

## Do farmers and scientists differ in their understanding and assessment of farm animal welfare?

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### Abstract

In response to an increased public awareness regarding how livestock are reared, animal welfare scientists have attempted to develop new methods of welfare assessment at the farm level. Furthermore, in recent years they have increasingly moved away from the conventional approach of evaluating the provision of resources necessary to ensure good welfare, and have instead focused on the use of animal-based measures of welfare. In contrast, it is believed that farmers use mostly resource-based and management-based measures (eg the provision of food, water and housing) when assessing the welfare of their animals. They also seem to be driven more by economic and financial concerns than by the welfare of the animals per se, when it comes to the provision of animal welfare. Different approaches to the definition and assessment of farm animal welfare were explored in work carried out at Newcastle University as part of the Welfare Quality® project by both social and welfare scientists. Social scientists explored farmers' perceptions and understanding of animal welfare, whilst welfare scientists developed animal-based measures of welfare for use in a prototype on-farm welfare monitoring system. Based on two separate surveys, this paper focuses on UK farmers' perception and understanding of animal welfare and their criteria of assessment in contrast with those employed by welfare scientists, using a specific case study of pigs. Results show that, despite scientists being unaware of the findings from the farmer survey, they produced a set of measures to assess welfare which were very similar to those used by farmers. However, 'instinctive' terms used by farmers to describe (positive or negative) animal behaviour did not bear any relation to more objective welfare measures. Compared with conventional monitoring systems which focus more on the provision of resources to promote good welfare than on the animal itself, the prototype monitoring system may be more acceptable to farmers given that it uses similar animal-based measures to assess welfare to those they use themselves, and furthermore, the focus is on the animal.

**Keywords:** animal-based measures, animal welfare, farm assurance schemes, pigs, qualitative behaviour assessment, welfare monitoring system

### Introduction

Although 'animal welfare' is a widely used term, there is no agreed definition for it and how it should be measured (Barnard 2007). There is, however, a consensus amongst animal welfare scientists regarding its complexity and multi-dimensional nature (eg Duncan & Fraser 1997; Fraser *et al* 1997; Fraser 1999; Scott *et al* 2001; Sandøe *et al* 2003; Fraser & Weary 2004; Duncan 2005). The multi-faceted issues of the animal welfare concept lie within the nature of the animal welfare science as *per se*, an inter-disciplinary work, which includes (*inter alia*) the study of husbandry and human-animal interaction (Lund *et al* 2006). It is actually the link to humans and their understanding of animals, especially in relation to feelings, needs and natural behaviour, that makes animal welfare a more intricate concept. As physical, mental and natural aspects of welfare can sometimes conflict, the concept is also subject to practical and ethical challenges (Buller & Morris 2003;

Hewson 2003). Additionally, at the society level, the definition incorporates the "cultural developments of the societal view about the relations between man and animals" (Carenzi & Verga 2009). Hence, "the term can mean different things to different people" (Hewson 2003).

Scientists examine animal welfare from various individual and disciplinary angles (Bock & van Huick 2007), and the definition and assessment of welfare often reflects the researchers' background (Carenzi & Verga 2009). For example, welfare scientists (throughout this paper welfare scientists refer to natural scientists) examine the concept from an 'animal's point of view', trying to understand how different livestock production practices affect the well-being of animals, whereas social scientists study 'animal welfare from a human point of view and into the concerns and interests of citizens and consumers' (Bock & van Huick 2007). Yet, the assessment of animal welfare from 'an animal's point of view' is subject to debate as most 'tradi-

tional concepts and measures of welfare have relied on a suite of essentially anthropomorphic criteria" (Barnard 2007). Nonetheless, amongst animal scientists, it is generally agreed that a comprehensive definition and assessment of animal welfare should consider not only physical (eg freedom from disease, injury and incapacity) and mental (eg emotional distress) aspects (eg Simonsen 1996; Webster 2001), but also animal behavioural needs (eg Hewson 2003; Fraser 2004).

