Data in Brief 32 (2020) 106250

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Data on farmers' perception and acceptance of sustainability standards

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ARTICLE INFO

Article history:
Received 14 June 2020
Revised 16 August 2020
Accepted 26 August 2020
Available online 31 August 2020

Keywords:
Farm sustainability standard
Innovation adoption
Standard design
Choice experiment
Willingness-to-accept
Expected reward
Risk elicitation

ABSTRACT

The presented data informs about a comprehensive online survey on the perception and acceptance of farm sustainability standards amongst German farmers. We conducted the online interviews, with a total of 598 adequately answered questionnaires in summer 2017. The resulting sample is representative of German farmers, as the distribution of participants corresponds very well to the percentage distribution of farms in Germany. The survey contained a discrete choice experiment (DCE), a structured survey of 30 sub-aspects of rewards to be expected from the application of a sustainability standard and a risk elicitation lottery choice-task. Besides, the personal characteristics of the farmers (e.g. gender, education, communication behaviour, age) and farm characteristics (e.g. farm type, size, labour, profit) were recorded. Since the complete raw dataset cannot be published due to the privacy rights of human subjects and the stated data use agreement (DUA) with the participants, the present article demonstrates the data collection process, describes the parameter of the DCE and, present summary statistics of the sample. In addition, we illustrate the variables coding and data structure using a model data set with 10 generated entries. Further, a reduced and edited exercise dataset, which is structured analogous to the real dataset, is used to demonstrate the analysis of the DCE data step-by-step. The results and the interpretation of the actual DCE data analysis are published

DOI of original article: 10.1016/j.jenvman.2020.110617
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https://doi.org/10.1016/j.dib.2020.106250

in the article 'Acceptance of sustainability standards among farmers' - empirical evidence from Germany' [1]. The survey data can provide further insights on farmers' expected rewards from participating in a sustainability standard, on the role of risk perception and tolerance of German farmers, and the role of communication behaviour in the innovation adoption context.

Specifications Table

Subject	Economics and Econometrics
Specific subject area	Agricultural Economics, Experimental Economics, Behavioural Economics, Economic Experiments, Discrete Choice Experiments, Lottery Experiments
Type of data	Tables, Figures, Text files, CSV files, do-files for the Stata code
How data were acquired	Online survey including a Discrete Choice Experiment (DCE) (online questionnaire using the survey software 'Questback' by Unipark)
Data format	Analysed data Meta data on the collected variables Anonymized, restructured demo-data set for the DCE analysis example
Parameters for data collection	The survey aimed to measure the preferences of a spatial representative sample of German farmers regarding farm sustainability standards. Therefore, an online survey was used containing a discrete choice experiment (DCE), Likert-scaled multiple questions on latent psycho-metrical factors and various forms of risk measurement, amongst them a behavioural experiment following the approach of 'Holt and Laury'.
Description of data collection	In mid-June 2017 a cooperating German farmers association invited 13,020 farmers (members and non-members) to an anonymous online survey. A reminder e-mail was sent to the identical mailing list four weeks after the start. The online survey closed at the end of July with 918 entries, 598 of them sufficiently completed.
Data source location	Germany
Data accessibility	Meta data of the collected variables and a demo data set for the DCE analysis is with this article.
Related research article	V. Hannus, T.J. Venus, J. Sauer, Acceptance of sustainability standards by farmers - empirical evidence from Germany. Journal of Environmental Management. 267 (2020). https://doi.org/10.1016/j.jenvman.2020.110617

Value of the Data

- The survey data presents the first representative data collection including a DCE on the acceptance of sustainability standards amongst German farmers.
- The data allows measuring and comparing changes in the perception and attitude towards sustainability standards in farming with future studies on the same topic.
- The data allows further analysis of different farm types' managers' sensitivity to policy measures in the sustainability standard acceptance.
- The complete description of the DCE: deduction, online survey realisation and, elaboration and, statistical analysis of the DCE data (using the statistic program Stata 15), helps to perform similar studies and to verify the obtained results.
- Research and policy can gain insights into farmers' decision-making processes by analysing the psychometrical reward measurement questions combined with the farmers' characteristics.

