SUSTAINABILITY EXCELLENCE IN LIGHT OF GERMAN FARMERS' SELF-ASSESSMENT: RESULTS FROM A MIXED METHODS STUDY

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Abstract

European agriculture is being confronted with the need to transform towards more sustainable practices. However, development paths towards sustainability differ greatly depending on the farms' operating characteristics, management systems and starting positions, and farmers' individual decisions play an important role in this process. A survey was conducted of conventional and organic German farmers about what they perceive to be the most outstanding, above-standard sustainability activities undertaken on their farms – their sustainability excellence. Results from a mixed methods approach show that organic farms primarily view their organic farming practices as sustainability excellence, while conventional farms mostly contribute to diverse cultural landscapes and optimise nutrient management. In future, both farming types should strengthen efforts to learn from one other.

Keywords

Agriculture, Sustainability Excellence, Network Analysis, Mixed Methods.

1. Introduction

The European Union has set itself the goal of being climate-neutral by 2050. In order to achieve this target, far-reaching changes are required in almost all areas of life and the economy, which are to be accompanied by the so-called Green Deal as an action plan. For agricultural and food value chains, the Green Deal is to be implemented through the farm-to-fork strategy, which is intended to initiate an ambitious transformation process towards an economically, ecologically and socially sustainable agricultural and food sector (EUROPEAN COMMISSION, 2020). Furthermore, an increasing number of mandatory regulations on the sustainability transformation of companies is emerging as a framework for sustainable finance, corporate activities and non-financial reporting, e.g. EU Taxonomy and the Corporate Sustainability Reporting Directive (CSRD). While many new EU regulations are targeting large and listed companies directly (e.g. in the food sector), small and medium-sized enterprises (SMEs), such as the agricultural sector and farmers, need to be more aware of the indirect impact of these regulations (EUROPEAN PARLIAMENT, 2022). Thus, farms and SMEs in the EU are probably going to face a period of more intensified transition towards increasingly sustainable production practices. However, transition needs innovations, plural approaches and new ideas since "no one size fits all" (TERMEER, 2021). In this context, several studies have emphasised the small wins approach, which favours individual or excellent nudges by small firms towards transformation (e.g. WIGBOLDUS et al., 2021; GEBHARDT, 2022a). In addition to regulations and action plans, initiating change in the agricultural system requires leaders, best-practice or role models (ZKL, 2021) who break new ground through outstanding and excellent sustainable activities (PETERS and WATERMAN, 2015) and inspire others to follow their example (VILLIGER et al., 2000; DAHLGAARRD-PARK and DAHLGAARD, 2006; GEBHARDT, 2022b).

Sustainable agricultural development pathways vary widely between sites, management systems and individual farms because the sustainability and intensity of agricultural systems differ greatly by location (BUCKWELL et al., 2014). Furthermore, different farm characteristics, e.g. intensification or specialisation, have different effects on environmental, economic and social sustainability aspects (MEYER et al., 2021). The way farms are managed – organically or conventionally – also has an impact on various aspects of the social and environmental sustainability dimension, although the direction of the effects differs depending on the aspect considered (SANDERS and HEß, 2019). For these reasons, there is not just one way to achieve transformation towards sustainable agriculture (PRETTY, 2008). The methods and measures designed to lead to sustainable agriculture also differ in their impact and implementation effort (KURTH et al., 2019).

The research presented in this manuscript therefore aims to answer the following research questions:

1) In what type of activities do conventional and organic farms currently define their own particular sustainability excellence?
2) How do these views differ between organic and conventional farms?
3) Which socio-demographic characteristics of farms influence the most frequently mentioned activities of sustainability excellence on both organic and conventional farms?

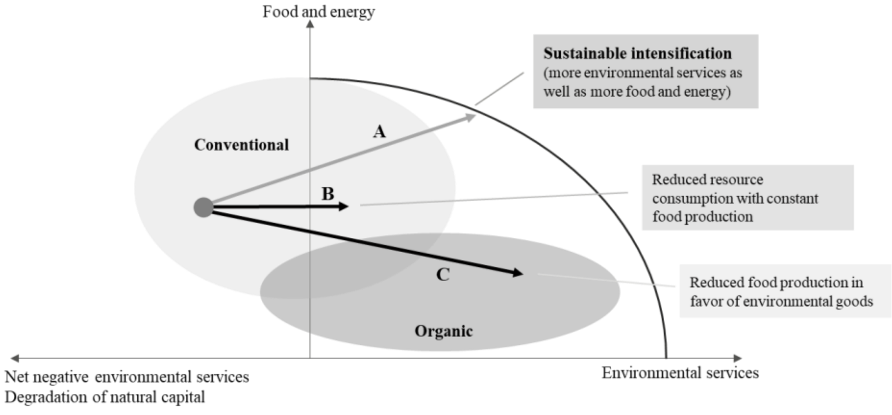
In the following sections, these questions were analysed on the basis of a nationwide survey conducted with farmers in Germany in 2022 as part of the research project "Sustainability Excellence in Agriculture (NEAL): More Visibility for the Hidden Lighthouses of Everyday Practice" funded by Landwirtschaftliche Rentenbank.

