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Applying the HEXACO Model of Personality to German Livestock Farmers:

Item Scale Validation, Personality Structure and Influence on Participation in Livestock Certification Schemes

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ABSTRACT

Decisions made by farmers have impacts beyond the farm boundary, because farmers are the first link in the food supply chain. For this reason, understanding their decision-making behaviour may be of interest to all stakeholders of food systems. Since there is considerable evidence that personality traits may affect decision-making behaviour, we investigated personality traits utilising the HEXACO model of personality in a sample of 244 German livestock farmers. Based on comparisons with data obtained from existing literature that investigated the HEXACO personality traits using community samples and with preliminary data from an own community sample, we found that the livestock farmers differed from the general population. The farmers had higher scores in Honesty-Humility and Conscientiousness and were more emotionally stable. Results of a multinomial logistic regression model showed that personality traits influenced farmers' decisions to participate in particular livestock certification schemes. While high Conscientiousness increased the probability of participating in conventional animal welfare schemes, high Openness to Experience facilitated participation in organic schemes. However, the results of a confirmatory factor analysis indicated that the German version of the short item scale used to measure the personality traits of the farmer sample should be partially modified. Even though the results should be understood rather as first indications and as a basis for further research, our findings extend the understanding of farmers' personality and provide information on underlying factors of farmers' decision-making related to participation in livestock certification schemes. They could help to better align support strategies, e.g. for more environmentally and animal-friendly production, with the personality of farmers.

Keywords: *livestock farmers; personality traits; HEXACO model of personality; livestock certification schemes*

1 Introduction

Farmers are the first link in the food supply chain; their decisions have impacts on down-stream actors in supply chains, other stakeholders of food systems and the natural environment. Considering in this context, that a well-functioning, sustainable agriculture is the basis for securing the food supply of a constantly growing world population within planetary boundaries, it seems very important to comprehensively understand farmers' decision-making behaviour (Öhlmér, Olson and Brehmer, 1998). A range of economic-based models of farmer decision-making have been developed in order to predict potential changes in agriculture and land use under future policy and market scenarios. Since the end of the 20th century, classical economic approaches to understanding decision-making have been supplemented by an increasing input from psychology. This research indicates that besides socio-demographics, characteristics of the farm household, structure of the farm business or the wider social milieu, also the psychological make-up of the farmers affect their decisions (Edwards-Jones, 2006). Against this backdrop, personality traits of farmers may be of interest for different reasons. Firstly, personality traits can influence farmers' attitudes, objectives and behaviour on a variety of farming issues (cf. section 1.3). Thus, a better understanding of farmers' personality traits may allow better predictions of their production decisions (Austin, Deary and Willock, 2001; Edwards-Jones, 2006), which may be of particular interest with regard to changing political and economic conditions and social demands. Secondly, Hirsh, Kang and Bodenhausen (2012) show that tailoring messages to the personality can be an effective communication strategy and can influence the decisions of the target audience. Here, knowledge about personality traits could be used to better support farmers in their decision-making processes, e.g., regarding participation in agri-environmental schemes or conversion to more socially accepted livestock production methods, through targeted communication. And thirdly, understanding and considering the personality of farmers can help to develop agricultural policy measures and (voluntary) agricultural certification schemes better accepted by the agricultural sector (Roccas *et al.*, 2002; Baur, Dobricki and Lips, 2016). This could also be relevant for the livestock sector, whose production methods are increasingly criticised by the public (Christoph-Schulz *et al.*, 2018). Here it seems important to establish measures and schemes that not only meet the demands of society but also the needs of farmers. However, even well-adapted schemes and measures might be poorly accepted if they are communicated in an inappropriate way (Schenk, Hunziker and Kienast, 2007). Combining agricultural policy measures and certification schemes more tailored to the personality of farmers with personality-targeted communication thus might further increase farmers' acceptance of these measures and schemes.

1.1 Common livestock-related certification schemes in Germany

In Germany, there are already various certification schemes related to the livestock sector that aim to improve the quality and social acceptance of livestock farming and its products. Depending on their focus, these schemes can roughly be divided into three categories: quality assurance schemes that aim to control product and process quality along production stages and should lead to better compliance with legal requirements; animal welfare schemes that aim to improve animal welfare beyond legal regulations; and organic schemes as comprehensive approaches to improve animal welfare and environmental sustainability. The proportion of farmers participating in these schemes varies considerably. While the majority of German livestock farmers accepts quality assurance schemes (Jordan, 2009; Elite Magazin, 2015), such as QM-Milch (Qualitätsmanagement Milch; quality management system of the dairy industry) and QS (Qualität und Sicherheit; quality assurance system for fresh food), which constitute basic requirements of major down-stream processing companies, participation in organic production schemes is far behind the political goal of 20 percent organic farming (Umweltbundesamt, 2020). A well-established German animal welfare approach that does not require organic production is the Initiative Animal Welfare (ITW; in German: Initiative Tierwohl). This cross-sector alliance of associations and companies from the agricultural, meat and food retail sectors aims to improve the wellbeing of pigs and poultry on a broad scale (ITW, 2021a); in the future, the inclusion of cattle is also planned (WLV, 2020). The high acceptance of this approach among farmers (Schukat, Kuhlmann and Heise, 2019) is reflected in the fact that, as of December 2020, 70 % of broiler chickens and turkeys and 31 % of fattening pigs in Germany are kept according to the rules of the Initiative Animal Welfare (ITW, 2021b). The reasons for these differences in farmers' willingness to participate in specific livestock certification schemes seem to be multifactorial (e.g. Austin *et al.*, 2005; Edwards-Jones, 2006; Defrancesco *et al.*, 2007, Latacz-Lohmann and Schreiner, 2019; Schröter and Mergenthaler, 2021), with personality traits possibly playing a role (Balzani and Hanlon, 2020).

1.2 Personality

Even though there is no simple, single definition for the concept of personality, personality psychologists largely agree that personality refers to psychological qualities that contribute to an individual's enduring

(at least somewhat consistent across time and different life situations) and distinctive patterns (psychological characteristics that distinguish people from one another) of feeling, thinking, and behaving (Cervone and Pervin, 2016). A common approach to investigate personality characteristics is to derive the dimensions of personality from lexical studies of personality structure, i.e., to assume that the major dimensions of personality are represented in the common personality-descriptive adjectives of natural languages (Goldberg, 1993; Ashton and Lee, 2005).

The psycholexically based Big Five model and the related questionnaire-based Five factor model are popular and extensively researched personality models (Adler, Christley and Campe, 2019; De Raad and Mlačić, 2017). Both models describe personality variation along five dimensions: extraversion, openness to experience (or intelligence), conscientiousness, emotional stability, and agreeableness (De Raad and Mlačić, 2017). Even if the structure of the five factor models is described to be universal with a strong biological basis (cf. Yamagata *et al.*, 2006), i.e. independent of language and other cultural differences, a five-factor structure does not robustly emerge in every study.

A number of studies indicate that six personality dimensions exist (Lee and Ashton, 2004; Ashton *et al.*, 2007; De Vries, 2013; Moshagen, Hilbig and Zettler, 2014). Based on these findings, Lee and Ashton (2004) suggest that the five factor structure needs to be revised to include an additional dimension, and to rearrange facets of the existing dimensions. The authors developed the HEXACO Personality Inventory that captures six main dimensions of personality: Honesty-Humility, Emotionality, eXtraversion, Agreeableness, Conscientiousness and Openness to Experience. The dimensions Extraversion, Conscientiousness, and Openness to Experience are quite similar to their counterparts in the Big Five model. The dimensions Emotionality and Agreeableness are rotated variants of the homonymous factors in the Big Five framework and the additional dimension Honesty-Humility involves content that is only peripherally associated with the Big Five factors (Ashton *et al.*, 2007).

Each dimension of the HEXACO model is composed of four facets described in detail by Lee and Ashton (2009). The Honesty-Humility dimension includes the facets Sincerity, Fairness, Greed Avoidance and Modesty. Persons with high scores on Honesty-Humility avoid manipulating others for personal gain, do not want to break rules, and are not interested in luxurious life and elevated social status. The Emotionality dimension consists of the facets Fearfulness, Anxiety, Dependence and Sentimentality. Persons with high scores on the Emotionality scale are fearful of physical danger, respond anxiously to stressful situations, require emotional support and feel empathy and sentimental attachments to others. The domain eXtraversion is constituted by the facets Social Self-Esteem, Social Boldness, Sociability and Liveliness. Persons with high scores on the eXtraversion scale have a positive self-image, feel confident leading or addressing groups of people, enjoy social life, and experience positive feelings of enthusiasm and energy. The Agreeableness dimension includes the facets Forgivingness, Gentleness, Flexibility, and Patience. Persons with high scores on the Agreeableness scale forgive the unfairness they experience, judge others leniently, are willing to compromise and cooperate with others, and can control their temper well. The Conscientiousness dimension comprises the facets Organisation, Diligence, Perfectionism and Prudence. Persons with high scores on the Conscientiousness scale are well organised, disciplined in working towards their goals, strive for accuracy and perfectionism, and make thoughtful decisions. The last dimension, Openness to Experience, includes the facets Aesthetic Appreciation, Inquisitiveness, Creativity, and Unconventionality. Persons with high scores on the Openness to Experience scale enjoy the beauty of art and nature, are inquisitive, have an extensive imagination and are interested in unusual ideas or people (Lee and Ashton, 2004, 2009).