1. Data Description

The following section describes the collected data. The online collected data serves to assess the perception, acceptance, and reservations about farm sustainability standards amongst German farmers, without restriction to specific farm types. Appendix 1 displays the survey translated into English. Appendix 2 shows the original German online version. The obtained sample is representative of German farmers, as the distribution of participants corresponds very well to the percentage distribution of farms in Germany (Table 1). Metadata on all collected variables and their coding is enclosed in Appendix 3.

Socio-economic data about the farm, such as farm type, size, available labour, and farm profit, participation in agri-environmental programmes and, marketing activities is displayed in Table 2. Table 3 shows farmers' investment behaviour in the years 2012 to 2017. The farmer informed in the survey also about their gender, age, education, family status, kids, successor status and,

Table 1
Spatial sample distribution in Germany*.

Federal state (of Germany)	Share of Farmers in % in the sample($n = 492$)	German average in 2016**
Baden Württemberg	12.2	14.7
Bavaria	33.9	32.7
Brandenburg	2.6	1.9
Hesse	6.3	5.9
Meckenburg Western Pommerania	2.3	1.8
Lower Saxony	11.5	13.9
North Rhine Westphalia	12.5	12.2
Rhineland Palatinate	7.6	6.4
Saarland	0.9	0.4
Saxony	2.1	2.4
Saxony-Anhalt	2.1	1.6
Schleswig-Holstein	5.7	4.6
Thuringia	0.5	1.3

* Information added on basis of the given farmers' postal codes.
** Reference [2].

Table 2
Socio-economic farm characteristics by farm types (cf. App. 3).

Farm type	Farms	Average size	Labour force	Profit class	Share of farmers in %				
	number	ha	Persons		Assoc. mem.	Organic farm	Main income	Part. in schemes	Promot. initiatives
spec. crop farm	211	274.59	2.08	6.30	0.64	0.10	0.27	0.55	0.24
mixed crop production	11	313.18	5.23	6.09	0.64	0.09	1.00	0.55	0.18
spec. forage farm	99	153.99	3.55	6.06	0.33	0.06	0.93	0.64	0.30
mixed livestock production	32	80.47	1.93	4.53	0.28	0.19	0.62	0.56	0.56
spec. finishing PIG	91	109.17	4.26	6.31	0.46	0.03	0.82	0.51	0.42
spec. finishing POULTRY	28	158.19	2.81	7.46	0.39	0.11	0.93	0.32	0.64
spec. horticultural	6	45.67	6.00	5.67	0.33	0.50	0.84	0.50	0.50
spec. permanent crops	16	75.31	3.44	5.25	0.56	0.19	0.69	0.38	0.69
mixed crop/livestock	93	450.68	6.93	6.72	0.49	0.10	0.84	0.59	0.46
not specified	11	47.10	2.50	5.18	0.18	0.33	0.09	0.18	0.55
Total	589	230.24	3.58	6.23	0.49	0.10	0.79	0.54	0.37

Table 3
Investments by farm types.

Farm type	Farmers (absolute)	Share of Farmers in %, which invested in...			
		Stable construction	Technology & machinery	Plant con-struction	Renewable energy
spec. crop farm	147	0.04	0.88	0.34	0.29
mixed crop production	10	0.20	1.00	0.20	0.40
spec. forage farm	73	0.58	0.81	0.35	0.33
mixed livestock production	22	0.64	0.82	0.41	0.18
spec. finishing PIG	73	0.67	0.66	0.21	0.38
spec. finishing POULTRY	18	0.66	0.72	0.33	0.39
spec. horticultural	3	0.00	0.33	0.67	0.33
spec. permanent crops	10	0.00	0.90	0.30	0.50
mixed crop/livestock	64	0.45	0.86	0.36	0.25
not specified	6	0.33	0.67	0.33	0.83
Total	426	0.37	0.81	0.32	0.32

Table 4
Farmer characteristics.