Duncan (2005) stressed that two schools of thought have evolved within the scientific animal welfare community, ie the 'biological functioning' school dealing with the 'physical health and well-being' and the 'feelings' school which concentrates more on psychological health and animals' feelings. In their study, Dockès and Kling-Eveillard (2006) tried to capture all of the above aspects, but also added new dimensions to the definition of animal welfare. They identified four major scientific approaches for defining animal welfare: (i) the biological and technological approach which focuses on the fundamental needs of animals and the 'five freedoms' (as defined in Brambell's Report) as well as on animals' technical performance; (ii) the legal (regulations) approach through which animals are recognised and defined as 'sentient beings' and which translates some social expectations and scientific definitions into laws; (iii) the philosophical approach which concentrates on the animals' roles in the society (eg as a 'pet or 'production tool'); and (iv) the communication between man and animal, with a specific emphasis on the interaction between farmer and animal and the farming industry. Recently, Carezzi and Verga (2009) also concluded that for a comprehensive definition of animal welfare it is not only the 'body and mind' of the animal that matter but 'everything that links them'.

Despite the existence of a variety of scientific approaches to assess animals' well-being, the evaluation and monitoring of animal welfare at the farm level is rather complex, given the variety of farmed species and the large number of welfare criteria/parameters that should be considered (Hubbard *et al* 2007). As regards farmers, their assessment of animal welfare is based, in general, on personal judgement, experience and stockmanship, which some may argue relate more to resource management-based measures rather than to animal-based measures of welfare. However, although farmers associate animal welfare primarily with health, the provision of food and water, and shelter (Te Valde *et al* 2002; Vanhonacker *et al* 2008), there is little doubt that they would not wish to see their animals suffering unduly (Buller 2009). Animal welfare on the farm is also linked with the economic well-being of the farmer (Scott *et al* 2001), and this aspect should not be ignored when assessing farm animal welfare. Nevertheless, although farmers seem to be 'more economically driven' and concerned with 'the need to make a living', they are also interested in supplying "high quality products, to have a satisfying job and establish a more positive image of agri-

cultural and livestock production" (Vanhonacker *et al* 2008). Several studies (eg Te Valde *et al* 2002 and Marie 2006) noted that farmers are rather indifferent towards some aspects of animal welfare, for example, an animal's ability to engage in natural behaviour. Yet, Vanhonacker *et al* (2008), examining citizens' and farmers' perception of animal welfare, found that farmers were far from being indifferent with regards to animal natural behaviour. In their view, this is mainly due to an existing conflict between farmers' interests and their values, as a shift towards a production system with more consideration for natural behaviour is perceived as highly costly and "may jeopardise the economic performance and continuity of their farm".

Many of the existing monitoring systems developed by welfare scientists for farm animal welfare are based largely on environmental (resources) and production-based descriptors, however, the link between specific resource measures and an animal's welfare status is not always clearly understood (Blokhuys 2008). This may be behind the work of animal welfare scientists in recent years, who have attempted to develop new, modern methods of welfare assessment at the farm level, and have increasingly moved away from the conventional approach of evaluating the provision of resources (eg food, water and shelter) necessary to ensure good welfare, and instead focused on the use of animal-based measures of welfare (eg behaviour). One such example of this 'modern' approach to welfare assessment at the farm level is the recently completed Welfare Quality® project. One of the main aims of this project was to develop a standardised (prototype) on-farm welfare monitoring system that uses predominately animal-based measures of welfare (eg behaviour, health, appearance conditions and human-animal relationship). This prototype monitoring system may be then translated to allow for clear marketing and profiling of products and, thus, could help consumers make informed choices about the products they buy.

This paper is based on two separate studies conducted within the Welfare Quality® project and allows for a comparison to be made between the way in which farmers (engaged in various farm assurance schemes or not) define and assess the welfare of their own animals, and the way in which welfare scientists define and assess animal welfare. Using a specific case study of pigs, a team of social scientists explored UK farmers' perceptions and understanding of animal welfare and their criteria of assessment, whilst welfare scientists were part of a team that developed animal-based measures of welfare for use in a prototype on-farm welfare monitoring system. To the best of the authors' knowledge, there are no comparable published studies that examine farmers' perceptions, understanding and assessment of farm animal welfare in comparison to those of welfare scientists. With this paper, the authors seek to contribute to the debate on the understanding of the complex concept of farm animal welfare, and add to the existing limited literature.