The manuscript is organised as follows: after a brief exposition of the theoretical framework in section 2, section 3 explains data collection and the mixed methods approach; section 4 presents results from a network analysis and limited dependent variable regressions; finally, section 5 discusses the findings and draws conclusions.

2. Theoretical Framework: Sustainability Transformation

Sustainable development is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (UNITED NATIONS, 1987). The guiding principle of sustainability is characterised by its three-dimensionality: ecological, economic and social. However, it remains unclear how a state of "sustainability" can be achieved. In the academic debate, there are opposing views about how to define and pursue sustainable agricultural development. Apart from scientific indicators, a wide range of methods and tools to evaluate sustainability (e.g., SAFA, RISE) has emerged in practice and offers farmers and their business partners along value chains the means to assess and compare aspects of sustainability on farms. Furthermore, farmers do not all start from the same common ground when assessing and discussing the level of their farms' "sustainability". From an agricultural economics perspective, "sustainable intensification" means "simultaneously improving the productivity and environmental management of agricultural land" (BUCKWELL et al., 2014).

Figure 1. Development pathways for a more sustainable agriculture



Source: Adapted from HESS (2021) according to BUCKWELL et al. (2014)

The task of sustainable intensification can be mapped using a production possibility frontier (Fig. 1). There are two dimensions: the provision or non-provision of environmental services on the x-axis, and the provision of energy and food on the y-axis. The left side of the diagram shows that agricultural production can be unsustainable. Agricultural production that occurs on the right side of the graph – producing energy and food while also generating net positive environmental services – is the goal. The two ovals indicate that there are differences in environmental performance and energy and food production between organic and conventional farms. The underlying hypothesis is that organic farms have a better environmental performance and lower energy and food production (BUCKWELL et al., 2014). In terms of economic sustainability, studies indicate that organic farms have lower yields but usually higher profits (MEYER et al., 2021; CROWDER and REGANOLD, 2015). Regarding the ecological dimension, studies indicate that the effects of organic farming on soil, water, biodiversity, climate and resource efficiency are more positive than those of conventional farming (MEYER et al., 2021).

The presence of an intersection of the organic and conventional ovals is based on the hypothesis that there are organic farms with the same productivity as conventional farms and conventional farms with the same environmental output as organic farms (BUCKWELL et al., 2014). Possible sustainable development pathways for farms are indicated by the arrows A to C. Arrow A shows development pathways of sustainable intensification, which is characterised by a north-east movement. Arrow B indicates an improvement in environmental performance with no change in productivity. Arrow C, however, shows a decrease in productivity, with simultaneous increases in environmental services (BUCKWELL et al., 2014). In conclusion, there is no one single pathway to sustainability for farms, but different pathways. The measures required and direction of development depend on the farms' starting position (BUCKWELL et al., 2014).

We propose the concept of 'sustainability excellence' to describe farmers who spearhead sustainability transformation on their farms through definite actions and innovations that go above and beyond regular, standard production practices. The term excellence describes brilliance and top performance (PETERS and WATERMAN, 2015), and is represented by outstanding performance or an outstanding position, which is achieved more successfully or effectively than the competition (GEBHARDT et al., 2020). Excellence is not an achievable end state, but rather indicates always being on the lookout for further improvements that can be made (PETERS and WATERMAN, 2015). The prerequisite for this is companies' ability and willingness to adapt or innovate (DAHLGAARD-PARK and DAHLGAARD, 2006).

This paper examines the sustainability excellence of farms, rather than all the sustainable activities that are undertaken on farms. In other words, it is about outstanding sustainable activities or operations that may set farms apart from their competitors. According to the logic outlined in Figure 1, we propose the concept of 'sustainability excellence' as a representation of the marginal changes by individual farms in an easterly or north-easterly direction. The following section describes our approach to assessing farmers' perceptions of their own sustainability excellence.

3. Material and Methods

3.1 Hypotheses and Mixed Methods approach

Sustainability excellence was assessed by asking the respondents to answer the following question: *"Write down one small or large sustainable activity or initiative that has been implemented in your company in the last five years and that may make you stand out from other companies. Please describe one activity only. Describe in as much detail as possible, including what the special feature could be/is, in about 5-6 sentences (max. 1200 characters allowed)."*

From this question, we expected qualitative answers that could be assigned to broader categories of excellent sustainable activities or micro innovations on the respective farms.