Variable name	Characteristic	Observations	Mean	SD	Min.	Max.
Age	Farmer age in years	429	47.78	11.50	18	72
Gender	1 if male	447	0.90	0.30	0	1
Family status	1 if living without partner	452	0.82	0.38	0	1
Succession safe	1 if yes	452	0.40	0.21	0	1
Education	1 if education is vocational training	32				
	1 if education is technical/master	237				
	1 if education is college/university	155				
Number of kids	0	127				
	1	81				
	2	123				
	3 and more	107				

private and professional communication behaviour (see Table 4 and Figure 1). Appendix 4 demonstrates the raw data structure in the form of a model data set.

Further, we surveyed the assessment of sub-aspects of economic rewards, social rewards, and personal rewards that the use of a sustainability standard provides on a 7 point Likert-scale. Table 5 display the respective summary statistics. The questionnaire also included three different types of questions to measure 'risk', such as risk perception, risk tolerance, and risk aversion. The latter was measured only from a small share of highly motivated participates as the risk elicitation lottery choice-task was placed after the end of the actual survey as an add-on.

The discrete choice experiment (DCE) enables to evaluate the preferences in the design of farm sustainability standards amongst farmers. The effect of the four included non-monetary attributes 'data provision', 'consultation', 'process optimization', 'level of sustainability' and the monetary attribute 'price premium' on the farmers' acceptance can be statistically estimated with the DCE data. The development of the experimental designs DCE is elucidated in the following methods section, as the DCE is a fundamental part of the survey. We illustrate the processing and analysis of the DCE data from the survey with Stata 15, using a reduced and edited exercise data set (see Appendixes 5, 6A and 6B). The article 'Acceptance of sustainability standards among farmers - empirical evidence from Germany' [1] illustrates the result of the analogous analysis of the complete data set. The anonymized raw data or specific analysis of the data can be accessed on individual requests.

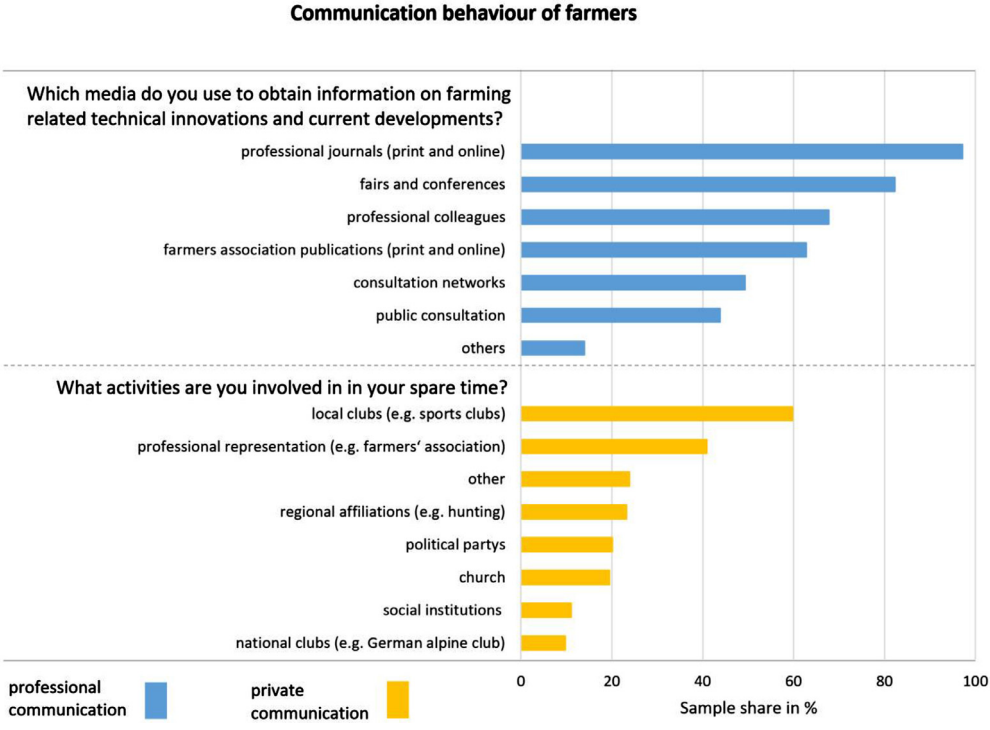

Fig. 1. Use of different channels for professional information and farmers' private activities