## Materials and methods

### Farmers' survey

#### Sampling

To assess the beliefs, attitudes and views of UK pig producers regarding animal welfare, a total of 60 UK pig farmers were surveyed using face-to-face semi-structured interviews (Hubbard *et al* 2005). As UK pig production is concentrated mainly in England (82% of the total number of pigs), the sample was composed only of English farmers, assuming that producers from Scotland, Northern Ireland and Wales would have the same behaviour, given the similarity of animal welfare standards that operate across the UK. Farmers were sampled in accordance with the geographical distribution of pig production across England, mainly from East Anglia, Yorkshire and Humberside. The sample covered all farm sizes and the three major types of pig producer, ie breeder, breeder and finisher and finishers, however the effect of the type of pig producer on their understanding of farm animal welfare was not considered. The sample was also constructed so to include farmers engaged within the major UK farm assurance schemes, ie Assured British Pigs (ABP), Freedom Food (FF) and Genesis Quality (GQ), but also organic farmers, members of the Soil Association (SA) and farmers who do not take part in any scheme (or 'non-assured'). The inclusion of farmers engaged in these types of farm assurance schemes was important to ascertain whether the type of farm assurance schemes (top-quality versus animal welfare-focused schemes) (in accordance with the definition of animal welfare scheme used within the Welfare Quality® project [see Bock & van Leuwen 2005] the UK schemes were classified as follows: ABP and GQ — top [farm] quality schemes which cover animal welfare standards more stringent than the EU and national legislation; FF — specific animal welfare schemes which focus explicitly on animal welfare and SA — organic scheme) influences farmers' views on animal welfare. Hence, the sample included 23 farmers from ABP, 6 from GQ, 19 from FF and 6 from SA. As ABP is the largest farm assurance scheme for pig producers in England (and Wales) covering 90% of the total pig production, the sample ensured that the largest share of interviewed farmers were ABP members. The share of those 'non-assured' farms accounted for only 10% of the total sample; however, this seems reasonable as the number of pig farms in the UK not engaged in farm assurance schemes is relatively small. Moreover, these non-assured farms are of small sizes and able to sell their products directly at the farm gate or through outlets which do not require farm assurance scheme membership. Some of these farms have been previously engaged with a scheme but withdrew (or were forced to withdraw) for various reasons. Membership of farm assurance schemes is voluntary in the UK, however, participation is very important particularly for those (large scale) farms that sell their products through retailers and other outlets which request membership. In fact, most abattoirs and the big supermarkets in the UK require their suppliers to be members of a farm assurance scheme.

#### Farmers' questionnaire and interviews

The interview guide was designed so to define integrated, knowledge-based and practicable strategies to improve farm animal welfare. It focused on exploring the diversity of farmers' views on animal welfare and identifying barriers (faced by farmers) for the delivery of higher animal welfare. Two questionnaires, comprising mostly open-ended questions, were designed; one for participants in farm assurance schemes and one for non-assured farms. The questions were clustered around a number of broad themes (although not all are discussed in this paper): motivation and barriers for participation in schemes; animal welfare definition, importance and practices for welfare assessment; knowledge of animal welfare legislation, monitoring, control and inspection; animal welfare during transport; and animal welfare and society. The majority of the interviews (50) were carried out by professional investigative officers from Farm Business Survey (FBS) Units (there are eleven FBS units across the UK, the main objective of which is to carry out regional surveys of farming profitability on behalf of the Department for Environment, Food and Rural Affairs [Defra], information which ultimately becomes part of the Farm Accountancy Data Network [FADN] of the EU), the rest were completed by one of the members of the research team. The interviews followed a semi-structured format and they lasted on average one-and-a-half hours. Farmers' answers were written down. Each question was then analysed individually across the interviews, and a list of 'themes' was identified for each type of farm assurance scheme and for non-assured farms. These were then compared and synthesised in an overall analysis. The closed questions (eg type of scheme, respondent's gender, type of farm, age, and number of animals) were coded and introduced in SPSS to generate some descriptive statistics.

#### Prototype welfare monitoring system

A team of welfare scientists working on the Welfare Quality® project identified four principles necessary for good animal welfare (good feeding, good housing, good health and appropriate behaviour), and for each, a number of welfare criteria were defined (Table 1) (Welfare Quality® Protocol 2009). These principles and criteria were identified through reviews of the scientific literature and/or pilot studies were undertaken where necessary, and were finalised using feedback from consumer focus groups (for full details see Miele 2009). Potential measures were further refined to produce a definitive set of animal-, resource- and management-based measures that were incorporated into three separate prototype monitoring systems (Velarde *et al* 2007) to reflect the different stages of pig production (grower/finisher pigs, sows and piglets and slaughter pigs). The monitoring system for grower/finisher pigs was trialled on farms in France and Spain, whilst the monitoring system for slaughter pigs was trialled at abattoirs in Spain. The sow monitoring system was trialled on 42 pig farms in the UK and 40 in The Netherlands. Since we are drawing comparisons with opinions of UK farmers, this paper considers only the data generated by the prototype monitoring system on UK farms.

