

Improving animal welfare: qualitative and quantitative methodology in the study of farmers' attitudes

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Abstract

The welfare of production animals provokes wide social discussion among the public, yet, despite this, farmers' voices and their representations of animal welfare are rarely heard, even though farmers are the ones actually able to improve animal welfare. Farmers' perceptions of what constitutes animal welfare and how it may be improved can differ from those of consumers and other stakeholders, and therefore it is crucial to understand what farmers mean when they talk about improving animal welfare. To chart farmers' perceptions, we conducted qualitative interviews and a questionnaire study using the theory of planned behaviour as a conceptual framework. We found that the farmers perceived the improvement of animal welfare as four specific, practical attitude objects (providing animals with a favourable environment; taking care of animal health; treating the animals humanely; and taking care of the farmer's own well-being) and two different but often overlapping general attitudinal dimensions (the instrumental and intrinsic evaluations of animal welfare). The farmers' intentions to improve animal welfare were best explained by their attitudes towards the specific welfare-improving actions. The concept of the improvement of animal welfare examined in this study outlines measures to improve animal welfare from the farmers' point of view and discusses their influence. Our study demonstrates that by adapting a valid conceptual framework and applying relevant qualitative and quantitative methods that support each other, we are able to elucidate the underlying meanings and values in farmers' views on improving animal welfare.

Keywords: animal welfare, attitude, farmer, production animal, qualitative attitude approach, theory of planned behaviour

Introduction

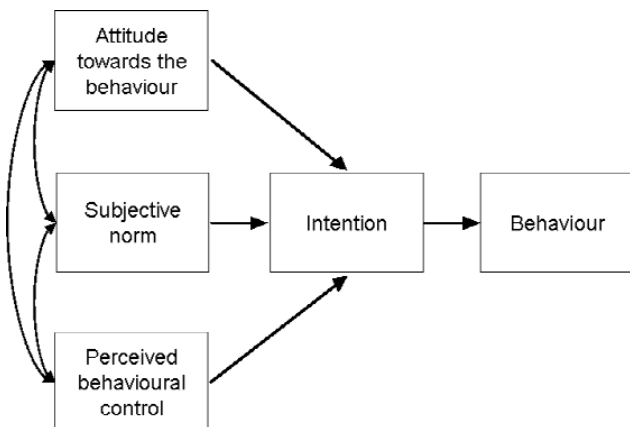
Production animal welfare provokes wide social discussion, particularly when the media are dealing with the current disadvantages of animal production. Consumer concern exists as to the welfare of animals on farms. However, farmers' voices and their representations of animal welfare are rarely heard. Whether the farmers, consumers, and other stakeholders are all talking about the same issue when they talk about improving animal welfare is open to debate. The welfare of animals can be defined in many ways (as in Brambell 1965; Millman 2009); understanding how different actors perceive it is a precondition for the successful improvement of animal welfare.

The attitudes of consumers (Frewer *et al* 2005), veterinarians (Heleski *et al* 2005; Sabuncuoglu & Coban 2008), and students (Heleski & Zanella 2006) concerning animal welfare have been well studied (Serpell 2004). For production animals, however, the most relevant attitudes are those of the farmers. The farmer, as a caregiver, has a vital influence on animal welfare (Coleman *et al* 2003;

Hemsworth 2003). It is acknowledged that the attitude and behaviour of the caregiver has an effect upon animal behaviour, welfare, health, and production (Rushen *et al* 1999; Waiblinger *et al* 2002; Boivin *et al* 2003). Yet, research on farmers' representations of and traditions of conceptualising animal welfare was scarce until recent years (Velde *et al* 2002; Lund *et al* 2004; Austin *et al* 2005; Lassen *et al* 2006; Bock & van Huik 2007). In particular, few studies from the perspective of improving animal welfare as an action have been published (Waiblinger *et al* 2002).

Our study aims to contribute to the development of robust theoretical and methodological approaches in the study of farmers' attitudes towards animal welfare. In our paper, we introduce two approaches to the study of attitudes in connection with animal welfare: two different ways to collect and analyse the data associated with two different theoretical traditions. The first tradition is Icek Ajzen's theory of planned behaviour (TPB; Ajzen 2002), which represents the mainstream research tradition with its mainly quantitative survey methods. In addition, we present a qualitative

Figure 1



Conceptual framework for the prediction of specific intentions and behaviours according to the theory of planned behaviour (modified from Ajzen 1991).

approach to attitudes that, complementary to the mainstream, focuses on the construction of attitudes in argumentative communication (Billig 1996; Rantanen & Vesala 1999; Vesala & Rantanen 1999, 2007). We explore these two research traditions by comparing them as interpretive frames for data collected with qualitative and quantitative methods.

The TPB has contributed significantly to the research on attitudes wherein the connection between attitudes and behaviours had long been debated (Augoustinos & Walker 1995; Manstead & Parker 1995; Fazio & Olson 2003). In the TPB, an individual's intention to behave in a certain way is assumed to be a precondition for the implementation of the behaviour in question. This intention, in turn, is determined by his or her attitude towards the behaviour, perceived behavioural control, and the supposed opinions of other people who are important to him or her (Figure 1). Where the TPB takes a step forward is the discovery that the attitudes directly connected with the behaviour in question explain human behaviour better than attitudes directed to the phenomenon in general. The attitude and the behaviour must have the same abstraction level to correspond to each other. If we want to predict human behaviour in the improvement of animal welfare, for instance, we need to study the attitudes towards the improvement of animal welfare in particular, not the general attitudes, eg towards the animals. Predicting intentions is easier, however, than predicting the behaviour itself because of several limiting factors outside the actor's control (such as money, time, or one's own well-being) (Ajzen 2002).

Attitudes can, in principle, be studied qualitatively and quantitatively. The methods might strengthen and supplement each other by suggesting various views on the topic, or they might point out each other's flaws (Sieber 1973; Brannen 2005). Carrying out a qualitative interview as a preliminary study is a common practice in drawing up a

questionnaire study in studies following a TPB approach. It can be used to search for unknown attitudes and to gather distinct observations into data-compiling meta-observations. A qualitative approach also contributes to interpreting the results and finding new meanings (Alasuutari 1995). Furthermore, some researchers have conducted independent studies on attitudes using qualitative approaches (Wetherell *et al* 1987; Vesala 2004; Nousiainen *et al* 2009).

