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Analysis

The Environmental Behaviour of Farmers – Capturing the Diversity of Perspectives with a Q Methodological Approach☆

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ABSTRACT

The aim of this investigation is to understand more deeply farmers' attitudes and behaviour towards multifunctional agricultural ecosystems and sustainable production. By discovering and describing these viewpoints in relation to a wider societal discourse, we are adding to a holistic picture of what role influencing factors play in farmers' viewpoints towards natural resources. Consequently, we make use of a Q methodological approach which offers a way of identifying and describing the diversity of farmers' viewpoints. Based on data from 30 farmers in Lower Austria we identify the *Diversity-maintaining*, the *Context-depending*, the *Economic Aspects-emphasising* and the *Change-promoting* viewpoints. To our knowledge, especially the *Context-depending* viewpoint in particular is not yet described in the scientific literature and, therefore, they allow a novel approach to treating environmental problems. Based on these markedly different notions, there are reasonable grounds for questioning a blanket approach from agricultural policies which does not take into account the specific differences of farmers' mindsets. It can, instead, be argued that taking this diversity of mindsets into consideration when trying to alter behaviour can contribute to a more stable environmental performance, since specifics of various farmer-groups can be tackled with more accuracy.

1. Introduction

To create an enduring sustainable agricultural system – that is, one which takes into consideration economic, environmental, social and health aspects – is a pivotal aim for European agricultural policy (DG Agri, 2013; Webster, 1999). As a result, the crucial role of farmers in shaping and preserving multifunctional agro-ecosystems, as well as natural resources, has been highlighted by agricultural scientists over the past decades (Kapfer et al., 2015; Krebs et al., 1999; OECD, 2008; Tilman et al., 2001). Ilbery and Bowler (1998) link the emphasis upon the productivity paradigm to an increased pressure on natural resources, resulting in external cost which society has finally to bear. Therefore, there is still the need to foster the sustainable development of agriculture and particularly to reduce the external cost (Donald et al., 2001; FAO, 2002; Krebs et al., 1999; Richardson et al., 2004; Tilman et al., 2002; Tilman et al., 2001).

In order to reach these goals, besides other strategies, specific portfolios of institutional mechanisms in the agricultural sector have been designed to enhance environmentally benign production and to reduce environmental harm; these have been implemented in the member states of the European Union and other countries. Agri-environmental programmes (AEPs) are basically designed to alter the behaviour of farmers through economic incentives, either via amplifying behaviour which leads to positive externalities or by restricting behaviour which leads to negative externalities (Ahnström, 2009; Baylis et al., 2008; Blackstock et al., 2010; BMLFUW, 2014; McMichael et al., 2007; Potter, 1998; Schur, 1990; Wissman et al., 2013).

However, policy measures and instruments which are mainly built on the assumptions of neoclassical economics have been criticised lately, since the analysis of the validity, testability and predictive power of neoclassical economic theories has uncovered their shortcomings (Blackstock et al., 2010; Gintis, 2000; Gowdy, 2008; Howley et al., 2015; Keen, 2010). In fact, AEPs come under criticism because their possible positive effects on biodiversity or landscape, for instance, cannot be verified. However, they do have the potential to be beneficial, if designed and implemented in the right way (BMLFUW, 2010; Kleijn et al., 2001; Kleijn and Sutherland, 2003; Ponce et al., 2014; Probstl-Haider et al., 2016; Zechmeister et al., 2003).

With regard to environmentally benign production, the mindset of farmers is seen as highly relevant. Hence, a profound and holistic knowledge of farmers' attitudes and behaviour, especially towards sustainability and ecosystem service criteria, provides a solid basis for

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reaching sustainability goals (DEFRA, 2008; Gowdy, 2008; OECD, 2012). Striving for a holistic inquiry into the issue can be seen as a way of tackling that issue. This also means including the surroundings in which the actual behaviour takes place (Kollmuss and Agyeman, 2002). Hence, in order to understand the environmental viewpoints and resulting behaviour of farmers and to alter them or adjust the circumstances in which agricultural production is taking place, it is important to build on adequate and accurate behavioural models (Burton, 2004; Feola and Binder, 2010; Öhlmér et al., 1998). Limiting the explanation of any given behaviour to merely economic considerations (i.e. cost-benefit) may be too narrow; only if the role of other aims and especially external drivers is appropriately reflected can a thorough understanding be achieved (Brekke and Johansson-Stenman, 2008; Mattison and Norris, 2005).

The aim of this investigation is to understand more deeply farmers' attitudes and behaviour towards multifunctional agricultural ecosystems and a sustainable production of food, fibre and fuel. Discovering and describing these viewpoints in relation to a wider societal discourse, we are adding to a holistic picture of influencing factors on farmers' viewpoints towards natural resources.[1] Consequently, we make use of a Q methodological approach which offers a way of identifying and describing the diversity of farmers' viewpoints and comparing and contrasting them. The novelty of our approach is twofold. First and foremost, the initial research phase actively involves interest groups from such divergent areas as environmental NGOs and the Chamber of Agriculture. Thus, we have been able to widen the realm of statements far beyond the core farming population. In this way, farmers were not only confronted with their own viewpoints but were also required to relate their attitudes to a wider societal discourse. Moreover, the sampling of farmers is guided by criteria found to be significantly correlated with environment-friendly agriculture. (See the "Method" chapter for further details).