Today, the HEXACO model is considered an established alternative or extension to the five-factor model (Moshagen, Hilbig and Zettler, 2014; Schreiber, Mueller and Morell, 2018) and outperforms the Five factor model in addressing some specific questions such as predicting workplace deviance (Pletzer *et al.*, 2019). Various studies confirm the six factor structure of personality and the validity of different HEXACO item scales also for German-speaking regions (Ashton *et al.*, 2007; Moshagen, Hilbig and Zettler, 2014; Schreiber, Mueller and Morell, 2018).

The original HEXACO Personality Inventory comprises 200 items and is rather unsuitable for using it in longer surveys due to the time required for responding to the items. For solving this problem, shorter item scales have been developed, see for example Ashton and Lee (2009), Milojev *et al.* (2013) or De Vries (2013). One very short item scale that is able to capture the six main dimensions of the HEXACO model, is the 24-item Brief HEXACO Inventory (BHI), of which an English and a Dutch version are available (De Vries, 2013). Each of the items covers one of the four personality facets of the six personality dimensions Honesty-Humility, Emotionality, eXtraversion, Agreeableness, Conscientiousness and Openness to Experience. The author reports that the BHI combines shortness with content breadth resulting in high suitability for using this item scale in exploratory research (De Vries, 2013).

1.3 Personality of farmers in agricultural context

Brayfield and Marsh (1957) were probably the first who captured personality traits of farmers with a personality inventory. This early research, based on the Minnesota Multiphasic Personality Inventory, provides evidence that personality traits can influence job satisfaction of farmers (Brayfield and Marsh, 1957). Later research is often based on the five-factor model of personality. These studies suggest that personality traits of farmers may influence a variety of agriculturally relevant issues.

Willock *et al.* (1999) outline correlations between personality traits according to the five-factor model and farmers' attitudes, objectives and behaviour in farming context. Building on these findings, subsequent research shows that personality traits influence the extent of production-oriented and environmentally oriented behaviour of farmers as well as their animal welfare orientation (Austin, Deary and Willock, 2001; Austin *et al.*, 2005). Panamá Arias and Špinka (2005) report that Czech dairy farm stockpersons differ in their personality from the general population and that their personality profiles can affect farm performance. Research by Judd *et al.* (2006), who compared Australian farmers to other people living in rural environments, also suggests that farmers differ from other population groups in their personality structure. The authors point out that the typical personality profile of farmers makes stress disorders less likely on the one hand, but on the other hand may act as a barrier to adapting to dramatically changing environmental conditions. Hanna, Sneddon and Beattie (2009) describe that personality of stockpersons influences their attitudes and empathy towards the animals they work with and, consistent with the above mentioned research by Brayfield and Marsh (1957), their job satisfaction. Some recent studies address the relationship between personality characteristics of livestock farmers and animal health measures. These investigations show that personality of livestock farmers is associated with differences in management and prevalence of animal diseases and influences the intention to vaccinate livestock and adopt biosecurity measures (O'Kane *et al.*, 2017; Sok *et al.*, 2018; Delpont *et al.*, 2020).

1.4 Objectives of the paper

As mentioned above, there are several studies that used the five-factor model to capture personality traits of farmers. However, there is a lack of studies applying the HEXACO model in general and the BHI in particular to farmer samples. Furthermore, the influence of farmers' personality on decisions to switch to more socially accepted production methods, e.g., by participating in specific certification schemes, has rarely been investigated. In particular, it is not yet clear whether personality traits according to the HEXACO model affect the decision of livestock farmers to participate in specific livestock-related certification schemes.

Based on this initial framework, the objectives of our paper are threefold:

1. To assess the suitability of the BHI for capturing the six personality dimensions of the HEXACO model in a sample of German livestock farmers.
2. To describe the personality of German livestock farmers according to the HEXACO model of personality using the BHI and to compare it to the general public.
3. To obtain deeper insights if the personality of farmers might be linked to their decision of participating in specific livestock certification schemes.

Based on the literature cited above, we expected that the livestock farmers of our sample would differ in their personality from the general public. We also expected that personality traits might influence farmers' decisions to participate in certain livestock certification schemes.

The remainder of this paper is structured as follows: in the second chapter, we outline the research framework with the sampling procedure, participant details, questionnaire measures, and statistical methods applied. In the third chapter, we report on the results. At first, we present descriptive statistics on the six personality dimensions and their facets together with the results of a confirmatory factor analysis applied to investigate the suitability of the BHI. Then, we compare the personality of the farmers with community samples using t-tests. Finally, we report on the results of a multinomial regression model that predicts the probability of the farmers' participation in specific livestock certification schemes, considering the six personality dimensions of the HEXACO model as independent variables. This is followed by a discussion of the results and limitations of the study in the fourth chapter. The paper ends with concluding remarks.

2 Material and Methods

2.1 Sampling procedure

The data for the present study were obtained in the context of a comprehensive online survey on animal welfare, conducted in summer 2018. The survey was intended to be answered only by livestock farmers. Therefore, the participants were motivated to participate through calls of professional farmers' organisations and announcements in various agricultural magazines. Ten vouchers worth 25 Euro were raffled off to encourage participation in the survey. Prior to the activation, the survey was pretested with German livestock farmers.

2.2 Participant details

The online survey was answered by 285 participants. However, the analyses for describing the farmers' personality and for assessing the suitability of the BHI were limited to the 244 participants who provided responses to all facets of all personality dimensions, i.e. who responded to all items of the BHI. Therefore, only the information provided by these participants was taken into account below to describe the sample.

The mean age of the participants was 44.16 (SD 12.91) years. The majority of the participants, 78.6 %, were male, 21.4 % were female. With regard to these demographic characteristics, our sample was similar to other studies that recently surveyed German livestock farmers. Heise and Theuvsen (2018) and Latacz-Lohmann and Schreiner (2019) report an average age of their livestock farmer samples of 45 and 43 years, respectively. Heise and Theuvsen (2018) also describe a similar gender distribution as found in our study with about 80 % male participants.

Most of the participants were farm managers, which is usually associated with an entrepreneurial function in family farms. Only about 17 % of the participants managed their farm as a sideline, which is a substantially lower percentage compared to the average of all German agricultural enterprises (BMEL, 2019).

The farm size was below 50 ha for 24.8 % of the farms, between 50 and less than 100 ha for 33.5 % of the farms, between 100 and less than 200 ha for 25.2 % of the farms. The remaining farms (16.5 %) had a size of 200 ha and more. Compared to the results of the Agricultural Census 2016 (Agrarstrukturerhebung 2016), the sample contains a considerably lower proportion of livestock farms with a farm size of less than 50 ha but a higher proportion of farms in all other magnitudes (BMEL, 2020).

The most important farm branch was cattle farming for 54 percent of the participants, pig farming for 37 percent of the participants and poultry farming for 9 percent of the participants.

2.3 Questionnaire measures related to personality traits

Appendix 1 displays the English version of the 24 items of the BHI (De Vries, 2013) and the German version used in this study to measure the HEXACO personality traits of the participants. The aforementioned author kindly provided us with the German translation of the items with the exception of two items that we had to translate ourselves (identified in Appendix 1). The Items were arranged randomly in the online-questionnaire and administered with the following instruction: 'Please describe yourself. Please select the appropriate answer for each point.' Similar to De Vries (2013), the items were rated on a response scale ranging from 1 (strongly disagree) to 5 (strongly agree). For calculating the scores for the personality dimensions, some items were reverse scored (see Appendix 1).

