Personality traits of German livestock farmers: Are there differences according to the production system?

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ABSTRACT

Decisions made by farmers can have large influences 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, this paper investigates personality traits according to the HEXACO model of personality in a sample of 244 German livestock farmers. Our results indicate that livestock farmers differ in their personality from the general population, with farmers scoring higher on honesty-humility, conscientiousness and being more emotionally stable. Comparisons within the farmer sample show that organic livestock farmers score higher on Openness than conventional farmers. However, the results of a confirmatory factor analysis suggest that the German version of the short item scale used to measure the personality traits of the sample should be partially modified. Even though our results should therefore be understood rather as first indications and a basis for further research, they could help to better align support strategies, e.g. for more animal-friendly production, with the personality traits of farmers.

Keywords: livestock farmers; personality traits; HEXACO model of personality; organic farming

1 Introduction

Farmers are the first link in the food supply chain; their decisions can have large influences on down-stream actors in supply chains as well as on all other stakeholders of food systems. Considering in this context, that a well-functioning, sustainable agriculture is the basis for securing the food supply of a constantly growing world population, it seems very important to comprehensively understand farmers' decision-making behaviour (Öhlmér et al. 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 two reasons. On the one hand, there is evidence that personality traits can influence farmers' decision-making on a variety of issues. They can affect, for example, decisions regarding the implementation of best practices to prevent animal diseases and to improve farm animal welfare, production efficiency or environmental sustainability (Austin et al. 2001; Austin et al. 2005; Panamá Arias, Špinka 2005; Hanna et al. 2009; O'Kane et al. 2017; Sok et al. 2018). On the other hand, Hirsh et al. (2012) show that tailoring messages to the personality can be an effective communication strategy and can influence the decisions of the target audience, e. g. the farmers' willingness to adjust their production towards socially more accepted production methods.

So far, there are only a limited number of studies on personality traits of livestock farmers. These studies are usually based on the five-factor model of personality (Big Five) that is a popular and the most widely used and extensively researched personality model (Adler et al. 2019). The model describes personality variation along five dimensions: Extraversion, Openness, Conscientiousness, Neuroticism, and Agreeableness (De Raad 2000). Even if the structure of the five factor model 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. For example, Gurven et al. (2013) failed to find robust support for the five factor model within a sample of Bolivian forager-farmers. As one possible explanation for this result, the authors point to the fact that their participants are deeply embedded in traditional practices and social exchange within their villages - unlike the participants of most other studies on the five factor model, who commonly originate from urban populations. In the literature, there is growing evidence that six personality dimensions exist (Lee, Ashton 2004; Ashton et al. 2007; De Vries 2013; Moshagen et al. 2014). Based on these findings, Lee, Ashton (2004) suggest that the five factor model needs to be revised to include an additional dimension, and to rearrange facets of the existing dimensions of the model. The authors developed the HEXACO Personality Inventory that captures six main dimensions of personality: Honesty-Humility, Emotionality, eXtraversion, Agreeableness, Conscientiousness and Openness to experience. Today, the HEXACO model is considered an established alternative or extension to the five-factor model (Moshagen et al. 2014; Schreiber et al. 2018). 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 et al. 2014; Schreiber et al. 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 were developed, see for example Ashton, Lee (2009), Milojev et al. (2013) or De Vries (2013). One short item scale that is able to capture the six main dimensions of the HEXACO model, is the 24-item brief HEXACO inventory (De Vries 2013). However, to the best of our knowledge, this short item scale has not yet been applied to a German sample or to a sample of livestock farmers. Based on this initial framework, the objectives of our paper are threefold:

1. To describe the personality of German livestock farmers using the 24-item brief HEXACO inventory (BHI)
2. To assess the suitability of the BHI for capturing the six personality dimensions in the present sample of German livestock farmers
3. To find first indications if the personality of farmers could be linked to their production decisions.

The following section describes our procedure to address these issues. The results are presented together with the discussion in the subsequent section. Descriptive statistics on the personality dimensions of the present farmers' sample are reported and the results are compared with community samples. The results of a confirmatory factor analysis for testing the suitability of the BHI are shown as well as the results of t-tests for comparing conventional and organic farmers for exploring a possible relationship between personality and production decisions. The section also outlines the limitations of the study and further research needs. The paper ends with concluding remarks.

