SOCIAL SUSTAINABILITY OF GERMAN DAIRY FARMERS: DEVELOPMENT OF A CONCEPT FOR MEASURING SOCIAL SUSTAINABILITY AND FIRST RESULTS FROM 8,677 FARMS

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Summary

Social sustainability is often neglected in sustainability discourse, including discourses concerning sustainable agriculture. When it is considered in sustainability assessment tools, the focus is often on the employees and not on the farm manager herself/himself. In German agriculture, however, family farms predominate, often with one farm manager having primary responsibility. The resilience of German dairy farms therefore also depends on the social sustainability situation of the farm manager. This paper describes the development of an indicator-based, self-assessment tool for dairy farmers to evaluate the status quo of their own social sustainability. To this end, indicators to measure and assess social sustainability have been developed in close consultation with more than 100 experts along the dairy value chain (e.g. scientists, farmers, dairy representatives). These indicators are aggregated into a social sustainability index (SSI) in this study. Initial descriptive results show that only an index score of 40% is achieved on average (median). Overall, however, the results show a dispersion, especially when looking at the results of different herd size classes or future prospects. For example, the SSI increases with increasing farm size.

Keywords

social sustainability; multi-criteria self-assessment; dairy farming

1. Introduction

Social, along with economic and ecological sustainability, is one of the three pillars of total sustainability. Although social sustainability is by definition as important as the other two pillars, it is often neglected in sustainability discourse, including discourses concerning sustainable agriculture (BINDER et al., 2010; DE OLDE et al., 2016; JANKER et al., 2019; LITTIG and GRIEßLER, 2005; VALLANCE et al., 2011). But what exactly is meant by social sustainability in an agricultural context? JANKER and MANN (2018) analyzed 87 existing sustainability assessment tools. Their analysis shows that there is no consensus on what is meant by the "social dimension" of the sustainability of agricultural systems. This is mainly because sustainability is in general a global goal, but it has to be allocated to individual countries, regions and companies. This goes hand in hand with the fact that the interpretation of sustainability (e.g. definitions) as well as the operationalization (e.g. topics and indicators for measuring sustainability) vary between countries, regions and companies, because backgrounds and purposes of the tools differ (JANKER and MANN, 2018). The main purposes of farm-level sustainability assessment tools include, for example, science-oriented approaches for research, monitoring and certification schemes designed to provide evidence to consumers, for example, farm advisory or self-assessment tools designed to assess the strengths and weaknesses of farms and serve as a basis for management improvements or farm strategy development, and assessment approaches used primarily for giving policy advice (SCHADER et al., 2014). The choice of indicators to measure (social) sustainability depends on the purpose of the particular sustainability assessment tool (FREEBAIRN and KING, 2003). For example, forced labor, severe forms of child labor and other violations of the core labor standards of the International Labor Organization (ILO) are not uncommon in the global agricultural economy. In particular, sustainability assessment tools that pursue the goal of labeling (e.g. Fairtrade, which was primarily introduced for trade with products from developing countries) often contain the aforementioned aspects. Other tools, designed for developed countries like Germany, where extensive labor and social legislation is in place, assess, for example, farmers' perceived quality of life (WBAE, 2020). According to JANKER and MANN (2018) recurring topics addressing social sustainability in global agriculture are labor conditions, life quality and societal impacts. The Scientific Advisory Board for Agricultural Policy, Nutrition and Consumer Health Protection at the Federal Ministry of Food and Agriculture in Germany (WBAE) identifies the

following issues as key aspects of the social sustainability of farms: working conditions, social security, volunteer engagement of the farm manager and the income situation of family farms (WBAE, 2020). While labor conditions and life quality can be assigned to internal (on farm) social sustainability, societal impacts pertain to external (off-farm) social sustainability (VAN CALKER et al., 2005).

When social sustainability is considered in sustainability assessment tools, the focus is often on the employees rather than on the farm manager himself[1] (JANKER and MANN, 2018). For example, since 54% of people working on German farms are non-family employees (the remaining 46% are family members, DESTATIS, 2021), it is undoubtedly very important to consider social issues of employees in sustainability assessment tools. However, what is special about farms is that they are usually independent micro-enterprises which are often primarily managed by one person (hereafter referred to as the farm manager). In Germany, for example, the world's fourth largest milk producer (HEMME, 2020), the average number of dairy cows per farm is 70, and 95% of farms have up to 200 dairy cows (TERGAST and HANSEN, 2021). According to the widespread understanding in research and practice, farms with close to 200 cows can still be considered as extended family farms in Germany. Extended family farms are farms with two to three family workers including the farm manager and additional non-family workers (SCHAPER et al., 2011). Thus, the resilience of German dairy farms also depends on the social sustainability situation of the farm manager and should therefore also be considered in sustainability assessment tools.