Quantitative surveys, in turn, extend the picture of the occurrence and the division of attitudes among respondents, and make it possible to estimate the extrapolation of the results. However, the questionnaire approach has its limitations. For example, the potential qualitative variation in the attitudes and attitude expression are left uncovered. In this case, a qualitative preliminary study increases the validity of a questionnaire study.

In the qualitative attitude approach (Vesala & Rantanen 2007), attitudes are methodologically approached as constructions that can be identified in argumentation (Billig 1996) and that must be actively interpreted and abstracted from the data. Variation may exist in attitudes according to, eg the context of argumentation. For example, a farmer might have alternative attitudes towards improving animal welfare depending on who he or she is talking to. In the qualitative attitude approach, the analysis of the data is based on the coding of the interviewees' stand-takings and justifications. Coherent combinations or patterns of such comments can be further interpreted as attitudes.

In this study, we explore these qualitative and quantitative approaches in the study of farmers' attitudes towards the improvement of animal welfare and of the benefits of using these two approaches together in such a context. In the qualitative part, we examine how the improvement of animal welfare is constructed as an object of the attitudes in farmers' speech as they comment on a statement concerning the importance of improving animal welfare. In the quantitative part, we study the attitudes by quantifying the variation that emerged in a questionnaire study. Following the TPB, we are also interested in farmers' perceived social norms, perceived control, and their behavioural intentions regarding the improvement of animal welfare.

Methods of data generation and analysis

Qualitative interviews

We informed Finnish farmers of the interview study with announcements in a national farmers' newspaper for a brief time in the spring of 2005. Consequently, five farmers volunteered for the study. At the same time, we chose 40 Finnish pig and dairy farms following the criteria that the herd size was over 40 sows or over 30 dairy cows, and that the farms were located regionally representatively around southern and central Finland. We sent each farm a letter asking for their willingness to participate, and from this recruited 13 farmers. On the whole, we interviewed nine dairy farmers (from medium-sized farms with 30–60 dairy cows and large farms with over 60 dairy cows) and nine pig farmers (from medium-sized farms with 40–100 sows and large farms with over 100 sows).

The interviews, conducted individually, consisted of ten attitudinal statements about animal welfare associated with the elements of the TPB. The statements were presented in written form, one at a time, and the farmers were asked to freely discuss the statements. In this article we only analyse the comments stimulated by one single statement, '*It is very important to maintain and promote animal welfare*' that represents the attitude element of the TPB. For the analysis, we transcribed the tape recordings *verbatim*. We collaborated in analysing the transcripts and discussed the analysis during the process. The analysis was conducted with the Atlas.ti programme (GmbH, Germany) which enabled comparison of different levels of analytical categories to each other and to the original transcripts at all analytical stages and facilitated exploration of their relationships.

The analysis included, firstly, the identification of the stands that the interviewees presented for or against the statements and the various related comments that they presented to justify and account for their stands. For example, in the following excerpt, a stand that approves of the statement is expressed with the word 'certainly'. In the interviewee's response to the interviewer's request for justification, two arguments can be identified: improving animal welfare is associated with health (or the absence of sickness) and with productivity.

I: Well yes. How about this, this is the first attitude statement, saying that "In my opinion, it is very important to maintain and improve animal welfare". Do you agree or [the interviewer shows the interviewee a paper on which this statement is written]

A: Certainly.

I: Yes? ... Why is it?

A: Well, sick animals surely don't produce anything.

Secondly, we analysed how the interviewees' comments may be viewed from the perspective of attitudes in the TPB. Following the principles of the qualitative attitude approach, the focus was on how these attitudes were constructed in the interviewees' comments and argumentation.

Questionnaire study

Material

We sent the questionnaire to all 342 members of a Finnish pig production recording scheme with ongoing piglet production and to 500 randomly but regionally representative dairy farms in summer 2006. Altogether, 298 farmers (35%) responded (137 pig and 161 dairy farmers).

For the study, we drew up a questionnaire (see Table 1) to make the TPB operational such that every object of attitude identified in the interviews received a measurable pattern of its own. We wanted the interviewees to comment on the activity of improving animal welfare both generally speaking and as specific objects of the attitude. With the exception of questions concerning background information, a seven-point Likert scale was used.

First, we asked for the respondents' opinion on the importance of different measures to improve animal welfare (later

called 'importance'). Based on the results of the interview study, we divided the measures into four sections: (i) providing animals with a favourable environment; (ii) taking care of the animals' health; (iii) treating the animals humanely; and (iv) investing in farmer's own motivation and well-being at work. Each section included one collective conceptual measure (eg in the section concerning animal health, '*How important do you perceive taking care of the animals' health at your own farm?*' and three more practical measures, eg '*How important do you perceive (i) alleviating pain or euthanising the sick animal; (ii) keeping the animals and pens/barns clean?; and (iii) keeping an eye on the behaviour of the animals?*'). According to the TPB, the aim of this pattern was to discover the specific attitudes of the farmers towards the issue.

Second, we used four similar sets of questions to ask for the respondents' perceptions of how easy it would be to carry out these measures at their own farms (later called 'easiness'; eg the conceptual measure: '*How easy do you perceive taking care of the animals' health at your own farm?*' with three practical measures, respectively). This pattern aimed to catch the effect of the perceived behavioural control.