2 Material and Methods

2.1 Sampling procedure

The data for the present study on farmers' personality traits 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 relevant 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 present analyses 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. 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. Most of the participants were farm managers, which is usually associated with an entrepreneurial function in family farms. About 17 % run their farm as a sideline. About 25 % of the farms had a farm size of up to 50 ha, 59 % of the farms had a farm size between 50 and 200 ha, and about 16 %

of the farms cultivated 200 ha and more. Most of the participants were cattle farmers (54 %), 37 % were pig farmers, and 9 % were poultry farmers (main operating branch).

2.3 Questionnaire measures related to personality traits

The Brief HEXACO inventory is a 24-item scale containing the 24 items developed by De Vries (2013). Appendix 1 displays the English version of the items and the German version used in this study. Each item covers one of the four personality facets of the six personality dimensions Honesty-Humility, Emotionality, eXtraversion, Agreeableness, Conscientiousness and Openness to experience. The Items were arranged randomly. They were 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 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).

2.3 Suitability of the 24-item BHI

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.
Indicator reliability was calculated by squaring the factor loadings. For calculating the factor reliability, we refer to Backhaus et al. (2015).

2.4 Personality traits of livestock farmers compared to the general population

Since the questionnaire of the present study was designed to be completed by livestock farmers only, no own data could be obtained that would allow comparing the personality traits of the farmers with the general population. To find out whether the livestock farmers of the present sample differ from the general population, data from De Vries (2013) were used, who recorded the six personality dimensions of the HEXACO model with same item scale, i.e. the 24-item-BHI, in the Netherlands. Additionally, the data of the present study were compared with data from Ashton et al. (2007) who used a 104-item form of the HEXACO personality inventory to capture the personality of their German participants. As in the present study, both studies used a five-point response scale from 1 = strongly disagree to 5 = strongly agree. The sample of the De Vries (2013) consists of 525 participants, the sample of Ashton et al. (2007) includes 323 participants. The t-statistics were computed utilising the t-test calculator of the STATA software (StataCorp. 2017).

2.5 Personality and production decisions

In order to assess if personality traits could be linked to production decisions, namely to the decision to produce organically, t-tests were carried out for each personality dimension between conventional (N = 209) and organic farmers (N = 35). The group of organic farmers included all farmers who have stated that they already practice organic farming (N = 25). In addition, farmers who have stated that they plan to convert to organic farming within the next two years were assigned to this group (N = 10).