The underlying hypotheses on the basis of which we sought to answer the research questions were that the probability of naming a category of excellent sustainable activities or practices is related to the structural characteristics of farms and farmers (=respondents) [1]. The explanatory variables were selected based on several studies investigating the relationship between different farm characteristics and sustainability. The dependent and explanatory variables are displayed in Table 1.

In order to test the hypotheses, a mixed methods approach was adopted (MAXWELL and LOOMIS, 2003). Here, qualitative content analysis (KUCKARTZ and RÄDIKER, 2022) was combined with the quantitative method of logistic regression. Furthermore, network analysis was chosen as a tool to identify patterns and relationships (WASSERMAN and FAUST, 1999) within sustainability excellence.

3.2 Data collection

An online survey was conducted between 12 May and 4 July 2022. The online survey aimed at ‘farmers’ was distributed by contacting 530 local, regional and national farmers’ associations in Germany and asking them to send the survey to their members. The target group of ‘farmers’ included farm owners, employed farm managers and other employees in agriculture (including forestry and horticulture). People not working in agriculture, forestry or horticulture were excluded from the survey. A total of 993 people accessed the link sent out by the associations. The completion rate was 25.68 %.

From the initial dataset (n = 575), respondents who did not belong to the described target group, or left the questionnaire at the beginning, or completed the questionnaire in less than five minutes were removed. This resulted in a dataset with 310 observations for the analysis. Ultimately, those ‘farmers’ (including forestry and horticulture) who described an outstanding sustainable activity (n = 234) were chosen for the analysis in this paper. Summary statistics of this sample are displayed in Table 1. Compared with the agricultural structure in Germany, the proportion of organic farms in our sample was substantially higher.

Table 1 provides descriptive statistics of the final data sample that was used for the subsequent analysis.

Table 1. Descriptive statistics (n = 234)

Dependent variables[1]	**Scale**	**%**
Diverse cultural landscapes	1 - mentioned (0 - not mentioned)	27.8
Biodiversity	1 - mentioned (0 - not mentioned)	23.1
Species-appropriate animal husbandry and animal welfare	1 - mentioned (0 - not mentioned)	19.2
Explanatory variables	**Scale**	**%**
Type of farm	Specialised crop farms Specialised livestock farms Mixed farms	39.8 32.5 14.5
Annual turnover	Below € 100,000 € 100,000 to 1 million Above € 1 million	32.9 38.5 9.3
Sustainability performance[2]	Good Medium Poor	23.9 28.2 29.4
Management	Conventional Organic Partly organic/in conversion to organic	37.2 43.2 8.6
Employees	1 to 9	79.1

[1] In this paper we consider farm characteristics. Another approach would have been to include farmer behaviour (CAMPOS, 2022). We thank a reviewer for this advice.

	10 and more			9.0
Operating Mode	Main occupation Sideline			62.8 27.4
Location	Eastern Germany Western Germany			7.8 90.1
Sustainability certification[3]	Certified Not certified			10.3 73.5
Implementation of selected activities[4]	Crop rotation/optimal crop rotation Extensification of land/biodiversity Improved livestock management/ animal husbandry			79.5 72.2 58.6
Explanatory variables	**Min**	**Max**	**Mean**	**SD**
Year of farm foundation	1000	2022	1940.9	131.7

[1] Categories resulting from the qualitative content analysis (Table 2).
[2] "How well do you think sustainability is currently being implemented on your farm overall?" on a scale from 1 = not at all well to 6 = very well. Dummy variables: poor (1 & 2), medium (3 & 4), good (5 & 6).
[3] "Has your company already dealt with sustainability certifications (e.g. DLG Certificate Sustainable Agriculture, or others)?" Scale: 1 = Yes, thought about it, 2 = Yes, has already been certified once, 3 = Yes, has been certified several times, 4 = No, never before. Dummy variables: certified (2 & 3), not certified (1 & 4).
[4] "Rate the implementation of the following measures on your farm." Scale: 1 = I have already been implementing for more than 5 years, 2 = I have been implementing for less than 5 years, 3 = implementation is planned for the next 5 years, 4 = No plans to do this. Dummy variables: implemented (1 & 2), not implemented (3 & 4).

Source: Own illustration

3.3 Empirical Analysis

The analysis of the dataset was in three steps. First, the responses of the farms to the question "Write down one small or large sustainable activity or… [see section 3.1]" were analysed by means of qualitative content analysis, according to KUCKARTZ and RÄDIKER (2022), using the program MAXQDA. The responses from the farms ranged from individual words and bullet points to several coherent sentences. In the qualitative content analysis, categories were formed in several runs based on the statements. The categories were created from the available material. In each run, the categories were refined and new categories were added. A category system was created to help with this: each category was subject to a definition, based on which the statements of the farms were assigned to the categories. Coded segments (=sequence of words coded with a category) can be nested or overlapping (KUCKARTZ and RÄDIKER, 2022). In doing so, 21 main categories were inductively formed.