Third, we enquired about the respondents' intentions to improve the welfare of their animals ('intentions', with correspondence to the TPB). Fourth, we asked the respondents to estimate how significant the animal welfare-related opinions of particular stakeholders, eg slaughterhouses, are for them ('subjective norms', with correspondence to the TPB). Fifth, the respondents evaluated ten statements on a Likert scale. The statements concerned animal welfare and the role of a farmer in general ('general attitudes', with correspondence to the TPB). (see Table 1)

Statistical analysis

The data were analysed with SPSS 15.0. We used the Wilcoxon test to find if there were differences between the means of the variables in the initial data. We utilised Principal Component Analysis (PCA) with a Varimax rotation to find summary variables that could be used in subsequent analyses. For the sake of clarity, before conducting the PCA we translated the statements into positive ones where needed; for example, the initial statement, '*talking to the animals is trivial*' was translated into '*talking to the animals is not trivial*'. As the questionnaire consisted of several theoretically distinct patterns (specific and general attitudes, perceived behavioural control, and subjective norms; the pattern of intentions was not processed), we treated these patterns as separate units in the PCA. The variables with communalities below 0.3 were left out. There were altogether 295 usable observations; the missing values were replaced with means.

On the basis of the PCA, we formulated the components (see Table 2) using the criteria that a variable was usually included in a component if it had a loading exceeding 0.3 and did not load on any other component. In addition, if the largest loading on a component exceeded 0.5 and there was a loading less than 0.4 on any other component, then that variable was also included. The components with

Table 1 The means, standard deviations, and statistically significant differences within each section (indicated with different letters) between the variables of the original data, n = 296.

The importance and easiness of improving animal welfare		Mean (\pm SD)	Difference
(Each part includes 4 subquestions with 7 answering options: 1 = very important/easy – 7 = not important/easy at all)			
How important/easy do you perceive...			
Providing the animals with a favourable environment	importance	2.50 (\pm 0.81)	a
	easiness	3.52 (\pm 0.95)	b
Taking care of the animals' health	importance	1.89 (\pm 0.58)	c
	easiness	2.38 (\pm 0.74)	a
Treating the animals humanely	importance	2.19 (\pm 0.81)	d
	easiness	2.07 (\pm 0.76)	e
Investing in Your own motivation and well-being at work	importance	1.81 (\pm 0.60)	f
	easiness	3.92 (\pm 1.03)	g
The farmers' intentions to improve animal welfare on their farms in the near future			
(7 answering options: 1 = very likely – very unlikely)			
In the near future, how likely are you to...			
Build or restructure facilities that improve animal welfare on the farm		3.84 (\pm 1.93)	a
Take care of the animals' health and treat diseases more intensively		2.83 (\pm 1.47)	b
Treat the animals more humanely		2.85 (\pm 1.49)	b
Take time off for leisure time and holidays		3.34 (\pm 1.70)	c
The subjective norms			
(Each part includes 3 subquestions with 7 answering options: 1 = very much – 7 = not at all)			
How much does the opinion of this stakeholder affect your activities?			
How much does this stakeholder emphasise the importance of animal welfare?			
How much does this stakeholder understand the issues of animal welfare?			
Slaughterhouse/dairy		2.79 (\pm 1.18)	a
Wholesale/retail trade		4.39 (\pm 1.59)	b
Veterinarian		1.93 (\pm 0.82)	c
Consumer		3.73 (\pm 1.45)	d
Agricultural adviser		2.86 (\pm 1.27)	a
Researchers and specialists		3.15 (\pm 1.19)	e
Other farmers		3.18 (\pm 1.08)	e
The general attitudes			
(7 answering options: 1 = strongly agree – 7 = strongly disagree)			
1) Animal welfare is the most important issue in my work		1.48 (0.84)	a
2) I always do my best to improve the welfare of my animals		1.56 (0.78)	b
3) Improving animal welfare is economically profitable		1.68 (0.98)	b
4) It is mentally rewarding to improve animal welfare		1.94 (0.91)	c,d
5) A farmer is obligated to treat her/his animals well		1.31 (0.63)	e
6) A high yield is evidence of good animal welfare		2.00 (1.22)	c,f
7) Improving animal welfare is a valuable PR activity		2.11 (1.31)	d,f
8) Animal welfare should not cost too much money		2.60 (1.52)	g
9) A farmer must not become attached to her/his animals		5.06 (1.79)	h
10) Talking to the animals is trivial		5.93 (1.33)	i

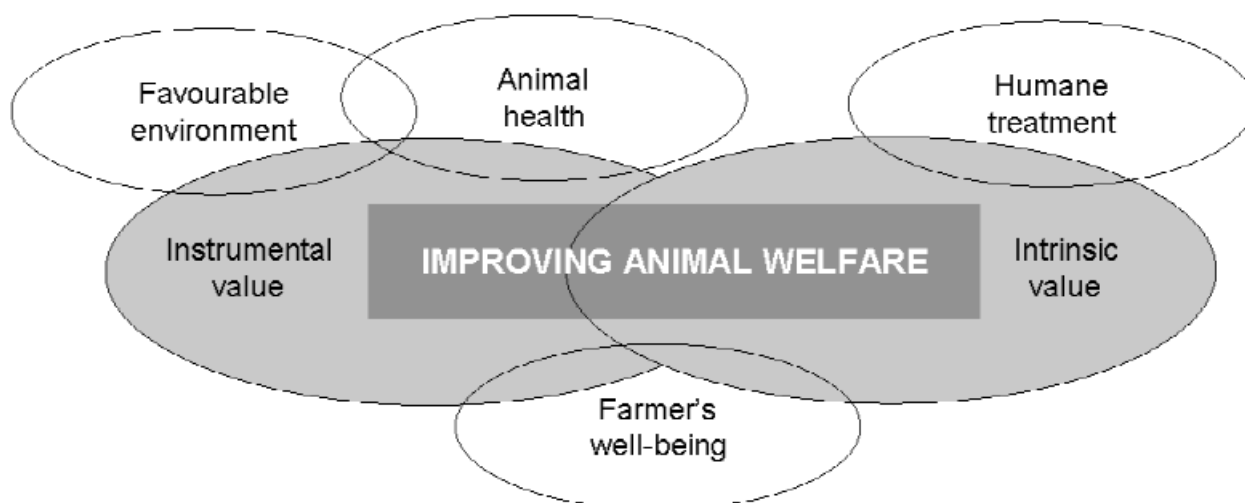
Table 2 Components of the four attitudinal patterns (importance, easiness, subjective norms, and general attitudes; in correspondence with the TPB). Response means range between 1 and 7 on the Likert scale (see Table 1).