**Table 1** The welfare principles and criteria defined by the Welfare Quality® project and the on-farm measures used to satisfy these criteria.

Principles	Welfare criteria	Sow/piglet	On-farm measures	
Good feeding	1 Absence of prolonged hunger	For sows	Body condition score Feeding management	
		For piglets	Age at weaning	
Good housing	2 Absence of prolonged thirst	For sows and piglets	Water supply (number of drinkers, hygiene of drinkers)	
		3 Comfort around resting	Absence of manure on the body	
	4 Thermal comfort	For sows For sows and piglets	Bursitis, shoulder sores Percentage of animals shivering Percentage of animals panting Degree of social thermoregulation (huddling) Environmental temperature	
Good health	5 Ease of movement	For sows	Total pen space and stocking density Presence and size of stalls Presence and size of farrowing crates	
		6 Absence of injuries	For sows and piglets For sows	Lameness assessment Wounds on the body Vulval lesions
	7 Absence of disease	For sows and piglets	Respiratory problems (coughing, sneezing, pumping) Enteric problems (rectal prolapse, scouring, constipation) Health management strategy Management of sick animals Criteria for euthanasia Hygiene/cleansing routine	
			For sows	Reproductive problems (metritis, mastitis, uterine prolapse) Skin conditions Ruptures and hernias Localised infections
			For piglets	Neurological problems (muscle tremors, paddling of limbs) Splay leg
		8 Absence of pain induced by management procedures	For sows For piglets	Mutilations (nose-ringing, tail docking) Mutilations (teeth clipping, castration, tail docking)
		9 Expression of social behaviours	For sows	Positive social behaviours (sniffing, nosing, licking) Negative social behaviours (aggression, biting)
			10 Expression of other behaviours	For sows and piglets For sows
	11 Good human-animal relationship	For sows		Fear of/withdrawal from humans

The prototype monitoring system used predominately animal-based measures of behaviour, health and physiology to assess welfare, including a qualitative behaviour assessment (QBA). This paper focuses on the QBA element of the monitoring system as the authors wanted to ascertain

whether terms farmers used to assess welfare were reflected in the QBA descriptors and how these related to more objective welfare measures. Those interested in the methodologies and preliminary analysis of the full monitoring system should refer to Scott *et al* (2009).



The qualitative assessment of behaviour essentially takes a 'whole animal' approach to assess the quality of an animal's experience (Wemelsfelder 2007). The observer combines different pieces of information that are rarely used in quantitative approaches, such as incidental behavioural events, the expressive quality of behaviour (eg *how* the animal moves, *how* it interacts with its surroundings), and the context in which the behaviour occurs (Wemelsfelder *et al* 2001; Wemelsfelder 2007). In the prototype monitoring system, 20 qualitative descriptors of pig behaviour were incorporated, including 'active', 'relaxed', 'fearful', 'playful', 'frustrated', 'content', 'bored' and 'aimless', each of which was evaluated on a continuous line of 125 mm (the same as used in Free Choice Profiling studies). The line was defined only by its left 'minimum' and right 'maximum' points, meaning that at 'minimum' the expressive quality indicated by the particular term was entirely absent in any of the pigs observed on the farm, and that at 'maximum' the expressive quality was ubiquitously dominant in all pigs (Wemelsfelder & Millard 2006). The QBA was carried out at the start of the farm visit, once the assessors had familiarised themselves with the farm and its various areas. The assessment was carried out at the farm level, after animals in a number of pens or areas had been observed for between 2.5 and 10 minutes each. The length of time pens/areas were observed for was dependent on the number of observation points the assessor selected (up to a maximum of eight), and was in accordance with a predetermined schedule (Wemelsfelder & Millard 2006). On small farms with fewer pens/areas, there were invariably fewer observation points, however, each observation was for a longer period of time (eg with two observation points, the duration of each observation was ten minutes, in contrast to seven observation points, where the duration of each observation was three minutes). For each term, a score of zero or 'minimum' indicated that the expressive quality indicated by the term was entirely absent; whilst a score of 125 or 'maximum' indicated that the term was pervasively dominant across all pigs.