To date, very few findings on the social sustainability situation of German dairy farm managers exist. Studies concerning the farm manager deal with individual aspects of social sustainability and provide insights into topics such as workload or income. Looking at individual indicators, however, does not provide an overall picture. Indexing across a range of social sustainability indicators can provide additional unique insights. Questions such as "What makes a socially sustainable farm?", "Which farms are more vulnerable or less resilient to shocks?" can thus be explored in future in-depth multivariate analyses to derive recommendations for agriculture and policy from the results: How can farmers be supported to achieve more social sustainability? What are the adjusting screws? Studies that examine multiple indicators simultaneously and even aggregate them into an index, hardly exist. The objectives of the present study are therefore: (1) to present the methodology used to develop social sustainability indicators and their respective assessments, (2) to create a social sustainability index (SSI) focusing on the farm manager and (3) to present initial descriptive results of the SSI. It is important to note, that the index is not intended to make any statements about "Who is socially sustainable and who is not?". The overall goal is to be able to use the index discussed here for further in-depth analyses in the future in order to identify relationships with other variables.

2. Materials and Methods

2.1. Development of a social sustainability index (SSI)

The present study describes in a first step the development of indicators for measuring and assessing (social) sustainability. The indicator development has taken place within the framework of a nationwide dairy sustainability project (Dairy Sustainability Tool, short DST) and its previous projects since 2012. The DST involves more than 30 German dairies – more than a quarter of all dairies in Germany – and their supplying farmers. In addition to social sustainability, the DST also encompasses the other two dimensions of sustainability – economic and environmental sustainability – and furthermore aspects of animal welfare. As mentioned above, the choice of indicators to measure (social) sustainability depends largely on the purpose of the data collection. The DST attempts to support as many dairy farms as possible in their

[1] Wherever masculine pronouns have been used only, this has been done solely for reasons of readability.

development towards increased sustainability. Thus, the tool's main purpose is a holistic farm self-assessment to didactically assess the strengths and weaknesses of a farm and serve as a basis for management improvement or strategy development. In addition, it serves as a monitoring scheme for the dairy industry (LINDENA et al., 2022). Many existing approaches for holistic farm sustainability assessment require a substantial quantity of data, which makes data collection expensive and very time-consuming for farmers (DE OLDE et al., 2016; ZAPF et al., 2009). These tools are therefore not suitable for a broad application to a large number of farms (e.g. ROESCH et al., 2016). Consequently, compromises have to be found in order to reconcile scientific knowledge and feasibility (BÉLANGER et al., 2012), which includes, in particular, cost-effective and efficient data collection. Against this background, the DST focuses primarily on indicators that are comparatively easy to collect at farm level with the help of a written questionnaire (self-assessment) (LINDENA et al., 2022).

The developed DST-indicators are combined into one index in the present study. Especially at the political and industrial level, several indicators are combined in one index to simplify the information (VAN PASSEL and MEUL, 2012). A unique score is also attractive for farmers for comparing systems (VON WIRÉN-LEHR, 2001). Besides the advantage of simplification that an index undoubtedly offers (MITCHELL, et al. 1995), there is a risk that combining indicators can result in a loss of information and thus to a lack of accuracy (HENNESSY et al., 2013). There are often recommendations in the literature that one should not work and argue exclusively with indices. In order to obtain an overview of the social sustainability situation of German dairy farmers, this study considers both individual indicators and develops an index. The selection and weighting of individual indicators is crucial for the outcome of any kind of assessment, but ultimately always subjective (SPOOLDER et al., 2003). Many agricultural sustainability assessment tools therefore use participatory processes and expert opinion to identify and select indicators (e.g., DIAZ-BALTEIRO et al., 2017, MEUL et al., 2008; VAN CALKER et al., 2005). The goal in developing the DST was to involve relevant experts and stakeholders along the dairy value chain. Therefore, an intensive discourse with a large number of experts and stakeholders, especially dairy farmers, forms the basis for the DST, which is described in the following.