2.4 Statistical analyses

All statistical analyses were conducted with STATA, version 15 (StataCorp., 2017). A confirmatory factor analysis (CFA) with maximum likelihood estimation was performed to investigate the suitability of the 24-item BHI for the present farmer sample. A six factor solution was tested, with each latent factor representing one of the six personality dimensions of the HEXACO model. Each latent factor was estimated by its four corresponding indicators, i.e. by the four items that represent these indicators. Items were allowed to relate only to the hypothesised latent factor. Factors were allowed to correlate, as there is evidence from previous studies on the HEXACO model that some factors may correlate moderately. The indicator reliability was calculated by squaring the factor loadings. For calculating the factor reliability, we used the formula described by Backhaus, Erichson and Weiber (2015):

Factor reliability: $$Rel(\xi j) = \frac{(\sum \lambda_{ij})^2 \phi_{jj}}{(\sum \lambda_{ij})^2 + \sum \theta_{ii}}$$

with:

λ_{ij} = estimated factor loadings

ϕ_{jj} = estimated variance of the latent variable (= 1)

θ_{ii} = estimated error variances

With the aim of better grasping the personality structure of farmers, the personality traits of the farmer sample were compared with those of the general population with the aid of t-tests. Since only livestock farmers completed the questionnaire, no own data were available from this questionnaire that would allow comparing the personality traits of the farmers with the general population. Therefore, data from De Vries (2013) were used, who recorded the six personality dimensions of the HEXACO model with the same item scale, i.e. the 24-item-BHI, in a community sample in the Netherlands. Additionally, the data of the present study were compared with data of Ashton *et al.* (2007) who used a 104-item form of the HEXACO personality inventory to capture the personality of their German participants and with data of an international online sample of Lee and Ashton (2018) who administered a 100-item English-language HEXACO Personality Inventory. All studies used the same five-point response scale as the present study, making the measurements comparable. The sample of De Vries (2013) consists of 525 participants, the sample of Ashton *et al.* (2007) includes 323 participants and that of Lee and Ashton (2018) consists of 100.318 participants. Furthermore, the data of the livestock farmer sample were compared with preliminary data from an own sample of a survey in progress at the time of writing this paper. This questionnaire was directed to the German general public and contained the 24-item BHI used in the questionnaire for the livestock farmer sample of the study described here. The only exception was one item for which we changed the translation of a word (translation of “cheerful” into German with “heiter” instead of “aufgeregt”; for the reason see discussion section 4.1). As of April 2021, 76 respondents had completed the questionnaire und could be used for analysis. The t-statistics were computed utilising the t-test calculator of the STATA software (StataCorp., 2017).

To answer the question whether the personality of farmers might be linked to their decisions to participate in livestock certification schemes, a multinomial logistic regression (MNL) model was estimated. The dependent variable of interest was the respondents’ affiliation to livestock certification schemes measured by asking the respondents: “Do you participate in one or more of the following livestock certification schemes or do you plan to participate within the next two years?”

Based on their responses, the participants were assigned to one of the following four categories:

1) NoS: No scheme (of the categories numbered 2-4)
2) QAS: Quality assurance scheme (QM or QS)
3) AWS: Animal welfare scheme (German program “Initiative Tierwohl ITW”)
4) OS: Organic scheme (not further specified)

All participants who had indicated that they were already participating or planning to participate in one of the schemes were assigned to the respective category. If a participant had selected more than one scheme, he/she was assigned to the category with the higher number. This approach was chosen because a higher category number is associated with higher animal welfare standards. Participants who had not selected any of the schemes in the categories numbered 2 - 4 were classified in category 1 (NoS). In this context, it should be noted that participation in the German animal welfare scheme ITW (category 2) presupposes participation in a quality assurance scheme.

The six personality dimensions of the HEXACO model were included as independent variables in the MNL model. Since previous studies suggest that sociodemographic and farm characteristics can influence farmers’ production decisions (Edwards-Jones, 2006; Karki, Schleenbecker and Hamm, 2011), gender, age, extent of agricultural activity (main occupation/sideline) and most important farm branch (cattle; other livestock) were also considered in the statistical model to control the influence of these variables. Appendix 2 provides a summary overview of the descriptive statistics of all variables included in the model and their Pearson correlations with the HEXACO dimensions.

Since coefficients from a MNL model are usually difficult to interpret, average marginal effects were calculated for each explanatory variable on each outcome with the margins command of Stata (StataCorp, 2019). The results were visualised using the user-written Stata command coefplot (Jann, 2014).

3 Results

3.1 Testing the factor structure of the German version of the 24-item BHI

FIGURE 1 illustrates the CFA model along with its estimated error variances, factor loadings, and correlations between the latent factors, i.e. the six the personality dimensions. The correlations between the latent factors were low to moderate, indicating no substantial overlap in the personality dimension represented by each factor (Cooper, Smillie and Corr, 2010). Honesty-Humility correlated significantly positively with Agreeableness (0.31; $p = 0.015$) and Conscientiousness (0.36; $p = 0.002$), eXtraversion correlated significantly positively with Conscientiousness (0.31; $p = 0.001$) and Openness to Experience (0.45; $p < 0.001$). The model provided significantly negative correlations between eXtraversion and Emotionality (-0.27; $p = 0.019$) and between Agreeableness and Emotionality (-0.29; $p = 0.029$).

The factor loadings with significant path tests ranged from 0.17 to 0.76 ($p < 0.05$). The four indicators with non-significant path tests showed factor loadings between 0.00 and 0.17: Sincerity ($p = 0.059$), Anxiety ($p = 0.085$), Liveliness ($p = 0.502$) and Flexibility ($p = 0.096$).

The CFA for the six-factor model of the 24-item-BHI provided a mixed overall model fit. The chi-square-test rejected the exact fit with χ^2 (237) = 446.47; $p < 0.001$. However, this test is sensitive to even trivial misspecifications with increasing sample sizes and thus this parameter is rather inconclusive for assessing the model fit (Donnellan *et al.*, 2006; Arzheimer, 2016). The ratio of χ^2 to df = 1.88 and the RMSEA = 0.060 (90% CI = 0.052, 0.069) indicated a good fit between the model and the observed data. The TLI = 0.600 showed a poor fit. This index is sensitive to low indicator reliabilities. The low indicator reliabilities that occurred in some cases in this study are discussed in more detail below (see section 4.1). For assessing the fit indexes, we refer to existing literature, for example Schreiber *et al.* (2006), Backhaus, Erichson and Weiber (2015) and Arzheimer (2016).

Table 1 provides beside the descriptive statistics additional information to assess the model on indicator and factor level. As the TLI and the factor loadings already suggested, the reliability of most indicators was only moderate since in most cases less than 50 % of the indicator variance could be explained by the underlying latent factor (Backhaus, Erichson and Weiber, 2015; Bagozzi and Yi, 2012). The factor reliabilities for Honesty-Humility, Emotionality and Agreeableness were also rather low and remain below the common threshold of 0.50 (Backhaus, Erichson and Weiber, 2015).

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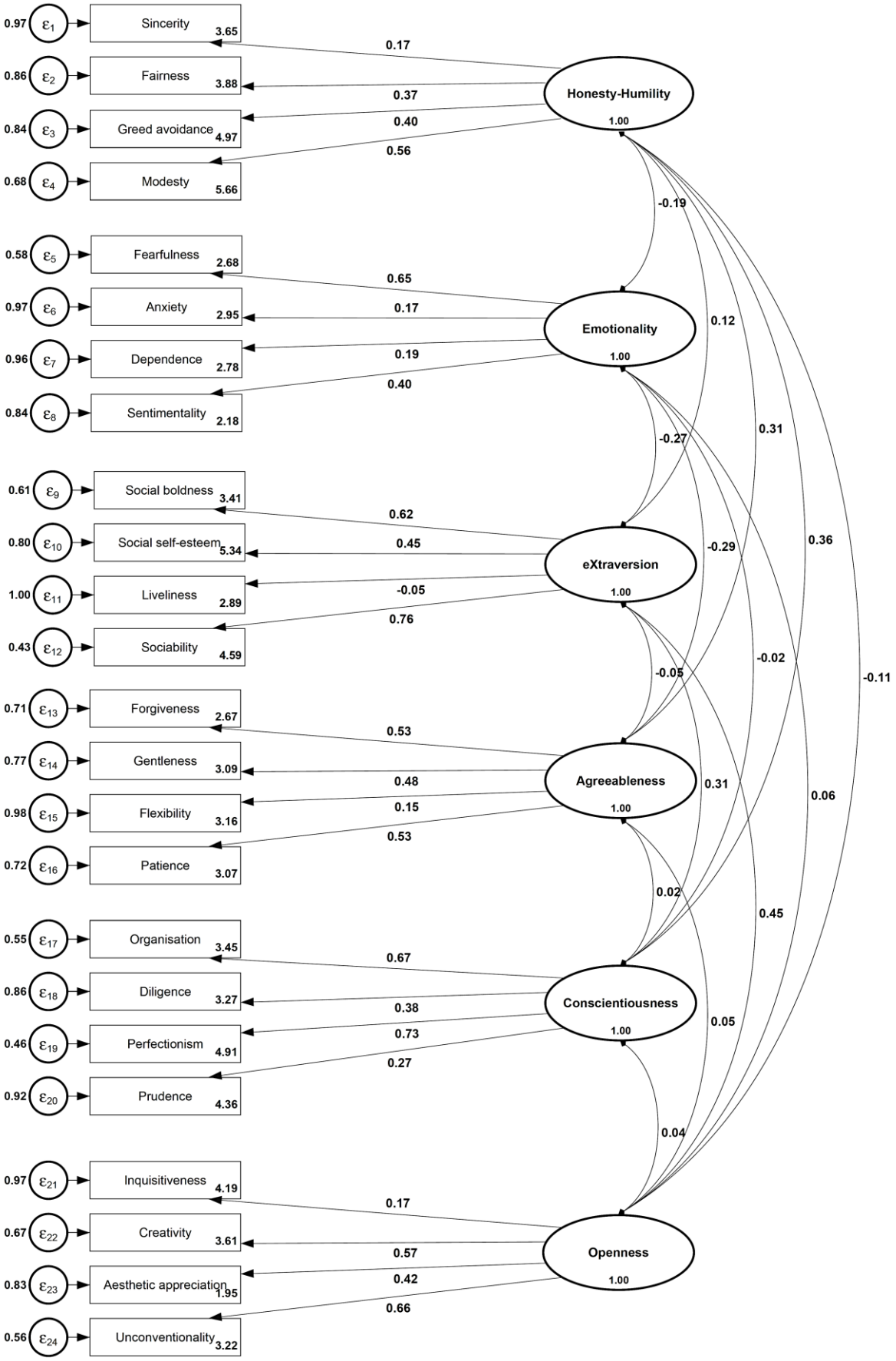