The structure of the article is as follows. The next section reviews the literature on farmer typologies connected to environmental attitudes and behaviour. The data, as well as the analysis, are presented in detail in Section 3. The subsequent "Results" section describes the four extracted groups of shared viewpoints among farmers, as well as their similarities and differences. We compare and contrast them with each other and reach conclusions based on this compilation of viewpoints. The advantages and shortcomings of Q methodology and our specific usage are debated in the "Discussion" section, where we also relate our results to previous studies in the field. The paper finishes with concluding remarks, which relate our work to recent agri-environmental policies at Austrian and European levels.

2. Farmer Typologies and Environmental Behaviour

Farmer typologies are promising when it comes to enhancing environmental performance, since they take into account variety and heterogeneity among farmers. Hence they offer a basis for describing, understanding and subsequently altering behaviour to make it more environmentally benign (DEFRA, 2008). There is a long history of, and lengthy experience in, agricultural policy and advisories on farm typologies (Landais, 1998) and in structuring farms based on such parameters as size, output and production focus. However, the classification of farmers and subsequently using these abstract models has not been given significant prominence so far. This is especially unfortunate since farmer typologies, although also criticised (Guillem et al., 2012), offer ways of tailoring specific programmes and other instruments of agricultural and rural policy (Emtage et al., 2006, 2007). Building on the seminal work of Van der Ploeg's (1994) concept of farming styles, a specific way of how farming should be done or "cultural repertoire" found within a region, numerous structuring and classification endeavours shed light on the different attitudes of farmers, decision-making concepts, values and behaviour. Classification studies share the common goal of overcoming the limitations of considering farmers as predominantly homogeneous mass of agents. Indeed, DEFRA (2008, p 13) points out that: "To be most effective, policy should be designed with a clear specification of target groups (not a one size fits all) and an understanding of value systems […]".

With regard to the studies on farmers' environmental behaviour, one noticeable aspect is that they either emphasise an agent or less often a systems explanatory approach. Burton (2004), for example, remarks that a large share of studies approach farmers' behaviour merely from an attitudinal vantage point, without considering social or cultural factors. According to the theoretical framework of Ajzen (1991), one predictor of behaviour might be the social norm, which is shaped by the social surroundings of a person. Howley et al. (2014) for instance, emphasise the importance of congruence between farmers' and the general public's environmental concerns.

The structuring of farmers, however, follows different rationales for which the classification is undertaken, although they might overlap or be used interchangeably. These concepts range from goals, values and motives to attitudes to behaviour. Barnes et al. (2011) as well as Morrison et al. (2012) base their classification on values and attitudes using cluster analysis to extract farmer types in Scotland and in Australia respectively. The former describe a multifunctionalist type which strongly adheres to environmental attitudes alongside a more efficiency- and economy-driven stance. The latter extract three divergent segments of landholders inclined towards the management of natural resources, who take part in specific public programmes and who run their properties to make a living. Similarly, using mainly values to classify, Maybery et al. (2005) extract three segments using PCA. Moreover, using a qualitative approach to construct a typology of graziers, Bohnet et al. (2011) find three different types based on their values and motives.

Focusing rather on the decision-making process and attitudes Pedersen et al. (2012), who use cluster analysis to structure a large farmer survey, demonstrate that some farmers tend towards a more productivist stance and might opt to forgo some profits. Darnhofer et al. (2005) use qualitative interviews to gain insights into conversion to organic farming, which is generally believed to be more environment-friendly. They find five types based on their decision-making processes but the distinction between primarily economically driven and primarily environment- and health-driven types can also be observed in both farming systems. Furthermore, Sutherland et al. (2011) use factor analysis to classify a sample of Scottish farmers based on their attitudes and decision-making strategies. They also find the dichotomy between an environmental and a business-orientated type.

The application of a Q methodological approach can also be found in studies to classify farmers with respect to their environmental viewpoints. For instance, Davies and Hodge (2007), as well as Brodt et al. (2006), find evidence for either an environmental or a business viewpoint (besides others). Although these two studies use Q methodology, they do not explicitly incorporate an outsider's view into their statements. This means that only a very limited environmental discourse is covered and hence farmers are not given the opportunity to reflect sufficiently upon societal demands. Moreover, it is not clear whether the participant samples are based on attributes which are positively or negatively correlated with environmentally benign behaviour.

Linking these attitudinal and behavioural results (i.e. farming styles) with data on agro-biodiversity yields an enhanced picture of landholders. For instance, O'Rourke et al. (2012) and Schmitzberger et al. (2005) describe a dichotomy between a traditionalist-modern, a productive-multifunctional or an environment-business farming style.

[1] The term "attitude" or similar expressions (like "perspective", "mindset" or "viewpoint") are used as defined by Eagly, A.H., Chaiken, S., 1993. The Psychology of Attitudes. Harcourt Brace Jovanovich College Publishers, Orlando, Florida: "*Attitude is a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour*".

Besides Bohnet et al. (2011), who pursue an explorative pathway and do not particularly highlight this dichotomy, a well-established differentiation between environmental orientation and business orientation is supported by most of the studies mentioned above. Farmers are, to some extent, both dependent on a well-functioning environment and, at the same time, exploiting and impairing the environment. It is therefore evident that they are operating within a tension field which mainly comprises economic and environmental considerations, as well as the social and political surroundings which influence the behaviour of farmers (Durpoix, 2010). For instance, Sulemana and James (2014) describe a dichotomy between a productivist and a conservation identity in their study on environmental ethics. Nevertheless, while the focus is most often placed upon the more economically oriented and upon the more ecologically oriented type, other types are often not treated with the same attention and in such depth. In most of the studies the economically and the environmentally types are described either first or second, although quantitative parameters do not always point towards a higher importance or a bigger share.