2. Experimental Design, Materials, and Methods

In this section, we provide information about the development and realization of the discrete choice experiment and its analysis using the statistic program Stata 15. From literature, we deduced the research questions and appropriate methods to develop an initial online questionnaire with a discrete choice experiment included [3,4]. Further, results from a preliminary study on the same topic were included in the development of the questionnaire [5]. A first test of the questionnaire started in April 2017 with 1,000 invited farmers. We collected in the test-survey 100 questionnaires, 50% of them completely answered. On basis of these results, we adjusted the questionnaire, added the data use agreement (DUA) and elaborated an experimental design for the discrete choice experiment (described in the following Section 2.1). As we aimed to collect data from different farm types and all regions in Germany to obtain a representative sample for Germany, the cooperating farmers association selected for the invitations mail addresses in proportion to the actual distribution of farms in Germany. The final questionnaire is displayed in the Appendixes 1 and 2 in English and in German respectively. Appendix 3 displays the variables and coding of all collected data; Appendix 4 demonstrates the structure of the resulting data set.

We realized the online data collection from mid-June to the end of July 2017. A total of 13,020 farmers were invited to participate in the anonymous survey. The German Agricultural Society invited the farmers in two different circulars, whereby about one third of member companies and two thirds of non-member companies were contacted. The addresses came from mailing lists of farmers interested in the associations' work. This group represents innovation-interested agricultural entrepreneurs. At the beginning of July, a reminder mail was sent to the same recipients. No special incentives to participate were given. We recorded the responses of the two

Table 5
Expectations on the use of a sustainability standard.

Expectations, perceptions and reservations	Observations	Mean	Std. dev.
Economic rewards			
I expect that the use of a sustainability standard on my farm would lead to:			
ER1 an improvement in technical performance.	459	4.17	1.55
ER2 an improvement in financial performance.	460	4.37	1.63
ER3 more efficiency.	458	4.05	1.58
ER4 labour savings.	458	3.32	1.66
ER5 lower costs.	458	3.67	1.63
ER6 higher selling price.	457	4.71	1.53
ER7 higher productivity.	456	3.89	1.54
ER8 lower financial risk.	456	3.90	1.53
ER9 higher returns.	454	4.58	1.55
ER10 higher profits.	455	4.38	1.59
Personal rewards			
I expect that building a certified stable would lead to me having feelings of:			
PR1 pride.	447	3.97	1.58
PR2 exhilaration.	450	4.21	1.58
PR3 meaningfulness.	449	4.09	1.48
PR4 responsible acting.	454	4.76	1.54
PR5 forward-thinking acting.	454	4.64	1.49
PR6 taking over societal responsibility.	454	4.50	1.59
Social rewards			
I expect that with the use of a sustainability standard, my farm work would be:			
SR1 be more appreciated by society.	447	4.64	1.51
SR2 be perceived as more desirable by society.	445	4.65	1.50
SR3 considered appropriate by colleagues.	447	3.63	1.29
SR4 seen as progressive by my social environment.	445	4.50	1.43
SR5 correspondent to people's perception of ‚good' agricultural enterprises.	445	4.71	1.49
SR6 no longer in sync with the expectations of my social environment	447	3.29	1.29
Risk tolerance			
RT1 I prefer certainty over uncertainty when I invest in my firm.	452	4.79	1.25
RT2 I avoid risks when deciding for my business.	452	4.11	1.36
RT3 I like to take financial risks.	452	3.92	1.41
RT4 I like to 'play it safe' when I invest in my firm.	449	4.41	1.28
Risk perception			
From a financial perspective, I consider the use of a sustainability standard as:			
RP1 very risky.	442	3.51	1.33
RP2 safe.	444	3.94	1.21
RP3 questionable.	443	4.15	1.48
RP4 involving a lot of risk.	443	3.91	1.34