The importance of improving animal welfare by	Communality	Humane treatment	Favourable environment	Farmer's well-being	Animal health
Giving the animals more space to move around	0.7189		0.814		
Improving the quality of bedding	0.660		0.790		
Using more litter/rooting material	0.692		0.820		
Keeping the animals and pens/barns clean	0.451		0.564		
Keeping an eye on the behaviour of the animals	0.393	0.520			
Talking to and stroking the animals	0.598	0.752			
Treating the animals humanely	0.677	0.803			
Avoiding force in handling the animals	0.427	0.649			
Treating the animals as individuals	0.638	0.780			
The farmer having enough leisure and holidays	0.554			0.718	
The farmer not having to hurry when at work	0.550			0.681	
Investing in the farmer's motivation and well-being at work	0.726			0.830	
The farmer enjoying his/her work	0.562			0.711	
Eigenvalue		5.573	1.740	1.589	
Variance explained % (Total 55.6%)		34.83	10.88	9.930	
Cronbach's α		0.799	0.807	0.762	
Response mean		2.175	2.596	1.811	
Response standard deviation		0.746	0.828	0.599	
The easiness of improving animal welfare by					
Providing the animals with a favourable environment	0.501		0.576		
Giving the animals more space to move around	0.551		0.699		
Improving the quality of bedding	0.668		0.783		
Using more litter/rooting material	0.551		0.676		
Alleviating pain or euthanising the sick animal	0.677				0.789
Keeping the animals and pens/barns clean	0.507				0.558
Keeping an eye on the behaviour of the animals	0.557				
Taking care of the animals' health	0.687				0.704
Talking to and stroking the animals	0.647	0.778			
Treating the animals humanely	0.663	0.795			
Avoiding force in handling animals	0.382	0.534			
Treating the animals as individuals	0.552	0.657			
The farmer having enough leisure and holidays	0.581			0.753	
The farmer not having to hurry when at work	0.660			0.800	
Investing in the farmer's motivation and well-being at work	0.700			0.781	
The farmer enjoying his/her work	0.618			0.640	
Eigenvalue		5.210	1.401	1.794	1.095
Variance explained % (total 59.4%)		32.56	8.758	11.21	6.843
Cronbach's α		0.729	0.725	0.788	0.684
Response mean		2.062	3.510	3.933	2.423
Response standard deviation		0.759	0.947	1.033	0.781

Table 2 (cont)

The subjective norms		Community	Wholesale/retail trade/consumer	Agricultural adviser	Slaughter-house/dairy	Other farmers	Veterinarian	Researchers & specialists
Slaughterhouse/dairy	a	0.766			0.705			
	b	0.811			0.831			
	c	0.824			0.836			
Wholesale/retail trade	a	0.732	0.599					
	b	0.643	0.693					
	c	0.731	0.774					
Veterinarian	a	0.814					0.684	
	b	0.740					0.775	
	c	0.761					0.802	
Consumer	a	0.656	0.651					
	b	0.601	0.597					
	c	0.733	0.832					
Agricultural adviser	a	0.867		0.800				
	b	0.855		0.827				
	c	0.854		0.814				
Researchers & specialists	a	0.785						0.633
	b	0.756						0.809
	c	0.764						0.820
Other farmers	a	0.768				0.769		
	b	0.711				0.741		
	c	0.776				0.803		
Eigenvalue		7.482	1.956	1.608	1.433	1.263	1.120	
Variance explained % (total 80.0%)		35.63	9.313	7.656	6.824	6.013	5.333	
Cronbach's α		0.869	0.897	0.844	0.784	0.785	0.791	
Response mean		4.277	2.964	2.822	3.170	1.928	3.236	
Response standard deviation		1.242	1.161	1.187	1.052	0.822	1.112	
a = How much does the opinion of this stakeholder affect your activities								
b = How much does this stakeholder emphasise the importance of animal welfare								
c = How much does this stakeholder understand the issues of animal welfare								
The general attitudes		Community		A reward-seeking farmer			An empathic farmer	
Animal welfare is the most important issue in my work		0.630		0.793				
I always do my best to improve the welfare of my animals		0.736		0.856				
Improving animal welfare is economically profitable		0.498		0.704				
It is mentally rewarding to improve animal welfare		0.524		0.663				
A farmer is obligated to treat his/her animals well		0.531		0.728				
A high yield does not guarantee good animal welfare		0.488		-0.523			0.463	
It is OK that animal welfare costs (too much) money		0.385					0.610	
It is OK that a farmer is attached to his/her animals		0.588					0.756	
It is not trivial to talk to your animals		0.515					0.662	
Eigenvalue				3.244			1.651	
Variance explained % (total 54.4%)				36.05			18.34	
Cronbach's α				0.778			0.509	
Response mean				1.655			4.108	
Response standard deviation				0.619			0.942	

Figure 2



An outline of the improvement of animal welfare as an object of attitude — from the farmers' point of view.

eigenvalues below 1.0 were ignored. The consistence of each component was sufficient (Cronbach's $\alpha > 0.6$), except for the one named 'an empathic farmer' ($\alpha = 0.5$), which has to be considered with caution (see however Knapp & Brown 1995). These components were then used to compute scores by averaging the variables that satisfied the criteria above. Components showing substantial non-normality were log- or square root-transformed. Each intention item was treated as a separate variable.

To examine the connections between specific and general attitudes, perceived behavioural control, subjective norms, and intentions, we calculated partial correlations with the gender and the line of production as controlling variables. Missing values were excluded pairwise. According to Ajzen and Fishbein (1980), in social sciences, correlations of less than 0.3 are negligible, although statistically significant. Because of this, only the correlations equal to or greater than 0.3 with $P < 0.01$ are considered relevant in this study.