Figure 1. Results of the confirmatory factor analysis (estimated error variances, factor loadings and correlations between constructs; standardized values; N = 244)

Table 1.
Descriptive statistics of the indicators and latent factors, indicator and factor reliability of the BHI

Indicator	Mean	SD	indicator reliability	latent factor	Mean	SD	factor reliability
Sincerity	3.89	1.07	0.03	***Honesty-Humility***	4.21	0.57	0.40
Fairness	4.25	1.10	0.14				
Greed avoidance	4.26	0.86	0.16				
Modesty	4.45	0.79	0.32				
Fearfulness	2.73	1.02	0.42	***Emotionality***	2.74	0.61	0.37
Anxiety	3.20	1.08	0.03				
Dependence	2.26	0.81	0.04				
Sentimentality	2.76	1.26	0.16				
Social boldness	3.50	1.02	0.39	***Extraversion***	3.72	0.57	0.53
Social self-esteem	4.39	0.82	0.20				
Liveliness	3.00	1.04	0.00				
Sociability	3.98	0.87	0.57				
Forgivingness	2.97	1.11	0.29	***Agreeableness***	2.99	0.63	0.47
Gentleness	2.93	0.95	0.23				
Flexibility	2.80	0.89	0.02				
Patience	3.26	1.06	0.28				
Organisation	3.50	1.01	0.45	***Conscientiousness***	3.68	0.62	0.60
Diligence	3.42	1.05	0.14				
Perfectionism	3.86	0.79	0.54				
Prudence	3.96	0.91	0.08				
Inquisitiveness	4.17	0.99	0.03	***Openness to Experience***	3.34	0.67	0.52
Creativity	3.51	0.97	0.33				
Aesthetic appreciation	2.38	1.22	0.17				
Unconventionality	3.30	1.02	0.44				

3.2 Personality traits of the livestock farmer sample compared to the general population

Table 2 displays the results of the t-tests comparing the personality traits of the farmer sample with four general population samples. For three of the six personality dimensions the results pointed clearly in one direction. The farmers had higher scores in Honesty-Humility and Conscientiousness and lower scores in Emotionality compared to all general population samples included, with almost all differences being significant. However, the results were not so clear for the other three personality dimensions. Farmers scored significantly lower in eXtraversion compared to the two population samples that relied on the 24-item BHI for capturing the HEXACO personality traits, but scored significantly higher compared to the two samples that used longer item scales. The scores for Agreeableness did not differ between farmers and the general population, with the exception of the sample of Lee and Ashton (2018). Compared to this sample, farmers were more agreeable. In terms of Openness to Experience, the farmer sample did not differ from two of the population samples; compared to the other two population samples, farmers had lower scores in Openness to Experience.

Table 2.
Comparison of personality traits of the present livestock farmer sample with data from the general population (t-tests). Data for the general population originate from De Vries (2013), Ashton *et al.* (2007), Lee and Ashton (2018) and from preliminary data (as of April 2021) of an own German ad-hoc sample.

Difference to …	**24-item BHI (De Vries, 2013) Dutch population**		**104-item PI (Ashton *et al.*, 2007) German population**		**100-item PI-R (Lee and Ashton, 2018) Online sample**		**24-item BHI (own data) German sample**	
Personality dimension	Difference of means (SE)		Difference of means (SE)		Difference of means (SE)		Difference of means (SE)	
Honesty-Humility	0.36 (0.05)	***	0.69 (0.05)	***	0.91 (0.05)	***	0.13 (0.08)	+
Emotionality	-0.26 (0.05)	***	-0.61 (0.05)	***	-0.38 (0.04)	***	-0.35 (0.09)	***
eXtraversion	-0.12 (0.05)	**	0.46 (0.04)	***	0.50 (0.04)	***	-0.22 (0.08)	**
Agreeableness	0.04 (0.04)		0.00 (0.05)		0.21 (0.04)	***	-0.01 (0.08)	
Conscientiousness	0.17 (0.05)	***	0.18 (0.05)	***	0.16 (0.04)	***	0.09 (0.08)	
Openness to Experience	0.03 (0.05)		0.01 (0.05)		-0.35 (0.04)	***	-0.38 (0.09)	***

Positive differences of the means indicate higher values for the farmer sample; farmer sample N = 244; sample De Vries (2013) N = 525, sample Ashton *et al.* (2007) N = 323, sample Lee and Ashton (2018) N = 100.318; own ad hoc sample, unpublished preliminary data N = 76; $^{+}$ p < 0.1, * p < 0.05, ** p < 0.01, ***p < 0.001

3.3 Influence of farm and personal characteristics, including personality traits, on decisions to participate in livestock certification schemes

Table 3 presents the results of the multinomial logistic regression analysis used to examine factors influencing farmers' decisions to participate in certain livestock certification schemes. The allocation of the participants to the categories of the dependent variable was as follows: the category QAS comprised by far the most participants with 130 persons and constituted the reference category; the category AWS comprised 47 participants, the category OS 32 participants, and the category NoS 18 participants.

The model was significant with χ^2 (30) = 99.09; p < 0.001. McFadden's Pseudo R^2 amounted to 0.19 indicating a satisfactory model fit, since according to McFadden (1977) values between 0.2 to 0.4 point to an excellent model fit. Cragg Uhler's R^2 (Nagelkerke R^2) amounted to 0.40.

Table 3.
Results of the multinomial logistic regression model

	NoS vs QAS		AWS vs QAS		OS vs QAS	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Honesty-Humility	-0.89*	0.50	-0.37	0.36	0.12	0.41
Emotionality	0.20	0.51	0.43	0.35	0.36	0.38
eXtraversion	1.18*	0.58	0.04	0.37	-0.09	0.42
Agreeableness	-0.23	0.49	0.50	0.32	-0.15	0.36
Conscientiousness	0.10	0.54	0.77*	0.35	0.53	0.40
Openness to Experience	0.18	0.42	0.08	0.32	1.07**	0.37
Gender (female = 1, male = 0)	1.34*	0.73	-0.95	0.62	0.25	0.55
Age	-0.01	0.02	-0.02	0.02	0.01	0.02
Business (main = 1, sideline = 0)	-2.76***	0.64	0.07	0.59	-1.24*	0.54
Livestock (cattle = 1, other = 0)	-0.78	0.58	-1.69***	0.42	1.12*	0.53
Constant	-1.45	3.76	-3.90	2.84	-7.88*	3.15

n = 227; $^{+}$ p < 0.1; * p < 0.05; ** p < 0.01; *** p < 0.001; NoS no scheme; QAS quality assurance scheme; AWS animal welfare scheme; OS organic scheme

Table 3 shows that farm characteristics affected the affiliation to livestock certification schemes. Running the farm as the main occupation decreased the probability of participating in none of the programs but also decreased the probability of participating in organic schemes compared to the reference category.

Cattle farming as the most important farm branch increased the probability of participating in organic schemes. On the other hand, cattle farming as the main livestock branch decreased the probability of participating in the (non-organic) animal welfare scheme compared to participating only in a quality assurance scheme.

No significant influence could be demonstrated for the socio-demographic characteristics included in the model, but being female in tendency increased the probability of participating in none of the schemes compared to the reference category.