groups in two parallel survey projects in the program Questback from Unipark. The final sample resulted relatively balanced between the two subgroups due to the lower response rate of non-members. The participation rate for the members was 12.3%. Of them 7.0% answered the first three parts of the questionnaire completely. The participation rate was significantly lower among the non-members: only 8.1% opened the link of the survey and 3.4% answered the first three questions. Compared to the pre-test less participants of both groups dropped answers in the choice experiment.

2.1. Development of the discrete choice experiment

We used the DCE for preference measurement of the hypothetical decision to adopt a sustainability standard for the individual enterprise. It is assumed in the experiment that a respondent decides in the election situation for the option that promises the greatest benefit for him

Table 6
Attributes and level in the discrete choice experiment.

Attribute Statement on Choice Card		Level (coding)
Data Provision	Data basis for sustainability assessment (and technical support for data provision)	- Separate data collection with questionnaire (0) - EDP data transfer from existing digital crop field records (1) - EDP data transfer from for the repeated application to EUs Integrated Administration and Control System (IACS) (2)
Consulting	Consulting by standard setting body	- once a year free of charge (-1) - fee based (optional) (1)
Process Optimization	Standard optimizes production processes	- Yes (1) - No (-1)
Level of Sustainability	Standard requirements & threshold values for sustainability assessment (e.g. nutrient balances and emissions)	- compliance with legal requirements (0) - limits somewhat stricter than the legal requirements (1) - limits somewhat stricter than the legal requirements plus additional action (e.g. participation in agri-environmental or conservation programs) (2)
Price effect	Percentage price premium	none; 2.0%; 4.0%; 6.0%; 8.0%; 10.0%; 12.0%; 14.0% (coding in accordance to the price levels)

overall. In the experiment so called 'choice cards' were presented to the participants, displaying three decision alternatives: two different standard options (choice set A and B) and a status quo alternative, also called opt-out option (see DCE in the Appendix 1 and 2). Whereby, the individual attributes of the decision options, influence the 'benefit' of implementing a sustainability standard for the individual farmer depending on the personal and operational factors of the respondent and his/her enterprise. The standard options available for selection were characterized by four non-monetary attributes and a monetary attribute to integrated financial attractiveness. The attributes were: 'data provision', 'consulting', 'process optimization', 'sustainability level' and 'price effect', as a generic factor for an increase in product prices. A detailed derivation of the used attributes and levels from the literature you find in the corresponding journal article [1]. We discussed the initially identified attributes and respective levels first in our research group. Then, we tested them in the test-survey and finally revised the statements according to the test results (e.g. of the analysis of the drop out points in not completed questionnaires). The statements that represented the final attributes in the choice sets are shown in Table 6. For the single decision options the attributes vary over a number of possible levels (=bandwidth of their expressions). All other content-related system attributes, as well as the limit values to be observed, are communicated to the participants as being consistent. The status quo alternative is 'I do not choose any of the options offered'.

The full factorial design for the DCE is 82,656 (288×287) possibilities of standard combinations in one choice card. These arise from five attributes and the corresponding expressions resulting in 288 ($= 3 \times 2 \times 2 \times 3 \times 8$) possible expressions for one single standard in a choice set [3]. Based on content considerations, a design should meet the following criteria as far as possible: orthogonality (= minimum correlation of the attributes), minimal overlap (=minimal overlapping of the expressions in one choice set), level balance (=numerical balance of the levels), and utility balance (= best possible utility values of the alternatives of one choice set) [4,6]. In addition, dominant alternatives should be excluded [4].