To further test the theory of planned behaviour, we applied a structural equation model (SEM) using Amos Graphics 7.0. First, we specified a measurement model where PCA components substituted for observed variables, and specific and general attitudes, subjective norms, perceived behavioural control and intentions served as latent variables. For example, the four PCA components of 'easiness' ('environment', 'health', 'humane treatment', and 'the farmer's own well-being') define the latent variable 'perceived behavioural control'. The sole exception is 'general attitude', which is defined by two separate initial variables drawn from the data, 'Improving animal welfare is the most important issue in my work' and 'It is OK that a farmer is attached to his/her animals', as we considered these variables to most unambiguously describe the two general values found in the

PCA. Secondly, we modified and tested a structural equation path model with a maximum likelihood estimation method to determine the adequacy of the TPB in explaining the farmers' intentions to improve animal welfare. In the SEM, we imputed missing values with expectation-maximisation (EM) algorithms and evaluated the applicability of the model by the comparative fit index (CFI) and the root mean square error of approximation (RMSEA).

Results

Qualitative interviews

Construction of the attitude objects

All the interviewed farmers agreed with the statement 'It is very important to maintain and promote animal welfare', although some reservations were made. Yet there was substantial variation among the justifications, and this constructs the improvement of animal welfare in different ways. The analyses of the interviews suggested that improving animal welfare is organised as two conceptual levels: a concrete and specific level and a more general, abstract level (Figure 2).

The concrete level

At a concrete level, improving animal welfare manifested itself in a wide group of practical welfare measures in farmers' speech. These hands-on measures can be divided into four main ways of improving animal welfare: i) providing animals with a favourable environment; ii) taking care of the animals' health; iii) treating the animals humanely; and iv) the farmer's motivation and well-being at work.

At the concrete level, improving welfare typically appeared as taking care of animals' health and providing animals with

a favourable external environment. This is well illustrated in the comments of an organic pig farmer:

I: It is very important to maintain and improve animal welfare (the interviewer shows the interviewee a paper sheet on which the statement is written).

A: Yes, of course, when an animal feels well and it has good living conditions, of course it will stay healthier and grow well, for example, biting tails is a good example of this issue...

The owner of a large dairy farm summed up:

A: In my opinion, that those cows feel great, their living environment and [...] and, of course, it is also easier for you. [...] if animals stay healthy and productive.

The farmers mentioned several practical measures of improving animal welfare. For example, providing animals with sufficient room, solid floors (compared with slatted floors), comfortable and soft bedding, a reasonable amount of litter, and access to a pasture were essential when it comes to a favourable environment. In relation to health-care, watching the behaviour of the animals, the good condition of hooves and hair, adequate feeding, regular veterinary care, and the treatment of mastitis and other illnesses were mentioned as essentials.

Some of the farmers justified their positive stance on the statement by referring to the humane treatment of animals. Respecting the animals, avoiding violence when handling them, talking to and stroking the animals, and treating them as individuals in everyday care were connected with this view. The owner of a medium-sized pig farm emphasised:

A: They behave just like human beings. Human beings chat and say hello ... pigs are like that, too ... animals are shy only because they do not trust their caretaker and do not know him ... of course in a modern efficient concentration camp one cannot afford to discuss, and stroke, and chat with an animal, the most important thing is that a caretaker knows his animal and the animal knows his caretaker and there is a mutual trust between them.

On the basis of the interviews, the welfare of farmers proved to be a crucial precondition for animal welfare. Several of the farmers considered the animals' and the caretakers' welfare to be equal: the welfare of an animal increases the well-being of the caretaker which, in turn, is a precondition for animal welfare. Treating animals individually and taking the characteristics of each animal into account were important to these farmers. The owners of a medium-sized pig farm (A and B) put this nicely:

A: It is important also because two issues have to work well: maintaining and improving animal welfare and maintaining and improving animal caretakers' welfare, because they go hand-in-hand. Because, in my opinion, if a caretaker is feeling happy and exuberant, in that case very few caretakers would treat animals badly. Personally I do not know anybody who would.

B: And equally, if in a piggery the animals feel great, the caretaker's life is probably also going all right.

The abstract level

Beside the four categories of practical measures of improving animal welfare, we found two more general and abstract attitudinal dimensions regarding animal welfare. Farmers seemed to evaluate animal welfare from these distinct but often overlapping viewpoints: welfare was to be either an instrument for production and economic output, or it was an intrinsic value. Based on the interviews, the farmers were aware of and appealed to both values. The most often expressed justification in our data was the instrumental view. The owner of an organic pig farm paralleled welfare with health and health with production:

I: It is very important to maintain and improve animal welfare (the interviewer shows the interviewee a paper sheet on which the statement is written).

A: Sure.

I: OK... Why is it important?

A: Of course, sick animals do not yield anything.

The owner of an organic dairy farm emphasised the connection between economic output and animal welfare:

A: It is the most important thing, that is what we are paid for. If the animals feel great, they are productive and less is needed...

Fewer farmers perceived improving animal welfare as an intrinsic value, as a universal duty in human action. In the speech of the owner of a medium-sized pig farm, animal welfare is even placed ahead of the welfare of his own family:

A: It is extremely important. It is as important as my livelihood, or in our case, animal welfare is even more important than that.

I: Yes, you also said something like that before.

A: We were on the edge of a bankruptcy, we had to gather our food from waste containers outside supermarkets. I did not have enough money to provide a livelihood for my family because I invested all our money in the animals.