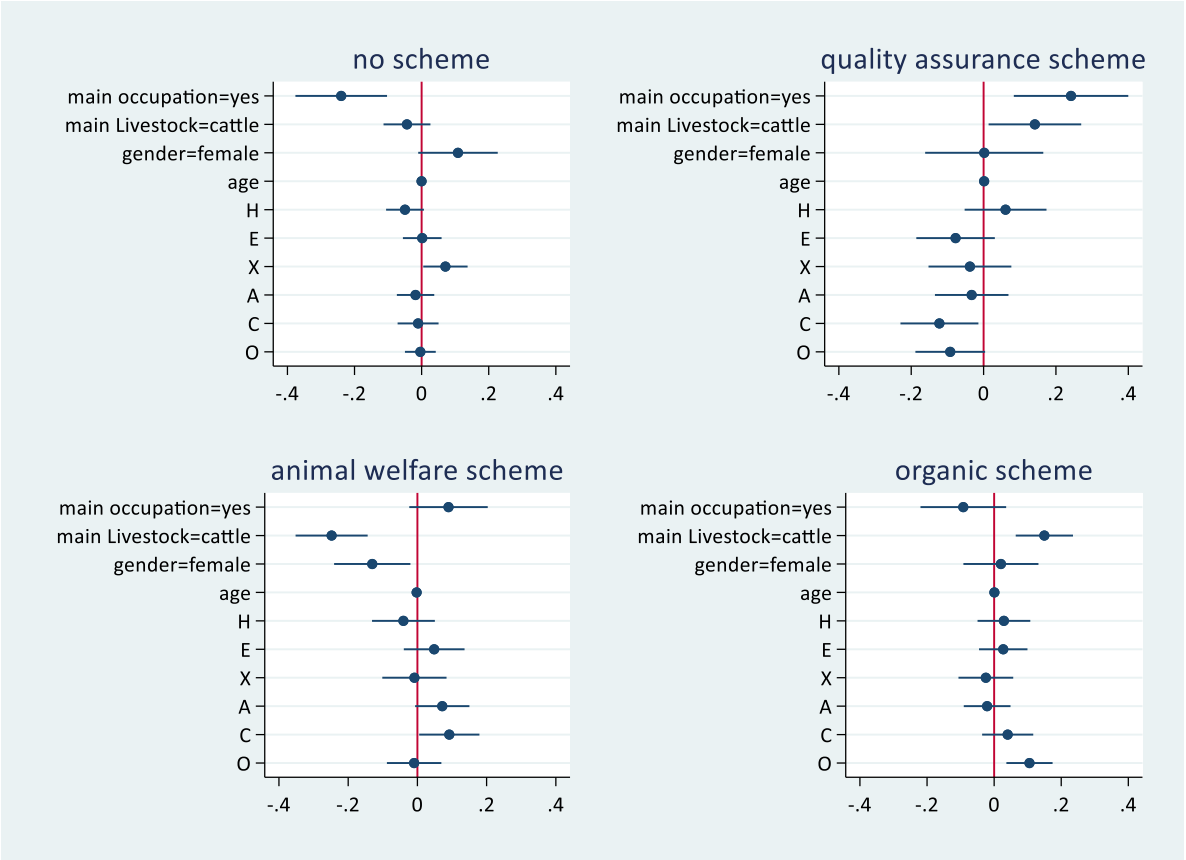

Figure 2. Estimated average marginal effects (points) with 95 % CI (lines) of the independent variables on the probability of participating in livestock certification schemes

The results of the multinomial logistic regression suggested that personality traits influenced farmers' decision to participate in production schemes since coefficients for the personality traits Honesty-Humility, eXtraversion, Conscientiousness and Openness to Experience were significant at least at the level of p = 0.1. Lower scores in Honesty-Humility and higher in eXtraversion increased the probability of participating in none of the schemes compared to the reference category. Higher scores in Conscientiousness increased the likelihood of participating in an animal welfare scheme, and higher scores in Openness to Experience increased the likelihood of participating in organic schemes, compared to (exclusive) participation in a quality assurance scheme (reference category).

To make the extent to which personality traits influence the probability of participation in the respective certification scheme more tangible, average marginal effects can be consulted (Figure 2). In the following, we only refer to average marginal effects that differ significantly from zero at the level p = 0.1. The probability of participating in none of the certification schemes decreased on average by 4.95 percent (p = 0.085) if the score in Honesty-Humility increased by one unit and increased by 7.09 percent (p = 0.036) if the score in eXtraversion increased by one unit. If the scores in Conscientiousness and Openness to Experience increased by one unit, the average probability of only participating in a quality assurance system decreased by 12.20 (p = 0.026) and 9.21 percent (p = 0.061), respectively. A one unit increase in Conscientiousness and Agreeableness led to an increase in the average probability of participating in an animal welfare scheme of 9.22 (p = 0.038) and 7.19 percent (p = 0.072), respectively. The average probability of participating in an organic schemes increased by 10.55 percent (p = 0.003), if the score for Openness to Experience increased by one unit. Since average marginal effects for continuous variables only describe the average effect on the outcome, in some cases they might not be a very good approximation of the effect of a one unit change in these variables in non-linear models. Therefore, the

average predicted probabilities of each outcome (participation in schemes) at representative values of the variables reflecting the personality dimensions were computed using the margins command of Stata and are presented in Appendix 2 as cumulative probabilities.

4 Discussion

4.1 Factor structure of the German version of the 24-item BHI

The correlations of the CFA model applied to our sample showed the same trend, i.e. the same sign, as the descriptive correlations reported by Milojev *et al.* (2013) and by Ashton and Lee (2009). Donnellan *et al.* (2006) describes also a positive correlation between the latent variables extraversion and intellect/imagination (similar to Openness to Experience) and moderate negative correlations between the variables extraversion and neuroticism (similar to Emotionality) as well as between agreeableness and neuroticism for the five factor model. Thus, the correlations between the latent variables in the present study are largely consistent with the results of previous studies.

The factor and indicator reliabilities of the CFA model remained partly below the common thresholds suggested, e.g., by Backhaus, Erichson and Weiber (2015). However, these thresholds should not be understood as rigid boundaries, but rather as recommendations. Previous research shows that confirmatory factor analyses testing personality models repeatedly generated factor loadings below 0.71, corresponding to indicator reliabilities of less than 0.50. Donnellan *et al.* (2006), who tested a short measure of the big five model, report factor loadings between 0.39 and 0.80. Milojev *et al.* (2013), who performed confirmatory factor analyses with a short measure of the HEXACO model, report factor loadings between 0.34 and 0.77, with most loadings below 0.71. Both studies achieved these results even though they worked with very different samples. While the results of Donnellan *et al.* (2006) are based on 296 undergraduate students, the study of Milojev *et al.* (2013) covers a representative sample of 4.289 participants. Thus, the factor loadings of our study appear to be similar to those of the two studies mentioned above. However, there were a few indicators with very low factor loadings in our study. These indicators, i.e. these items, should be thoroughly evaluated before using them in future research. Possibly, the German version of the items does not work as well as the English version. Particularly the German item representing the facet Liveliness needs to be revised. We suggest to translate the adjective “cheerful” with “lebenslustig”, as mentioned by Ashton *et al.* (2007), or with “heiter” instead of “aufgeregt”. The meaning of the latter German adjective can be twofold. It can be interpreted rather positively as “excited” in the meaning of awaiting positive events or situations. However, “aufgeregt” is often used in a rather negative context and can be translated into English as “agitated” or “nervous”. Based on the above findings, we recommend developing a validated German version of the 24-item BHI by personality psychologists.

Despite the mixed results regarding the overall model and indicator fit, we decided to continue to work with the data. This decision was based on the following considerations: Firstly, CFA models of personality measures often show only poor to moderate model fit, particularly measures with large numbers of observed indicators and/or latent factors. The constraining of cross-loadings to zero may be too restrictive for personality measures with complex structures (Cooper, Smillie and Corr, 2010; Marsh *et al.*, 2009). Secondly, recent research has repeatedly demonstrated the suitability of short measures of the five-factor or six-factor model of personality traits (Cooper, Smillie and Corr, 2010; Donnellan *et al.*, 2006; Milojev *et al.*, 2013; De Vries, 2013). Milojev *et al.* (2013) describe these short-form scales as practical tools for personality assessment in situations where long-form scales are too costly and time consuming. The authors consider these short form scales as valid and reliable as their long-form counterparts. Thirdly, the reliabilities of the BHI are also relatively low in the original study of De Vries (2013). The author states that this does not pose a serious problem because the items are intended to assess different facets and four items are enough to cover both the breadth of the personality domains and to include the high and low poles of the domains (De Vries, 2013). And finally, as already described in the introduction, we are not aware of any previous study that has recorded the personality traits of livestock farmers with the HEXACO model of personality.