Subsequently, the dataset was separated by farming type (conventional, organic and other). Due to the sample size, only the groups of organic and conventional farmers were considered in more detail. For the two farm types, the relations of the main categories in the two groups were examined. For this purpose, a matrix was created for each group using MAXQDA, which depicted the occurrence of the main categories in the same segment. A segment corresponded to the statement of a farm. The matrices were imported into the visualisation software "Gephi" in order to be able to form networks based on the main categories for the group of organic and conventional farmers (POKORNY et al., 2018).

In the last step, logit models were estimated in order to analyse which farm characteristics influenced mention of the three most important main categories in the group of conventional and group of organic farms (HOSMER et al., 2013, p. 1). The dependent variables (see Table 1) can be 1 (mentioned) and 0 (not mentioned). Equation (1) displays the logit model (GUJARATI, 2015):

(1)
$$P_i(Y_i = 1) = \frac{1}{1 + e^{-Z_i}}$$

where p(y=1) = probability that y = 1

e = Euler's number, $Z_i = (\beta_0 + \beta_1 * x_1 + \beta_2 * x_2 + \beta_3 * x_3 + \cdots + \beta_k * x_k + u_i)$,

x_k= independent variables, β_k= regression coefficients, u_i= error value.

In order to perform the logistic regression, the categorical explanatory variables had to be transformed into binary or dummy variables. Furthermore, some groups had to be colluded because of their small sample size. Due to the heterogeneity of the two groups, the logistic regressions were performed separately for the groups of organic and conventional farms. Model quality was assessed using the McFadden R^2 (MCFADDEN, 1947). The size of the effect (f^2) could be determined according to COHEN (1992). A small effect was present at a value of f^2 = 0.02, a medium effect at the value of f^2 = 0.15, and a strong effect at the value of f^2 = 0.35 (COHEN, 1992).

4. Results

4.1 Qualitative content analysis

The qualitative content analysis according to KUCKARTZ and RÄDIKER (2022) resulted in 21 main categories to describe the sustainability excellence of farms (Table 2). These categories could be assigned to the sustainability dimensions. It was noticeable that the ecological dimension was very strongly represented, with 14 subordinate categories, while the other three dimensions were less strongly represented. The governance dimension was the least represented, with only one subordinate category. The category “other” contained all text segments that could not be assigned to any of the other 20 categories. It was therefore not possible to assign this category clearly to one of the sustainability dimensions.

Table 2. Main categories of the qualitative content analysis

	Conventional (n = 87)		**Organic (n = 101)**	
Main categories	*n*	*%*	*n*	*%*
Ecology	164	80.39	210	69.77
Diverse cultural landscapes	27	13.24	27	8.97
Reuse and longer service life	4	1.96	6	1.99
Sustainable forestry	7	3.43	6	1.99
Biodiversity	18	8.82	26	8.64
Reduction in chemical inputs	9	4.41	3	1.00
Saving energy and emissions	11	5.39	6	1.99
Adapted mobility and technology	5	2.45	11	3.65
Optimised soil cultivation and soil protection	20	9.80	22	7.31
Expansion of renewable energies	11	5.39	14	4.65
Optimised nutrient management and fertilisation	20	9.80	22	7.31
Saving of packaging material. plastic and waste	2	0.98	5	1.66
Species-appropriate animal husbandry and animal welfare	18	8.82	23	7.64
Strengthening of the circular flow concept	4	1.96	17	5.65
Extensification and landscape conservation	8	3.92	22	7.31
Economy	27	13.24	31	10.30
Increased cooperation	9	4.41	13	4.32
Regional sales, purchase, processing and marketing	6	2.94	8	2.66
Participation in projects, competitions, certifications	12	5.88	10	3.32
Social	3	1.47	7	2.33
Fair working conditions	1	0.49	3	1.00
Education and training	2	0.98	4	1.33
Governance	1	0.49	42	13.95
Organic agriculture	1	0.49	42	13.95
Other	9	4.41	11	3.65
∑	204	100.00	301	100.00

Source: Own illustration

Differences between conventional and organic farms were evident in the frequency of categories. The five most frequently mentioned categories of the conventional farms were ‘diverse cultural landscapes’ (n = 27), ‘optimised nutrient management and fertilisation’ (n = 20), ‘optimised soil cultivation and soil protection’ (n = 20), ‘biodiversity’ (n = 18), and ‘species-appropriate animal husbandry and animal welfare’ (n = 18).