3 Results and Discussion

3.1 Suitability of the used 24-item BHI for capturing the six personality dimensions of the HEXACO model

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 are low to moderate, indicating no substantial overlap in the personality dimension represented by each factor (Cooper et al. 2010). Honesty-Humility correlates significantly positively with Agreeableness (0.31; p = 0.015) and Conscientiousness (0.36; p = 0.002), Extraversion correlates significantly positively with Conscientiousness (0.31; p = 0.001) and Openness (0.45; p < 0.001). The model provides significantly negative correlations between Extraversion and Emotionality (-0.27; p = 0.019) and between Agreeableness and Emotionality (-0.29; p = 0.029). These correlations show the same trend, i.e. the same sign, as the descriptive correlations reported by Milojev et al. (2013) and by Ashton, Lee (2009). Donnellan et al. (2006) describes also a positive correlation between the latent variables Extraversion and Intellect/Imagination (similar to Openness) 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.
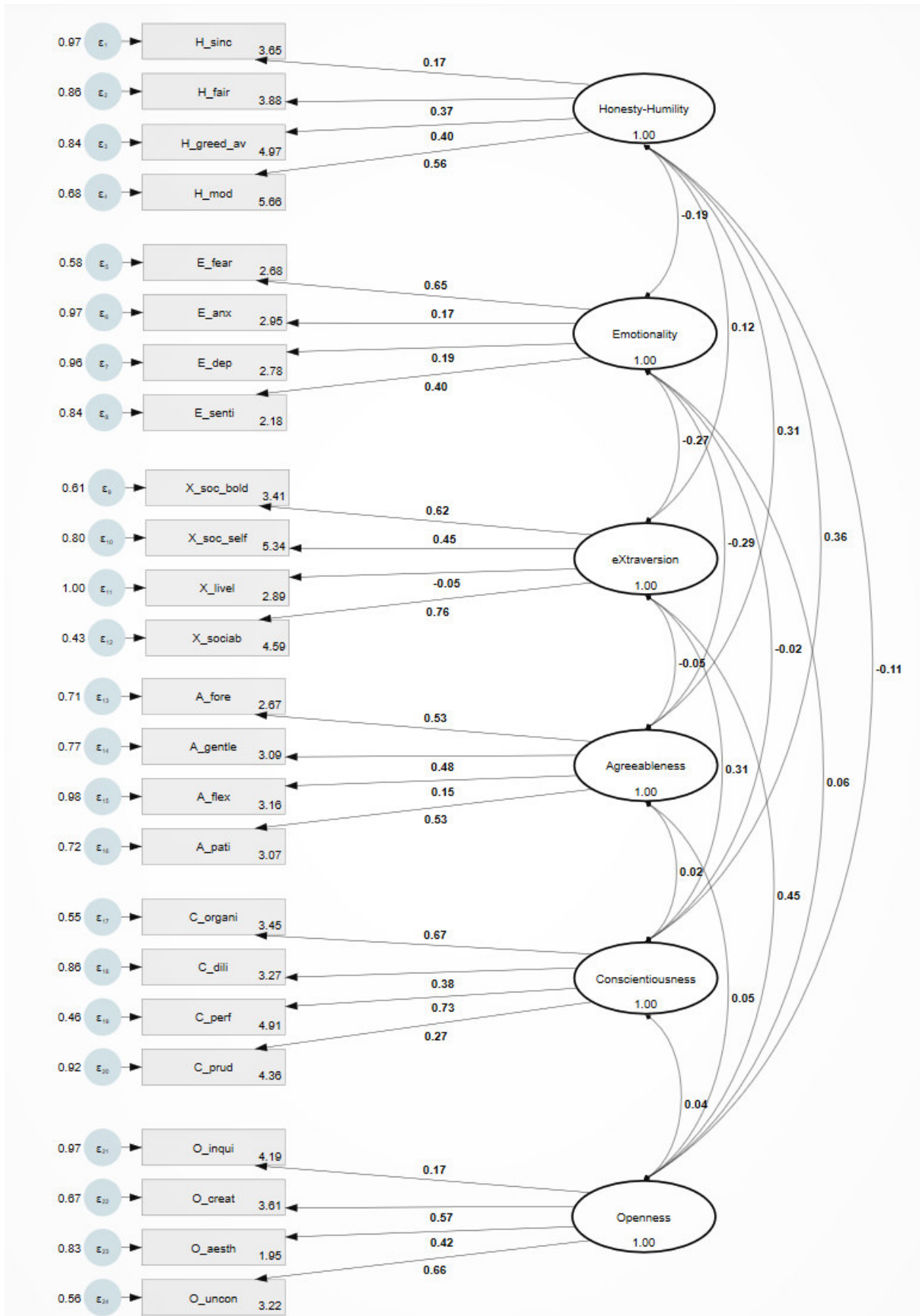
Figure 1 Results of the confirmatory factor analysis (estimated error variances, factor loadings and correlations between constructs; standardised values; N = 244)

Table 1 Descriptive statistics of the indicators and latent factors, indicator and factor reliability of the 24-item BHI

indicator	Mean	SD	indicator reliability	latent factor	Mean	SD	factor reliability
H_sinc	3.89	1.07	0.03	*Honesty-Humility*	4.21	0.57	0.40
H_fair	4.25	1.10	0.14				
H_greed_av	4.26	0.86	0.16				
H_mod	4.45	0.79	0.32				
E_fear	2.73	1.02	0.42	*Emotionality*	2.74	0.61	0.37
E_anx	3.20	1.08	0.03				
E_dep	2.26	0.81	0.04				
E_senti	2.76	1.26	0.16				
X_soc_bold	3.50	1.02	0.39	*Extraversion*	3.72	0.57	0.53
X_soc_self	4.39	0.82	0.20				
X_livel	3.00	1.04	0.00				
X_sociab	3.98	0.87	0.57				
A_fore	2.97	1.11	0.29	*Agreeableness*	2.99	0.63	0.47
A_gentle	2.93	0.95	0.23				
A_flex	2.80	0.89	0.02				
A_pati	3.26	1.06	0.28				
C_organi	3.50	1.01	0.45	*Conscientiousness*	3.68	0.62	0.60
C_dili	3.42	1.05	0.14				
C_perf	3.86	0.79	0.54				
C_prud	3.96	0.91	0.08				
O_inqui	4.17	0.99	0.03	*Openness*	3.34	0.67	0.52
O_creat	3.51	0.97	0.33				
O_aesth	2.38	1.22	0.17				
O_uncon	3.30	1.02	0.44				