3. Material and Methods

Q methodology offers a means of studying the subjective vantage point of people in order to investigate, for instance, people's attitudes or viewpoints by confronting participants with a so-called *Q sample* or *Q set* (i.e. a meaningful subsample of statements derived from a wider discourse on any given topic) (Brown, 1993; Stephenson, 1935). Usually, these statements are evaluated and rank-ordered by the participants in relation to each other in a forced quasi-normal distribution, for instance, from "least like I think" to "most like I think" (Watts and Stenner, 2005). By correlating these Q sorts, it is possible to gain insights into shared viewpoints based on the relative ranking of items and to describe their similarities as well as their differences (Brown, 1980). Although Q methodology is exploratory in principle, the analysis always includes some form of factor-analysis and subsequent rotation and is thus often called quali-quantitative in nature (Watts and Stenner, 2005). Q methodological studies usually work with small sample sizes of participants (the so-called *P sample*), offering valid results (McKeown and Thomas, 2013), and these participants are sampled rather on a theoretical basis (see: Strauss, 1994) as long as the hypothesised viewpoints have the opportunity to emerge (Brown, 1993).

3.1. The Concourse-Stakeholder-Interviews

As mentioned above, the statements or impulses comprise the so-called *Q sample*. Such a Q sample is usually gained via a reduction of the wider *concourse*. "A universe of statements for any situation or context is called a *concourse*, and refers to conversational and not merely informational possibilities […]" as Stephenson (1986, p 37) puts it. In other words, the concourse is the theoretically infinite debate about any topic (Brown, 1986, 1993).

In order to cover this 'volume of discussion', we conducted 17 stakeholder interviews with farmers, representatives of the Chamber of Agriculture, the federal Ministry of Agriculture, agricultural scientists, representations of interest and environmental NGOs (see also: Müller and Kals, 2004; Van Exel and de Graaf, 2005). These guided, semi-structured stakeholder interviews, which were open and explorative in nature concerning the broad issue of "farming and the environment", served as a source for statements and were based on the design illustrated by Meuser and Nagel (1991). The following subtopics stimulated the interviews with questions on farmers' general behaviour, their specific environmental behaviour, agricultural policy and the relationship between environmental and economic considerations for farmers. By not limiting the concourse to farmers, we were able to look at the topic from various angles and we were given a much more comprehensive discourse than can usually be found.

The interviews were recorded digitally, subsequently transcribed and roughly 270 possible statements were selected to make up the concourse. Hence, it was ensured that the concourse was "[…] sufficiently comprehensive to demonstrate a range of opinion" (Brown, 1993, p 97).

3.2. Q Sample – The Statements

With regard to Brown (1993, p 99) "[…] the main goal in selecting a Q sample is to provide a miniature which, in major respects, contains the comprehensiveness of the larger process being modelled." The statements, however, of any Q sample are not facts but merely opinions in the widest sense (Brown, 1993).

We needed to narrow down the extensive concourse to a manageable but nevertheless representative Q sample, for whose procedure only limited guidance is provided by the literature (Watts and Stenner, 2012). Therefore, the three most salient thematic categories – ecological, economic as well as social and political – were identified. Additionally, three possible forms which a claim can have were chosen (i.e. advocative, designative and evaluative), making it possible to have various forms of statements (see: Jeffares and Skelcher, 2011). In this respect, we generated a 3×3 matrix of three broad thematic categories and three types of claims respectively. In order to gain a balanced Q sample, we opted to select four statements of every cell, resulting in a 36-statement Q sample which contains only statements which are not limited to a specific farm type (i.e. dairy farm, permanent crop, etc.). Hence, at least theoretically every farmer can offer their subjective standpoint towards the whole Q sample.

3.3. P Sample – The Respondents

The sample of participants, i.e. the P sample, is not random but rather theoretical in nature (Brown, 1980). The P sample should justify that no potential viewpoint is discarded from the study up front.

Therefore, we chose four criteria which were found to correlate significantly (positive or negative) with environment-friendly behaviour in other studies (see Knowler and Bradshaw, 2007; Prokopy et al., 2008). The criteria derived from the previously mentioned studies were livestock, production condition, complexity of the AEP participated in and, finally, customer contact. This last criterion was assumed to have influence on environmental attitudes and behaviour. In this respect, the study investigates a P sample which is not limited to specific farm types (e.g. arable farming) but is in fact based upon criteria which are associated with differing environmental behaviour. Hence we had, in total, 16 different kinds of criteria combinations which guided our sample. The Chamber of Agriculture of Lower Austria and Bio Austria (i.e. the association of organic farmers) were asked to point us to farms showing the relevant criteria combination. To have some repetition as well, we ended up with a P sample of 30 farmers. Since we had no additional information about the population of farmers (and the inherent environmental viewpoints among them), it is not possible to conclude a priori that, based on our criteria, an anticipated viewpoint might not have the opportunity to emerge.