2.1.1. Starting point: Indicators in the German “Dairy Sustainability Tool“

In a first step scientifically based indicators for measuring (social) sustainability were compiled subsequent to an extensive literature review. Since international connectivity is an important goal, the indicator catalogues of the Sustainability Assessment of Food and Agriculture Systems (SAFA), the Sustainable Agriculture Initiative Platform (SAI Platform), and the Dairy Sustainability Framework (DSF) were also considered in the development of the DST indicator catalog. Furthermore, a broad range of already existing sustainability assessment tools are continuously analyzed in terms of topic and indicator selection; but also, to obtain initial conceptions for the assessment of the respective indicators. In particular, these five sustainability assessment tools are considered in this study: Response-Inducing Sustainability Evaluation (RISE); Sustainability Monitoring and Assessment RouTine (SMART), Criteria system for sustainable agriculture (KSNL), DLG Standard Sustainable Agriculture, and Sustainability check for farms (NaLa). Last but not least, the current requirements of the market partners (industry customers and food retailers) for the dairies were included in the work. Based on this, a questionnaire was developed to record selected sustainability indicators in dairy farming. This was followed by initial surveys to extensively test the practicability of the indicators in a questionnaire survey. The accumulated information as well as the initial survey experience led to a preselection of indicators (Flint et al., 2016).

In a second step, assessments were developed for the preselection of indicators in the form of a 4-point scale, with “level 3” indicating the optimal outcome in terms of sustainability and "level 0" representing the least favorable result. The content of the indicator assessments was based on: (1) scientific evidence on the respective indicator, (2) legal regulations, (3) available ratings

in existing sustainability assessment tools and (4) known distributions of practical data from statistics on individual indicators. For each indicator, a factsheet was prepared with detailed descriptions and an assessment approach (Flint et al., 2016). The assessment categories do not appear in the questionnaire and were therefore not known to farmers at the time of the survey. The questionnaire is structured in such a way that the farmers select those qualitative items that reflect the actual situation on their farm. The assessment categories (4-point scale) were then calculated; often from more than one question or more than 4 response categories.

Building on this, a large multi-stakeholder dialogue with experts along the dairy value chain and scientists was conducted in 2015 in the form of three workshops. These formed the basis for deciding which indicators should be included in the DST and which should not. One workshop focused exclusively on social and economic indicators. In this workshop, the potential indicators and the respective assessments were discussed using the World Café method (BROWN AND ISAACS 2005). Identical questions were discussed at four different topic sites: Is the DST on the right track in terms of indicator selection? Are all relevant indicators included? Do the assessment proposals meet with approval or is there possibly a need for further adaptation? The tables each included a farmer, a dairy processor representative, a scientist and/or consultant, a retailer and/or brand manufacturer representative and a representative from a non-governmental organization. The goal of the workshop was not to completely satisfy all participants (to find a consensus), but at least there should be no serious objections from anyone (in German: konsent). As topics and knowledge around sustainable dairy farming are constantly evolving, the multi-stakeholder workshops from 2015 were repeated in 2019 with the aim of reviewing the previous list of indicators for completeness and checking whether the respective assessments still correspond to the current scientific and legal status. In addition, guideline-based interviews were conducted with each stakeholder group, to prepare for and follow up on the workshops. Overall, there was a high level of agreement on the proposals for indicators and assessments. However, new indicators were also added as a result of the multi-stakeholder process. For example, it was initially suggested measuring the workload of the farm manager on the basis of annual leave days, regular days off per week and hours worked per week. But farmers' representatives in particular pointed out that these indicators would not fully cover the workload. Therefore, a further indicator was jointly developed in the workshop, which measures the individually perceived workload in the form of narrative response options in the questionnaire. Another example: The topic of occupational health and safety with the indicator number of occupational accidents was discussed in the workshops in relation to the farm manager, but was not included as an indicator in the DST. In essence, stakeholders pointed out that it is difficult to define accidents. What is an accident? What is not an accident? Even if one were to ask about accidents subject to compulsory reporting: one farmer would report the same accident, another would not. Overall, the recording of accidents via a questionnaire was still considered too complex. The decision against this indicator was made easier by the fact that Germany has a high standard of regulations, including safety measures, and that there is not as much reason to worry about safety risks to occupational health and safety as in poorer countries. In the discussions on the social and economic aspects, not all stakeholder groups provided equal input. Representatives from the retail sector were less engaged in this workshop and contributed more in the workshops on animal welfare and environmental issues.

In step 4 the questionnaire for measuring the selected sustainability indicators at the dairy farm level, which was revised from the previous version, was field tested with dairy farmers. During the field test, on-farm interviews to check the feasibility and clarity of the questionnaire were conducted. Final adjustments to the questionnaire were made after the field test. Data has now been collected continuously since 2017.