The factor loadings with significant path tests range from 0.17 to 0.76 (p < 0.05). The four indicators with non-significant path tests show factor loadings between 0.00 and 0.17: H_sinc (p = 0.059), E_anx (p = 0.085), X_livel (p = 0.502) and A_flex (p = 0.096). 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 suggest, the reliability of most indicators is only moderate since in most cases less than 50 % of the indicator variance can be explained by the underlying latent factor (Bagozzi, Yi 2012; Backhaus et al. 2015). The factor reliabilities for Honesty-Humility, Emotionality and Agreeableness are also rather low and remain below the common threshold of 0.50 (Backhaus et al. 2015). However, the aforementioned thresholds should not be understood as rigid boundaries, but rather as recommendations. Previous research show that confirmatory factor analyses testing personality models repeatedly generate 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 perform 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 in the main similar to those of the two studies mentioned above. However, there are 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 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 experienced psychologists.

The CFA for the six-factor model of the 24-item-BHI provides a mixed overall model fit. The chi-square-test rejects the exact fit with $\chi^2(237) = 446.47$, 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) indicate a good fit between the model and the observed data. The TLI = 0.600 shows a poor fit. This index is sensitive to low indicator reliabilities. The low indicator reliabilities that partly occur in this study have already been discussed above. For assessing the fit indexes, we refer to existing literature, for example Schreiber et al. (2006), Backhaus et al. (2015) and Arzheimer (2016).

Despite the mixed results regarding the overall model and indicator fit, we decided to continue to work with the data. This decision is 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 (Marsh et al. 2009; Cooper et al. 2010). Secondly, recent research has repeatedly demonstrated the suitability of short measures of the five-factor or six-factor model of personality traits (Donnellan et al. 2006; Cooper et al. 2010; De Vries 2013; Milojev et al. 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. And thirdly, 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.

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

Table 2 compares the personality traits of the farmer sample with the personality traits of the general population. The livestock farmers show significantly higher scores on Honesty-Humility and Conscientiousness and significantly lower scores on Emotionality compared to the Dutch and German general population sample. The scores for Agreeableness and Openness do not differ between the farmer sample and the general population, neither compared to the German nor the Dutch sample. Regarding eXtraversion, the results are diverging. Compared to the Dutch sample of De Vries (2013), the farmers of the present sample have significantly lower scores on eXtraversion, while the opposite is true compared to the German sample.

Table 2 Comparison of personality traits of the present livestock farmer sample with data from the general population. The data for the general population originate from De Vries (2013) and Ashton et al. (2007).

Difference to …	24-item BHI (De Vries 2013)			104-item PI (Ashton et al. 2007)		
	Dutch population			German population		
Personality dimension	Difference of means (SE)	t-value	p-value	Difference of means (SE)	t-value	p-value
Honesty-Humility	0.36 (0.045)	8.16	< 0.001	0.69 (0.05)	14.24	< 0.001
Emotionality	-0.26 (0.045)	-5.82	< 0.001	-0.61 (0.05)	-12.75	< 0.001
Extraversion	-0.12 (0.045)	-2.77	0.006	0.46 (0.04)	10.55	< 0.001
Agreeableness	0.04 (0.044)	0.94	0.349	0.00 (0.05)	0.02	0.986
Conscientiousness	0.17 (0.045)	3.89	< 0.001	0.18 (0.05)	4.01	< 0.001
Openness	0.03 (0.050)	0.56	0.576	0.01 (0.05)	0.16	0.871

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.

