustainability (Cluster 3) disagree with this statement.

Discussion and conclusions

This study is set out to analyze future-oriented dairy farmers' attitudes towards a sustainability standard and classify them based on their willingness to participate in a sustainability standard. The results show that, in general, future-oriented farmers are willing to implement a comprehensive sustainability standard on their farm. This is in sharp contrast to the results of former studies confirming that farmers are skeptical to participate in programs for the improvement of a specific sustainability standard, for instance, those regarding animal welfare or environmental protection (Bewket, 2007; Schenk et al., 2007; Kjaernes et al., 2007). This change in attitudes towards a sustainability standard might be due to the ongoing debate on sustainability and corporate social responsibility (cf. Heyder and Theuvsen, 2012; Aktar, 2013; Hartmann et al., 2013) and the growing concerns in the wider society concerning animal welfare standards in intensive livestock farming, which increasingly also affect dairy farms (Noordhuizen and Metz, 2005).

A closer look at farmers' willingness to participate in a sustainability standard shows high standard deviations, which affirm that the farmers cannot be seen as a homogenous group. The cluster analysis confirmed that there are different groups of future-oriented dairy farmers in the sample who differ concerning their willingness to participate in a standard. Three different groups could be identified. Two clusters (the *highly dedicated sustainability proponents* and the *halfhearted sustainability proponents*) evinced a generally high willingness to participate in a sustainability standard. The *profit-oriented*

sustainability refusers in contrast are less willing to participate in such a standard. The attitudes of the latter are to a greater extent in line with what former studies revealed concerning farmers' willingness to participate in sustainability standards (van Calker et al., 2005; Schlesinger, 2006; Bewket, 2007; Kjaernes et al., 2007; Schenk et al., 2007; Gocsik et al., 2014). But prior studies on the acceptance of certification systems in the agribusiness sector repeatedly revealed that there are in most cases three groups of companies, which can be identified: supporters, opponents, and the indifferent firms (Schulze et al., 2008; Gawron and Theuvsen, 2009). In that sense, our study confirms prior findings on the acceptance of and willingness to participate in standards.

Interestingly, the clusters differ significantly concerning their willingness to participate in a sustainability standard but less regarding socio-demographic and farm characteristics. This is due to the structural homogeneity of the sample as a consequence of the focus on future-oriented dairy farms but also reveals the need for additional analyses of the determinants of farmers' differing degrees of willingness to voluntarily participate in a newly established standard. In any case the results imply the need for targeted and precisely tailored sustainability management on the part of dairies if the companies want to integrate as many suppliers as possible in their standard-based programs for increasing sustainability.

The *halfhearted sustainability proponents* as well as the *profit-oriented sustainability refusers* are both highly motivated by financial incentives. These results confirm the existing literature about the financial motivation as a main incentive for farmers to participate in a sustainability commitment (Graafland and Mazereeuw-van der Duijn Schouten, 2012; Schaltegger, 2012; Swinton et al., 2015). Especially for the *profit-oriented sustainability refusers*, a financial reward is the most important incentive to take part in a standard but these farmers do not think a standard will have a positive influence on the financial success of their farms. This indicates that these farmers expect additional costs, which are just covered by the higher milk prices demanded so that the latter do not contribute to higher farm profit or income.

In Cluster 2 the current literature can be affirmed in the sense that farmers can also be intrinsically motivated to attend a sustainability standard. The personal joy of commitment by taking responsibility for, for instance, the environment is a central inducement in this consideration (cf. Schenk et al., 2007; Sattler and Nagel, 2010; Greiner and Gregg, 2011; Mzoughi, 2011). Respondents' answers in cluster 2 also affirm studies, which show that the generation of a competitive advantage is an important incentive for farmers to participate in a sustainability standard (Graafland and Mazereeuw-Van Der Duijn Schouten, 2012). The current situation in the milk market – especially the low producer price and the associated existential fear (Fink-Keßler et al., 2015) – reinforces farmers' motivation to strengthen their own position in the market and the dairy supply chains (Flint and Golcic, 2009; Graafland and Mazereeuw-Van Der Duijn Schouten, 2012). However, none of the respondents in the three clusters is convinced that a sustainability standard is a good tool in order to react to volatile milk prices after the liberalization of the European milk market.

The general willingness of future-oriented dairy farmers' to participate in a standard is a chance for dairies for a successful implementation of a sustainability standard (cf. Ahnström et al., 2009; Gocsik et al., 2014). But the descriptive results also show that respondents see difficulties in implementing a standard. Dairies, therefore, need to consider this in their communication with their farmers and during the definition process of a standard. Farmers should be informed about the ongoing process while implementing a standard, e.g. through newsletters or informative meetings. Upon that dairies should include farmers in the defining process of a sustainability standard in the form of asking them what is necessary for a more sustainable milk production (Theuvsen, 2005). Empirical research has shown that involving farmers' in the process of sustainability management improves their willingness to participate in a standard. Thus, these aspects should be included in dairies' communication strategies (cf. Källström and Ljung, 2005; Schenk et al., 2007; Bewket, 2007).

Nevertheless, a financial reward would be a major incentive to implement a sustainability standard, especially for the *halfhearted sustainability proponents* and the *profit-oriented sustainability refusers*. Facing the current situation in the milk market, this central motive should be under consideration by dairies while designing a standard. Equally a sustainability commitment can be supported by politics, e.g. through financial support to increase the sustainability of dairy products. A sustainability standard would benefit if it had the potential to improve the financial situation of the dairy farmers. This provides a starting point for program development, for instance in the second pillar of the Common Agricultural Policy. Another option would be a financial encouragement of pilot projects in the development phase of a sustainability standard in cooperation with dairies and research institutions.

Due to the rather small sample size and the limited variance with regard to socio-demographic and farm characteristics, the survey is not fully representative for the population of all dairy farmers. Another limitation derives from the question concerning the already existing sustainability aspects on a farm. 90 %

of the respondents agree that they have already implemented some aspects of sustainability. In future questionnaires the groups of participants and non-participants in a sustainability standard have to be defined more concretely. Additionally to the question whether a lenient standard is sufficient, it would be helpful for future research to ask respondents about their satisfaction with a sustainability standard. Under these considerations, this study can be seen as an explorative analysis, which provides first insights into the topic under analysis. Therefore, there is a need for future research on implementing a sustainability standard in the dairy sector, especially by including other farm types. Another area of interest is to determine, which factors exert the greatest influence on farmers' motivation and the adoption of a sustainability standard in dairy as well as in other agricultural subsectors. Upon that it might be of interest to find out which sustainability aspects farmers rate as important and realizable and what actually determines farmers views.

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