These four steps were performed in earlier projects and in close consultation with other scientists and in several workshops with farmers and dairies (Lassen et al., 2014 and 2015, Flint et al., 2016). In total, 111 experts have participated in the development of the social

sustainability indicators and their assessments since 2015: 17 experts representing farmers, 32 representatives of dairies, 10 representatives of food retailers, 15 representatives of the processing industry, 9 representatives of farmers' associations, 3 representatives of dairy associations, 2 representatives of food retail associations, 3 representatives of NGOs, 7 representatives of agricultural extension services, and 13 scientists. From all interviews and workshops with experts, a list of 86 sustainability indicators — thereof 11 relevant social indicators describing the social sustainability situation of the farm manager (Table 1) — was compiled. These 11 indicators cover the key aspects of social sustainability of farms identified by the WBAE (2020) and thus also include aspects of farm income.

2.1.2. Further development: Establishing relative weights for the selected indicators and aggregate indicators to an index

Scoring methodologies of tools for accessing sustainability frequently apply a “weight-and-sum” aggregation of indicators (DE OLDE et al., 2016). This study also opted for a "weight-and-sum" aggregation, since a "simple additive" aggregation does not do justice to the individual DST indicators used to measure social sustainability. For example, to measure the workload of a farm manager, the indicators 1) Average weekly working time 2) Regular days off per week in the last year, 3) Annual leave days and 4) Workload of the farm manager are considered. In the literature on work psychology, it is undisputed that high working time load and too little or no recovery time can, in the worst case, result in illness, accidents, or even physical and psychological exhaustion, including burnout (e.g. SIMKIN et al., 1998; WIRTZ, 2010; CONWAY et al., 2017; RAU, 2017; KNOOP and THEUVSEN, 2019; REISSIG et al., 2019). However, it should be noted that the amount of weekly working time, or the amount of time off is perceived very differently depending on the age of the farm manager, family situation, and individual personal disposition (LINDENA et al. 2022). Therefore, the subjectively perceived workload (4) of the farm manager is considered to be the most important indicator and is weighted accordingly highest among these four indicators (Table 1). GAZZARIN et al. (2004) also point out that the attractiveness of working as a farmer (and thus the continued existence of the farm) can be increased not so much by reducing working hours as by reducing workload.

The following weights (Table 1) are derived on the basis of discussion with scientific experts. Weightings based on the frequency of inclusion of topics/indicators of already existing assessment tools based on the analyses from step 1 were considered, but rejected. Reasons for this were a) that, as mentioned above, the tools have very different purposes and thus use different topics and indicators to measure social sustainability and b) that the situation of the farm manager in particular is often neglected in sustainability assessment tools and thus weighting based on other sustainability assessment tools is difficult.

In addition to “Workload”, the topics “Satisfaction with the personal work situation of the farm manager”, “External know-how for the farm manager”, “Profitability” and “Stability” are key topics of social sustainability of farms (Table 1).

Job satisfaction is an essential component of quality of life and significantly influences work productivity (HÖRTENHUBER et al., 2013). With this in mind, “Satisfaction with the personal work situation” is included in the SSI as one of five key topics (Table 1).

“External know-how for the farm manager” is represented by the participation in off-farm training and the voluntary engagement. Volunteering is often considered as external social sustainability (strengthening social cohesion) in sustainability assessment tools. However, volunteering can bring new impulses for one's own farm development (internal social sustainability) through exchange with other fellow farmers or people outside of agriculture. According to ZAPF et al. (2009), volunteering increases satisfaction, professional self-confidence and, moreover, the understanding of the non-farming population for one's own concerns. Voluntary engagement can therefore also have a positive impact on farm

Table 1: Social indicators focusing on the farm manager included in the social sustainability index, distribution of the surveyed farms (n = 8,677) among the respective assessment classes and methodological aspects.