As previously mentioned, the prototype monitoring system incorporated a number of other animal-based measures of welfare (eg health and physiology), and this allowed for the relationship between these more objective measures of welfare and the QBA terms to be investigated. Most of the animal-based measures were assessed using a three-point scale, ranging from 0 to 2. For each measure, the qualification of the different points of the scale were specific to that measure alone, (for full details refer to the Welfare Quality® assessment protocol for pigs [Welfare Quality® 2009]), however, for all measures the assessment scales were selected so that a score of 0 was awarded where there was no welfare problem, a score of 1 was awarded where there was a mild welfare problem and a score of 2 was awarded where there was a severe welfare problem. Pearson correlation coefficients were calculated (using Minitab Release 15.1) to investigate the relationship between specific QBA terms and mean farm scores for a variety of animal-based measures (eg body injuries, health problems and stereotyped behaviour).

## Results

### Farmers' survey

Animal welfare is an important consideration for farmers; 90% of survey participants rated animal welfare as very important or important, and only 10% of participants were ambivalent about welfare, regarding it as neither important nor unimportant. When asked why welfare was important to them, most farmers stated as major reasons moral/ethical concerns (58% of total participants) and economic performance (57%); however, 30% of participants were also concerned with the public's perception of pig farming, with some farmers stating:

... from a public point of view, animals must be seen to be treated well...to have confidence in our product (ABP farmer).

Today it is obviously important for people outside farming to know that animals are kept well (FF farmer).

Farmers have the obligation to their animals to provide high welfare. The public now have a greater understanding of welfare issues and ultimately they [the consumers] are our market (ABP farmer).

Most farmers who mentioned ethics also pointed out economic performance as an important reason. In farmers' view, animals treated badly will not perform, so:

they [animals] should be looked after properly as animals that thrive are more economic (ABP farmer).

Animal welfare is vital. Stock not well kept does not thrive and good performance is necessary on economic grounds (FF farmer).

Only nine farmers mentioned other reasons (eg food safety and law enforcement) for why animal welfare is important. Farmers, in general, view animal welfare in a broader context. Animal welfare is, after all, a moral obligation but is also important from an economic point of view. Across the farm assurance schemes, however, there are some differences between farmers' perception regarding the reasons why animal welfare is important. Most farmers from FF (63%) and all SA farmers consider that animal welfare is important primarily from an ethical point of view:

From a moral point of view we would always want our animals to be looked after and have a happy life. All good farmers want to look after their animals properly as living beings with rights (FF farmer).

It is unthinkable to me not to treat animals with all the proper care and consideration that they deserve (SA farmer).

In contrast, farmers from ABP and GQ see animal welfare as primarily important from the perspective of economic performance and the profitability of their businesses. Still, most of these farmers link ethics to the economics of their business. This situation is also revealed when analysing the perceptions of 'non-assured' farmers. All stated that animal welfare is important from both an ethical and economic point of view, as "a happy animal is a productive animal".

Farmers were also questioned about their perception and understanding of animal welfare. Analysis of the responses showed that most farmers (95% of total) perceived animal

welfare as the quality of life, or the well-being, of the animal. Additionally, 88% of them associated animal welfare with the freedom from hunger, thirst, pain, injury, discomfort, stress and fear. Animal welfare also means good stockmanship (human-animal interaction) as most of them take pride in caring about their animals; additionally, 83% of farmers related animal welfare to animal health and some 73% to the freedom to express normal behaviour. With one exception, there are no clear differences between farmers' perception of animal welfare across the schemes or between those that are members of a scheme and those that are not. The exception is that whereas most FF (90%) and all organic farmers associated animal welfare with the freedom to express normal behaviour, this was valid for only 62% of the ABP and GQ farmers, taken together.

When asked how they assess the welfare of their animals, most farmers mentioned it as being good and very good. The majority (86%), however, considered that there is still room for improvement of animal welfare at the level of their farm. Their assessment of animal welfare is based, in general, on personal judgement, experience and stockmanship. A good and experienced stockman knows how to care properly for his animals, has the ability to 'communicate' with them and can handle them in a gentle and effective manner. As a criteria of assessment, farmers placed a high degree of emphasis on the animals' appearance and behaviour, for example, good health, animals look content/comfortable/relaxed, are non-aggressive, are playful and energetic, have bright eyes and do not look stressed. They also check and observe their animals daily and ensure that animals are provided with 'what they need': proper food and clean water, bedding (eg straw), enough space, ventilation, light, shelter and shade, and sanitation. Checking and observing the animals closely is crucial for ensuring good farm animal welfare. Overall, farmers perceive their ability to assess animal welfare as part of their professional knowledge and practice. They are also consistent in how they assess the welfare of their animals and there are no clear differences amongst the schemes' members or between these and 'non-assured' farmers. Five major criteria of welfare assessment have emerged overall:

- (i) provision of necessary resources: appropriate food, water, sufficient space, ventilation and light;
- (ii) animals' appearance and behaviour: good health/content looking/comfortable/relaxed/non-aggressive/playful and energetic/bright eyes/unstressed;
- (iii) economic performance: growth rate/food conversion;
- (iv) low mortality and lack of diseases and vices;
- (v) satisfactory veterinary inspections and other (farm assurance scheme) inspectors' opinions.

#### *Prototype welfare monitoring system*

The welfare scientists were unaware of the results from the farmer survey when they were developing the prototype monitoring system, however, they independently produced a set of animal-based measures to assess welfare that were very

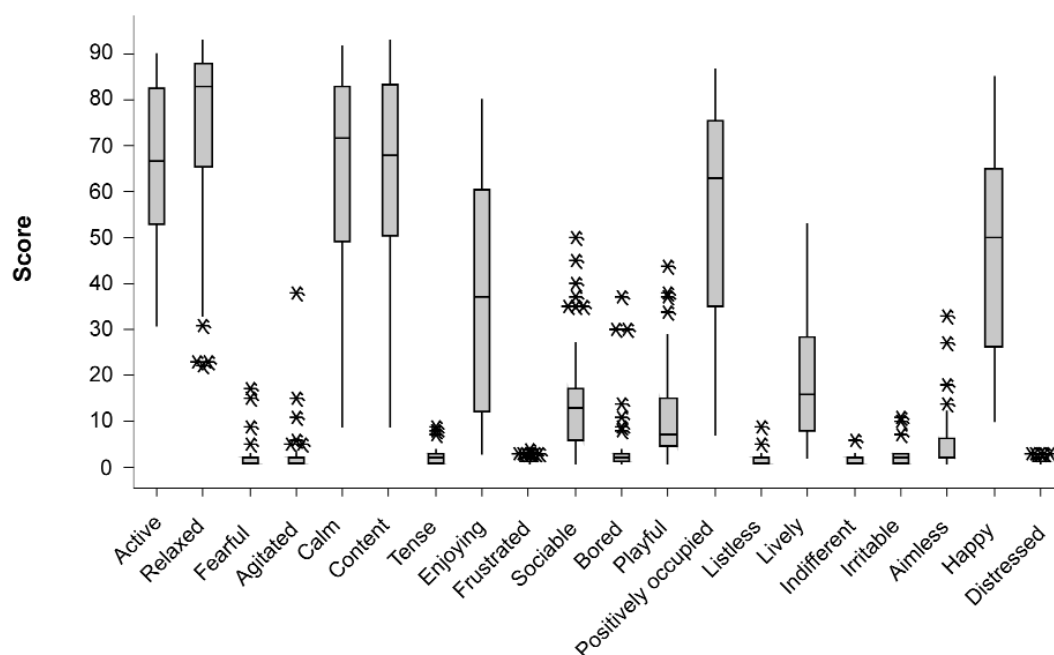
similar to the criteria mentioned by farmers. Farmers highlighted the importance of good health for pig welfare, and a variety of different health conditions were assessed in the prototype monitoring system. Farmers also placed emphasis on the animals' behaviour when assessing welfare, ensuring that they do not look stressed or act in an aggressive manner, and these parameters were assessed by the behavioural measures within the prototype monitoring system.

Scores of the 20 terms used in the QBA section of the monitoring system are presented in Figure 1, and include several terms that farmers mentioned in the survey when asked how they assessed the welfare of their own animals, namely 'relaxed', 'playful', and 'content'. Positive terms in the QBA (eg active, relaxed, calm, enjoying) showed much greater variation than negative terms (eg fearful, tense, frustrated). On each farm, the QBA was carried out first, so that the assessment of the terms was not biased by the outcome of other measures incorporated in the prototype monitoring system (eg body injuries). There were no significant correlations between the proportion of animals on a farm with intermediate and severe body injuries or health problems and the farm score for the specific QBA terms of 'relaxed', 'content' and 'playful', suggesting that the instinctive terms that farmers use to assess welfare do not bear any relation to these more objective measures of welfare (Table 2). Similarly, there was no significant correlation between the proportion of animals that permitted the farm assessor to be in close physical proximity to them and the farm score for the terms 'relaxed', 'content' and 'playful' (Table 2). However, the proportion of animals on farms displaying stereotyped behaviours (eg sham-chewing, drinker biting) was highly significantly correlated with the farm score for the terms 'relaxed' and 'content' (Table 2).