Panamá Arias, Špinka (2005), who used the five-factor model of personality to compare the personality of Czech dairy farm stockpersons with the Czech general population, describe the stockpersons also as more conscientious. In contrast to our results, the stockpersons of their sample were substantially less extroverted, less open to experience, and somewhat less agreeable compared to the general population. Their samples did

not differ in neuroticism (Panamá Arias, Špinka 2005). However, the comparison of our sample with the sample of the aforementioned authors might be somewhat misleading. On the one hand, they used the five-factor model of personality with its partially different contents of the personality dimensions compared to the HEXACO model. On the other hand, the authors obtained their data from farm employees, while our sample mainly includes 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 et al. (2010) show in their meta-analytic review on personality traits of the Big Five model, that conscientiousness, emotional stability, extraversion and openness to experience 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 et al. (2011) claim that honest-humble persons may be well suited for jobs with care-giving roles. Narcissists, on the other hand, might be a poorer fit for jobs that require empathy, understanding and caring (Johnson et al. 2011). 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 might be explained by the fact that it is difficult to promote oneself in front of animals. Thus, it might not be interesting for narcissists to work in animal husbandry. High emotional stability could be also 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.

However, when interpreting the results, one should always bear in mind that some personality facets might be not recorded satisfactorily, as discussed in section 3.1 (low factor reliabilities). This might have biased the values of the personality dimensions of the present sample to a certain extent, which might lead to limited comparability to other studies.

3.3 Personality and production decisions

Table 3 represents the six personality dimensions of the HEXACO model for the conventional livestock farmers of the sample and the farmers who already produce organically or plan to produce organically (herein after referred to as organic farmers).

Table 3 Comparison of personality traits of conventional livestock farmers and livestock farmers who already produce or plan to produce organically

	Conventional farmers Mean (SD)	Organic farmers Mean (SD)	t-value	p-value
Honesty-Humility	4.20 (0.57)	4.32 (0.58)	-1.21	0.228
Emotionality	2.72 (0.59)	2.81 (0.73)	-0.81	0.419
eXtraversion	3.71 (0.56)	3.74 (0.59)	-0.23	0.817
Agreeableness	3.01 (0.63)	2.90 (0.60)	0.93	0.354
Conscientiousness	3.65 (0.62)	3.86 (0.60)	-1.88	0.062
Openness	3.29 (0.64)	3.65 (0.73)	-3.04	0.002

The scores of the dimensions Honesty-Humility, Emotionality, eXtraversion and Agreeableness do not differ between conventional and organic farmers. The scores for Conscientiousness are tendentiously but not significantly higher in the organic farmer group. Regarding Openness to experience the t-test shows a clear result. The organic farmers of the sample score significantly higher on Openness than the conventional farmers.

Conscientiousness has repeatedly been reported to be positively associated with farm performance (Austin et al. 2001; Austin et al. 2005; Panamá Arias, Špinka 2005; O'Kane et al. 2017). In addition, high scores in Conscientiousness are associated with environmentally oriented behaviour of farmers (Austin et al. 2001), empathy and liking of animals and animal welfare orientation (Austin et al. 2005). Existing literature indicates, that high scores on Openness to experience are also associated with environmentally and production oriented behaviour (Austin et al. 2001; Hirsh 2010; Milfont, Sibley 2012). Our data suggest that high values in both personality dimensions might facilitate a production decision in favour of organic farming. Possibly, the organisation and order and the patience that comes with high conscientiousness (Hanna et al. 2009; O'Kane et

al. 2017) may make it easier for these farmers to convert their production to organic farming, i.e. to implement the stricter production standards and to manage the transition period. Openness is related to higher levels of aesthetic sense, reflection and the higher-order personal value of self-transcendence (Hirsh 2010; Milfont, Sibley 2012). These people are more likely to hold unconventional beliefs and to be open to new experiences. Their great sensitivity for nature, unconventionality and the possibility of achieving overriding goals could additionally predestine people with high values in openness for organic farming.