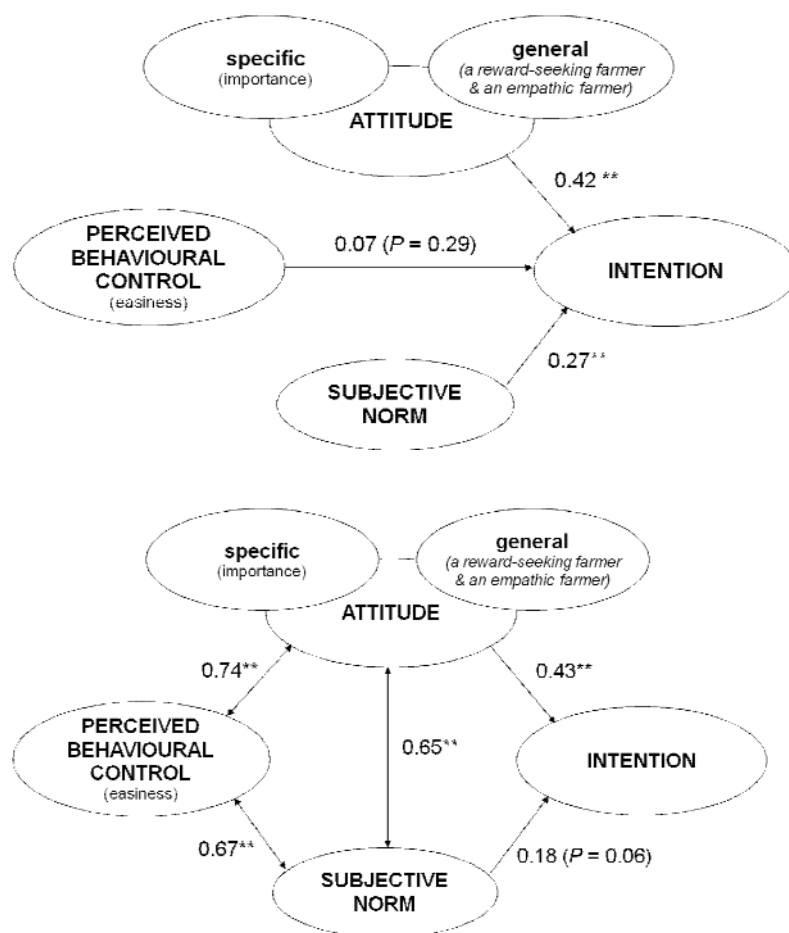
The farmers regarded animals as individuals when emphasising welfare as an intrinsic value. Most of them stressed that the welfare of their animals and themselves are dependent on each other. This ethical viewpoint was often intertwined with the humane treatment of animals as an object of the attitude, even though it was possible to support humane treatment with instrumental grounds as well.

In this context, both the abstract values discussed above could also be interpreted as general ideologies that provide two positive but different evaluations of animal welfare. The instrumental view was most smoothly associated with providing the animals with a favourable environment and taking care of the animals' health. The farmers holding the instrumental view seemed to think that improving animal welfare is important because they believed that it increases the economic output.

We have been discussing farmers' attitudes here with a single interview statement as an example, but similar

Figure 3

Standardised regression weights (single-headed arrows) and correlations (double-headed arrows) between the elements of the TPB in two separate models (** $P < 0.01$). Compare with Figure 1.



attitude constructs were also identified in the farmers' comments on the other statements. When commenting on the rest of the statements, the farmers' stands and justifications also revealed different views on the other main elements of the TPB, subjective norms and perceived behavioural control. In the course of the interviews, the farmers cited authorities such as slaughterhouses and dairies as well as veterinarians and other outside authorities regularly visiting the farm. Consumers were often ignored or referred to with a dismissive tone. The interviewees associated the intrinsic attitude with fewer norms than the instrumental attitude. Most farmers stated that the resources for improving animal welfare are constrained, the limiting factors being concerns, such as the economic situation, increased competition, the principles of effectiveness, and the farmer's own well-being. In this case, improving animal welfare was understood as investing heavily in animal housing, technological and management solutions, the employing of stockpeople, etc. A few farmers thought improving animal welfare depended on one's own attitude: if you want to, you can improve the welfare of your animals.

Here, improving animal welfare was seen as the humane treatment of animals, as small everyday choices and practices which do not necessarily require much money.

Questionnaire study

Description of the original data

Table 1 illustrates the summary statistics of the initial variables in the study. The farmers considered taking care of the animals' health and their own well-being as the most important means of improving animal welfare. Treating the animals humanely was the easiest measure to follow. Likewise, taking care of the animals' health and treating them humanely were the most favoured intentions. In general, the measures to improve animal welfare were regarded as important but not as easy to put into practice. Veterinarians were the most influential of the subjective norms, while traders and consumers had the least significance. The farmer's obligation to treat his/her animals well was the most important issue at the level of general attitudes.

Results of the Principal Component Analysis

Table 2 illustrates how specific animal welfare improvement measures are grouped into four main objects of attitudes in the PCA when concerning the easiness ('humane treatment', 'farmer's well-being', 'favourable environment', 'animal health') and into three objects when considering the importance of improving animal welfare (using all the above-mentioned objects except 'animal health', whose items were scattered within other components). Abstract, general level attitudes appeared as two separate value dimensions: the respondents were profiled as so-called 'reward-seeking farmers', and as 'empathic farmers'. Subjective norms were loaded into separate components of their own, except for the first one, which included both the traders and the consumers. These components accounted altogether for 54–80% of the variance. The averages of each component appear in Table 2 as the response mean.

Correlations between the components of the PCA

There were a few connections between the attitude components and the four behavioural intentions, although the correlation coefficients were generally low. The general attitude of 'the reward-seeking farmer' ($\rho = 0.31, P < 0.01$), the specific attitudes regarding the importance of humane treatment ($\rho = 0.35, P < 0.01$) and a favourable environment ($\rho = 0.35, P < 0.01$), and perceiving other farmers as subjective norms ($\rho = 0.32, P < 0.01$) correlated with the intention to treat animals humanely. Stressing the importance of a favourable environment also correlated with the intention to take care of the animals' health ($\rho = 0.32, P < 0.01$). Perceiving the researchers and other specialists as subjective norms was connected with the intention to build or restructure facilities that improve animal welfare on the farm ($\rho = 0.34, P < 0.01$). There was no connection between the perceived behavioural control (ie the perceived easiness of improving animal welfare) and the intentions.

The Structural Equation Model of Attitudes (SEM)

We specified the measurement model by defining the latent variables where the four elements of attitudes formulated with PCA served as latent variables. There were only two observed variables defining the latent variable 'general attitude'; therefore, we combined general and specific attitude into one single latent variable named 'attitude'. This first structural path model (Figure 3 [top]) with a maximum likelihood estimation did not provide a good fit to the data ($\chi^2 = 548.8, df = 149, P < 0.001, RMSEA = 0.095, CFI = 0.749$) and had to be modified. First, we omitted the direct connection between the perceived behavioural control and the intentions, and second, we allowed the perceived behavioural control, the attitudes, and the subjective norms to correlate with each other. The modified model (Figure 3 [bottom]) provided a fairly reasonable fit to the data ($\chi^2 = 370.2, df = 147, P < 0.001, RMSEA = 0.072, CFI = 0.860$). According to the second model, the attitude (consisting of the general and the specific attitudes) was the strongest predictor of the behavioural intentions. The perceived behavioural control

did not directly predict the intentions, but was strongly connected with the attitudes and the subjective norms that were related to each other. This modified model with a slight deviation from the TPB better described our data than the first model, which strictly followed the theory.