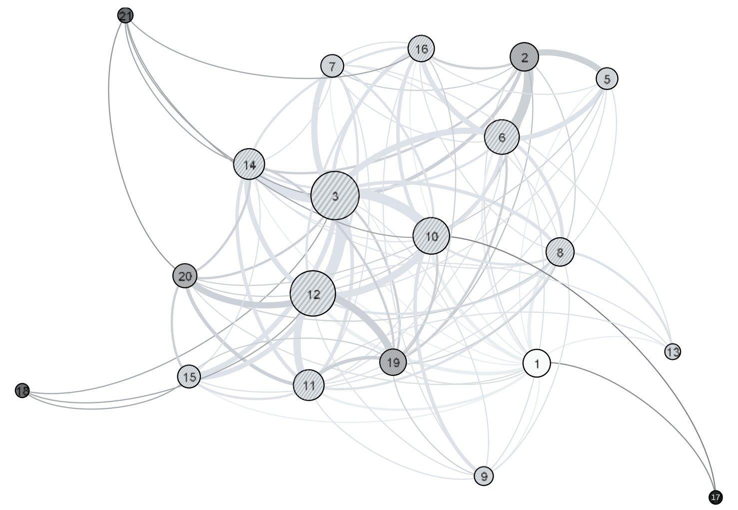
The five most frequently mentioned categories among the sub-sample of the organic farms were ‘organic agriculture’ (n = 42), ‘diverse cultural landscapes’ (n = 27), ‘biodiversity’ (n = 26), ‘species-appropriate animal husbandry and animal welfare’ (n = 23), and ‘extensification and landscape conservation’ (n = 22).

‘Biodiversity’, ‘species-appropriated animal husbandry and animal welfare’, and ‘diverse cultural landscapes’ were among the top five categories in both groups. ‘Strengthening the circular flow concept’, ‘extensification and landscape conservation’ as well as ‘organic agriculture’ were more frequently mentioned in the organic group, whereas ‘reduction in chemical inputs’ and ‘saving energy and emissions’ were more frequently mentioned in the conventional group. In the case of organic farms, organic management was very important in their sustainability excellence.

4.2 Network analysis

The network analyses were conducted separately for the groups of conventional and organic farms. The two weighted undirected networks are shown in Figures 2 and 3. The number represents the main categories and the colour indicates the assignment of the main categories to the sustainability dimensions: economy (checked pattern), ecology (stripes), social (dark grey) and governance (black). The size of the nodes is determined by their weighted degree. The weighted degree indicates the number of lines touching a point, and thus its degree of connectedness (JANSEN, 2006).

Figure 2. Network of conventional farms



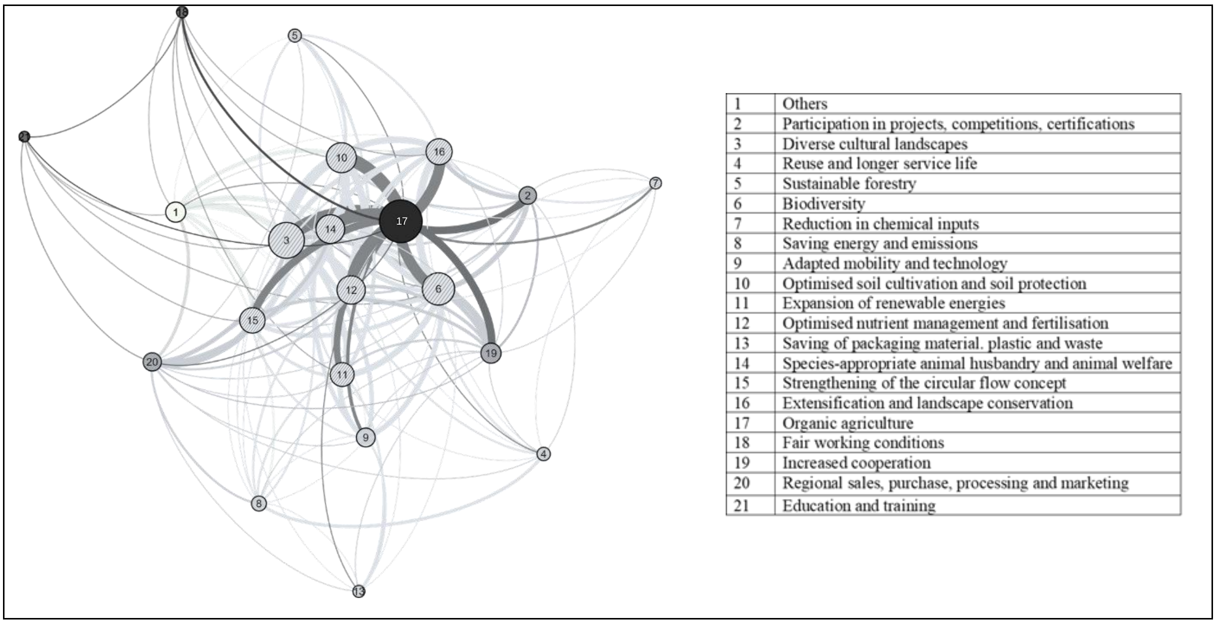
1	Others
2	Participation in projects, competitions, certifications
3	Diverse cultural landscapes
4	Reuse and longer service life
5	Sustainable forestry
6	Biodiversity
7	Reduction in chemical inputs
8	Saving energy and emissions
9	Adapted mobility and technology
10	Optimised soil cultivation and soil protection
11	Expansion of renewable energies
12	Optimised nutrient management and fertilisation
13	Saving of packaging material. plastic and waste
14	Species-appropriate animal husbandry and animal welfare
15	Strengthening of the circular flow concept
16	Extensification and landscape conservation
17	Organic agriculture
18	Fair working conditions
19	Increased cooperation
20	Regional sales, purchase, processing and marketing
21	Education and training