The federal province of Lower Austria, which is known for its diverse agricultural landscape and production condition as well as various types of farms, served as a study region. In 2013 there were 40.117 farms in Lower Austria which represents a 24% share of Austria's farms. Most of these farms were family farms (94%) which managed 77% of Lower Austria's AUC. Farmers who managed their farms as a main occupation managed 50 ha on average and those who had a side job managed roughly 20 ha per farm. Besides forest (43%), the most important area is acreage (42%) followed by permanent pastures (11%) (Amt der Niederösterreichischen Landesregierung, 2015). Hence, we found a broad range of farms within a clear-cut geographical region; this also presents an opportunity to investigate farmers operating under different production condition within a few kilometres' distance. To gain some data on the farm and the farmer's family, we made use of a

questionnaire. The most relevant data on participant characteristics can be seen in Table 4 in the "Results" section in the column P sample.

3.4. Q Sorting Procedure

The participants have to rank-order each of the 36 statements in relation to each other. The sorting instruction was to arrange the statements according to the participants' agreement with the statements. The actual wording was "[the statement] describes most (+4)/least how I think (−4)". A sorting grid has been produced "forcing" every participant to rank the same number of statements under the respective ranking.

The sorting grid is shaped symmetrically around 0 in the following way:

Table 1
Forced choice distribution.

Ranking value	−4	−3	−2	−1	0	+1	+2	+3	+4
Number of statements	2	3	4	5	8	5	4	3	2

3.5. Correlation and Factor Extraction

The Q sorts are correlated and the resulting correlation matrix offers a way of finding both similarities and differences among individual Q sorts. The Pearson product-moment correlation coefficient between each pair of Q sorts is calculated using the formula: $r = 1 - (\sum d^2/k)$.

In this formula d is the difference between the ranking given to each statement by two respondents who are to be compared and the denominator k is a constant ($k = 2Ns^2$ with $N = 36$ which is the number of statements). The term s^2 represents the variance of the distribution which is the same for all 30 Q sorts since the sorting grid is the same (see Table 1). Repeating this procedure for every Q sort results in a $n \times n$ correlation matrix (Brown, 1980). The correlation between any two Q sorts can therefore range from −1 to +1 and showing the degree of similarity of the ranking by means of an individual's Q sort.

The 30 Q sorts were subsequently factor-analysed using Principle Components Analysis and Varimax Rotation. The software PQMethod was used to detect corresponding patterns among the sorts, leading to the extraction of different viewpoints (Schmolck, 2002). The factoring and rotating was done in a standard way (see: Backhaus et al., 2015).

The extracted factors in turn are expressions of shared viewpoints among the participants. They are composed of the weighted average of those Q sorts used to define a factor and are depicted as factor arrays which resemble a theoretical Q sort done by this factor. The loading of each participant on any extracted factor thereby reflects the extent to which a participant corresponds (positively or negatively) to this shared viewpoint. Crucial in this respect is first and foremost the decision over the number of factors to extract. Subsequent to these statistical procedures on the dataset, it is once more an interpretative approach which sheds light on the nature of each viewpoint (Van Exel and de Graaf, 2005).

Based on the criteria cited in literature, several viewpoints would have been possible to extract and describe (Watts and Stenner, 2012). After intense testing of different outcomes and using a medium-strict rule, we decided that the most accurate number of factors is four. This decision was not merely based on the results of the scree test of the explained variance, which indicates a four-factor solution, but more importantly on the qualitative considerations which this solution offers. Based on the Eigenvalue criterion, it would have been possible to extract up to eight factors and based on the parallel test only two factors would have been justified (Franklin et al., 1995; Horn, 1965; Watts and Stenner, 2012).

4. Results

In our study a Q sort is defining a factor if the individual loading exceeds 0.6 and there is no loading on another factor which greatly exceeds 0.43, which is the 0.01 significance level calculated for the study at hand. Hence, we accept only those Q sorts as defining a factor which load rather high on that respective factor and which therefore bear a great resemblance to that factor array. This higher threshold is justified, as long as it is applied consistently across all factors (Watts and Stenner, 2012). From the 30 Q sorts, 22 were used to constitute the factors, two Q sorts were not used since they were not loading high enough on the respective factor (Q sorts 10 and 12), six were not loading on any factor or were confounded, meaning they loaded on more than one factor. Table 2 shows the four factors and the respective loading of each participant - defining Q sorts are marked in bold. The resulting four factors were subsequently interpreted using the most significant statements (±4 and ±3), followed by the distinguishing statements (which are significantly different than for other factors). Additionally, we made use of the crib-sheet as described by Watts and Stenner (2012).

As can be seen from Table 2, the explained variance, as well as the number of defining sorts, is very high for the first factor, as compared to the subsequent ones. However, it must not be concluded that among the farmers this is also the prevailing viewpoint. Another remarkable aspect of the results is the rather high correlation between the factor scores of Factors 1 and 4 (0.51) which exceeds the study's significance level of 0.43. Although these factors share several important aspects in common, we choose to describe them as separate viewpoints,

Table 2
Factor characteristics.