Discussion

Farmers' perceptions

Improving animal welfare as specific actions and general values

The qualitative study indicates that improving animal welfare can be constructed in many different ways and at different conceptual levels. In the interviews, farmers discussed improving animal welfare as four concrete sets of specific actions and as two general, abstract values. Providing the animals with a favourable living environment and healthcare were the most often mentioned ways to improve animal welfare. These findings are similar to previous studies where pork producers defined animal welfare in terms of high productivity (Borgen & Skarstad 2007; Hubbard *et al* 2007), as a good health status (Bruckmeier & Prutzer 2007; Kling-Eveillard *et al* 2007), and as the good physical functioning of animals (Menghi 2007; van Huik & Bock 2007). In our study, farmers considered taking care of their own well-being a particularly important group of actions: they perceived that animal welfare and their own welfare were dependent on each other. Another important group of actions disclosed in this study was the humane treatment of animals which, however, resulted in a higher variation in farmers' opinions. At the general level, the farmers evaluated improving animal welfare on the basis of either an instrumental or an intrinsic value. This has also been found in previous studies (Lund *et al* 2004; Porcher *et al* 2004; Austin *et al* 2005). Depending on the context, the same farmer might use both values.

The quantitative study asserted that the division of actions and values was statistically valid. The same patterns of the specific actions and general values emerged in the questionnaire study. The variation in the responses reveals that the farmers took stands in several ways depending on the set of specific actions in question. For example, improving animal welfare by treating the animals humanely was more important to the farmers than improving welfare by providing the animals with a favourable environment. The farmers' comments also differed depending on the phrasing of the question: whether we asked their opinion on improving animal welfare in general or improving it with a certain set of actions. At the general level, the value dichotomy differed slightly from the one found in the qualitative study: the instrumental value was replaced with the concept of 'the reward-seeking farmer', which represented the majority of farmers. The concept of 'an empathic farmer', representing the minority of the farmers, corresponded with the intrinsic value. The main reason for the difference between the findings in the qualitative and quantitative analyses is presumably the fact that in the qualitative part, the farmers did not perceive the two values as

excluding each other but rather as being connected in many different ways. The farmers also expressed the difficulty of prioritising one value over another. For this reason, it is understandable that the instrumental and intrinsic values did not divide the farmers into two separate groups in the quantitative part.

Intentions predicted by attitudes, subjective norms, and perceived behavioural control

The farmers' intentions to improve animal welfare were best explained with their attitudes towards the specific welfare-improving actions in the questionnaire study. A positive attitude towards the humane treatment of animals, as well as providing animals with a favourable environment, was associated with the intention to treat animals humanely. The perceived importance of a favourable environment was also associated with the intention to take care of the animals' health, which can be interpreted as preventative healthcare. Staying healthy can be seen as a physical and physiological feature of an animal promoted by improving the animal's living conditions: as is well known, high quality flooring promotes hoof health, for instance (Moultotou *et al* 1998; Rushen *et al* 2007).

Being 'a reward-seeking farmer' was associated with the intention to treat the animals humanely. Being 'an empathic farmer' was not associated with any of the intentions; thus prioritising animal welfare would not necessarily lead to genuine improvements in animal welfare. According to previous studies, this is not surprising: for example, people can be very fond of their pets and, at the same time, ignorant and even indifferent regarding the care of them (Drews 2002). On the other hand, the empathic farmers may already have a high standard of animal welfare, but when considering improving animal welfare as a process there is no absolute maximum level.

In addition to the specific attitudes, the subjective norms affected the farmers' intentions. Appreciating researchers and other specialists was associated with the intention to provide the animals with a favourable environment. Thus, scientific knowledge or the trust in the credibility of that knowledge can affect the farmers' intentions to improve animal welfare by investing in the animals' living conditions and buildings at the farm. However, based on this data, we cannot know if it was the scientific information that inspired the farmer or if the farmer first had the intention and then sought out the scientific information. The importance of other farmers as a peer group was associated with the intention to treat animals humanely. On the basis of these results, we state that researchers and other farmers can make a difference: if the farmer considers these authorities to be important and feels that they expect improvements in animal welfare, he/she will probably also devote himself/herself to improving the welfare of his/her animals. In the qualitative interview data, there were more subjective norms associated with the instrumental attitude towards improving animal welfare than with the intrinsic one. This means that the authorities behind the subjective norms have the greatest influence on the production-centred farmers

with instrumental attitudes. The way these authorities define animal welfare may interfere with and affect the farmers' own perceptions as items such as health, lack of illness, good growth, and high quality of meat or milk are used as indicators of animal productivity and welfare.

In our data, the importance and easiness of the welfare-improving actions were often in conflict: the farmers perceived the actions as important but relatively difficult to carry out. In contrast to Ajzen (2002), the easiness of improving animal welfare as an indicator of perceived behavioural control was not significantly associated with any of the intentions. Several factors, such as economic resources or legislation (Fishbein & Ajzen 1975), might hinder farmers from carrying out their intentions. The farmers considered taking care of their own well-being as extremely important but particularly problematic in practice. This might be a further obstacle to improving animal welfare: if the farmers are at the edge of their own well-being and motivation, then carrying out animal welfare-improving actions is probably challenging. However, the SEM illustrated the indirect effects of perceived behavioural control and subjective norms through attitudes on intentions in our data.

The qualitative interview and survey as support for each other

The analysis of the qualitative interviews specified the ways farmers take stands in improving animal welfare and how they conceptualise animal welfare as a whole. By means of this qualitative specification, we were able to construct the quantitative part of the study (the questionnaire). Thus, carrying out the qualitative study as a preliminary research step ensured that the quantitative questionnaire study focused on the relevant issues of improving animal welfare from the farmers' point of view. The qualitative analysis of the interview study also disclosed themes not explicated in previous studies, such as the considerable influence of the farmer's own well-being on the improvement of animal welfare.