Following the approach of Greiner et al. [7] we used an experimental design for the final DCE [see also 8,9]. First, we estimated the impact of the standard design on the election decision (=utility parameter) with a simple conditional logit model using the data collected in the test-survey. Subsequently, we adjusted the attribute levels and reduced the target number of choice cards per participant to 6 in order to decrease the dropout rates. Then, we calculated a so-called

Table 7
Choice set composition and coding.

Choice card number	Choice set	Data provision	Consulting	Process optimization	Level of sustainability	Price premium
1	1	0	−1	+1	0	8
1	2	−1	+1	−1	1	2
2	3	0	−1	−1	1	0
2	4	+1	+1	+1	1	0
3	5	−1	+1	+1	2	4
3	6	0	−1	−1	0	6
4	7	−1	−1	+1	1	0
4	8	−1	+1	−1	2	2
5	9	−1	−1	−1	1	12
5	10	0	+1	+1	1	8
6	11	+1	−1	−1	2	14
6	12	0	+1	+1	0	6
7	13	0	−1	−1	1	0
7	14	+1	−1	+1	1	8
8	15	+1	+1	−1	2	12
8	16	0	−1	+1	0	14
9	17	+1	+1	−1	0	6
9	18	−1	−1	+1	2	10
10	19	−1	+1	+1	2	10
10	20	+1	−1	−1	0	14
11	21	+1	−1	+1	2	2
11	22	+1	+1	−1	1	0
12	23	+1	−1	+1	1	6
12	24	+1	+1	−1	0	4
13	25	0	+1	+1	0	4
13	26	+1	−1	−1	2	12
14	27	−1	+1	−1	0	8
14	28	0	−1	+1	2	12
15	29	0	+1	−1	2	6
15	30	−1	−1	+1	0	8
16	31	+1	**+1**	+1	0	10
16	32	−1	**+1**	−1	2	10
17	33	−1	−1	−1	0	14
17	34	+1	+1	+1	2	8
18	35	−1	+1	+1	**1**	2
18	36	−1	−1	−1	**1**	4

'optimal design' using the utility parameter estimates and the target number of 18 choice cards using the programme 'Ngene 1.1.1' [10]. For the composition of the choice sets, we used effect coding as shown in Table 7. The assignment of the codes to the attribute levels is indicated in Table 6 in the brackets. Each participant was presented six choice cards in the experiment with two standard options and a status quo alternative (see Table 2). The final design has a D-efficiency of 95% (d-error 0.04967) and an A-efficiency of 87% (a-error 0.13188). Whereby, the closer the D-efficiency is to 100% the better is the design and 'the design with the lowest a-error is' the A-optimal design [10: 86, 92].

2.2. Implementation of the discrete choice experiment

The DCE started with a short explanation of the notional standard and a so-called 'Cheap Talk' [11,12]. The considered sustainability standard should regard various aspects of sustainability in the sense of the 'three-pillar model'. This common model places sustainable developments in an ecological, social and economic context [13]. The Cheap Talk technique is used with the aim of reducing the proportion of socially desirable responses and increase the reliability of estimates [11]. It prepares participants to make the decision as if in a genuine decision-making