Farmer	Factor			
	1	2	3	4
1	**0.69**[a]	0.21	0.40	0.31
2	**0.85**	−0.17	−0.03	0.18
3	**0.71**	0.17	0.02	0.18
4	**0.82**	−0.17	0.10	0.14
5	0.03	**0.71**	−0.05	0.10
6	0.27	0.23	0.15	**0.67**
7	0.14	−0.08	**0.66**	0.17
8	0.27	0.00	0.31	0.11
9	**0.70**	−0.18	0.41	0.18
10	0.48	0.16	0.24	0.01
11	0.31	**0.72**	−0.09	0.08
12	0.28	0.54	0.36	0.13
13	**0.75**	0.11	0.16	0.11
14	−0.07	0.22	0.56	−0.58
15	0.43	0.17	0.00	**0.64**
16	**0.79**	0.11	0.26	0.14
17	0.41	0.25	0.24	0.40
18	−0.05	0.07	**0.61**	−0.07
19	0.08	0.61	0.21	−0.51
20	**0.70**	0.03	−0.16	0.26
21	**0.76**	0.24	0.10	0.08
22	0.09	0.17	**0.74**	−0.16
23	**0.84**	0.16	0.11	0.16
24	−0.01	0.51	0.46	0.28
25	**0.77**	0.22	0.00	−0.02
26	**0.73**	0.01	−0.08	−0.16
27	−0.02	**0.71**	0.13	−0.09
28	**0.77**	0.10	0.25	−0.15
29	0.47	0.31	0.01	−0.54
30	**0.73**	0.22	−0.30	−0.02
Number of defining variables	14	3	3	2
Explained variance in %	31	11	10	8
Correlation between factor scores				
Factor 1		0.21	0.19	0.51
Factor 2			0.14	0.23
Factor 3				0.11

[a] Marked in bold are those Q sorts used to create the factor estimates.

Table 3
List of statements and factor scores.[a, b]

Statement	Factor scores			
	F_1	F_2	F_3	F_4
1. When it comes to biodiversity, conservation and extensification, it is more useful to work with subsidies rather than legal regulations.	1	2	1	3
2. Organising competitions, exhibitions and the like in connection with nature and environmental issues are necessary. Such activities increase my willingness to do something for nature.	1	−2	−2	0
3. In order to conserve natural resources, it is essential to support and expand the model of small-scale, family farms.	4	1	4	2
4. From my point of view, unprofitable or inefficient operation branches should be identified as quickly as possible and not maintained any longer.	−1	0	−1	−2
5. I find it quite difficult to implement environmental measures where the meaning and benefit for the environment are not clear to me and I do not put the same effort into their realisation as I do into implementing other measures.	0	0	**−3**[a]	0
6. Enough can be done to protect the environment if one implements a precise, well-measured and computer-assisted delivery of fertilisers and pesticides.	**−3**	0	1	**−4**
7. The preservation of an attractive cultural landscape is particularly important for tourist regions. In other areas, this is of minor importance and one does not have to invest as much in the preservation of these landscapes.	−3	−1	1	**4**
8. Idealism with regard to the environment and the common good is all well and good. However, these aspects can only be integrated into my farm concept if they do not negatively impact on my income.	*−2*[b]	*−2*	*−1*	*0*
9. For me, economic aspects have an overriding importance in the management of my farm. Other considerations are secondary.	−2	−1	**3**	−1
10. If one would like to achieve behavioural changes in terms of environmental services, merely offering financial incentives is not sufficient. An adequate level of awareness-raising, education and information are vital components in reaching this goal.	**4**	1	0	1
11. Agri-environmental measures are mainly designed to improve specific points which are often hardly ever problematic. This means that the truly pressing problems are often not tackled at all.	0	0	−2	1
12. With regard to environmental services, the way things were done in the past or have been done for a long time are essential factors in my farm-management decision-making. This management style should indeed have had a reason and proven useful.	0	**−4**	2	0
13. I can sense, or I am even aware, that the use of chemicals in agriculture is not beneficial.	3	−1	0	2
14. I often lack the courage to try unknown and more environment-friendly production methods on my farm. Much depends on it and changes in the system often have far-reaching consequences.	*−1*	*−3*	*−1*	*−3*
15. Continuous growth is of central importance to me. Without growth it will not be possible to make a living out of farming in the future.	**−2**	3	3	**1**
16. At least at a regional level, a diverse agriculture must be maintained or re-established.	3	**−3**	2	0
17. Environmental services need to be more valued in monetary terms and higher financial incentives for environment-friendly production should be offered to farmers. I believe it is not enough simply to pay for the additional costs or for reduced yields.	1	1	0	3
18. In the future, more environment-friendly production methods will certainly be demanded of farmers. Therefore, it is necessary that I deal comprehensively with the topic.	2	0	2	−2
19. Environment-friendly production methods have reached a very high level in Austria. Therefore, enhancing them is not urgently required.	−1	0	0	0
20. It is essential for farmers to specialise as much as possible. In a modern society based on the division of labour, it is simply necessary.	−2	1	3	−1
21. Some environmental regulations do not bring any advantages for either animals or the environment. These only complicate farm management without any recognisable benefits.	**−1**	3	**−3**	2
22. In my farm management, I have the attitude that I do not own the farm but rather I have received it from my ancestors for the period in which I cultivate it, before passing it on to the next generation.	**3**	0	0	−2
23. Agri-environmental programmes which go more towards extensification and thus push the production function more into the background should be further promoted.	1	−2	−2	2
24. In my opinion, rare and endangered animal or plant species on my land are not important or even a nuisance. As far as I am concerned, these organisms need not be protected.	*−4*	*−4*	*−4*	*−3*
25. Demands from retail companies can sometimes have a negative impact on the environment.	2	**4**	**−3**	0
26. In the area of environmental protection, larger farms are often the pioneers, making use of environment-friendly techniques earlier than smaller ones.	−1	−2	1	−1
27. From my point of view, it is quite understandable that the public expects farmers to take measures to protect the environment in their production.	2	2	0	1
28. The most important and central task of agriculture is the production of domestic and regional food. All other duties and functions are of less importance.	*0*	*0*	*0*	*−1*
29. In my opinion, the farming of animals, crop production and soil must be optimised in a way that the yield is as high as possible.	−4	1	0	−4
30. The environmental problems caused by agriculture have their origin primarily in consumer-consumption behaviour.	0	2	−1	4
31. The influence on agricultural production through legislation and subsidy programmes has now reached a reasonable level in Austria.	0	−3	1	−2
32. I am pleased with a high yield. Only when I harvest enough can I be satisfied with my performance as a farmer.	0	2	2	**−3**
33. It does happen that you try to circumvent certain environmental regulations or not follow them precisely. I do this, as does every other farmer to some extent.	−3	−1	**−4**	0
34. Due to the numerous record-keeping requirements, I lose valuable time working in the stables and in the fields. I would prefer to work more agriculturally and less administratively.	**0**	**4**	−2	−2
35. The environmental and conservation achievements of farmers need to be communicated more clearly and more strongly so that the rest of the population becomes aware of the public goods which farmers are providing.	1	3	4	3
36. In my view, modern agriculture has, for the most part, lost its connection to animals and to nature. This form of agriculture causes major problems for soil, plants, animals and people.	2	−1	−1	1