Topic and indicator (according to Flint et al. (2016))	Assessment categories (according to Flint et al. (2016))			To whom does it apply? [1]	Data type [2]	Weighting (%)	Max. achievable score.	Max. achievable score; weighting
	Level 2 (and level 3) 2 points	Level 1 1 point	Level 0 0 points					
Work situation/Workload (total weight: 20%)								
1) Average weekly working time	**≤ 42 hours/week** 13%	**> 42 bis ≤ 55** 14%	**> 55 hours/week** 73%	FM	qt	3.3	2	6.6
2) Regular days off per week in the last year	**every week at least 1 day** 7%	**from time to time 1 day off per week** 25%	**no day off** 69%	FM	ql	3.3	2	6.6
3) Annual leave days	**at least once a year 6-10 consecutive days** 15%	**at least once a year 5 consecutive days** 12%	**less than 5 consecutive days per year** 73%	FM	ql	3.3	2	6.6
4) Workload of the farm manager	**well affordable, rather seldom at personal limit** 19%	**often high, but still affordable; only occasionally at or above or over personal limit** 62%	**permanently very high and often also over personal limit** 19%	FM	ql	10.0	2	20.0
Satisfaction (total weight: 25%)								
5) Satisfaction with the personal work situation	**very satisfied, satisfied** 36%	**rather satisfied** 31%	**rather dissatisfied, dissatisfied or very dissatisfied** 33%	FM	ql	20.0	2	40.0
External know-how for the farm manager (total weight: 25%)								
6) Off-farm training in the last year	**participation in multiple events** 41%	**participation in one event** 13%	**No** 46%	FM	ql, qt	10.0	2	20.0
Engagement in...	**more than 8 hours a month**	**up to eight hours a month**	**no engagement**		ql,	5.0	2	10.0
7) work-related volunteering	7%	35%	58%	All	qt			
8) non-agric. Volunteering	18%	36%	46%			5.0	2	10.0
Profitability (total weight: 20%)								
9) Satisfaction with the economic situation of the whole farm for the last 3 fiscal years	**very satisfied, satisfied** 25%	**rather satisfied** 29%	**rather dissatisfied, dissatisfied or very dissatisfied** 46%	All	ql	20.0	2	40.0
Stability (total weight: 20%)								
10) Protection of farm in case of long-term illness, occupational invalidity or death of the farm manager	**Yes** 37%	**Mostly** 30%	**partly or not at all** 33%	All	ql	10.0	2	20.0
11) Extent of risk management	**existential and other significant risks assessed & hedged** 9%	**existential risks assessed & hedged** 44%	**no systematic risk analysis** 47%	All	ql	10.0	2	20.0
						∑100		**∑200**

[1]FM = Farm manager, All = all family farm members; [2]qt = quantitative data, ql = qualitative data

development, especially if it takes place at the regional and supraregional level, e.g., through involvement in political structures or interest groups at the federal or state level (VOGEL et al., 2018; 2013). In addition to the farm manager, such impulses can also be contributed by other persons with main responsibility for the farm (e.g. partners, farm successors working on the farm), which is why other persons with main responsibility for the farm were also included in the data collection at this point.

Income security for farmers is an essential criterion for socially sustainable agriculture (WBAE, 2020). In order to measure aspects of profitability and stability, no specific accounting data are asked for various reasons. On the one hand, not all farms are subject to compulsory accounting, and on the other hand, accounting data are not readily disclosed in surveys. Instead, indicators are collected (e.g. various management measures, qualitative data) that influence the profitability and stability of the farm or indirectly provide information on these farm objectives (LINDENA et al., 2022). Furthermore, qualitative data can rapidly help identify strengths and weaknesses in a system and define trends (e.g. BÉLANGER et al., 2012). The indicators on profitability and stability are queried in particular with the help of narrative surveys along the lines of "Which of the following situations applies to you?". “Profitability” is represented here with the indicator 9) Satisfaction with the economic situation of the whole farm for the last 3 fiscal years. The indicators 10) Protection of farm in case of long-term illness, occupational invalidity or death of the farm manager and 11) Extent of risk management were used to measure “Stability”.

In order to aggregate the individual indicators into an index, the information contained in the indicators has been converted into a standard, dimensionless scale. The assessment of the class characteristics of the individual social sustainability indicator J was expanded with a point scale P. The normalized value of 0 represents “level 0” and a value of 2 ”level 2” and level 3”. Equation (1) shows how a weighted (w) social sustainability score is calculated for an individual farm manager using the selected social sustainability indicators (Table 1):

$SSI_i = \sum_{J=1}^{11} P_{j,i} * w$ for i=1,…, N respondents/dairy farms. (1)

2.2. Data from the German “Dairy Sustainability Tool“

The indicators developed within the DST were collected by means of a questionnaire distributed through the dairies. The underlying cross-sectional survey data were collected between May 2017 and January 2022. The final data set comprised 8,677 farms, which corresponds to 15.8% of the dairy farms in Germany. The mean response rate across all dairies was 62%. One dairy achieved a response rate of 100%. The lowest response rate was 13% and was achieved by a dairy that implemented the topic of sustainability more intensively with farmers for the first time and was met with skepticism from these farmers. Since only dairy farmers belonging to dairies that participated in the DST were able to complete the questionnaire, this is a convenience sample.