Source: Own illustration

Figure 2 shows that the category ‘diverse cultural landscapes’ (indicated by the number 3) is the largest node and therefore the single most frequently mentioned category within the subsample of conventional farms. This means that the sampled conventional farmers most often named excellent sustainable activities that could broadly be understood as contributions to diverse cultural landscapes. The most links between two categories were between ‘diverse cultural landscapes’ and ‘optimised nutrient management and fertilisation´ (n = 9), ‘diverse cultural landscapes’ and ‘optimised soil cultivation and soil protection’ (n = 8), and ‘biodiversity’ and ‘participation in projects, competitions, certification’ (n = 8). The category ‘re-use and longer service life’ is not displayed in the conventional network because it is not connected to another category. The two social sustainability dimension categories and the governance dimension category were located on the periphery of the network, indicating that these categories were less connected to other categories.

The category ‘organic agriculture’ was the one most frequently mentioned by organic farms (Figure 3). The most links between two categories were between ‘organic agriculture’ and ‘diverse cultural landscapes’ (n = 13), ‘organic agriculture’ and ‘optimised soil cultivation and soil protection’ (n = 12), and ‘organic agriculture’ and ‘species-appropriate animal husbandry and animal welfare’ (n = 11).

Figure 3. Network of organic farms



Source: Own illustration

In the group of conventional farms, there were 108 single scored links (edges) between the individual categories. Considering the frequency with which an edge occurs, there were a total of 232 weighted edges. In comparison, there were 146 single scored and correspondingly 426 weighted edges in the group of organic farms. Therefore, the mean degree (organic: 13.91, con: 10.29) and the weighted mean degree (organic: 40.57, con: 22.1) of the network of organic farms were higher than those of the network of conventional farms. In addition, the diameter of the network of organic farms was smaller (organic: 2, con: 3) and the density greater than that of the network of conventional farms (organic: 0.7, con: 0.51). Furthermore, the average path length was lower than in the network of conventional farms (organic: 1.31, con: 1.44). All these ratios show that the categories in the statements of the organic farms were more interconnected.

4.3 Logistic regressions

Table 4 summarises the results of three logistic regressions performed according to equation 1. In the group of conventional farmers, only the chi-square test of the ‘species-appropriate animal husbandry and animal welfare’ model (hereafter: ‘animal welfare’) was significant ($X^2(12)$ = 34.25, p = 0.0006***, R^2 = 0.45). This was a strong effect (f^2 = 0.82). The significant explanatory variables in the model were ‘specialised livestock farms’, ‘mixed farms’, ‘10 and more employees’ and ‘1 million euros or more’. The results show that animal farms were 131 times and mixed farms 52 times more likely to fall into the category ‘animal welfare’ than crop farms. No clear picture emerged with regard to the size of the farm. Farms with 10 and more employees were 33 times more likely to fall into that category than farms with 1 to 9 employees. Moreover, farms with a turnover below 100,000 euros were 154 times more likely to fall into that category than farms with a turnover above 1 million euros. The ‘diverse cultural landscapes’ and ‘biodiversity’ models were not significant. In these models, the selected farm characteristics did not provide significant information on whether the categories were mentioned or not.

In the group of organic farms, the chi-square tests of the ‘diverse cultural landscapes’ ($X^2(13)$ = 23.26, p = 0.0387*, R^2 = 0.26) and the ‘animal welfare’ model ($X^2(13)$ = 28.33, p = 0.0081**, R^2 = 0.34) were significant. These were strong effects (f^2 = 0.35 and f^2 = 0.51). The statistically significant variables in the ‘diverse cultural landscapes’ model were ‘specialised livestock farms’, ‘mixed farms’, ‘10 and more employees’, ‘1 million euros and more’ and ‘eastern Germany’.