[a] Statements which are distinguishing for that respective factor at the 0.01 significance level are marked in bold.
[b] Consensus statements (those which do not distinguish between any two factors at $P > 0.5$) are given in italics (statements: 8,14, 24 and 28).

since there are also interesting details in which they differ quite strongly (see below and Table 3).

4.1. The Diversity-maintaining Viewpoint[2]

Fourteen Q sorts are defining Factor 1. It is a shared viewpoint which accounts for 31% of the total variance. This viewpoint is mainly characterised by a strong feeling of responsibility towards nature, the environment, cultural landscapes and the common good, which also involves the sacrifice of additional income (3/+4, 13/+3, 36/+2, 7/−3, 24/−4, 9/−2, 8/−2). According to this viewpoint, natural resources are best conserved by small-scale farmers and this diversity must be supported (16/+3, 20/−2). These farmers are highly critical when it comes to evaluating the modern agricultural system and the seemingly important aspects within it (36/+2, 6/−3, 29/−4). It is first and foremost the overriding importance of economic aspects which is decisively rejected by these farmers (9/−2, 8/−2). Moreover, the modern agricultural system is responsible for causing major problems to the environment and nature (36/+2). The strong focus on Awareness-raising with regard to environment-friendly production and the positive feedback on the current agri-environmental programme are additional characteristics of this trait (10/+4, 11/0, 21/−1). Furthermore, a clear preference for diversity is expressed (16/+3). It is also characteristic

[2] Statements and their ranking are given in parentheses for each factor.

for this notion that a farm is not owned but rather borrowed from the following generations (22/+3). Hence, a clear sustainability focus can be seen in this viewpoint, although the inter-generational dimension might only be limited to family members.

Compared to the other viewpoints, the Diversity-maintaining viewpoint is markedly different when deciding between environment-friendly methods and possible economic gains. It is clearly visible that environmental aspects are at least equally or even more important than economic and business aspects. This viewpoint apparently reflects the thinking that subsidies are not as useful as legal regulations when it comes to environmental protection. There is thus a differentiation between this viewpoint and Factors 2 and 4, which opt decisively for "carrot-over-stick" politics (1/+1).

Directing farmers' behaviour towards a more environmentally benign approach will have several leverage points for this viewpoint. First of all, information and awareness-raising are inherent parts (10/+4); and secondly, competitions and exhibitions – knowledge-transfer activities – are prone to having positive effects (2/+1). To summarise, these farmers are already environmentally aware and could be further motivated by measures which actively increase knowledge and not simply by the passive compliance with regulations (31/0, 1/+1).

4.2. The Context-depending Viewpoint

Three Q sorts are defining Factor 2. It is a shared viewpoint which accounts for another 11% of the total variance. This viewpoint is mainly characterised by a strong outward focus and thus a high degree of dependency on circumstances is revealed (25/+4, 30/+2, 31/−3). Most notably, this viewpoint criticises the high degree of bureaucracy in farmers' work. Those who share this attitude want to work more in the fields and in the stables and find paperwork annoying (34/+4). To continually grow and expand their farm is highly important to them, although this striving to grow is not directly connected to a higher profit; optimising the production factors on the farm in order to achieve a higher yield is more important to the Context-depending viewpoint than to the other factors (15/+3, 32/+2, 29/+1, 9/−1). Additionally, this viewpoint shows a strong tendency towards a modern or contemporary notion of agriculture (12/−4). This means that, in particular, optimisation, precision farming and innovation, as well as growth, are pivotal components of their self-concepts as farmers (15/+3, 6/0). Environmental concerns are not neglected but are only considered as far as they do not interfere with more important goals (27/+2, 28/0).

More than all the other viewpoints, farmers attributed to this factor assign responsibilities for environmental harm to policy, the retail sector and consumers (25/+4, 21/+3, 30/+2, 11/0). Compared to the other viewpoints, these farmers severely criticise environmental regulations which, in their view, often lack positive effects for nature and only complicate farming (21/+3). For them, it is also less likely that small-scale farming per se can be seen as more environment-friendly, which translates into an intensive rejection of diversity on a regional level (3/+1, 16/−3). Discarding a diverse agriculture at the regional level is also a characteristic for this viewpoint (16/−3).