Nevertheless, the sample closely approximates the diverse structures of dairy farming in Germany: the sample consists mainly of conventional (95%; 5% are organic) fulltime farms (86%) specialized in dairy farming (90%). The average herd size in the sample is larger (98 dairy cows per farm, Table 2) than the average German herd size (70 dairy cows per farm (TERGAST and HANSEN, 2021)). The average milk yield is 8,402 kg per dairy cow per year (compare: in Germany 8,250 kg per dairy cow per year; (BMEL, 2021)). On average, 3.6 people work on the farms, of which 2.3 are fulltime, 1.1 are part-time and 0.2 are trainees. The average dairy farmer is 49 years old. Unfortunately, there is no information about the farmer's sex. Nine percent those in the sample have a university degree, which is almost in line with the German farming population, of which 11% have a university degree (BMEL, 2021). Agricultural college degrees (“Fachschule”), on the other hand, are significantly overrepresented (31% in the sample and 14% in the German farming population, (BMEL, 2021)). 11% of farm managers have

indicated that they will very probably give up dairy farming in the next 10 years; another 18% indicated they were "quite likely" to stop producing milk. This is in line with the observed structural change in Germany (FORSTNER and NIEBERG, 2019).

Table 2: Descriptive results of the sample (n = 8,677)

	Mean	% of farms	SD	min.	max.
Herd size [Number of dairy cows per farm]	98	-	109	1	2.400
Average milk yield [kg per dairy cow per year]	8,403	-	1,794	1,068	13,045
People working on the farm					
a) Full-time	2.26	-	4.09	0	150[1]
b) Part-time	1.14	-	1.52	0	46
c) Trainees	0.18	-	0.59	0	15
Age of farmer [years]	49	-	11	18	86
Agricultural education					
a) No agricultural education	-	12.08	-	-	-
b) Vocational training (agriculture)	-	17.25	-	-	-
c) Agricultural college	-	30.81	-	-	-
d) Vocational training with a "Master agriculture" degree	-	30.68	-	-	-
e) Agricultural university degree	-	9.18	-	-	-
Expected existence of dairy farming in 10 years?					
a) "Yes, definitely"	-	20.82	-	-	-
b) "Rather likely"	-	31.77	-	-	-
c) "I cannot estimate"	-	18.29	-	-	-
d) "Rather unlikely"	-	18.29	-	-	-
e) "Certainly not"	-	10.55	-	-	-

[1]This is a farm with direct marketing.

3 Results and discussion

3.1 On-farm indicator results and discussion

According to the assessment categories, more than two-thirds of farm managers are in the "red zone" (0 points) for the indicators working hours per week, days off per week and annual leave days (Table 1). A high workload in agriculture is also known from other studies. For example, in the area of working hours, which other studies report as 10 to 15 hours per day (SIMKIN et al., 1998; KALLIONIEMI et al., 2016) or 58.8 hours per week plus hours at weekends (KNOOP and THEUVSEN, 2019). Or in the area of annual vacation days, where in an Austrian study only 20% of dairy farmers reported taking at least one week of vacation last year (Wiesinger, 2005). It is not only questionable how sustainable the workload is in terms of days off, leave days and weekly working hours for the farm managers themselves, but also whether it has an advertising effect for the next generation to keep the farms viable? In their study on the perception and classification of stress factors of young farmers, KNOOP and THEUVSEN (2020) found that a high work intensity is perceived especially by younger farmers. According to SUTTER (2004), one goal of young farm successors is to reduce the workload to a reasonable level in the future.

During the multistakeholder workshops, many farmers repeatedly emphasize that it is more stressful for them to go on vacation and leave the responsibility for the farm in the hands of others than to work through the whole year. However, it is known from scientific studies that too little or no recovery time can, in the worst case, result in illness, accidents or even physical and mental exhaustion, including burnout (e.g. WIRTZ, 2010; RAU, 2017; REISSIG et al., 2019). With regard to the frequency of occupational accidents agriculture is unfortunately one of the occupational groups with the highest risk (EUROSTAT 2017). Other studies show that with increasing farm size farmers benefit from more regulated working and vacation times through the employment of outside labor, which is especially true for livestock farms (e.g. SCHMITT and HOFFMANN, 1997). A first look at the DST data shows the same trend. At the same time, however, it can be seen that some farm managers take regular days off per week or leave days

at a stretch, regardless of herd size. The question arises: What can farm managers with similar herd size structure learn from each other in terms of work organization?