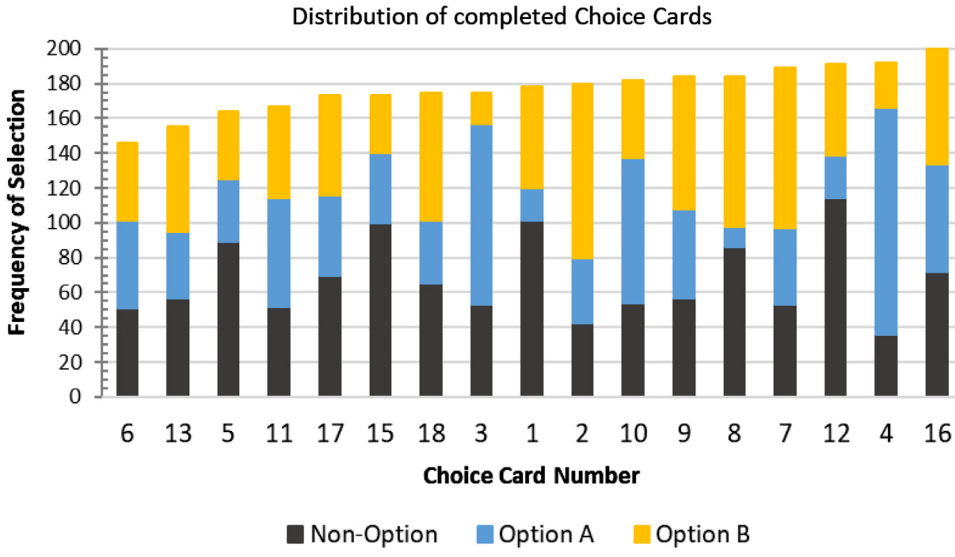

Fig. 2. Distribution of completed choice sets and selected options

situation. We prepared the farmers for the experiment with six voting decisions and told them, that in each decision they were offered two generic alternatives 'Standard A', 'Standard B' and a status quo alternative. We asked the farmers to consider the individual design elements for their decision to accept a sustainability standard, all else being equal. We displayed the choice sets in the online survey in randomized order. To control the obtained number of completed choice sets aiming at a balanced number of selected options we continuously recorded the number of completed choice sets. Fig. 2 displays the final number of selected choice options.

2.3. Statistical analysis

For the analysis of the collected DCE data from our survey, we used Stata 15. Appendix 5 contains a reduced and anonymized example data set to illustrate the data one can get from a survey like ours. In Appendix 6 you find the Stata code for the analysis of the survey data as presented in the article of Hannus et al. [1]. Appendix 6A illustrates the code and the expected results using the test data of Appendix 5, whereas appendix 6B provides the Stata code in a do-file format. We used a mixed logit model using maximum simulated likelihood following the analysis method of Hole [14]. In the example code of the appendix, we used 500 random draws according to the Halton sequence method to get the starting values, whereas for the final estimation for the publication [1] we used 1,000 draws as suggested for publications. For the estimation of a latent class conditional logit model, the approach of Pacifico and Yoo is applied [15].

3. Ethics Statement

Since the survey collected many farm and farmer specific and –partially– confidential information, with which conclusions could be drawn about the respondent or the referenced farm we cannot share the raw dataset. We assured the participants not to pass their personal data on to third parties in a data use agreement (DUA) at the beginning of the questionnaire in order to

maintain the privacy rights of involved human subjects. Participants gave their informed consent to participate in the presented study with the aim 'to assess the attitudes and opinions of the farmers' profession towards sustainability systems in agriculture' by answering to the questionnaire you find in Appendix 1.

Declaration of Competing Interest

The author declares that she has no known competing financial interests or personal relationships, which have, or could be perceived to have, influenced the work reported in this article.

Acknowledgments

The State Conference of Women and Equal Opportunities Representatives at Bavarian Universities (LaKoF Bayern) Germany funded this research with a scholarship grant. Many thanks to J. Sauer of the Technical University of Munich for supporting the entire research work and for supervision. In addition, I thank the German Agricultural Society (DGL) for support with the survey, and J. Roosen of the Technical University of Munich for providing support on the design of the DCE with the program Ngene.

Supplementary Materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.dib.2020.106250. You find in the sup-ple-men-tary ma-te-r-ial the following appendices: App.1 The survey (translated in English).pdf, App.2 The online survey (Original in German).pdf, App 3. Variable definitions and coding.pdf, App 4. Raw data structure.csv, App 5. CE example data sustainability.csv, App 6. Sustainability hannus Stata-do.pdf, App 7. Sustainability hannus.do, App 8. Data use agreement.pdf, App 9. Author declaration.pdf.

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