Changing attitudes and the aims of the stakeholders involved may therefore lead to a behavioural change in farmers in the perspective of Factor 2. Nevertheless, it is the circumstances which need to be tackled and changed and it seems that farmers taking this approach do believe that agricultural production will follow and is therefore just an analogy for wider public preferences (18/0). They do indeed argue that, if the public demands more environment-friendly production methods, they are willing to produce in that way and to sacrifice some income (8/−2).

4.3. The Economic Aspects-emphasising Viewpoint

Three Q sorts are defining Factor 3, which accounts for another 10% of the total variance. This viewpoint is mainly characterised by a strong drive towards economic aspects and a focus on enhancing the farm; this may lead to a diminished provision of environmental services (15/+3, 9/+3, 20/+3, 32/+2). Nevertheless, farmers taking this sight can see the need for environmentally sound production but are not willing to give up the use of chemical substances; however, they are willing to implement modern technological advancements to get the job done (18/+2, 6/+1, 13/0). On the contrary, it is particularly contemporary methods which are promising when it comes to preserving natural resources, combined with more traditional approaches which have proven useful in the past (12/+2, 6/+1). With regard to other stakeholders (i.e. policy, consumers and the retail sector) Factor 3 does not see any requests from these actors which might proof harmful to the environment (30/−1, 11/−1, 21/−3, 25/−3).

Distinct from all other viewpoints is their balanced version of traditional production methods. These are combined with modern methods, as well as the advantages for nature which they discover in both small-scale farms as well as large farms (3/+4, 26/+1). Striking in the specific gestalt of this viewpoint is the tendency to deny the demand of the wider population for more protection, although they clearly expect these demands to increase in the future (27/0, 18/+2). These are pivotal and need to be addressed by the farmers.

Apparently, this viewpoint reveals the opinion that the major responsibility for any harm and benefit to the environment is rooted in the individual farmer's management decisions and they are confident that modern farming methods will reduce environmentally harmful agriculture (25/−3, 30/−1, 6/1). They believe that intervention from outside has reached a reasonable level and see the main responsibility of agricultural policy and interest representatives as being to communicate the positive environmental developments more intensively to the public (31/+1, 35/+4).

4.4. The Change-promoting Viewpoint

Two Q sorts are defining Factor 4 and it is a shared viewpoint which accounts for another 8% of the total variance. This viewpoint is mainly characterised by very clear expectations of how to increase environment-friendly behaviour in farmers (35/+3, 1/+3, 17/+3, 23/+2). There are actually two components which will guarantee the success of such endeavours. First of all, one has to alter the behaviour of consumers (30/+4). The consumption behaviour is seen as largely responsible for the major part of the negative impact of agriculture on the environment. As a next step, an increased communication effort – accompanied by more specific and better established agri-environmental programmes – is seen as crucial and inevitable (35/+3, 21/+2). Farmers sharing the Change-promoting viewpoint criticise developments in agriculture but do not declare traditional ways of farming superior with regard to their environmental performance (36/+1, 13/+2, 12/0, 6/−4). Imbedded in this attitude is also a decline in over-focusing on economic aspects (8/0, 9/−1, 20/−1, 4/−2). Hence, the current agricultural production systems and its influencing circumstances are critically evaluated and on various points alteration may be needed. These farmers seem, to a large extent, to believe that their decisions are crucial for the environmental and for the economic performance of the farm. Apart from consumers, they do not name any other stakeholders and state their influence as reasons for their individual behaviour (30/+4, 25/0, 34/−2). However, they do not fully endorse the current agri-environmental programme. Hence, this viewpoint expresses a need for change more than any other viewpoint and they criticise current ways of enhancing environment-friendly production (17/+3, 23/+2).

Distinct from other viewpoints, there is a seemingly unemotional stance. This can be seen, for instance, in Statement 7 (+4), in which they are of the opinion that the cultural landscape does not need to be picturesque in all regions and in Statement 32 (−3). Additionally, the strong focus on monetary incentives in order to act in an environment-friendly way is more pronounced than in all the other viewpoints (17/+3).

Table 4
P sample ($n = 30$) and factor characteristics.

	P sample		F1 ($n = 14$)	F2 ($n = 3$)	F3 ($n = 3$)	F4 ($n = 2$)
	Mean (min/max)					
Age	49.8 (25/69)		50.6 (25/69)	47 (39/52)	46 (27/66)	59 (58/60)
Experience as a farm manager (years)	22.2 (0/46)		23.4 (4/46)	23 (18/32)	11.7 (0/19)	34 (31/37)
Farm size (ha)	48.7 (3.25/175)		31 (3/82)	109 (48/175)	29 (28/30)	25 (12/37)
	%	*n*	*n*			
Gender (male)	87	26	13	2	1	2
Level of education						
Primary	6.7	2	1	1	–	–
Vocational	66.7	20	9	1	3	1
Secondary	20	6	3	–	–	1
University	6,7	2	1	1	–	–
Employment status (full-time)	66.7	20	10	3	3	–
Type of farming						
Field crops	30	9	4	1	–	–
Wine	0	0	–	–	–	–
Permanent crops	3.3	1	1	–	–	–
Milk	13.3	4	2	–	1	1
Animal fattening	3.3	1	–	1	–	–
Pigs/poultry	6.7	2	2	–	–	–
Mixed	30	9	3	1	2	–
Other	13.3	4	2	–	–	1
Sampling criteria						
Livestock	53	16	7	2	2	2
Less favoured area	47	14	5	2	1	2
Organic	43	13	8	1	–	1
Direct customer contact	57	17	9	1	3	1

Although this viewpoint may show more self-responsibility than Factor 2, in some aspects they do reject the blame for environmental damage. It is consumers in particular who are made responsible for directing farmers' production (30/+4). This may change if communication with these consumers is enhanced (35/+3); this might show them what farmers are already doing for the environment and lead to a shift in consumer behaviour. Additionally, increased financial incentives will further encourage farmers to act positively for the environment (8/0).