4.2 Comparison of livestock farmers’ personality traits with the general population

Comparing the personality traits of our livestock farmer sample to those of general population samples led to results partly similar to previous literature. Judd *et al.* (2006), who examined personality differences between Australian farmers and non-farmers, report that farmers are more conscientious, less neurotic, i.e. more emotionally stable, and somewhat less open to experience. The farmers of their sample do not differ in agreeableness and extraversion from non-farmers (Judd *et al.*, 2006). Panamá Arias and Špinka (2005), who compared the personality of Czech dairy farm stockpersons with the Czech

general population, describe stockpersons also as more conscientious. In contrast to our results, the stockpersons of their sample are substantially less extroverted and somewhat less agreeable compared to the general population. Their samples do not differ in neuroticism (Panamá Arias and Špinka, 2005). However, the comparison of our sample with the samples of the aforementioned authors might be somewhat misleading, since Judd *et al.* (2006) as well as Panamá Arias and Špinka (2005) used the five-factor model of personality with its partially different contents of the personality dimensions compared to the HEXACO model. In addition, Panamá Arias and Špinka (2005) obtained their data from farm employees, while our sample mainly included farm owners, i.e. entrepreneurs. The differences of our sample compared to the general population might be partly explained by the entrepreneurship of the participants. Zhao, Seibert and Lumpkin (2010) show in their meta-analytic review on personality traits of the Big Five model, that conscientiousness, emotional stability and extraversion are associated with entrepreneurial intentions and entrepreneurial performance, while agreeableness appears to be unrelated. Regarding the additional dimension of the HEXACO model, Honesty-Humility, Johnson, Rowatt and Petrini (2011) claim that honest-humble persons may be well suited for jobs with care-giving roles. Our data support these findings, even though the authors mentioned above conducted their study with participants from the field of medical care. Livestock farmers have also a care-giving role – not for other people, but for their animals. This would explain the high scores in the Honesty-Humility dimension. The lower scores in the Emotionality dimension compared to the general population, i.e. higher emotional stability of farmers could be a prerequisite for successfully dealing with the uncertain framework conditions in agricultural production in general and with the special challenges of animal husbandry, such as sick animals.

Baur, Dobricki and Lips (2016), who analysed differences between the value orientation of the general population and farmers, report that farmers value stability, continuity and predictability. This matches the findings of our study, since high scores in Honesty-Humility are associated with feeling bound by rules and restrictions and high scores in Conscientiousness are associated with less engagement in risky behaviour (Weller and Tikir, 2011). These results could be used to better align agricultural certification schemes with the personality of farmers. Baur, Dobricki and Lips (2016) suggest to conceptualise new schemes as a continuation or modification of existing schemes rather than as a break with the status quo to reduce scepticism and facilitate the acceptance of voluntary certification schemes.

4.3 Influence of farm and personal characteristics on decisions to participate in livestock certification schemes

The results of the MNL model indicated that farm characteristics and personality traits may influence livestock farmers' decisions to participate in livestock certification schemes, while sociodemographic characteristics might be of minor importance. In terms of farm characteristics, the main livestock branch appeared to be an important determinant of the decision to participate in a particular certification program. In our sample, cattle farming as the main livestock branch increased the probability of participating in organic schemes, which might be due to the fact that converting to organic production is relatively easy for dairy cattle and suckler cows compared to other livestock (Reinsch *et al.*, 2020). In contrast, for pig farmers, a conversion to organic farming poses major challenges. Meeting the standards of organic pig farming regarding space and outdoor access usually lead to high investment costs. The requirements regarding area-based livestock production might be a further obstacle (Böhm, Gauvrit and Schaer, 2019; Kötter-Jürs, 2019; Reinsch *et al.*, 2020).

That cattle farming as the main livestock branch was associated with decreased probability of participating in the (non-organic) animal welfare scheme compared to participating only in a quality assurance scheme is not surprising. The animal welfare scheme in question, ITW, has so far only been established for pigs and poultry. However, around 15 percent of the farmers who stated that cattle farming was their most important farm branch also kept pig or poultry. Thus, participation in the ITW scheme would have been possible for these farmers as well. Furthermore, the inclusion of cattle in the ITW programme is planned (WLV, 2020), so that theoretically also cattle farmers could have envisaged a future participation.

Regarding personality traits, Conscientiousness and Openness to Experience had the most noticeable effects on the decision to participate in particular livestock certification schemes, while Honesty-Humility, eXtraversion and Agreeableness had only minor impact. These findings are in line with results of previous studies that repeatedly report on relationships between farmers' production-oriented behaviour and the personality traits Conscientiousness and Openness to Experience. However, the direction of the relationship seems to be clear only for Conscientiousness with farmers who are more conscientious being more production oriented (Willock *et al.*, 1999; Austin, Deary and Willock, 2001; Austin *et al.*, 2005). Conscientiousness has also been repeatedly reported being positively associated with farm performance (Austin, Deary and Willock, 2001; Austin *et al.*, 2005; Panamá Arias and Špinka, 2005; O'Kane *et al.*, 2017).

Results for Openness to Experience are contradictory, with studies showing a positive relationship between Openness to Experience and production oriented behaviour and other research reporting a negative relationship (Willock *et al.*, 1999; Austin, Deary and Willock, 2001; Austin *et al.*, 2005). Moreover, Openness to Experience and Conscientiousness are associated differently with risk taking behaviour. Conscientious individuals are generally more careful and thus prefer to avoid unnecessary risks; open individuals are more risk-tolerant (Willock *et al.*, 1999; Weller and Tikir, 2011). Thus, it is not surprising that the priorities of very conscientious farmers differ from those of farmers with high scores in Openness to Experience with respect to the characteristics of livestock certification schemes.

Animal welfare schemes that allow maintaining most aspects of conventional farming could be particularly attractive to conscientious farmers. This might result from their careful consideration of risks and benefits (Weller and Tikir, 2011) of adapting their production to the standards of specific production schemes. The benefits might not only arise from use values, but also from non-use values, since Conscientiousness is also associated with empathy and liking of animals and animal welfare orientation (Austin *et al.*, 2005). Thus, participation in a scheme that does not require high financial investment and does not imply a complete change in production methods might be a good compromise, since risks seems manageable and the benefits might outweigh the risks from the point of view of these farmers. In addition, the organisation and order and the patience that comes with high Conscientiousness (O'Kane *et al.*, 2017; Hanna, Sneddon and Beattie, 2009) may make it easier for these farmers to implement the stricter production standards. Higher scores on Agreeableness might further force a decision in favour of a "conventional" animal welfare scheme since agreeable individuals tend to cooperate und get along with others (Lee and Ashton, 2004; Weller and Tikir, 2011). Participation on such a scheme would allow farmers to meet the needs of the society to a certain extent while maintaining many production routines.

Organic livestock farming, on the other hand, often requires a profound transformation of production routines, not only with regard to animal welfare but also with regard to environmental orientation, combined with high financial investment (Böhm, Gauvrit and Schaer, 2019; Reinsch *et al.*, 2020). Existing literature indicates, that higher scores in Openness to Experience are associated with higher financial risk taking (Willock *et al.*, 1999), environmentally oriented behaviour (Austin, Deary and Willock, 2001; Hirsh, 2010; Milfont and Sibley, 2012) and animal welfare orientation (Furnham, McManus and Scott, 2003). Openness to Experience is related to higher levels of aesthetic sense, reflection and the higher-order personal value of self-transcendence (Hirsh, 2010; Milfont and Sibley, 2012). These people are more likely to hold unconventional beliefs and to be open to new experiences. Moreover, open people seem to focus more on the benefits that certain activities offer them and less on the associated risks (Weller and Tikir, 2011). This emphasis on benefits, the great sensitivity for nature, unconventionality and the possibility of achieving overriding goals could predestine people with high values in Openness to Experience for organic livestock farming.

The connection between personality and participation in none of the livestock certification schemes is somewhat harder to explain. Individuals who report low Honesty-Humility tend not to feel bound by rules and restrictions thus tending to violate societal conventions and norms (Weller and Tikir, 2011). Perhaps, farmers that do not participate in certification schemes are opposed to the restrictions these schemes impose on them. Furthermore, people who are low in Honesty-Humility are less willing to cooperate with others (Hilbig *et al.*, 2018). This might hamper consensual and satisfying cooperation with supervisory bodies of the institutions behind the certification schemes. However, it is not easy to sell agricultural products without participating in quality assurance schemes. Here, extroverted farmers could have advantages due to their confidence in social situations and their tendency to enjoy conversation and social interaction (Lee and Ashton, 2004). They may find it easy to sell products through direct marketing or otherwise establish personal relationships to sell products without participation in any scheme.