#### **Discussion**

In this paper, the question of whether farmers (engaged in farm assurance schemes or not) and scientists differ in their understanding and assessment of farm animal welfare has been addressed. Based on two separate studies, the paper focuses on UK farmers' perception and understanding of animal welfare and their criteria of assessment in contrast with those used by welfare scientists, using a specific case study of pigs. Although welfare scientists were unaware of the findings from the farmer survey, they independently produced a set of measures to assess welfare which were very similar to the criteria identified by farmers. Welfare science is focusing increasingly on using animal-based measures of welfare, and the prototype monitoring system discussed in this paper provides a novel and important method of assessing animal welfare in a practical on-farm context, predominantly using the animal itself as a source of information about its welfare. Some farmers complained that audit inspectors for existing farm assurance schemes (eg ABP) concentrate more on processes (eg ticking boxes to indicate the provision of a particular resource) and less on the animal itself (Hubbard *et al* 2007). The prototype monitoring system described in this paper may therefore be more acceptable, and possibly of more value to farmers, given

Figure 1



Score values attributed on a 0–125-mm line (where 0 indicates that the expressive quality indicated by the term is entirely absent in the observed pigs, and 125 indicates that it was ubiquitously dominant) for a list of defined terms used in the QBA part of the prototype welfare monitoring system.

**Table 2** Correlation coefficients and significance levels for a select number of measures from the prototype monitoring system and specific QBA terms.

Measure	QBA score for terms used both by farmers and in the prototype monitoring systems		
	'Relaxed'	'Content'	'Playful'
Proportion of animals with intermediate or severe body injuries	$r = -0.241$ $P = 0.129$	$r = -0.138$ $P = 0.388$	$r = -0.100$ $P = 0.534$
Proportion of animals with intermediate or severe health problems	$r = 0.183$ $P = 0.252$	$r = 0.112$ $P = 0.112$	$r = -0.096$ $P = 0.552$
Proportion of animals that permitted the assessor to be in close proximity	$r = 0.094$ $P = 0.558$	$r = -0.169$ $P = 0.291$	$r = 0.097$ $P = 0.548$
Proportion of animals displaying stereotyped behaviours	$r = -0.713$ $P = 0.000$	$r = -0.590$ $P = 0.000$	$r = -0.206$ $P = 0.197$

that it uses similar animal-based measures to assess welfare to what they use themselves and, furthermore, the focus is on the animal and not the provision of resources.

In the farmer survey, farmers highlighted the importance of good health for pig welfare, and a variety of different health conditions are assessed in the prototype monitoring system. Farmers also placed emphasis on the animals' behaviour when assessing welfare, ensuring that they do not appear stressed or act in an aggressive manner, and these, amongst others, are assessed by the behavioural measures within the prototype monitoring system. The findings from the

farmers' survey are in accordance with those of Vanhonacker *et al* (2008) who reported that farmers considered aspects related to 'feed and water', 'animal health' and 'human-animal relationship' as the most important for an acceptable level of farm animal welfare, but also regarded the animals' ability to engage in natural behaviour as relatively important. The farmers' survey also revealed that there are some differences between farmers participating in various farm assurance schemes, with those members of Freedom Food and Soil Association defining animal welfare primarily on a moral basis and the freedom to express

natural behaviour. Nonetheless, there are no differences between farmers as regards the criteria employed to assess the welfare of their animals.

Several of the assessment criteria identified by farmers corresponded with those in the prototype monitoring system, eg the provision of necessary resources, good health, lack of diseases and vices, and animal appearance and appropriate behaviour. The findings of this research are supported by Keeling and Book (2008) who noted that monitoring animal welfare using animal-based measures “fits well and is similar to how farmers assess the welfare of their animals”. In some respects it could be argued that the prototype monitoring system is providing a more scientific and objective way of assessing welfare using virtually the same criteria as farmers use currently. There are many similarities between the criteria that respondents in the farmer survey use to assess the welfare of their own animals and the measures incorporated in the prototype monitoring system (eg health, behaviour). However, the measures in the prototype monitoring system are reliable, feasible and have been validated, and consequently are more robust than subjective farmer opinion. The QBA incorporated terms that farmers in the survey had used to describe the welfare of their animals (ie ‘relaxed’, ‘content’, ‘playful’), however, the lack of significant correlation between objective welfare measures, such as body injuries or health, and these terms suggests that these ‘instinctive’ terms that farmers use to assess welfare do not, in fact, bear any relation to more objective assessments. Nonetheless, the QBA element of the prototype monitoring system may reassure farmers that their personal judgement of animal welfare is still valuable.