In Table 4 the most relevant demographics of the P sample and the four factors are given.

5. Discussion

In our study, we have investigated the environmental attitude of farmers in Lower Austria in order to describe the characteristics of different viewpoints which we assumed to be present in the farming population. Our results show the diverse range of traits with regard to farmers' environmental attitude and behaviour. As initially assumed, all four viewpoints exhibit some natural-resource-conserving notions but show different emphases on aspects of the environmental discourse. For instance, an extensification via AEPs (Statement 23, Table 3) is favoured by F1 and F4, while the remaining factors oppose this development.

At first glance, the differentiation between an environmentally focused typed (F1) and a rather business-orientated one (F3) is the most striking. Although these two types are well known (Fairweather and Keating, 1994; Sulemana and James, 2014), the fine-tuned versions of our analysis show two types which both clearly see the need for enhanced environment-friendly farming, since this will be demanded by the public. For both of them, small-scale family farming is an integral part of this endeavour. Hence, these two types, although perhaps for different reasons, are clearly ready to intensify their pro-environmental farming methods. These two viewpoints resemble those extracted by Davies and Hodge (2007), which clearly supports this dichotomy.

Factor 2 is mainly characterised by a strong outward focus which differentiates this factor's view to the rest of the extracted viewpoints. This is so predominant that, in its view, farming is to a large extent influenced by the system in which it is embedded. In the view of Factor 2, it is society which decides upon the current farming system and the single farmer only translates their demands into action on the farm. This notion can best be explained as extrinsically motivated (see for instance: Matzdorf and Lorenz, 2010), since the farmers are seemingly pro-AEPs as opposed to legal regulations but the incentives have to come from outside. According to de Groot and Steg (2010) and Darnhofer et al. (2005), these farmers might be less likely to perform rather complex and difficult measures like organic farming.

Factor 4, called the Change-promoting viewpoint, might be the most resilient, since it is aware of the need for constant change. In fact, more than any other viewpoint Factor 4 is dissatisfied with current AEPs, especially in monetary terms, and farmers who hold this view propose several ways to enhance environment-friendly farming. With regard to implementing measures which are resource-conserving, these farmers resemble the *support optimizers* as described by Schmitzberger et al. (2005) and O'Rourke et al. (2012).

The fact that the farmers had to refer to a more comprehensive selection of statements, made transparent various aspects of the different perspectives (e.g. the view towards demands from the wider public), which have not yet been described to this extent. Using Q methodology to reveal farmers' viewpoints on the importance of certain issues with regard to the environment, nature, the common good and environmental services of farmers has proved to be a useful tool in this respect. To illustrate their optimal blend of measures, the mixture of items we offered to the participants covering institutional mechanisms, such as legal regulations, monetary incentives or information provision, proved to be useful. Nevertheless, since Q methodology does not work with standardised statements, we tried to keep the statements as verbatim as possible, although it may be that some statements might have a range of interpretations.

However, the study can only serve as a basis for further research on single viewpoints or on the compilation as a whole. For instance, the spatial distribution of viewpoints, the share of the respective viewpoint within specific groups with different socio-demographic characteristics, and the possibility of to generalise the findings, which is highly relevant for policy, cannot be concluded from our approach. Moreover, from our methodological procedure it can only be assumed that these viewpoints are shared viewpoints and are present in the population of farmers. It is

not possible, however, to conclude that all relevant viewpoints have emerged. The four Factors show a high variability and quite distinct evaluation of the presented Q sample. Nevertheless, a certain proportion of social desirability in the Q sorts cannot be ruled out, especially since the investigated topic might be rather controversial.

Another limitation of our study is the fact that we did not include actors from the value chain. Thus, in particular the crucial role of the retail sector could be reflected to a greater extent. Due to the fact that we wanted the Q sample to work for all kinds of farms (e.g. no specific statements on the topic "animal welfare"), we were limited in the scope of the concourse.

6. Conclusion

Research in the area of environment-friendly behaviour in agriculture often focuses on the assumption of an agent who first and foremost maximises profits. Although this might be the case, not all four viewpoints place a comparable high importance on economic aspects. Moreover, associated considerations like continuous farm enlargement and the optimisation of production factors are evaluated quite differently between the four Factors. Based on our findings, it is not justified to work with one single agent who, in fact, shows even more complex traits than one might assume. The economically focused type is more or less concerned with raising the awareness of the population and wants to farm without external influences. In contrast, the environmental type is highly motivated but is more attracted by direct knowledge transfer measures. Indeed, a mixture of different policy measures is already in place in many countries but a more targeted approach might lead to tailored measures and hence, have an increased impact.

For further investigation in Austria or in other countries, as well as for policy or environmental protection measures, it is advisable to develop a quantification and distribution of the viewpoints by using narratives (see Baker et al., 2010). If more is known about different farmers-groups' reactions to specific incentives, demands and regulations existing policy instruments might be further developed and new measures might be integrated into appropriate mixes of instruments. Furthermore, since farmers' environmental-related behaviour is often driven by demands from the retail sector and consumers, it is necessary to work on an enhanced integration of different stakeholders (e.g. representatives of the retail sector) into research as well as policies and design of measures.

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