The SEM of the questionnaire data revealed the connection between the farmers' attitudes and their intentions as well as the connection between the subjective norms and intentions. In the quantitative analysis of the questionnaire data, however, certain unpredictable phenomena emerged, such as that the perceived behavioural control was not directly connected with the behavioural intentions. Through the influence of the farmer's own well-being, the lack of connection between the perceived behavioural control and the intentions can be seen in a new light: if farmers perceive it hard to keep up their own well-being and motivation, they probably also find it demanding to invest in improving animal welfare (according to well-established theories of depression, lowered motivation is related to impaired performance and decision-making [Abramson *et al* 1978; McAllister 1981]). Without the qualitative analysis, the significance of the farmers' own well-being, that is, the gap between the perceived behavioural control and the intentions, would have remained a statistical oddity or at least incompletely explained.

The polarisation of farmers into two groups, the instrumental business-oriented and the intrinsic welfare-oriented groups, has already been seen in previous studies (eg Lund *et al* 2004), but the general attitudes of reward-seeking and, on the other hand, empathy, are the concepts related to the evaluation of animal welfare discovered in our questionnaire study. Through the concept of instrumental and intrinsic values, the responsible and animal welfare-prioritising viewpoints can be put into perspective and paralleled with the findings of previous studies. These examples demonstrate how the concepts disclosed by the qualitative interview study make it possible to explain and generalise the statistical findings of the quantitative questionnaire study theoretically and extensively to a larger group of farmers.

The TPB as a conceptual framework in structuring the interaction between the qualitative interviews and the questionnaire study

The TPB is often applied in quantitative approaches where the focus is not on the respondents' justifications for their comments. It is also typically applied with an assumption that the respondents' objects of attitudes are preconceivable and that the researchers and the respondents share and identify the idea of the object in the same way. Yet, the same issue can be perceived and understood in several ways as several distinct objects of attitudes (Asch 1940; Vesala & Rantanen 1999). For example, the farmers in our study were almost unanimous in their perceptions of the importance of animal welfare but had different motivations: a farmer with an instrumental view on animal welfare evaluates the outcomes of animal welfare improvement measures through the economic output, whereas a farmer with an intrinsic view weighs the outcomes from the standpoint of the animals' feelings. Through a mere structured questionnaire study it would not be as easy to identify such differences in attitude objects.

The central idea of the TPB is to examine specific attitudes focusing on a certain behaviour rather than general attitudes focusing on an abstract phenomenon. When studying the connections between attitudes and behaviours, it is essential to measure the object of the attitude on a relevant scale, that is to say, the attitude measured and the consequential behaviour must be on the same scale. Through the interviews, we aimed at finding out how the farmers perceive the improvement of animal welfare as an action, and thereafter in the questionnaire study we asked the farmers about their intentions to carry out these actions. In some of the previous studies concerning farmers' and caretakers' attitudes, the object of the attitude has been the production animal itself (Lensink *et al* 2000), production animal welfare in general (Velde *et al* 2002), or the human-animal relationship (Bertenshaw & Rowlinson 2009; Hanna *et al* 2009). Yet, according to the TPB, the attitude towards certain behaviour gives a better estimate of future behaviour than a general attitude, which has also been proven in a previous study concerning caretakers' behavioural intentions (Waiblinger *et al* 2002).

Critical aspects in the implementation of the study

According to the TPB, a crucial factor preceding and predicting human behaviour is the individuals' perceived behavioural control over the issue they perceive as important, irrespective of their actual control. In our study, we measured the perceived behavioural control by asking the respondents to estimate how easy it would be to carry out particular animal welfare-improving measures on their own farms. We did not enquire about the respondents' opinions on their actual control over the desired outcome. This may partly result in the observed gap between the easiness of improving animal welfare as a measure of perceived behavioural control and the behavioural intentions.

In addition, we did not ask the respondents if they had already carried out certain measures to improve animal welfare at their farms, but only asked for their intentions. The farmers may think they already have a welfare standard high enough, or they already have implemented the actions they consider important. For instance, farmers who have just built a new barn with welfare-improving technical solutions are probably not going to rebuild one in the near future. The lack of relationship between attitudes and intentions may thus be more pronounced than in reality due to the fact that we do not know the actual welfare standard of the farms. Yet, according to the TPB (Ajzen & Fishbein 1980), this is of little significance: when considering the improvement of animal welfare, it is not a question of being satisfied with the existing welfare standard but of being willing to improve it even further. A farmer with a high welfare standard but with no intentions to push it any higher is not, by definition, interested in the actual process of improving animal welfare, where the focus of our study lies.

The response rate of the questionnaire study remained 35%. We sent the questionnaires to the farmers at the beginning of the summer when most farmers were busy with their farm work. In a later telephone survey of dairy farmers, being too busy was the main reason for not responding. The missing responses on pig farms were analysed by contrasting the respondents' piglet production figures with the correspondent figures of the farmers who failed to respond. The farmers who had responded reached a number of weaned piglets slightly above the national average. Obviously, the welfare-oriented farmers are over-represented in our data; consequently it is not possible to generalise the results to all Finnish farmers. The positive view on improving animal welfare was strongly emphasised in the interview data as well. Thus, we can only indirectly estimate how the improvement of animal welfare would be constructed if the data also contained interviewees and respondents with distinctly negative, opposing attitudes.

Animal welfare implications

The farmers' way of perceiving the improvement of animal welfare as two abstract, general values and four categories of specific, concrete actions is the most important finding of this study. The perceived conflict between the farmers' views on the importance of improving animal welfare and the difficulty of putting it into practice indicates that the

improvement of animal welfare requires society to take more responsibility.

Our study demonstrates that by adapting a valid conceptual framework and applying relevant qualitative and quantitative methods that support each other, we are able to elucidate the underlying meanings and values in farmers' views on improvement of animal welfare. This approach aids in developing communication between farmers and other stakeholders.

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