Table 3. Logit models

		Diverse cultural landscapes			Biodiversity			Animal welfare		
		Coeff.	*SE*	*z*	*Coeff.*	*SE*	*z*	*Coeff.*	*SE*	*z*
Conventional	C	-2.96	1.46	-2.03	−4.46	1.99	−2.24	−3.79	2.29	−1.65
	Specialized livestock farms	0.10	0.71	0.14	−0.67	1.01	−0.66	4.87***	1.37	3.55
	Mixed farms	-0.26	0.74	-0.35	−1.13	0.98	−1.16	3.95*	1.55	2.54
	Partly organic farms	-1.26	0.89	-1.42	−1.73	1.15	−1.50	−0.64	1.26	−0.51
	10 and more employees	-21.47	0.80	-26.76	−0.1	1.12	−0.89	3.50**	1.24	2.82
	€ 100.000 to 1 million	0.47	0.70	0.66	0.16	1.05	0.15	−0.6	0.85	−0.70
	€ 1 million and more	-1.05	0.99	-1.05	−1.34	1.78	−0.75	−5.04**	1.79	−2.82
	Main occupation	0.12	0.77	0.15	2.42	1.30	1.87	−1.63	1.21	−1.35
	Poor sustainability performance	0.21	0.81	0.26	−0.37	1.00	−0.37	−0.69	1.40	−0.49
	Medium sustainability performance	1.54	0.73	2.11	−1.19	0.95	−1.25	−1.28	1.16	−1.10
	East Germany	2.10	1.27	1.65	−20.76	1.37	−15.15			
	Not certified	1.04	1.12	0.94	−1.01	1.04	−0.97	1.04	1.81	0.57
	Year of farm foundation	0.00	0.00	1.23	0.00	0.00	1.75	−0.00	0.00	−0.36
	Crop rotation change/ optimal crop rotation	0.26	0.75	0.35	/	/	/	/	/	/
	Extensification of land/ biodiversity	/	/	/	1.83	0.86	2.12	/	/	/
	Improved livestock management/ animal husbandry	/	/	/	/	/	/	1.89	1.01	1.86
	Likelyhood Quotient Test	$X^2(13)$ = 19.23			$X^2(13)$ = 21.72			$X^2(12)$ = 34.25***		
	McFadden R^2	0.20			0.30			0.45		
	Total observations	72			76			64		
		Diverse cultural landscapes			**Biodiversity**			**Animal welfare**		
		Coeff.	*SE*	*z*	*Coeff.*	*SE*	*z*	*Coeff.*	*SE*	*z*
Organic	C	−2.51	2.14	−1.17	−4.43	1.96	−2.26	−5.35	2.00	−2.67
	Specialized livestock farms	−1.56*	0.77	−2.03	0.21	0.69	0.31	2.81***	0.83	3.40
	Mixed farms	−3.04**	1.07	−2.85	0.12	1.05	0.11	0.07	1.80	0.04
	Partly organic farms	−0.02	1.10	−0.01	−1.81	1.00	−1.82	0.97	0.80	1.21
	10 and more employees	−36.75***	1.92	−19.17	−0.39	1.38	−0.28	−19.01***	1.41	−13.46
	€ 100.000 to 1 million	0.29	1.29	0.23	−1.56	0.80	−1.95	−1.67	1.14	−1.47
	€ 1 million and more	20.55***	1.78	11.54	−0.53	1.75	−0.31	20.10***	1.89	10.61
	Main occupation	−0.43	1.30	−0.33	2.27	1.06	2.15	0.92	0.99	0.93
	Poor sustainability performance	−0.45	0.84	−0.54	−0.41	0.67	−0.61	−0.68	0.84	−0.82
	Medium sustainability performance	−0.00	0.78	−0.00	−0.19	0.77	−0.25	1.82	0.95	1.91
	East Germany	3.07**	1.05	2.91	−0.44	1.16	−0.38	2.30	1.59	1.44
	Not certified	2.21	1.90	1.16	0.88	1.10	0.80	−0.13	1.41	−0.09
	Year of farm foundation	−0.00	0.00	−1.13	0.00	0.00	2.08	0.00	0.00	0.27
	Crop rotation change/ optimal crop rotation	1.00	1.45	0.69	/	/	/	/	/	/
	Extensification of land/ biodiversity	/	/	/	0.81	1.56	0.52	/	/	/
	Improved livestock management/ animal husbandry	/	/	/	/	/	/	2.32	1.28	1.82
	Likelyhood Quotient Test	$X^2(13)$ = 23.26*			$X^2(13)$ = 13.26			$X^2(13)$ = 28.333**		
	McFadden R^2	0.26			0.15			0.34		
	Total observations	77			82			75		

Source: Own illustration.