Although our results are largely consistent with those of previous studies, they should be interpreted with caution. Our sample consists mainly of conventional farmers, the share of organic farmers is only 14.3 %. This value matches the current share of organic farms in Germany of about 12 % (Statista 2019) quite well. However, this also means that only the measurements of 35 organic farmers are available for the calculation of the personality dimensions, whereas 209 measurements are available for conventional farmers. As already discussed in 3.1 and 3.2, the problem of the partially low indicator reliabilities should also be taken into account here. Due to these limitations, our results should be understood primarily as first indications that the personality of farmers could influence their production decision regarding organic or conventional agriculture. However, these results need to be verified in further investigations.

4 Conclusions

Our results 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 also seems to influence the decision in favour of organic production. These findings might be important when developing strategies to support farmers in their transition to more animal friendly production systems, e.g. to overcome the limited success of animal welfare programs. In this context, it might be helpful to better align support strategies with the personality traits of farmers.

References

Adler, F.; Christley, R.; Campe, A. (2019): Invited review: Examining farmers' personalities and attitudes as possible risk factors for dairy cattle health, welfare, productivity, and farm management: A systematic scoping review. In *Journal of dairy science* 102 (5), 3805–3824. DOI: 10.3168/jds.2018-15037.

Arzheimer, Kai (2016): Strukturgleichungsmodelle. Eine anwendungsorientierte Einführung. Wiesbaden: Springer VS (Lehrbuch). Available online at http://dx.doi.org/10.1007/978-3-658-09609-0.

Ashton, M. C.; Lee, K. (2009): The HEXACO-60: a short measure of the major dimensions of personality. In *Journal of personality assessment* 91 (4), 340–345. DOI: 10.1080/00223890902935878.

Ashton, M. C.; Lee, K.; Marcus, B.; Vries, R. E. de (2007): German lexical personality factors: relations with the HEXACO model. In *Eur. J. Pers.* 21 (1), 23–43. DOI: 10.1002/per.597.

Austin, E. J.; Deary, I. J.; Edwards-Jones, G.; Arey, D. (2005): Attitudes to Farm Animal Welfare. In *Journal of Individual Differences* 26 (3), 107–120. DOI: 10.1027/1614-0001.26.3.107.

Austin, E. J.; Deary, I. J.; Willock, J. (2001): Personality and intelligence as predictors of economic behaviour in Scottish farmers. In *Eur. J. Pers.* 15 (S1), S123-S137. DOI: 10.1002/per.421.

Backhaus, Klaus; Erichson, Bernd; Weiber, Rolf (2015): Fortgeschrittene Multivariate Analysemethoden. Berlin, Heidelberg: Springer Berlin Heidelberg, checked on 8/17/2019.

Bagozzi, R. P.; Yi, Y. (2012): Specification, evaluation, and interpretation of structural equation models. In *J. of the Acad. Mark. Sci.* 40 (1), 8–34. DOI: 10.1007/s11747-011-0278-x.

Cooper, A. J.; Smillie, L. D.; Corr, P. J. (2010): A confirmatory factor analysis of the Mini-IPIP five-factor model personality scale. In *Personality and Individual Differences* 48 (5), 688–691. DOI: 10.1016/j.paid.2010.01.004.

De Raad, Boele (2000): The big five personality factors. The psycholexical approach to personality. Seattle: Hogrefe & Huber.

De Vries, R. E. (2013): The 24-item Brief HEXACO Inventory (BHI). In *Journal of Research in Personality* 47 (6), 871–880. DOI: 10.1016/j.jrp.2013.09.003.

Donnellan, M. B.; Oswald, F. L.; Baird, B. M.; Lucas, R. E. (2006): The mini-IPIP scales: tiny-yet-effective measures of the Big Five factors of personality. In *Psychological assessment* 18 (2), 192–203. DOI: 10.1037/1040-3590.18.2.192.

Edwards-Jones, G. (2006): Modelling farmer decision-making: concepts, progress and challenges. In *Anim. Sci.* 82 (6), 783–790. DOI: 10.1017/ASC2006112.

Gurven, M.; Rueden, C. von; Massenkoff, M.; Kaplan, H.; Lero Vie, M. (2013): How universal is the Big Five? Testing the five-factor model of personality variation among forager-farmers in the Bolivian Amazon. In *Journal of personality and social psychology* 104 (2), 354–370. DOI: 10.1037/a0030841.