Despite the many working hours per week and the paucity of recreation periods, 81% of the farm managers consider the workload still or even well affordable (Table 1). Conversely, 19% of farm managers feel permanently overloaded. Of these 19% (=1,635 farms), a total of 45% have insured their farm only partially or not at all for the case of long-term illness, occupational disability or death of the farm manager. Is the resilience of these farms at risk? Notwithstanding the high workload, two-thirds of farm managers are rather satisfied or very satisfied with their work situation, which is probably due to the fact that identification with the profession in agriculture is very high, as other studies have shown (KÖRNER et al., 2012).

The results of the survey in the area of "external know-how for the farm manager" vary from farm to farm: 46% of farm managers have not taken part in any off-farm training in the past year, while 54% have. Are these farms well-positioned against the backdrop of changing conditions (e.g. rules of the new common agricultural policy)? Furthermore, 42% and 54% of farms also engage in volunteer work (work-related and not work-related, respectively).

Although many farms are less well off in terms of profitability as measured by economic satisfaction, management practices that ensure farm stability are not common across all farms. For example, 47% of all farms do not conduct systematic risk analysis or do so inadequately.

3.2 On-farm index results and discussion

The presentation of the results of the individual indicators makes it possible to identify strengths and weaknesses and to point out potential for improvement. The aggregation of the 11 individual indicators into an index now allows an overall view. The farms in the dataset achieved farm individual social sustainability scores of between 0 and 196.65 points. Thus, almost the entire range of the index is achieved. The median SSI score was 80, representing 40% of the maximum possible SSI score of 200 points. Only a few farms achieve the highest index values, whereas many farms achieve low to medium index values, which is reflected in a slightly left-skewed distribution. The social sustainability situation as judged by the SSI is at an intermediate to low level. Figure 1 shows that farm managers who assume that they will definitely still be producing milk in 10 years comparatively achieve a higher median index value of 113. However, the question of the direction of impact arises here: Are farmers "socially sustainable" because they are setting themselves up for the future? Or do farm managers have a future only because they pay attention to their own social sustainability? Furthermore, larger farms (500 cows and more) achieve higher SSI values (median 112), whereby an upward trend can already be observed on farms with more than 200 cows.

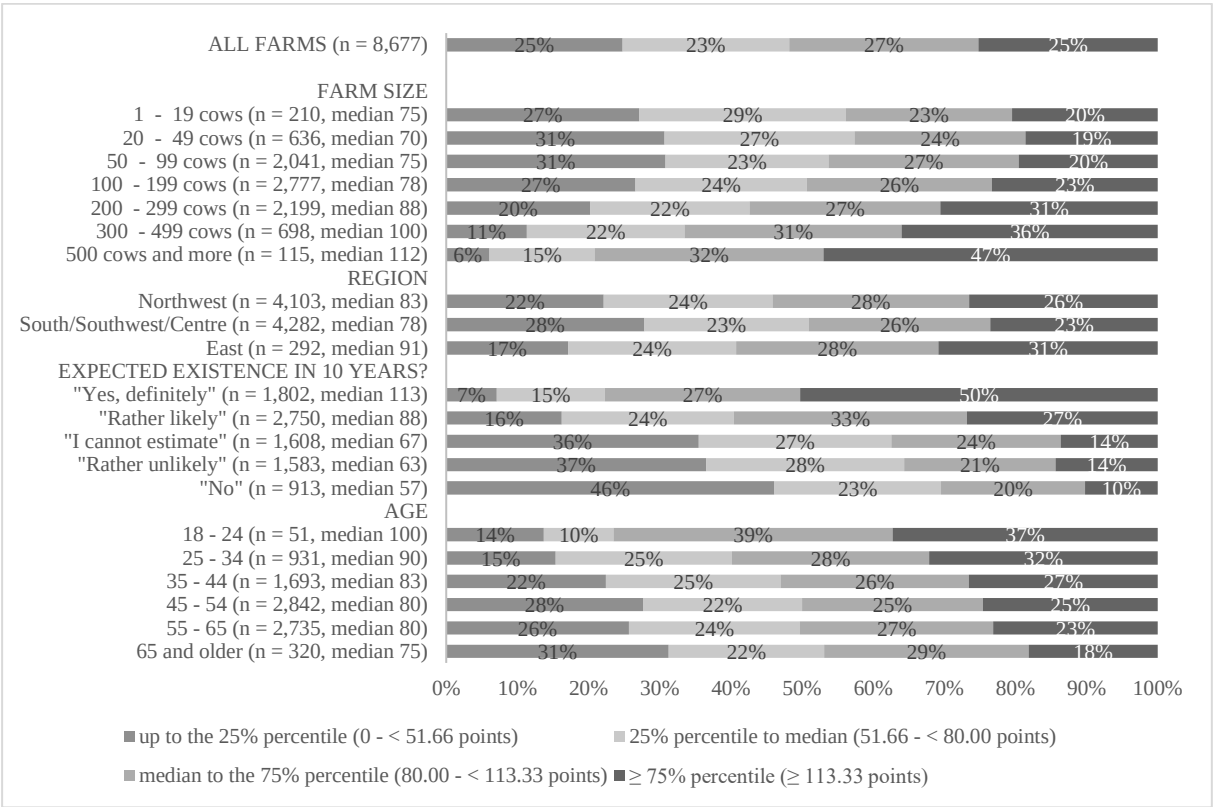
The SSI not only enables a simple descriptive comparison, as shown in Figure 1, but also, for example, the identification of promising socially sustainable farms, which will be the subject of future multivariate analyses. However, aggregating all 11 indicators into one score presents a major difficulty: For example, a mean score of 100 could be interpreted to as the farm manager having no problem concerning his/her own social sustainability, even though an individual indicator might have a low score, such as personally perceived workload, but contribute strongly to the resilience of the farm. This aspect underlines our approach of introducing different weightings for the individual indicators. Nevertheless, when presenting results, regardless of whether the index value is a farm-specific value for individual farmers or the mean value for a specific group of farmers, the index value should always include a description of the performance of each indicator.