Crops farms were five times more likely to fall into the ‘diverse cultural landscapes’ category than animal farms and 21 times more likely to fall into that category than mixed farms. Farms with a turnover above 1 million euros were >1000 times more likely to report excellent sustainable activities in the ‘diverse cultural landscapes’ category than farms with a turnover below 100,000 euros. Farms located in eastern German states were 22 times more likely report activities in the category ‘diverse cultural landscapes’ than farms located in western German states.

The significant variables in the ‘animal welfare’ model were ‘specialised livestock farms’, ‘10 and more employees’ and ‘1 million euros and more’. Naturally, livestock farms mentioned measures related to animal husbandry and animal welfare more frequently than farms with a crop farming orientation. The annual turnover in the organic group indicated that farms with high annual turnover were significantly more likely to mention activities that fell into the two categories. The ‘biodiversity’ model was not significant. The results regarding the explanatory variables ‘10 and more employees’, ‘annual turnover above 1 million euros’ and ‘eastern Germany’ should be interpreted with caution as the characteristic values had small numbers of observations.

5. Discussion and conclusions

European farmers are facing the challenge of transforming their production systems and production practices towards greater sustainability. However, it remains rather unclear how this would happen in practice: while legislative frameworks at EU and national level tend to regulate only minimum requirements and private standards typically work with static lists and indicators, we have tried to assess how farmers themselves may act in this respect beyond the minimum requirements. We therefore surveyed German farmers about their self-reported activities and micro-level innovations in their day-to-day practice that they view as outstanding voluntary contributions to sustainability transformation. We relied on the concept of sustainability excellence as a framework that addresses outstanding activities undertaken by farms in food systems.

With regard to the first research question of where conventional and organic farms see their particular sustainability excellence, the qualitative semantic network analysis (see section 4.2) showed that farmers mainly described activities that can be assigned to the ecological sustainability dimension, regardless of whether the production method was organic or non-organic. Social and economic activities were mentioned less. This is generally shown in studies investigating sustainability performance or sustainability communication (e.g. WIRÉN-LEHR, 2001). However, differences between conventional and organic farms could be found in the focus of concrete sustainable activities and the interconnections. Organic farmers primarily viewed the organic farming practice itself as a stable state of sustainability, since this was the outstanding sustainability category most often mentioned. From a scientific perspective, this raises questions about the future development of organic farming practices in Europe. Organic agriculture has the potential to improve environmental impacts. However, it should not be seen as the sole measure, since it has well-known limitations in transforming the food system (MULLER et al., 2017; SEUFERT and RAMANKUTTY, 2017). A further development in organic agriculture is necessary that considers challenges on both the production side and the consumption side (MULLER et al., 2017).

In the second research question, we asked how the views and the frequency of individual mentions and their connectedness may differ between organic and conventional farms. For conventional farms, the category of sustainable activities most often mentioned was contributions to diverse cultural landscapes. Saving energy and emissions as well as reducing chemical inputs were mentioned more frequently by conventional farms than by organic farms. Considering the semantic networks created, the network of organic farms showed a higher degree and density of the network and had shorter average path lengths. As a result, the categories in the statements of the farms were more strongly interconnected. In addition, it appeared that especially social, but also economic activities were located more on the edges of the networks and were therefore less connected with the other categories.

In the third research question we tried to assess which of the farms' socio-demographic characteristics may be statistically correlated with the most frequently mentioned activities of sustainability excellence, both in the group of organic farms and in the group of conventional farms. However, it turned out that the selected farm characteristics only had a statistically significant relationship with the main analysed categories to a limited extent in all five models. This may point to the fact that excellent sustainability activities would perhaps relate more to the individual characteristics of farmers or employees, and not so much to structural characteristics and reinforces the important role of individuals for a positive change (CAMPOS, 2022). This shows that excellent sustainability activities may have close relations with innovations and entrepreneurship (PETERS and AUSTIN, 1986). In addition, sustainability excellence refers to the outstanding, which is not carried out by the majority, but rather can be a role model in sustainability transformation.

Furthermore, the question remains of whether, in future, dividing between the groups of conventional and organic farms will be fruitful for development paths towards a more sustainable agriculture (e.g. BUCKWELL et al., 2014). Our results actually suggest that for an intensified transformation towards sustainable agricultural systems, both organic and conventional farmers should intensify efforts to learn more from each other in future: conventional farmers by thinking more in terms of flows, relations and interconnectedness of resources within their agricultural systems, and organic farmers by introducing forward-looking innovations that seek to adapt and modify the existing framework of organic farming practices to the challenges faced, such as from climate change. Furthermore, the links found between excellent actions implemented can be considered in future sustainable agriculture support programmes, enabling these synergies to be used to achieve a more successful sustainability transformation.

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