Hanna, D.; Sneddon, I. A.; Beattie, V. E. (2009): The relationship between the stockperson's personality and attitudes and the productivity of dairy cows. In *Animal : an international journal of animal bioscience* 3 (5), 737–743. DOI: 10.1017/S1751731109003991.

Hirsh, J. B. (2010): Personality and environmental concern. In *Journal of Environmental Psychology* 30 (2), 245–248. DOI: 10.1016/j.jenvp.2010.01.004.

Hirsh, J. B.; Kang, S. K.; Bodenhausen, G. V. (2012): Personalized persuasion: tailoring persuasive appeals to recipients' personality traits. In *Psychological Science* 23 (6), 578–581. DOI: 10.1177/0956797611436349.

Johnson, M. K.; Rowatt, W. C.; Petrini, L. (2011): A new trait on the market: Honesty–Humility as a unique predictor of job performance ratings. In *Personality and Individual Differences* 50 (6), 857–862. DOI: 10.1016/j.paid.2011.01.011.

Lee, K.; Ashton, M. C. (2004): Psychometric Properties of the HEXACO Personality Inventory. In *Multivariate behavioral research* 39 (2), 329–358. DOI: 10.1207/s15327906mbr3902_8.

Marsh, H. W.; Muthén, B.; Asparouhov, T.; Lüdtke, O.; Robitzsch, A.; Morin, A. J. S.; Trautwein, U. (2009): Exploratory Structural Equation Modeling, Integrating CFA and EFA: Application to Students' Evaluations of University Teaching. In *Structural Equation Modeling: A Multidisciplinary Journal* 16 (3), 439–476. DOI: 10.1080/10705510903008220.

Milfont, T. L.; Sibley, C. G. (2012): The big five personality traits and environmental engagement: Associations at the individual and societal level. In *Journal of Environmental Psychology* 32 (2), 187–195. DOI: 10.1016/j.jenvp.2011.12.006.

Milojev, P.; Osborne, D.; Greaves, L. M.; Barlow, F. K.; Sibley, C. G. (2013): The Mini-IPIP6: Tiny yet highly stable markers of Big Six personality. In *Journal of Research in Personality* 47 (6), 936–944. DOI: 10.1016/j.jrp.2013.09.004.

Moshagen, M.; Hilbig, B. E.; Zettler, I. (2014): Faktorenstruktur, psychometrische Eigenschaften und Messinvarianz der deutschsprachigen Version des 60-Item HEXACO Persönlichkeitsinventars. In *Diagnostica* 60 (2), 86–97. DOI: 10.1026/0012-1924/a000112.

Öhlmér, B.; Olson, K.; Brehmer, B. (1998): Understanding farmers' decision making processes and improving managerial assistance. In *Agricultural Economics* 18 (3), 273–290, checked on 4/15/2020.

O'Kane, H.; Ferguson, E.; Kaler, J.; Green, L. (2017): Associations between sheep farmer attitudes, beliefs, emotions and personality, and their barriers to uptake of best practice: The example of footrot. In *Preventive veterinary medicine* 139 (Pt B), 123–133. DOI: 10.1016/j.prevetmed.2016.05.009.

Panamá Arias, J. L.; Špinka, M. (2005): Associations of stockpersons' personalities and attitudes with performance of dairy cattle herds. In *Czech J. Anim. Sci.* 50 (5), 226–234. DOI: 10.17221/4162-CJAS.

Schreiber, J. B.; Nora, A.; Stage, F. K.; Barlow, E. A.; King, J. (2006): Reporting Structural Equation Modeling and Confirmatory Factor Analysis Results: A Review. In *The Journal of Educational Research* 99 (6), 323–338. DOI: 10.3200/JOER.99.6.323-338.

Schreiber, M.; Mueller, I. M.; Morell, C. (2018): Handbuch HEXACO Personality Inventory-Revised (HEXACO-PI-R), Züricher Hochschule für angewandte Wissenschaften. Available online at https://www.laufbahndiagnostik.ch/assets/de/Handbuch_Fragebogen_HEXACO-PI-R-3bc41893943d07c12f96086d8fc41bf8713a7953b1292406389f56bb1d5dca4c.pdf, checked on 4/15/2020.