Of course, there is also the question of whether all relevant indicators are included in the index. As mentioned in chapter 2.1.1, the topic of occupational health and safety has not yet been addressed in relation to the farm manager. In the future, however, it should be critically examined whether this indicator could be included in the DST, e.g. in the form of a narrative query. Furthermore, against the background of the long survey period, it is important to pay

attention at the time robustness of the indicators. Economic satisfaction, for example, is an indicator that is very dependent on the current milk price and is therefore time sensitive. Against this background, the index was also calculated once without economic satisfaction. However, the results from Figure 1 did not change fundamentally. The median index value in % merely increased from 40% to just under 42%. A similar assumption concerning time-robustness could be made for indicator 4) Workload of the farm manager. Could there be seasonal variations in the responses? This should be considered for further in-depth analyses.

Furthermore, it is debatable whether the reality of family farming is well covered by our index. Several family members may be involved in the farm and family members who do not work on the farm may also be affected by the farm manager situation as e.g. JANKER et al. (2019) point out. In the present study, the focus is on the farm manager as the unit of analysis. However, family members have not been completely excluded. Indicators 7-11 also include family members (see Table 1). Nevertheless, it would be interesting to survey other involved family members as well, for example on criteria 4) workload and 5) satisfaction with personal work situation. Unfortunately, this was too extensive in the context of the DST. Considering the fact that the farm manager often bears the overall burden, it was decided to simplify it in this way.

Figure 1: Percent of farms in the various index value classes, broken down by farm size classes, regions, future prospects and age of the farm manager.



4. Conclusions

The social sustainability situation of (dairy) farm managers has hardly ever been considered in sustainable assessment tools. In German agriculture, however, family farms predominate, often with one farm manager having primary responsibility. Thus, the resilience of German dairy farms also depends on the social sustainability situation of the farm manager. This study's main objective was to investigate the social sustainability situation of German dairy farmers using a social sustainability index (SSI), which was developed as part of a larger project on sustainability in dairy farming. Initial descriptive results show that only an index score of 40% is achieved on average (median). Overall, however, the results show a dispersion, especially

when looking at the results of different herd size classes, and future prospects. Crucial to this result is the selection and weighting of the individual indicators. The indicators were developed in close consultation with many experts along the dairy value chain. The weightings have so far been based on discussions with expert scientists. In the future, the weightings developed here should be discussed by the target group itself, in the form of a focus group of farmers, and adjusted in the form of a consensus weighting. Aggregating the individual indicators into the SSI allows an overall view of the social sustainability situation of the farm manager and in-depth multivariate analyses of the drivers of SSI. Questions such as "What makes a socially sustainable farm?", "Which farms are more vulnerable or less resilient to shocks?", “How can farmers be supported to achieve more social sustainability?” can thus be explored in to derive recommendations for agriculture and policy from the results.

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