Webster (2003) warns that any welfare assessment that is based only on behaviour, or motivational state, or physical appearance, or production performance, is never a true reflection of welfare. This sentiment appears to be shared by both the farmers in the survey and those responsible for the development of the prototype monitoring system since both use a combination of animal-, resource- and management-based measures when assessing welfare. Although farmers in the survey placed a high regard on the animals’ appearance and behaviour as an indicator of welfare, they acknowledged the importance of providing the necessary resources (ie appropriate food and water, bedding, sufficient space). Similarly, the prototype monitoring system uses resource-based measures, including stocking density, and bedding and environmental enrichment provision, since more objective measures such as these are also important in assessing welfare. If the prototype monitoring system is developed into a fully operational ‘scheme’, consumers, through clear profiling and marketing of products, may make informed welfare-friendly product choices, and farmers may perceive the ‘scheme’ as valid and useful as they would be able to identify with many of the measures used to assess welfare.

Farmers are legally required to safeguard the welfare of their animals, and many are members of farm assurance schemes which further regulate animal welfare, and in some cases (eg Freedom Food), set standards that exceed

minimum legal requirements. These schemes, consumers, retailers, and even the scientific community to an extent, can demand certain levels of animal welfare, but ultimately it is the farmer who is responsible for the day-to-day welfare status of the animals on his farm. With the exception of the case studies carried out within the Welfare Quality® project (WP3) and more recently Vanhonacker *et al* (2008) and Dockès and Kling-Eveillard (2006), the authors are unaware of any other studies where farmers have been questioned on how they assess the welfare of their own animals. The pilot studies of the prototype monitoring system described in this paper were not carried out on the farms of those who participated in the survey, however, both farm and farmer samples were reflective of ‘standard’ pig production systems. In general, low levels of clinical welfare problems (eg body injuries) were observed on farms participating in the prototype monitoring system (Scott *et al* 2009), and this may be due to the fact that farmers place a high regard on animal appearance and health when assessing welfare themselves.

### Animal welfare implications

Any welfare assessment based on one element of welfare alone, for example only behaviour, or only physical appearance, can never tell the whole story (Webster 2003). This is supported by the present paper, since both farmers and scientists use a combination of animal- and resource-based measures to assess welfare. The prototype welfare monitoring system described in this paper provides a novel and reliable method of assessing animal welfare using predominately the animal itself as a source of information about its welfare. Farmers who express concerns that some farm assurance schemes focus more on the paperwork and minor omissions than inspection of the animals may therefore view the Welfare Quality® monitoring system as a better reflection of the welfare status of their animals. Additionally, any technique developed by scientists could benefit from the co-operation of farmers, and thus work together to contribute to the development and promotion of higher animal welfare standards.

Environmental- and production-based descriptors used commonly in many farm assurance schemes and welfare monitoring systems are not always the most valid tools with which to assess welfare, nor are they representative of day-to-day measures used by farmers to assess their own animals. Whilst farmers consider the provision of adequate resources as an important factor in ensuring good welfare, they place a high regard on the animals’ appearance and behaviour as an indicator of welfare. The prototype welfare monitoring system using predominately animal-based measures of welfare described in this paper could therefore be perceived as valid and useful by farmers and could stimulate welfare improvements.

### Acknowledgements

The authors wish to thank all the farmers who participated in both studies and colleagues from the Animal Sciences Group, Wageningen University and the Farm Business Survey Units from Newcastle University, Imperial College



Wye, Askham-Bryan York and University of Exeter. The help of the Soil Association and Freedom Food is also gratefully appreciated. We also extend our sincere thanks to Professor Sandra Edwards for helpful comments on an earlier draft of the manuscript. We also thank all reviewers for their comments. This study is part of the Welfare Quality® Project, which is co-financed by the European Commission, within the 6th Framework Programme, Contract No FOOD-CT-2004-506508. The text represents the authors' views and does not necessarily represent a position of the Commission who will not be liable for the use made of such information.

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