Sok, J.; Hogeveen, H.; Elbers, A.R.W.; Oude Lansink, A.G.J.M. (2018): Perceived risk and personality traits explaining heterogeneity in Dutch dairy farmers' beliefs about vaccination against Bluetongue. In *Journal of Risk Research* 21 (5), 562–578. DOI: 10.1080/13669877.2016.1223162.

StataCorp. (2017): STATA. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC. Version 15.

Statista (Ed.) (2019): Ökologische Landwirtschaft in Deutschland. Dossier, did-18345-1, checked on 1/24/2020.

Yamagata, S.; Suzuki, A.; Ando, J.; Ono, Y.; Kijima, N.; Yoshimura, K. et al. (2006): Is the genetic structure of human personality universal? A cross-cultural twin study from North America, Europe, and Asia. In *Journal of personality and social psychology* 90 (6), 987–998. DOI: 10.1037/0022-3514.90.6.987.

Zhao, H.; Seibert, S. E.; Lumpkin, G. T. (2010): The Relationship of Personality to Entrepreneurial Intentions and Performance: A Meta-Analytic Review. In *Journal of Management* 36 (2), 381–404. DOI: 10.1177/0149206309335187.

Appendix

Item german version	English item version, according to deVries (2013)		Indicator name in CFA
	Honesty-Humility		
Es fällt mir schwer zu lügen.	I find it difficult to lie.	Sincerity	H_sinc
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	H_fair
Ich würde gern berühmt werden.(R)	I want to be famous.(R)	Greed avoidance	H_greed_av
Ich habe Anspruch auf Sonderbehandlung.(R)	I am entitled to special treatment.(R)	Modesty	H_mod
	Emotionality		
Ich habe Angst, verletzt zu werden.	I am afraid of feeling pain.	Fearfulness	E_fear
Ich mache mir weniger Sorgen als Andere.(R)	I worry less than others.(R)	Anxiety	E_anx
Ich kann gut mit meinen eigenen Schwierigkeiten umgehen.(R)	I can easily overcome difficulties on my own.(R)	Dependence	E_dep
Ich muss weinen, wenn ich traurige oder romantische Filme sehe.	I have to cry during sad or romantic movies.	Sentimentality	E_senti
	Extraversion		
Ich komme leicht in Kontakt mit Fremden.	I easily approach strangers.	Social boldness	X_soc_bold
Niemand redet gern mit mir.(R)	Nobody likes talking with me.(R)	Social self-esteem	X_Soc_self
Ich bin selten aufgeregt.(R)	I am seldom cheerful.(R)	Liveliness	X_livel
Ich rede gern mit anderen.	I like to talk with others.	Sociability	X_sociab
	Agreeableness		
Ich bleibe unfreundlich gegenüber jemanden, der gemein zu mir war.(R)	I remain unfriendly to someone who was mean to me.(R)	Forgiveness	A_fore
Ich übe oft Kritik.(R)	I often express criticism.(R)	Gentleness	A_gentle
Ich stimme schnell mit anderen Personen überein.	I tend to quickly agree with others.	Flexibility	A_flex
Ich bleibe ruhig, auch wenn ich schlecht behandelt werde.	Even when I'm treated badly, I remain calm.	Patience	A_pati
	Conscientiousness		
Ich sorge stets dafür, dass alle Dinge an ihrem Ort sind.	I make sure that things are in the right spot.	Organisation	C_Organi
Ich schiebe schwierige Aufgaben so lange wie möglich auf.(R)	I postpone complicated tasks as long as possible.(R)	Diligence	C_dili
Ich arbeite sehr genau.	I work very precisely.	Perfectionism	C_perf
Ich tue oft Dinge, ohne darüber nachzudenken.(R)	I often do things without really thinking.(R)	Prudence	C_prud
	Openness		
Ich finde Wissenschaft langweilig.(R)	I think science is boring.(R)	Inquisitiveness	O_Inqui
Ich habe viel Fantasie.	I have a lot of imagination.	Creativity	O_creat
Ich kann lange ein Gemälde betrachten.	I can look at a painting for a long time.	Aesthetic appreciation	O_aesth
Ich mag Menschen mit seltsamen Ideen.	I like people with strange ideas.	Unconventionality	O_uncon