4.4 Limitations of the study

Although our results are largely consistent with existing literature, they should be interpreted with caution due to some limitations of the study.

The first thing to mention here is that the sample was an ad hoc sample. Even if the sociodemographic characteristics of the sample were largely comparable to other recent samples of German livestock farmers, the results might be biased by the non-random selection (Hirschauer *et al.*, 2020) and may lack generalisability with respect the population of German livestock farmers.

Second, when interpreting our results, one should always bear in mind that some personality facets might not have been recorded satisfactorily, as already mentioned in section 4.1 (low indicator reliabilities). This might have biased the values of the personality dimensions of the present sample to a certain extent, implying that the results are only to a limited extent comparable with other studies on HEXACO personality traits. These potentially biased results might have affected the analyses based on this data,

i.e., the comparisons of the farmer sample to the general population samples (sections 3.2/4.2) and the results of the MNL model (sections 3.3/4.3).

Third, with regard to sections 3.2/4.2 it should be critically mentioned that the comparison of our German livestock farmer sample with the samples of Ashton *et al.* (2007) and Lee and Ashton (2018) might be biased due to the use of different item scales with different lengths and non-overlapping items. The comparison with the sample of De Vries (2013) was based on the same item scale, but again it is not entirely clear whether measurement invariance is established (Thielmann *et al.*, 2020) and thus the t-test yields unbiased results. The comparison with the German sample was based on preliminary data from an ongoing survey, i.e. these data may still change until the survey is closed.

Fourth, the findings of the MNL model (sections 3.3/4.3) should be assessed with the sample composition in mind. The sample consisted mainly of farmers participating in quality assurance schemes only (57 percent), while the proportion of the other categories was considerably lower. The proportion of farmers assigned to a conventional animal welfare scheme was 21 percent and that of organic farmers was 14 percent. The proportion of farmers who participated in none of the certification schemes was very low at 8 percent. Even though this distribution might be similar to the actual proportion among German livestock farmers, the limited number of farmers participating in none of the schemes in particular might have impaired the model performance (Jong *et al.*, 2019). Furthermore, the MNL model contained only some factors that could influence farmers' production decisions without considering potential mediator or moderator variables.

Future research aiming to verify our results could overcome the limitations mentioned above by implementing the following suggestions. To ensure generalisability of the results, efforts should be made to obtain a random sample from the targeted population, i.e., the livestock farmers of a country. The application of longer item scales already validated in the corresponding national language could contribute to a more accurate recording of the HEXACO personality facets and subsequently of the personality traits. In addition, other-reports of personality could be included in the research design. When comparing personality traits of livestock farmers with those of community members, issues of inadequate scale invariance and cultural differences can be avoided by collecting data from both groups within the same country and using the same item scale for both (representative) samples.

Predictive performance of the MNL model could be improved by increasing the sample size, which would result in a higher absolute number of individuals in the smaller outcome categories, assuming the percentage distribution remains similar to our study. A stronger theoretical foundation of future research could help to explain more precisely the behaviour of livestock farmers under consideration, i.e., their decisions in favour of certain certification schemes. One theoretical model that could be applied here is the Reasoned Action Approach of Fishbein and Ajzen (2010). According to this model, mediator variables such as behavioural, normative and control beliefs and moderator variables, such as environmental factors influence behavioural intention and behaviour and thus could be included in the research design of future studies.

5 Conclusions

The results of our study suggest that the personality of livestock farmers may differ from those of the general population, whereby in particular higher values in Conscientiousness and Honesty-Humility and a stronger emotional stability are to be emphasised. Personality traits seem to influence farmers' decisions regarding the participation in particular livestock certification schemes. Conscientiousness appears to facilitate decisions in favour of conventional animal welfare schemes while Openness to Experience seems to facilitate decisions in favour of organic production.

These findings could be taken into account when introducing and communicating new certification schemes or adapting existing schemes. The personality structure indicates that schemes requiring moderate changes in production routines are more likely to be accepted by farmers, while abrupt changes in the status quo might cause rejection. Furthermore, the heterogeneity among farmers should be taken into account. Schemes aimed at encouraging environmentally and animal friendly production practices should provide framework conditions that make participation in these schemes attractive also for less conscientious and less open farmers. Personality-tailored communication strategies could further enhance the willingness of these farmers to participate in such schemes. For example, due to the high level of participation in quality assurance schemes, these schemes could be further developed to gradually introduce higher environmental and animal welfare standards in this way.

Further research is necessary to validate the results of the present study and to be able to provide more targeted recommendations for appropriate designs of livestock production schemes and communication

content related to these schemes.

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Appendix 1 Items of the study

German item version used in this study	English item version, according to deVries (2013)	Represented facet of personality
	Honesty-Humility	
Es fällt mir schwer zu lügen.	I find it difficult to lie.	Sincerity
Ich bin neugierig, wie man auf unehrliche Weise Geld verdienen kann.(R)	I would like to know how to make lots of money in a dishonest manner.(R)	Fairness
Ich würde gern berühmt werden.(R)	I want to be famous.(R)	Greed avoidance
Ich habe Anspruch auf Sonderbehandlung.(R)	I am entitled to special treatment.(R)(T)	Modesty
	Emotionality	
Ich habe Angst, verletzt zu werden.	I am afraid of feeling pain.	Fearfulness
Ich mache mir weniger Sorgen als Andere.(R)	I worry less than others.(R)	Anxiety
Ich kann gut mit meinen eigenen Schwierigkeiten umgehen.(R)	I can easily overcome difficulties on my own.(R)	Dependence
Ich muss weinen, wenn ich traurige oder romantische Filme sehe.	I have to cry during sad or romantic movies.	Sentimentality
	eXtraversion	
Ich komme leicht in Kontakt mit Fremden.	I easily approach strangers.	Social boldness
Niemand redet gern mit mir.(R)	Nobody likes talking with me.(R)	Social self-esteem
Ich bin selten aufgeregt.(R)	I am seldom cheerful.(R)	Liveliness
Ich rede gern mit anderen.	I like to talk with others.	Sociability
	Agreeableness	
Ich bleibe unfreundlich gegenüber jemanden, der gemein zu mir war.(R)	I remain unfriendly to someone who was mean to me.(R)(T)	Forgiveness
Ich übe oft Kritik.(R)	I often express criticism.(R)	Gentleness
Ich stimme schnell mit anderen Personen überein.	I tend to quickly agree with others.	Flexibility
Ich bleibe ruhig, auch wenn ich schlecht behandelt werde.	Even when I'm treated badly, I remain calm.	Patience
	Conscientiousness	
Ich sorge stets dafür, dass alle Dinge an ihrem Ort sind.	I make sure that things are in the right spot.	Organisation
Ich schiebe schwierige Aufgaben so lange wie möglich auf.(R)	I postpone complicated tasks as long as possible.(R)	Diligence
Ich arbeite sehr genau.	I work very precisely.	Perfectionism
Ich tue oft Dinge, ohne darüber nachzudenken.(R)	I often do things without really thinking.(R)	Prudence
	Openness to Experience	
Ich finde Wissenschaft langweilig.(R)	I think science is boring.(R)	Inquisitiveness
Ich habe viel Fantasie.	I have a lot of imagination.	Creativity
Ich kann lange ein Gemälde betrachten.	I can look at a painting for a long time.	Aesthetic appreciation
Ich mag Menschen mit seltsamen Ideen.	I like people with strange ideas.	Unconventionality

(R) Reverse scored
(T) Translated by ourselves

Appendix 2.

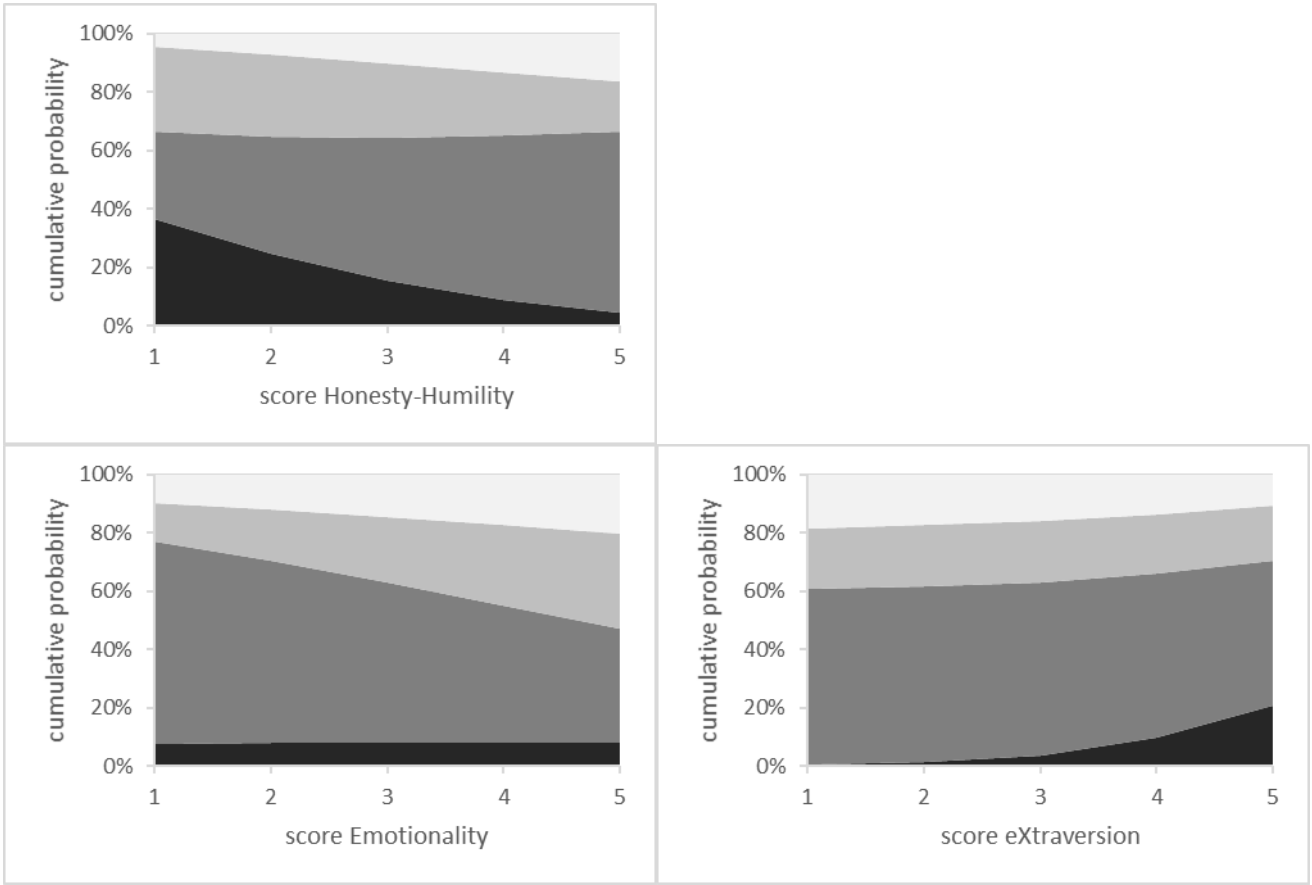
summarising overview on descriptive statisticts of all independent variables and categories of the dependent variable included in the multinomial logit model and their correlations with the HEXACO dimensions

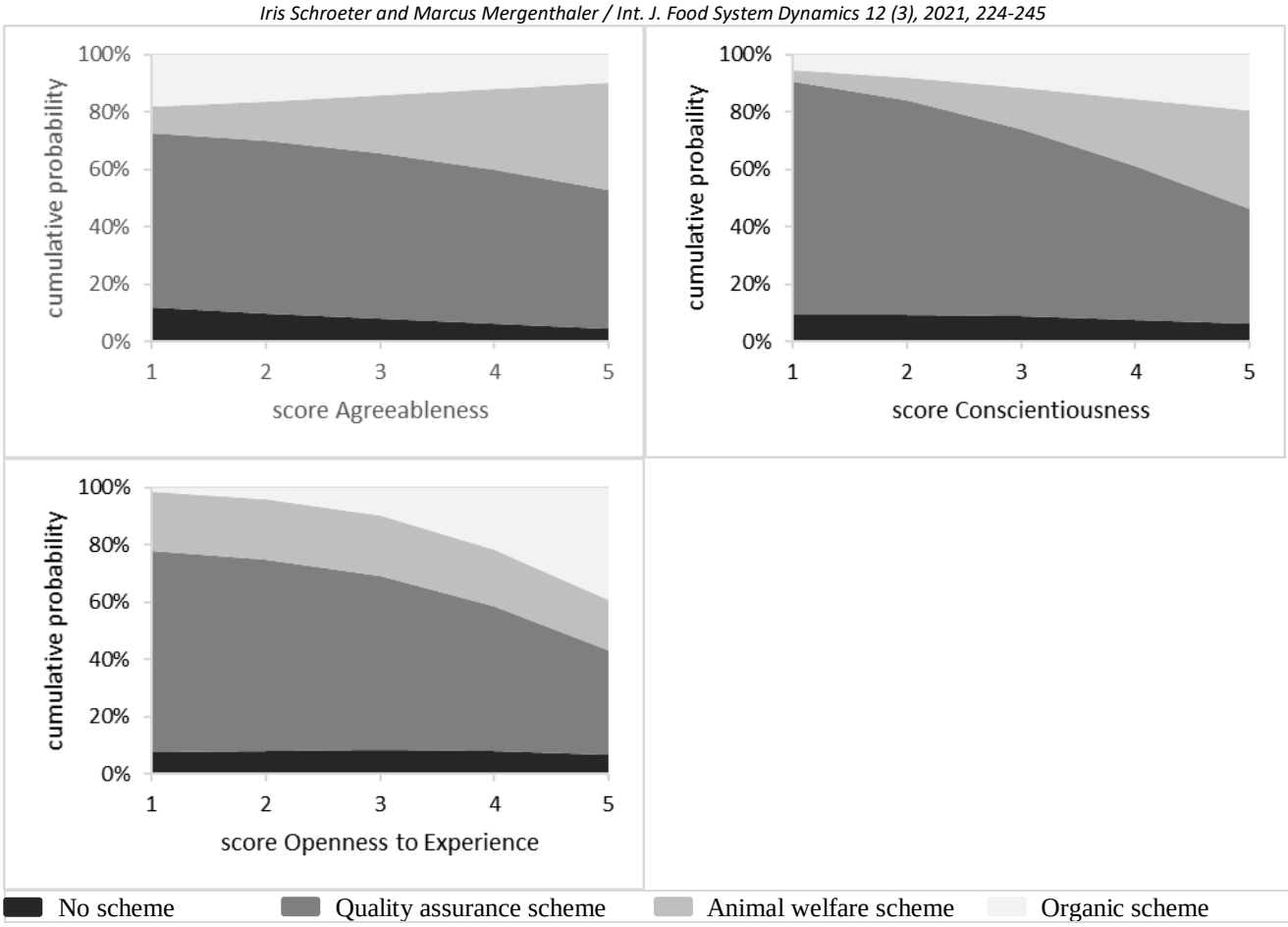
	Descriptive statistics[1]	**Correlation coefficients (Pearsons' r)**					
		H	E	X	A	C	O
H (Honesty-Humility)	4.21 (0.57)						
E (Emotionality)	2.74 (0.61)	-0.04					
X (eXtraversion)	3.72 (0.57)	0.03	-0.03				
A (Agreeableness)	2.99 (0.63)	0.09	-0.13*	-0.15*			
C (Conscientiousness)	3.68 (0.62)	0.27*	-0.05	0.21*	-0.02		
O (Openness to Experience)	3.34 (0.67)	-0.01	0.02	0.24*	0.00	0.11	
Main occupation[2;5]	82.99%	0.01	0.01	0.08	-0.02	0.00	0.04
Main livestock cattle[3;5]	54.10%	0.04	0.09	-0.09	-0.06	-0.13*	-0.11
Gender female[4;5]	21.40%	0.16*	0.32*	-0.04	0.01	0.08	0.06
Age	44.16 (12.91)	0.11	0.04	0.07	-0.22*	-0.03	0.06
Categories of dependent variable							
No scheme[5]	8.09%	-0.14*	0.03	0.12	-0.08	-0.04	0.01
Quality assurance scheme[5]	56.60%	0.05	-0.04	-0.08	-0.01	-0.15*	-0.17*
Animal welfare scheme[5]	20.43%	-0.04	-0.02	0.00	0.13*	0.11	0.02
Organic production scheme[5]	14.89%	0.08	0.06	0.02	-0.07	0.12	0.20*

[1]mean (SD); percent for binary variables; [2]remainder: sideline; [3]remainder: other livestock; [4]remainder: male; [5]categorie mentioned in row coded with 1, remainder coded with 0; *correlation significant at the level $p < 0.05$

Appendix 3.

Average predicted probabilities (cumulative) of participation in different livestock production schemes at the HEXACO personality dimension scores 1, 2, 3, 4 and 5




100%
80%
60%
40%
20%
0%
cumulative probability
1
2
3
4
5
score Agreeableness
score Conscientiousness
score Openness to Experience
No scheme
Quality assurance scheme
Animal welfare scheme
Organic scheme